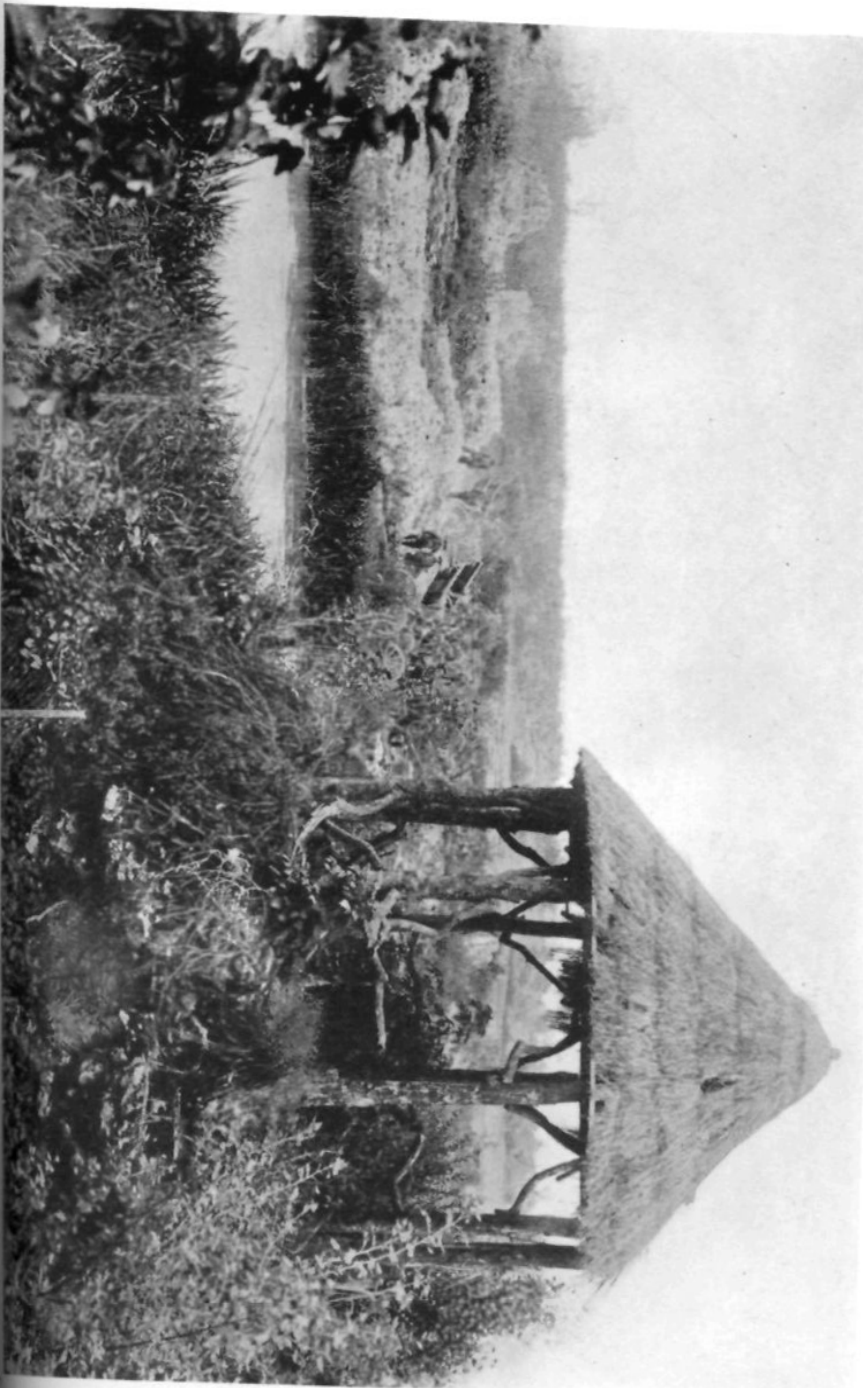


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IN THE MEUSE-ARGONNE
BATTERY C, 130TH FIELD ARTILLERY ACROSS THE RIVER AIRE VARENNES FRANCE, SEPTEMBER 27, 1918

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NO. 3

CANNON

WHEN Henry the Eighth was England's king,
Armed in its majesty and might,
Four hundred cannon might roar and bring
Terror to man-at-arms and knight.
Culverin, bombard and falconet,
Massed as a menace to overwhelm,
Ready on carriage and parapet—
Such was the threat of a single realm.
Proudly a chronicler wrote and well,
"Cannon enough to conquer Hell!"

Time told off of its centuries four.
Cannon by thousands flamed in France,
Thunderclaps of a world-wide war,
Miles of deafening dissonance,
Field piece, mortar and howitzer
Hurling steel in a crimson blaze.
But he in the place of the chronicler,
Spending no words on a fine-wrought phrase
In his communiques, terse and short,
Mentioned artillery support.

FAIRFAX DOWNEY.

A FIELD ARTILLERY VIEWPOINT OF ORDNANCE DEVELOPMENT

BY MAJOR RALPH McT. PENNELL, F.A.

A LECTURE DELIVERED IN THE OFFICE OF THE CHIEF OF ORDNANCE

You are doubtless familiar with the two adjacent newspaper columns, one entitled, "We note with alarm," and the other, "We view with pride." It is under the last title that the field artillery view of ordnance development belongs. We do view with pride and with satisfaction your energetic and your successful efforts to develop the equipment best adapted to our needs and suited to our uses.

This discussion is concerned principally with ordnance development since the war and with future development, but you will not forget, I hope, that the ordnance development before the war is the very solid foundation on which our present advancement is based.

I would not have you think from the subject of this talk that the views I may express reflect the studied opinions of all of your field artillery customers. You will fully appreciate that what is said can hardly be more than the viewpoint of one field artilleryman and that you should give it only that weight.

My interest in ordnance development runs back to a visit as a cadet to Watervliet and a later attempt to join your attractive branch.

I was a sort of a chief gunner for the field trails in 1908 of another ordnance development, that is, of the old 3.8-inch and 4.7-inch guns and the 3.8-, 4.7- and 6-inch howitzers. One of them gave up the ghost at a very inopportune moment, so that I still carry a piece of it with me. All the parts were carefully gathered up, for study and investigation. The only thing that could not be found was a prism of the panoramic sight. Captain Westervelt expressed his sympathy by saying that it was most unfortunate it had not located in the part of my anatomy more in need of light.

One of your best officers said recently in conversation, "I feel that our present designs of guns and carriages are as far from what they might be as is the automobile of 1902 from the automobile of to-day." That well illustrates the ambition of your department to give us the best possible weapons, but we must remember that cannon have been developed over a much longer period than automobiles and that our recent models compare favorably with the development of any other country.

The report of the Calibre Board, in 1919, provided an orderly

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plan as a guide for ordnance development for the Field Artillery. Much discussion of the value of its recommendations has taken place, but its greatest merit has been that it provided for our ordnance engineers certain definite requirements and characteristics for cannon. This report, being the consensus of the best artillery thought of the principal allied nations at a time when the lessons of the war were very fresh in their minds, is entitled to the reliance which you have placed on it.

It is doubtful if any member of the Board expected that so many of its specifications, laid down as ideal, would have been accomplished practically in this comparatively short time. That you have in some cases even exceeded those requirements, is proof of the energy with which you have attacked the problems it set for you. The Field Artillery extends to you its heartiest congratulations on this progress and thanks you for it. More than all, it appreciates the truly loyal effort you have made to meet in every way its desires and to fill its needs.

THE DIVISION GUN

The first model in the evolution of the new matériel proposed in the specifications of the Calibre Board, came out in 1920. Though keenly interested in all the development, the Field Artillery has probably watched with greatest interest that of the division or light gun. Four models have been constructed; two of the split trail, and two of the box-trail, axle-traverse type.

The 1920 Model was laid to conform as nearly as possible to the Calibre Board specifications. That is, it is a carriage common to the gun and the light howitzer, has 30° traverse, 80° elevation and a range of 15,000 yards. It weighs 3700 pounds.

The Field Artillery Board concluded that this weight, which is 1000 pounds more than our present equipment, was too great. Many also believed that a suitable carriage of box-trail type was possible. In order to give expression to that view the 1921 Model was built. This carriage has 10° traverse, 52° elevation, and weighs 2700 pounds.

The Board found it in the main satisfactory. However, the proponents of the split-trail type felt that in the construction of this model advantage had been taken of the experience gained in building the 1920 Model so that a comparison of the two was unfair to the split-trail type. For that reason the Model 1923 was designed as a split-trail gun. It has 45° traverse, 52° elevation and weighs 3200 pounds. This carriage is equipped with steel tires, which are about 200 pounds lighter than rubber tires.

It will be noted that the requirement of a carriage common to

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the division gun and howitzer, had been abandoned after the 1920 Model was built.

Before this latter model reached the Board for the field test, a sighting system designed to afford the advantage of the independent line of sight without its complication, was envolved. Also the Model 1925, 105-mm. howitzer, which was a box-trail carriage, was believed to embody a number of improvements over the 1921 Model box-trail 75-mm. gun. In order to test these in a 75-mm. gun carriage, the 1925 Model was built. This carriage has 9° traverse, 50° elevation and weighs 3000 pounds, equipped with steel tires.

It is apparent that the question of whether or not this division gun should be split trail or box trail is of considerable importance. Without reciting the numerous arguments for and against, it may be said that the question is in fact whether or not a wide traverse is necessary. The box-trail supporters say that the price of increased weight, complication of design, and less rugged carriage, is too great to pay for wide traverse. The split-trail supporters say that tanks are certain to be a pressing problem for the future artillery, and that it must be ready to fire promptly over wide fronts. These, with other reasons, they regard as of sufficient importance to compel the adoption of the wide traverse gun, whatever the price.

At first thought it might be concluded that it should not be necessary to build four models in order to develop a 75-mm. gun. On the contrary the building of these models has been of the greatest value in permitting a thorough study of all phases of the problems attending its development. It has afforded our designers invaluable experience and has given a background for the final design, which could have been attained in no other way.

In the development of an automobile engine brought out at the automobile show this year, it was stated that ten distinct and different engines were built and discarded before adoption of the one shown. Now, if one member of the automobile industry, with all the hundreds of various engines before him, finds it necessary to do that, we must conclude that the only company in the United States (that is the Ordnance Department) charged with the production of the most important artillery implement, has been very conservative in building only four models. Maybe before the final weapon is accepted, four more will have been built, but if that final weapon is superior to that of any other nation, the money and work will have been well spent.

The Field Artillery feels that the development so far has been along right lines, that great progress has been made, and that the final product will be satisfactory. In fact satisfactory models have

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already been produced. It is only that we desire to perfect them by approaching still closer to the ideal specifications.

THE DIVISION HOWITZER

The development of the division howitzer has passed through about the same stages as the gun. Following the rejection of the common carriage idea after the 1920 Model, a box-trail carriage known as the Model 1921 was built. This carriage has 8° traverse, 65° elevation and a range of 12,000 yards. It weighs about 3000 pounds. The axle of this carriage is of I-beam cross-section, curved so as to avoid movement of the wheels in traversing.

The Board, after testing this carriage, recommended a number of modifications and the construction of a third model embodying them. The 1925 Model was built as a result of this recommendation. It is of box-trail construction also. Its most noteworthy characteristic is that about 50 per cent. of the total weight moves in recoil. It has 8° traverse, 65° elevation, and weighs about 3000 pounds. This model is still at Aberdeen undergoing certain modifications and so has not been given a field test. Meanwhile a model of the split-trail type is being laid down.

A diversion came up in the development of this howitzer, from the proposal to adapt to our use a number of 105-mm. German howitzers on hand from captured matériel. It was felt to be of importance to get such a howitzer into actual use as promptly as possible. While every country engaged in the war has since emphasized the necessity of a light howitzer, we have none in service. The teachings at our service schools do not include its use and its importance may be overlooked by those who will later control its incorporation into our organization. For several reasons this temporary use of the German matériel was deemed inadvisable and its conversion to our use was abandoned.

CORPS GUN

The 4.7-inch gun and the 155-mm. howitzer, Model 1920, were also mounted on a common carriage. Sacrifice of desirable characteristics of both the gun and howitzer were found necessary, to adopt them to the combination carriage. This idea was, therefore, abandoned.

The 1921 Model 4.7-inch gun was built. This model has 60° traverse, 45° elevation, weighs in firing position around 11,000 pounds, and has a maximum range of over 20,000 yards with a 50-pound projectile. It passed the proving ground tests in a very satisfactory manner, and is now under test by the Field Artillery Board. It is a very handsome gun—a delight to any artilleryman's

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eye. If its field performance equals its appearance, the corps gun problem is solved.

CORPS HOWITZER

The 1920 Model 155-mm. howitzer, mounted on the common carriage, has been given its service test. This howitzer has 60° traverse, 65° elevation and weighs 13,000 pounds. Its maximum range is 16,000 yards with a 95-pound projectile. Here is an excellent illustration of what we must pay to get the increase in range we demand. Our present howitzer has a maximum range of 12,500 yards, with the same weight of projectile, and weighs 7600 pounds in firing position. That is, for an increase of 3500 yards in range the cost is about two and a half tons in weight with the probable necessity of having to add the complication of a transport wagon.

A later model, improved as a result of the tests of the 1920 Model, is being built. It will doubtless represent a considerable advance over the first model.

ARMY MATÉRIEL

The 155-mm. gun and 8-inch howitzer, Model 1920, were also mounted on a common carriage. Here the ballistic and other requirements are such that it is probable that the specification of a common carriage can be complied with, without sacrifice of the desirable features for either weapon.

Quite properly the development of this heavier matériel has not been pushed at the same rate as that of the lighter matériel. Much that is learned in the development of the lighter can be applicable to the heavier matériel and the final result attained at less cost.

PACK ARTILLERY

It has been said that the only three things we are sure of are death, Hell, and taxes. The Ordnance Department probably feels it is sure of a fourth,—that is, the pack-gun problem. Shall it be a four-mule load or a six-mule load; must it be strong enough to fall off a mountain undamaged, or must you catch it in a blanket when the mule bucks it off? Whatever the correct answer may be, one has been built of fairly sturdy parts, packing in six loads, firing the regular 75-mm. projectile over 9000 yards, and weighing only 1250 pounds.

Surely that ought to satisfy the long range half of the mountain artillery anyway.

In the developments of the practical weapons having the characteristics of the ideal as laid down by the Calibre Board, you have met with restrictions imposed from time to time by the Field Artillery. For instance, it has required that the clearance under the axle must

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be a certain amount and that parts subject to damage must not extend above the profile of the wheels.

Is it possible that in your efforts to give us what we think we want, you have too readily accepted those restrictions without telling us what we would have to pay for them? You must remember that we do not have your knowledge and experience in design, and it may be if you told us that in order to get the required clearance it would be necessary to raise the centre of gravity, which would make the gun less stable in firing and on the road, or that if no small parts could extend higher than the wheels, then the sighting mechanism could no longer be attached directly to the gun trunnions and that both of these changes would necessarily add to the weight, we would want to hedge on some of those restrictions or at least to compromise on them.

Such compromises are difficult to secure by correspondence or even by personal conference when the work consists of study of drawings and examination of wooden models. For most of us, to be able to intelligently criticise any new design, we must be familiar with it from the first rough sketches. That is the only way we can know why the sight mechanism is located as it is, or why it is necessary to use the particular design of elevating arc found. One may say that the teeth of this elevating arc should be on the under side, instead of the top side, in order that it will not gather and hold such dirt and small stones as may be thrown on it in travel. But if it is known that the rough draft did show it that way, and that it had to be changed in order to locate some gear train in the limited space available, the criticism will fall.

You have made the drawings and models and plans free for our examination, but I think we must go farther. An experimental gun costs a lot of money. The Field Artillery can well afford to put two of its best officers on duty in your office for the entire time of the design and building of any new piece of matériel for its use.

If they are experienced officers, as they should be, their advice would be of assistance in working out the many hundred details that come up in designing a new weapon, because they ought to be able to present the users' view at the time at which it is most useful to the designer, and at a time at which suggested changes can be put into effect with the least cost, that is, when it is being put on paper. Numerous details arise in which it is just as easy for you to do one thing as another. Discussion right at the time would determine which is preferable to the users. These men should be available for the immediate call of the designer and draftsman. On many minor points the latter cannot wait two or three days or two or three hours; he must discuss the points as they arise or not at all. Unfortunate as it may be, I am convinced that it is the sum of these little

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details, maybe unimportant in themselves, that greatly influence the reception given a new weapon by the using service, somewhat like the boy who could not see the city for the houses.

These officers would go to Rock Island and be there while the new matériel is being manufactured. In this way they would know the evolution of every part, from the first sketches to the finished product. They would be present throughout the tests by the Field Artillery Board. Their intimate knowledge of the piece would be of inestimable value to that Board. Such recommendations as it might decide were necessary, would then be made with a full knowledge of all the considerations that have influenced you in the design.

For example: Not long ago the 1925 Model of the 105-mm. howitzer was received at Aberdeen. In this howitzer the piston rod is fixed and the recuperator recoils when the piece is fired. It was stated that this was done to make the recoiling weight as great as possible and so reduce the strain on the carriage. A few weeks later a 75-mm. gun was received, mounted on a similar carriage, except that in this one the recuperator does not recoil. Now the question will immediately arise, when these two carriages go to the Field Artillery Board, "If it is a good thing to have the recoiling weight as large as possible for the howitzer, why does not the recuperator also move in recoil in this new gun?" If we had on that Board men who are familiar with the entire history of the development and building of the two pieces, they would know why and at once dissipate any prejudice that might arise.

The Board may say, "It is important to have the teeth on the bottom of this elevating arc." These men would be able to say, "We did try that and found it would be necessary to move the top carriage two inches to the rear, and this in turn required lengthening the trail six inches to regain the stability we had before."

At present a new gun with a descriptive handbook is sent to the Board. They have never seen it before and are totally unfamiliar with it. Though that Board is made up of the best officers, specially selected, it is inevitable that a large part of their time during the test is really spent in learning the whys and wherefores of the piece.

You who are here in daily touch with all these matters, knowing the history of each development from its inception, can realize how valuable an intimate knowledge such as that, would be if constantly available to the board making the test. Might not such a plan produce with less expense and fewer models a weapon combining more completely the best thought of the producer and of the users, and would it not be more likely of adoption?

General Rohne says, "Tacticians, constructors, and ballistic experts must coöperate in the projected design of a new field gun. I do not consider it proper that the tactician should regard great

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range as of a primary importance, since it is only in exceptional cases that it is requisite. If he demands a great fire effect at decisive battle range, then the necessary range has already been obtained. If this does not suffice, he must be prepared to concede a greater weight to the gun."

SIMPLICITY OF DESIGN

As the specifications for the ideal gun grow more complex, it is inevitable that the gun itself will be more complicated. Probably many of us thought when greater elevation and traverse were specified, that it was mostly a matter of making the traversing rack longer and putting some more teeth in the elevating arc. Because it was not admitted that such methods were not practicable, we have continued the split-trail box-trail argument through several years, although the split trail was inevitable from the moment wide traverse of 30° or more was demanded. The price was loss of ruggedness and increase in complication, and we were haggling over the price.

The specification for greater elevations forced the gun trunnions from the centre of gravity toward the breech, which in turn compelled the use of equilibrators. It also necessitated the adoption of variable recoil or the digging of a pit at the higher elevations.

The possibility of rubber tires for guns forced the more complicated brake drum and brake band with its lining, over the old iron shoe attached with two bolts and applied against the tire.

On becoming enamoured with the independent line of sight, we added another elevating device and another set of tipping parts.

Such a list can be greatly extended. It is enough to show that a carriage more complex than our old one is unavoidable. It may not be so apparent that simplicity of design is a more urgent matter than ever. The average field artilleryman is not mechanically inclined nor can we expect many high-grade battery mechanics in war, after you preferred creditors have exercised your selective draft privileges.

The simpler that you make the parts of this machine, the fewer guns will be missing from the firing line and the less overwhelming the work of your maintenance company. It may happen that what is mechanically 99 per cent. perfect when in adjustment and clean, may be only 50 per cent. efficient, on the average, when in service use. Often what is the best theoretical design is not the best practical design. Something that surely works is better than some highly efficient machine which is easily damaged through abuse, so that it will not operate.

For example, some of our new weapons have a number of roller and ball bearings. They also add to the number of the parts and the adjustments. The failure of one of these bearings might put

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the piece out of action. These are not sufficient reasons to reject the anti-friction bearings, but we should not adopt them simply because they are desirable. To adopt them, and the added complication, it should be necessary to show that the old, plain bearings are unsatisfactory.

A firing mechanism of a number of parts and difficult to assemble, should not replace one of the hammer-and-nail type, unless other reasons make it necessary.

If the pump for replenishing the oil can be attached directly to the recuperator, it should not be necessary to attach it to the gun and then connect a long piece of easily damaged copper tubing between the pump and the recuperator.

The method of moving the gun tube back to the travelling position should not require several implements. The travelling lock should be so constructed as to lock the top carriage and gun tube together whether the tube is in the firing position or travelling position, rather than two separate locks.

After the design of the gun and carriage is completed should come the work and study of how each part may be simplified to reduce the number of parts, avoid difficulty of manufacture, and simplify maintenance while in service.

The ease of serving the piece is a component in its efficiency sometimes not fully considered. If the positions of the members of the gun squad in laying the piece are constrained, the accuracy will suffer as these men grow tired. If the location of the bubbles, scales, and eyepieces, are difficult to see, or the location of the handwheels are such that the gunner cannot comfortably look from sight to bubbles and back again, efficient and rapid service is difficult. If empty cartridge cases fall so that one removing them is in danger of being struck by the recoil, the rate of fire is decreased. When the location of the gunner is such that he is continually being pushed by the loader, trouble arises. All these things effect the accuracy just as surely as poor design.

The statement is frequently met that the tractor has increased the allowable weight limit for the division gun. The weight limit is governed by the requirement that the cannoneers must be able to easily manhandle it in and out of gun pits, across obstructions impassable to the draft power, and for rapid shift of fire. This is abundantly borne out by the ideal specifications of the English, French and Germans since the war.

SIGHTING APPARATUS

The importance of convenient arrangement of the sighting apparatus has been mentioned. It is possible that the designers of some of this equipment have worked under the difficulty of not

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having before them the gun or howitzer on which the design is to be used. To locate bubbles and various rotating handles so that they will be convenient and yet not easily damaged in transport, is difficult enough under any circumstances.

It is probable that the time has come to consider redesign of the panoramic sight to take advantage of the advance in the methods of waterproofing, arrangement of the scales, and reduction of size.

Considerable variation in the design of the levelling bubbles is found in our matériel. With the higher velocities any deviation from the proper elevation produces a greater error in range. This makes desirable a level vial very sensitive near the centre of its run.

Lost motion in the range drum or between the sighting apparatus is another cause of inaccuracy hard to eliminate. The difficulty of doing this is shown by the fact that, for very accurate laying, battery commanders generally prefer the use of the gunner's quadrant placed directly on the metal of the tube.

AMMUNITION

The recuperators, the breech blocks, the carriages, the guns and the tractors are only the means to an end. All those accessories, and the artillery itself, exist purely for the object of putting projectiles where they will be effective. The expenditure of ammunition on any target depends mainly on two things,—the efficiency of the projectile, and the ability to place the projectile in the target. We feel that here is the greatest opportunity you have to help us be more efficient artillerymen.

Since the war you have opened up in this subject an unexplored field. It is because you have already shown us so many of the possibilities, that we are eager for you to go the limit. We realize that it will take months and years of research and experiment to cover all the possibilities, and that at the end you will not have a wonderful machine to exhibit as a monument and a proof of your achievements.

The approved methods of fire to-day contemplate that the greater part of artillery fire will be as concentrations on definite targets. At present there are many targets on which the artillery does not fire because the expenditure of ammunition and time is too great. Our new drill regulations state, "The expenditure of ammunition necessary for the destruction of a battery, provided the adjustment has been accurate and the fire is observed and corrected during fire for effect, is, for the 75: from 500 to 800 rounds, depending on the range." "To open a breech on horizontal terrain through an entanglement 15 to 30 yards deep the average expenditures are: at 4000 yards, 800 rounds: at 7000 yards, 1200 rounds."

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That is the price we pay for dispersion. If you can cut those figures in two, you have, in effect, doubled the number of guns in a division. Obviously the problem is worthy of your best thought and study.

The effect of such an increase in accuracy would be far reaching, and would greatly affect the principles for the use of the artillery in the attack. You remember that the artillery preparation for an attack in the World War grew until it required so long a time and consumed so much ammunition that its use became prohibitive because of its cost in these two vital elements, and the tactics of making the attack without any artillery preparation at all came into use. We know that if our infantry follow the barrage close enough for it to be of real use to them, they will suffer some casualties from the fire of their own artillery. Here again, if dispersion can be cut in half, tactics would doubtless be changed.

You are not responsible for all the factors causing dispersion. The artillery itself must shoulder some of them. The proving ground probable errors are increased 50 per cent. for field use. Under that assumption the artillery is responsible for one-third of the dispersion. This is not the place to discuss its efforts to reduce this. We hope you will give continuing study to each of the factors causing the other two-thirds. It may be that the artillery, in its constant and rather insistent demand for more range, has not sufficiently emphasized at the same time the importance of accuracy.

Of the factors producing the other two-thirds of the dispersion of which we spoke, variations in muzzle velocity have been mentioned as one of the largest. One suggestion worthy of study is the use of a quicker powder. The effect of the use of such powder on the design of the gun, I do not know. The experiments in bursting guns, carried on last year at Aberdeen, indicate that our guns may be able to safely stand much higher pressures than we have heretofore considered safe.

The Calibre Board's report pointed out some defects of Nitrocellulose powder, stating, "This powder takes up moisture from a damp atmosphere and deteriorates in its ballistic qualities. It requires elaborate and expensive containers and, even with the containers which have been provided, large quantities of powder have been rendered unfit for service. A powder containing nitroglycerine, or similar compounds, can be used in simpler containers and will tolerate adverse conditions of moisture." I think the board also had the impression that the powders used by some other countries gave greater accuracy than ours.

After thorough investigation you found it possible to eliminate the objections, cited above, to the use of our present powder, and to continue its use. It ought to be determined beyond all doubt that

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in meeting these objections its ability to give uniform velocity has not been lowered.

Just what a complete investigation of dispersion will lead to is not known. The Field Artillery School endeavors to show the students each year by demonstration what a well-trained firing battery should be able to do. In preparing for this the guns were being calibrated. The dispersions of the individual guns varied greatly. In further firing an old gun, condemned as past its useful life, was brought in. This gun put all its shots, not in the 100 per cent. zone, but in the tabular 50 per cent. zone, while the shots from a comparatively new gun fell in what might be called the 150 per cent. zone. Now this new gun, when star-gauged, was normal in every way. The layings were all accurately checked by an officer. In order to eliminate any hidden personal error the gun squads were swapped, but the results were unchanged. Somewhat the same differences between an old and a new gun were observed in the range firing of the 155-mm. howitzer at Aberdeen last year.

In some 3-inch anti-aircraft gun firings it was found that in the same gun, after it was so worn and coppered up that apparently the rotating band did not take the grooves at all, the accuracy was greater than when the gun was new and the rotating bands of the projectile showed perfect engraving from the lands.

Investigation of such anomalies should give valuable information on the subject of dispersion.

PROJECTILES

The investigation of the projectile form is another field in which what you have already done shows such possibilities that we hope for a great deal more. Your wonderful improvement in the small arms bullet leads us to hope that through exhaustive study you may do as much for the larger artillery projectiles. This will include a study of the ideal weight of projectile for each calibre. In a very interesting article by General Rohne on this subject the inference is drawn that our present weight of shell should be slightly increased. He indicates the lack of accurate knowledge on this subject by pointing out that during the World War the demand for greater range was met by the French, who increased the weight of their projectile, and by the Germans, who did the opposite and reduced the weight of theirs.

Investigation of projectile forms has two objects, first and foremost, improvement of accuracy and, second, increased range. If these two requirements are conflicting, the accuracy requirement must control. If, as in the case of the 75 when the normal and supercharge rounds are issued already made up, it would be possible, it might be desirable to issue the normal round with a projectile whose

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form is controlled solely by the accuracy requirement, and the supercharge with a projectile whose form is such as to give the greatest range.

FUZES

The Calibre Board stated, "It is especially desirable to reduce the number of types of fuzes issued to any single organization. In the past war 75-mm. shells were normally supplied with four varieties of fuzes. It is recommended the number be reduced to two."

Our efforts to produce a single fuze, giving either an instantaneous or a short delay action, have met with many unexpected difficulties. Such a fuze would simplify ammunition supply and would facilitate the service of the piece by permitting the ammunition to be issued already fuzed. It is sincerely hoped that you will not be discouraged by this admittedly difficult problem and we have all full confidence in your ability to get the desired result. Major Anderson stated, "Such a fuze offers advantages to the Field Artillery sufficient to warrant the utmost effort in its perfection. Setbacks and difficulties in obtaining this end should but call for greater ingenuity and effort in its development."

Your experiments at Aberdeen and those of the Field Artillery Board, emphasize the importance of the super-quick action. Every inch that the projectile enters the ground before the fuze acts, reduces its efficiency at a rapidly increasing rate. Our fuze must be the equal, and we hope the superior, of the I A L fuze in this respect.

High-burst ranging, as a method in the adjustment of fire, has been developed and promises to be of a considerable use. A time fuze for shell is desirable. Means for providing this should be studied.

FORMS OF PROPELLING CHARGES

The increased use of the howitzer as a division weapon, with the requirement that the angle of fall exceed 25° , and the use of reduced and normal charges or normal and super-charges for guns, has complicated the form of propelling charges and also their use. The 155-mm. howitzer has seven zones; the base charge and the six increments are all of unequal size. Several practical difficulties arise in the use of these charges:

- (a) The firing tables are quite large.
- (b) Mistakes may occur in night firing due to the difficulty of distinguishing the several increments from each other.
- (c) In loading, the increments do not always take the same position with respect to the primer and irregular ignition may occur resulting in variations in muzzle velocity.

Some months ago some experiments were conducted in which the various increments were put up in pyralin containers. These containers

VIEWPOINT OF ORDNANCE DEVELOPMENT

are short cylindrical boxes and may have a hole through the centre to fit over the primer. For some reason the experiments were stopped. It is thought they offer sufficient promise to be worthy of more extended trials. They have several advantages,—the silk cloth container is no longer necessary; the increments always occupy the same position with respect to the primers; the possibility of using the wrong charge at night could be reduced by a sort of charge measure. This measure might consist of two space blocks set at a distance apart corresponding to the height of the increments making up the charge ordered. By this means the cannoneer would not require a light to read numbers in making up charges, but would know he had the correct charge when the increments exactly filled the space between the two blocks. These boxes would also afford better protection against the weather for the charges. Their arrangement in the chamber of the gun should be more uniform than with the bag form of increment.

Our adoption of the sliding type breech block compels the use of the cartridge case in the small calibres and entails extra and perhaps unnecessary weight. The problem of getting these increments, whatever their form, out of the cartridge case is difficult. For these reasons a study of other forms of breech block is desirable.

MECHANICAL TRANSPORT

The World War gave a great impetus to mechanical transport. Taking advantage of the knowledge gained, your progress in the further development has been most satisfactory. You have designed a tractor for division artillery, for corps artillery, and for army artillery. You have also thoroughly investigated the commercial field. As a result we are satisfied that when the necessity arises the transport you furnish us will be suitable for our use.

The Field Artillery trusts you to continue to keep in close touch with commercial tractor development. You will doubtless soon initiate the necessary step to place tractors such as the Holt T-35, the Best 30 and Best 60 on your book of standards. We consider it of importance that by such indirect subsidies as you are able to provide, you assist the manufacturer of these tractors to keep them up to the required standard.

One of the deficiencies of mechanical transport has been the lack of a suitable cross-country reconnaissance vehicle. You have well supplied that difficulty in the recently developed light car with large tires. It can be made to run continuously at tractor speeds, which has been impossible with any other vehicle so far.

Much grief in our tractor development has arisen through the effort to secure excessive speeds for tractors. The primary requirement

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for tractors is that they be durable and reliable, that is, that they can be depended on to run continuously without breakdowns and frequent returns to the shops for overhaul. Speed is the deadly enemy of that reliability.

The Pavesi tractor appears to be a commercial tractor well adapted to emergency use. We cannot consider it so long as it is not built in this country, but if you are able to interest a strong organization like General Motors in introducing it here, it would be a great addition to tractors available for call.

No commercial tractor large enough to haul our heaviest loads is being manufactured. Whether the answer is to build a special tractor, to use two smaller tractors in tandem, or split up our loads into smaller units, is a matter for further investigation.

Our experiments with self-propelled mounts did not meet with the success we hoped. Here again I think the high speeds used were, more than anything else, responsible. At any rate the results were such that the Chief of Field Artillery recommended, "That no further development or experimental manufacture of motor carriages for the light guns or howitzers be undertaken at this time. This recommendation is based primarily on a consideration of the shortage of funds and the comparative importance of the project."

If at some later date sufficient funds are available, it is hoped it will be possible to resume the development of a 75-mm. gun on a self-propelled mount. Two very important uses suggest themselves. It ought to be an excellent anti-tank gun and it is another answer to the accompanying gun problem. A battery of four in the artillery brigade would permit their allotment so as to cover the front of the division in the attack.

The possibility of mounting the recently developed pack howitzer on the T-35 tractor should be considered. Here we have a weapon capable of firing the regular 75-mm. shell 9000 yards and the parts to be mounted on this tractor weigh about 800 pounds. Such a vehicle would offer a very small target, and should be very effective.

WORK OF THE ORDNANCE

If this talk has been largely of problems which still confront us, it is with no lack of appreciation for the tremendous progress you have already made. Rather it is because you have made such progress that we are encouraged to ask so much. Your achievements are sufficient guarantee to us that, as new problems arise, we may look with confidence to you for the best solution. It is for those past achievements the Field Artillery so sincerely thanks you, and because of them it views with pride and confidence its future weapons.

OUR NATIONAL DEFENSE POLICY

BY MAJOR HERBERT S. DUNCOMBE, JAG—RES.
(OF THE NEW YORK BAR)

CURIOSLY enough, the word "war" is of Teutonic origin, "werran," to confound, and has been variously defined to mean "the armed conflict of states, in which each seeks to impose its will upon the other by force"; "war is the opposite of peace and is the subject of military art." General Sherman gave us a terse and definite definition which was readily understood, although the events of the World War have caused us to enlarge our conception of his definition.

War has existed in some form or other since creation, first among the wandering tribes of mankind, who fought for possession and defense of necessities, and later, among political tribes of men, who called themselves nations, and who fought for economic and political reasons.

The instinct to fight, or rather the instinct to defend, is present in all creation, and every living thing has developed a defense against attack. Perry, in his "Ethnological Studies of Warfare," tells us that war has been in the world for twenty thousand years, and is not a primeval thing.

Wells, in his "Outline of History," in describing the development of man, says in substance, in reference to so-called hierolithic culture which began to develop in Mesopotamia in 4000 B.C., that the first condition necessary to a real settling down of Neolithic man was an all-the-year-round supply of war fodder for the animals, food for themselves, and building material for their homes. Under such conditions, man ceased to war and settled down, "almost unawares." But in the less fertile and more seasonable lands outside of these favored areas, there developed a thinner and more active population of people, which he calls the primitive Nomadic peoples. They hunted and fought constantly for pastures against hostile families. They became more war-like. The man who from a slow drifter for food settled down and grew grain, developed in an opposite direction from his nomad brother, who relied chiefly on cows and milk. So it was inevitable that these should clash, and the nomad should become hard and barbarous, and the settled folks soft and effeminate and very good plunder, and as the development of man progressed, every action of epoch in the history of their development shows some leader or tribe powerful enough to force

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a sort of unity upon its kindred tribe, and then begin a war of conquest. Instead of carrying off the booty, the conquerors settled down on the conquered land, and the villages and townspeople were reduced to servitude and tribute-paying.

This is a picture of the conditions of probably some twenty thousand years ago, at present a situation so modern that we recognize it readily. Our national existence was founded on war.

It is not the purpose of this monograph to prove that war must always exist, or that the fighting instinct of creation cannot be eradicated, or to decry any attempt by legislation, association, or otherwise to put an end to this destruction. Any sane man must be opposed to war. Its destruction of man, moral, and material, is a standing reflection on the intellectual progress of man, and every gesture for peace, even though ineffectual, is worth the spirit which promoted it. Prolonged periods of peace, extending over hundreds of years, in different hemispheres, are not unknown in history. Mr. Ling Chi Chao, in his pamphlet on "China and the League of Nations," says that in the sixth century, B.C., certain great powers in China laid the foundation for a league that kept peace for one hundred years. The pamphlet was a very able argument in favor of the League of Nations, and sought to prove the efficacy of the League. My purpose in quoting it is not to support any political contention, but merely to prove that prolonged periods of peace have not been unknown in the early history of mankind. But at this time, when the minds of the nation are leading us and the world to peace, it may be instructive, or at least interesting, to examine the history of our military policy, and see if it has been conducive to peace, and the preservation of the lives of our citizens, and a saving of treasure, or whether after one hundred and forty-five years of national existence without a military policy, having adopted one by the enactment of our National Defense Act, which Congress adopted as our military policy in 1916 and reaffirmed in June, 1920, we should not make it effective by carrying out its spirit and intent.

Our prejudice against the standing army is natural and hereditary. In my humble opinion, we have never thoroughly appreciated the distinction between an army subject to an autocrat, and an army subject to the will of the people, but if this distinction is not borne in mind, we are apt to carry on this hereditary prejudice.

Our ancestors had ample reason for their prejudicial attitude, founded on experience. McCauley, in his history of England, 1688, says:

"Our ancestors had known a standing army only as an instrument of lawless power."

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And Burnett says of James the Second's army:

". . . that it was kept for some time in western countries, where they lived at free quarters, and treated all that they thought disaffected, with rudeness and violence insufferable."

A petition of rights, which in 1628 Charles the First was compelled to accept, complained, among other things, that "the inhabitants were compelled to take soldiers into their houses against their will," and the Colonial Declaration of Rights of October 14, 1774, complained that "keeping of a standing army in these colonies in times of peace, without the consent of the legislature of that colony, is against the law."

All during the Revolution a feeling of intense opposition to a standing army seriously affected our military operations and crystallized into a passionate belief that a standing army was dangerous to the liberty of the people, which spirit can be recognized in the discussions in the Constitutional Convention on the adoption of the provisions limiting the power of Congress in dealing with that subject.

These historic facts and the experiences of the Colonists with the British army, evidently strongly impressed the framers of our Constitution, and when they reached the subject of maintaining an army, their discussions conclusively show that they were affected by the conditions above stated. Charles Pinckney gave a draft of this Article to the Convention, giving Congress the absolute power to raise armies in peace or war, without any limitation on its authority, and the committee reported a draft wherein the words "to raise armies," without any qualifying clause, was contained, but when they came before the Convention, they were referred to the Committee on Detail, who insisted on some qualifying limitation. The arguments made show that the historic facts mentioned had influenced the minds of the delegates, as well as their lack of appreciation of the probable development of the country.

Mason argued that the danger of perpetual revenue, evidently meaning expenditures, must be restrained, otherwise it would subvert the liberty of the country. Gerry also pointed out the fact that the draft contained no clause limiting the standing army in times of peace. He said he "could not consent to this," and proposed a draft providing that not more than two or three thousand troops should be kept up in times of peace. (This showed their conception of the future of the country.) He was met with the inquiry from other delegates, "if no troops could be raised until an attack was made," and after a discussion they evidently decided that such a limitation would be unwise, as they passed on to the suggestion "that no troops should be kept in times of peace except

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by consent of the legislature," and that the "military should always be subordinate to the civil power," and "no grant of money shall be made by the legislature for supporting military forces for more than one year at a time."

None of these provisions were reported on by the Committee on Detail, but they later added, to the limitation of the power of Congress "to raise and support armies," the words, "that no appropriation of money to that use shall be for a longer period than two years," which finally, after a discussion and an attempt to amend it, was adopted. That Constitutional provision, which was passed for the purpose of preventing Congress from building up a military class and leading the American nation into military channels rather than avenues of peace, has doubtless been partially responsible for the lack of a fixed military policy in this country, as an uncertainty in respect to the appropriation has made it impossible for the general staff to lay out a general program, which they could carry out with certainty for any period of years.

Passing on to the militia, which was evidently considered to be the backbone of our national defense, a few moments examination of Clauses 14, 15 and 16 of Section 8 of Article 1, enables us to understand the reasoning of the delegates, for limiting Congress in dealing with that subject. Congress is empowered by Clause 14, "To make rules for the government and regulation of land and naval forces," which was adopted, apparently, without much discussion. The necessity for the government of the army by uniform regulations, prescribed by Congress, was evidently even then appreciated, but when Clause 15 came before the Convention, providing for the means of calling forth the militia and using them, the doctrine of states' rights began to assert itself. Pinckney made a draft of a clause which gave Congress express power to order the militia of one state, into another, but the suggestion called forth a storm of opposition, all voicing the danger to the liberty of the people in giving Congress an unrestricted right over the militia, and after a discussion in which apparently Pinckney stood alone, the power of Congress over the militia was limited to the purpose of "Executing the laws of the Union, to suppress insurrection and to repel invasions."

Clause 16 deals with the organization of the army and disciplining the militia, and there again the delegates fought to reserve to the states their power over the militia. Pinckney argued that the right should be conferred upon Congress. Randolph insisted that each state should have full control over its militia. Mason wanted the power vested in the general government, saying that he supposed there would be no standing army in times of peace and considered

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it unlikely that thirteen states could agree on any one system. Other plans were proposed by Ellsworth, Dickinson, Mason and Gerry, Gerry being especially sarcastic about the project to give national control, saying, "We had best go on and destroy the states at once, and have an executive for life."

After much discussion, the right was reserved to the states of the appointment of officers and the authority of training all the militia, according to the regulations prescribed by Congress, which meant that the regulations prescribed by Congress were to be interpreted by the officers appointed by the governors of the different states, many of whom, as experience has shown, were without qualification, education, or the experience necessary to impart this training, and as a result, officers and men were sent into the field without any uniformity of military education.

General Washington's attitude on this subject is very little known from his expressions in the Convention. His position, of course, affected his freedom of debate, but his opinion was very highly valued, and from his recorded expressions in regard to the Constitution, we may be justified in concluding that he was more anxious to weld the states together than to raise issues over details. He is reported to have said of the Constitution adopted, "That it was the best Constitution that could be obtained at that epoch, and that this or a dissolution, which awaits our choice, is the only alternative." But Washington was a soldier first. Lieutenant-colonel, 1754; colonel, 1755; served with General Braddock, commander of the Virginia forces, 1758; commander, advance guard of General John Forbes, and commander June 15, 1775; commander-in-chief of the armed forces of the United States. He knew the value of military training and its necessity, and spent the first months of this command, from July 15, 1775, to March, 1776, in organizing and training his army, and his later expressions indicate clearly that he favored a standing army. He wrote about that time as follows:

"The jealousy of the standing army and the evils to be apprehended from one are remote, and in my judgment, situated and circumstanced as we are, not at all to be dreaded, but the consequence of the want of one, according to my idea, formed from the present view of things, is certain and inevitable ruin. For, if I was called upon to declare upon oath whether the militia had been most serviceable or hurtful, on the whole I should subscribe to the latter."

Washington believed that the nation should at all times be insured against war by military preparation, commensurate with the existing conditions, which would cause the respect of the world.

It may be claimed that the action of the Convention in limiting

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the power of Congress over the appropriation for military uses, was a declaration of policy which we have consistently followed, by providing for a small regular army in times of peace, and permitting our wartime organization to disintegrate, without preserving the benefits of their experience, but I would prefer to call it a lack of policy, rather than infer it was due to affirmative deliberation. It was apparent, after the Revolutionary War, and has been since at the close of each war in which we have been engaged, that many lives were lost and material spent, due solely to the lack of preparation and training, and the ignorance of the men of the fundamental rules of hygiene and sanitation, so necessary in the amalgamation of and movement of large bodies.

It might be well to glance briefly at the means adopted to raise troops for our wars, the method pursued by Congress in raising and training the armies, the training received by the troops engaged in each war, and the consequences, for the purpose of enabling the reader to draw a comparison between the results which followed a lack of a military policy in each war, and which resulted in the passage of the National Defense Act in 1916, and then decide, as citizens, whether, having committed ourselves to a military policy for the purpose of avoiding a repetition of the disastrous results of the past, and providing for an insurance against the future possibility of war, we should allow this Act to remain inoperative on our statute books by failure to support Congress in appropriating sufficient funds to carry it out.

My work in this respect is made nominal by a very able pamphlet, entitled, "Epitome of Upton's Military Policy of the United States," from which I quote freely, and in some instances literally. My information is not derived solely from this source, but is the result of some general reading, but whereas our histories are apt to deal with generalities, General Upton deals in figures and facts, obtained from the statistics of the War Department, and inasmuch as that is the best evidence which we have of the conditions which he outlines, it is fair to the reader to use the statistics which he quotes, for the reason that if he is in error, that fact can readily be ascertained.

As early as 1774, it is a well-known historical fact that several of the colonies began to make preparations for an armed conflict with Great Britain. The Massachusetts troops were organized by giving a captain's commission to anyone who would enroll a company of fifty-nine men, and the commission of colonel to anyone who could get together ten such companies. General Upton draws our attention to this method pursued, and emphasizes this system of making the ability to raise men the sole qualification for a command, and draws our attention to the fact that it has been employed without

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exception, in principle, at the beginning of all our wars. His pamphlet was written in 1881, which statement naturally excludes the Spanish-American War. But if my information is correct, while that practice was abandoned in detail during the Spanish-American War, the organization of provisional regiments by states was largely along the same principle. The officers were elected by the men, and usually the men were elected officers who were instrumental in organizing regiments. That practice was in effect when the writer was in a national guard regiment twenty years ago. So it was not until the passage of the National Defense Act in 1916, that the practice in principle was eliminated.

General Upton says that after the engagement of Lexington, militia and Minute Men from all the New England colonies began to arrive near Boston and these men were organized into the Continental Army. Recognizing the necessity of having a body of men to reinforce the regular army, the Provincial Congress, of which John Hancock was president, recommended "to the inhabitants of the united English colonies, that all able-bodied effective men, between sixteen and fifty years old, be formed into companies of militia, that officers of each company be chosen by the respective companies. This militia could only be called out with the consent of the state legislature and were intended for home defense." The Revolutionary Army was therefore composed of the so-called regular army and the militia, as stated. Congress was committed to these two methods of raising troops to carry on the war. The enlistment period of the regular army was finally extended to two and three years, which enabled men to acquire discipline, which, General Upton says, "ultimately proved the salvation of our cause."

The militia, however, proved the more popular branch of the service, probably due to the short term of enlistment, and the regular army was always, therefore, from one-third to one-half below its prescribed strength, and inasmuch as the colonies denied Congress the power to compel enlistments, Washington was compelled to resort to bounties, which principal remained in force during the Civil War. It appears that the states indulged in competitive bidding for men and in one instance Congress asked the State of Maryland to reconsider its bid, giving \$10.00 Colonial bounty in lieu of one hundred acres of land. The bounties began with clothing, land and money, and mounted higher as the necessity for recruits increased, until in January, 1779, Congress authorized General Washington to grant a bounty not exceeding \$200.00 to each able-bodied veteran or new recruit who would enlist for the war, or reënlist. It might be interesting to pursue this subject further, for the purpose of proving that as a result of this system (and it is not my purpose to criticize the bounty system of the Revolutionary War, it was probably

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necessary and the only method of raising an army and the result justified the action) but as a result of this system, we had ample evidence at the time of the adoption of our Constitution, and have had since, of the evils of our persistent refusal to look squarely at the results arising from our neglecting to adopt a military policy commensurate with our growth and development as a nation.

As a result of the efforts of the colonies, 395,848 Continentals and militia were furnished during the Revolutionary war. General Upton is the authority for this statement, that notwithstanding this respectable number of men for that time, that the largest force, Continental and militia, that Washington could lead to battle at any one time during the Revolutionary War, was less than 17,000, and that at the battles of Trenton and Princeton, his effective strength was less than 4000. It does not require a mind trained in military science to conclude that the small maximum fighting strength was out of proportion to the total number of men employed in the war.

It is also interesting to note what it cost the nation to produce a maximum fighting strength of 17,000 men. At the close of the Revolutionary War, we had on our pension rolls 95,753, 39,287 of whom were widows (379 of whom survived for 92 years after the close of the war)—almost twenty-five per cent. of the total strength were pensioners. Forty per cent. of the pension claims were based on fatalities. We therefore paid pensions to 95,753 to produce a maximum fighting force at any given time, of 17,000. In money, it meant that to June 30, 1876, we paid out in pensions for enlistment periods of six months or over, \$46,177,845.44. To widows of soldiers who served six months, the amount paid was \$19,668,795.70. To these figures must be added \$15,000,000 paid to invalids, disabled in the Revolution, bringing the total amount of pensions to approximately \$80,000,000. No one will dispute for a moment that the result was worth the cost, or that the conditions under which the war was waged were unexceptional, but the situation which suggests itself is this: The cost was out of all proportion to the effectiveness of our effort at any given moment. If so, why? We are not obliged to grope for the answer. General Upton puts it before us simply and clearly, and having it before us, and having followed the same mistake from 1776 to 1916, is it consistent with a wise policy, or fair to our posterity, that, the errors having been corrected in the National Defense Act, we should emasculate it and render it useless by refusing to put it in operation? General Upton points out nine causes of weakness in the system employed, which we will no doubt recognize at once as obvious, and it is interesting to know these objections made at this time and follow their recognition and correction in the framing of the National Defence Act.

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First: The employment of militia and undisciplined troops commanded by generals and officers utterly ignorant of the military art.

Second: Short enlistments of from three months to three years, instead of for and during the war.

Third: Reliance upon voluntary enlistments, instead of voluntary enlistments coupled with conscription. The term "conscription" should be used as analogous to the selective service act, and General Upton doubtless meant universal conscription, without substitution or substitutes.

Fourth: The intrusion of the States in military affairs and the consequent waging of all our wars on the theory that we are a confederacy and not a nation.

Fifth: Confusing volunteers with militia, and surrendering to the States the right to commission officers of volunteers, the same as officers of the militia.

Sixth: The bounty, a national consequence of volunteer enlistments.

Seventh: A failure to appreciate a military education and to distribute trained officers as battalion, regimental and higher commanders in our volunteer armies.

Eighth: The want of territorial recruitment of regimental depots.

Ninth: The want of post-graduate schools to educate our officers in strategy and the higher principles in the art of war.

General Upton proposed that in time of peace and war, the military forces of the country should consist of the regular army, the national volunteers and the militia. The framers of the National Defense Act have accepted General Upton's recommendation in principle, but have divided the component parts into the regular army, the organized militia, and the reserves, which is in effect the adoption of his suggestion, under different names. We have by the National Defense Act a method for the uniform expansion in time of war. We have the method, all we need now is the money to furnish and educate a sufficient number of officers to train the reserves. These reserves serve their country gratuitously and without reward, without even the privilege of engraving their military title on their calling cards. Nor are they militarists but rather pacifists in the truest cause, being almost without exception men of affairs devoted to the growth of their business interests, but profoundly convinced that the surest method of insuring peace in the United States is to make war very unattractive to any nation that may covet our property or interfere with our rights or liberties. They are equally convinced that the surest way to insure war is to neglect our defensive potentialities, that war upon us may be attractive to a nation coveting our wealth or trifling with our rights and liberties. In addition to the value of such an organization as

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an insurance against war, we will attempt to prove that the result of such training is an economic gain to the country, and not a loss.

Between the close of the Revolutionary War and 1812, the country was involved more or less with Indian troubles and the possibility of war with foreign powers was also present.

The prejudice against a regular army still existed and an attempt was made to provide for our national defense by the passage of the Militia Act of 1792. The principle laid down in the first section of the Act, that every able-bodied male citizen owed military service to his country, was emphasized here. It afterwards, in 1916, formed the fundamental principle of the National Defense Act, adopted one hundred and twenty-four years afterwards, but was abandoned in principle in the Civil War, and the Spanish War in 1898. The effect of the passage of the Militia Act of 1792 was to substitute for one national army, a State army from thirteen or more states, and instead of having a small but efficient national force, supported by indirect taxation, the citizens of each state were called upon to support an undisciplined force of militia, which, General Upton says, was totally ignorant of the first principles of military art. This policy could not have been influenced by the belief that the militia was more effective than the regular army, or that it was in the last analysis cheaper, as even if all the states had maintained their quota of militia during the long period of peace, they would have supported a large armed force for the benefit of the national government without compensation, except in time of war, and the possibility existed, and afterwards developed, that certain states did not keep up their quota, and the burden of their failure fell on the remainder. It cannot be said they believed the militia as efficient as the regular army, as they had numerous opinions from General Washington on that subject, one of which was written twelve years before in reference to the defeat of General Gates. General Washington wrote to the president of Congress on the 15th of September, 1780, as follows:

"I am happy to find that the last disaster in Carolina has not been so great as its first features indicated. This event, however, adds itself to many others to exemplify the necessity of an army, and the fatal consequences of depending on militia. Regular troops alone are equal to the exigencies of modern war, as well for defense as offense, and whenever a substitute is attempted, it was proven illusory and ruinous. No militia will ever acquire the habits necessary to resist a regular force. Even those nearest to the seat of war are only valuable as light troops, to be scattered in the woods and harrass, rather than do serious injury to the enemy. The firmness requisite for

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the real business of fighting is only to be attained by a constant course of discipline and service. I have never yet been a witness to a single instance that can justify a different opinion, and it is most earnestly to be wished that the liberties of America may no longer be trusted in any material degree to so precarious a dependence. I cannot but remark that it gives me pain to find the measures pursuing at the southwest still turned upon accumulating large bodies of militia, instead of once for all making a decided effort to have a permanent force there. In my ideas of a true system of war at the southwest, the object ought to be to have a good army, rather than a large one."

What Washington said in 1780 was appreciated in 1914, and again and again demonstrated at different times between those periods. Even the most casual reader learned during the World War that raw troops could not be put in the trenches. Congress, with the evidence before it of the value of militia and the cost thereof, turned from economy and safety, to waste and inefficiency, and enacted the Militia Act of 1792. But it was popular. The country was soon to pay dearly again for its dependence on militia; the War of 1812 came on. The militia had been organized under the Act of 1792, the officers received such instruction as the States thought proper, and were now face to face with the test. There is not much in our history about the capture of Washington in 1814, neither have any monuments been erected to the militia who defended it, but the facts, in brief, are that the regular troops, composed largely of recruits, numbered 2208 men, who were then stationed in Maryland and Virginia and were ordered to various points along the Chesapeake and of whom General Upton says, were therefore "incapable of speedy concentration." That is rather difficult for us to visualize at this time, but it was doubtless due to the lack of transportation facilities.

On July 2, 1814, a military district was created consisting of the States of Maryland, the District of Columbia and part of Virginia. On July 12, 1814, the general commanding this district was authorized, in case of actual or menaced invasion of the district under his command, to call out the entire Maryland quota of six thousand militia, two thousand from Virginia, two thousand from the District of Columbia, and five thousand from Pennsylvania, in all fifteen thousand men. On the 24th of August, 1814, he exercised his authority and the troops above mentioned were called out. Using the language of their commander, they were without discipline, organization, officers, or the least knowledge of service, and numbered 5401, 400 of whom were regulars, 600 marines and 20 sailors,

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the remainder being volunteers and militia. On the same day, this army was formed in order of battle, was attacked, defeated and routed, with the loss of eight killed and eleven wounded, and Washington fell to the British. The British forces numbered 3500, of which only a part of the advanced division of 1500 was engaged.

Statistics furnished by General Upton, show that the number of troops employed from the beginning to the end of the war, were as follows:

Regulars (including 500 sailors and marines).....	56,032
Volunteers	10,110
Rangers	3,000
Militia	458,463

It is important to note the fact that the troops engaged in the War of 1812 were practically entirely militia. The terms of service of the above are set out as follows, and we would particularly call your attention to the terms of service. The terms of service of the troops above mentioned were:

12 months or more	63,179
6 months or more, to 12	66,325
3 months or more, to 6	125,643
1 month or more, to 3	125,307
less than 1 month	147,200

The number of officers engaged to June, 1814, who had received a professional education in the Military Academy, was 120. The total number of troops employed in the war was 527,654. Washington was defended and lost by 5401, and eight soldiers laid down their lives in defense of their national capital.

The war cost \$198,000,000.00, exclusive of pensions. General Upton says, "had Congress, from 1808 to 1811, applied one-fourth of this sum to the maintenance of an army of 15,000 so organized as to have been capable of expansion by the aid of voluntary enlistments and obligatory service to double or triple its numbers, there is little reason to doubt that Canada would have been ours and the war brought to a close in a single campaign."

"In the Revolutionary War, notwithstanding the steady decline of our military strength, two British armies of more than 6000 men each, were made captive. In the War of 1812, less than five thousand men for the period of two years, brought war and destruction into our territory and successfully withstood the misapplied power of seven millions of people."

We are confronted with exactly the same situation to-day, in regard to the wisdom of applying a future war cost to the support and maintenance of a regular army and the training of the reserves.

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In each war, experience shows that our policy has been costly in the lives of men and material, even beyond belief. "Where there is no vision the people perish." The National Defense Act of 1916–1920 is the vision of America fresh from the battlefields of Europe, for the first time crystallized into law, the execution of which will not only insure our safety, but will insure our continued peace and tranquillity. It is called the National Defense Act. In fact, it is our National Insurance Act.

From 1836 to 1841 we had the Indian Wars to gather experience. In 1846 we became involved in the Mexican War. A comparison of the forces engaged and the result achieved, are valuable as again illustrating the trained army as compared to militia trained under short enlistments, by officers commissioned by states, and as a further proof that we have indisputable evidence in our own history, which we have no right to ignore, that when men undisciplined and untrained, officered by men, however brave, who have not had the benefit of a uniform education in the science of war, means not only failure in their undertaking, but waste of life, the most precious of war material.

It will be remembered that there were 458,463 militia employed in the War of 1812, 250,950 of whom were enlisted for ninety days or more, not to exceed six months. In the War of 1846 there were 31,024 regulars, 12,601 militia, and 60,659 volunteers and rangers, a total of 104,284, as against a total of 521,622 troops employed in the War of 1812.

General Scott, who in 1814 was compelled to teach the regular officers of his brigade the elements of squad drill, left his views to the Senate in the memorable words:

"I give it as my fixed opinion that but for our graduated cadets, the war between the United States and Mexico might, and probably would, have lasted some four or five years; with, in its first half, more defeats than victories falling to our share, whereas in less than two campaigns we conquered a great country and a peace without the loss of a single battle or skirmish."

The battles of Palo Alto and Resaca de la Palma were fought by 3554 officers and men, all of the old establishment. Four-fifths of the officers had received their training at the Military Academy and the troops had had six months' training at the camp of instruction at Corpus Christi. In the battle of Buena Vista of 1847, our forces numbered 4759 men, all of whom were regulars but 517, and who defeated the entire Mexican army, estimated at 20,000, our loss amounting to 746 killed, wounded and missing. Our army, previous

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to that engagement, had had the benefit of nearly eight months' training.

The campaign of the City of Mexico was fought by men who had had eight months' training, officered by regular army officers. In the battles of Contreras, Cherubusco, El Molino del Rey, and Chapultepec, our army at its maximum consisted of 8479 men, and our loss was 2703. General Taylor finally entered Mexico City with an army of six thousand men.

The success attained by our army in the Mexican War led to a gradual abandonment of the reliance on the militia as a "bulwark of national defense," as was inevitable from a comparison of the character of the forces employed and the results accomplished in the War of 1812 and the Mexican War. An analysis of this situation can leave no doubt in the mind of a layman, as to the wisdom and humanity of employing skilled and seasoned troops. General Upton says, "In the War of 1812, the combined force of regulars and volunteers of twelve or more months' service, was but twelve per cent. of the total number of troops employed. The same force in the Mexican War was no less than eighty-eight per cent. In the War of 1812, the militia was ingloriously defeated. In the Mexican War, the army, organized and supported by Congress, closed a successful campaign without a single defeat. In the War of 1812, six thousand raw militia abandoned the defense of the national capital with a loss of nineteen killed. In the Mexican War, a force of less than five thousand trained volunteers, supported by a few regulars, defeated the Mexican army of four times its number."

It must be remembered that the facts above noted are not and never have been secrets. They are a part of the history of our country, well known to all military men and students of military science. These statistics have always been available and doubtless always have been urged by the War Department at different periods in our history, as cogent reasons why legislation should be abandoned based on a system which has proven to be a failure, and a policy adopted which experience has shown would produce the best results.

But after the close of the Mexican War, the same military inertia manifested itself. They doubtless argued, as many people do now, that we would never have another war, and if so, a million men would spring to arms, etc.

THE WAR OF THE REBELLION

At the close of 1860, our population numbered thirty-one million. Our regular army consisted of eighteen thousand and ninety-three officers and men. The militia, on paper and unorganized, numbered three million men. General Upton, in referring to the situation, says, "Such was the condition of the national defense when, on the

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20th day of December, 1860, South Carolina in convention passed the ordinance of secession."

The war was begun by the bombardment of Fort Sumpter on April 12, 1861, and ended on the last days of April, 1865. Instead of expanding the army by using the regular army as a base for the military development, a policy of raising an army by volunteer enlistment for a short term period was followed. On the 22nd day of July, 1861, Congress authorized the President to accept enlistments, not exceeding 500,000, for such time as the President might direct, not exceeding three years, to be called from time to time by a proclamation, proportionately from the States, having in mind the number of men already in service from each state.

The details of the organization of the army were provided, and a general commanding a separate department or detachment army, was authorized to appoint a board for the examination of commissioned officers. Any vacancy occurring, an election was called by the colonel of a regiment and the enlisted men were authorized to elect their officers to the rank of captaincy. Vacancies above captain were filled by the vote of the commissioned officers of the regiment, and all officers so elected were commissioned by the respective governors of the States or by the President. That method was not such an advance over the method employed in the Revolutionary army.

From the outbreak of the Civil War and until about March, 1863, Congress apparently relied upon volunteers for short terms of service. In March, 1863, Congress was obliged to resort to a draft law, which provided that all able-bodied male citizens in the United States, and all persons of foreign birth who had declared under oath their intention to become citizens of the United States, between the ages of twenty and forty-five, except those who were exempted by the Act, were liable for military duty.

The country was divided into enrolment districts. Any man drafted was authorized to furnish a substitute or payment, not in excess of \$300.00, and the Act rescinded the orders of the War Department with reference to enlistments of volunteers, by providing that thereafter no enlistments should be allowed.

Congress thereafter, in February, 1864, attempted to equalize the operation of the draft by providing that each ward, city, town, etc., should furnish a certain quota of men in proportion to the residents therein liable to military service, and if that quota was not filled by volunteer enlistments, the draft should be resorted to to fill the quota, the intention being to credit each district with the volunteers, and draft the remaining quota. This information is taken from the Federal Statutes, and the deduction I gathered from the situation is that Congress first depended on volunteers who were untrained and whose officers were untrained, and did not use the

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regular army, even for training purposes. The short term of the enlistment made it extremely difficult to adequately train an efficient army; the men having authority to elect their immediate commanders and the governors having authority to commission men, notwithstanding the creation of the examining boards, deprived the organization of a uniform system of training under the regular army, which would have enabled them to coördinate, coöperate and become an efficient force.

With an army emerging from the legal machinery just quoted, and organized under those conditions, the first battle of Bull Run was fought, which resulted in the disastrous defeat for the Federal forces. General McClellan then took command of this army, which became known as the Army of the Potomac, and in the face of almost universal opposition, he insisted on time to organize and train his men. The magnitude of his task may be appreciated, when we realize that none of his brigade, division or corps commanders had ever seen service as such, nearly all of whom having come from civil life. He stood alone as a military authority, and how well he did his work is appreciated. The Army of the Potomac is known as one of the finest armies of history. The brief summary of the history of this army is indicative of the general situation. We had no military organization, no experienced men. General Lee, the two Johnstones, McClellan, Grant and Sherman had served in the old army. General Logan, a volunteer, became an army commander.

History still speaks of General Grant's army, and General Sherman's army, etc., emphasis being laid on the leader. We are apt to visualize an armed force as a large body of men following a dashing general officer, and proceed on the theory that soldiers can be developed as the crises arise.

We learned, however, in 1870, that the preponderating influence of the trained army was made manifest; prior wars had shown the value of an educated general. Prussia demonstrated in the War of 1870 the value of an educated army, and if we look back into history, we will find that it was not courage that made Hannibal, Alexander and Cæsar the great names of antiquity, but their ability for organization.

WAR WITH SPAIN

On the 25th day of April, 1898, war with Spain was declared by act of Congress, and the army was expanded by the organization of land forces, consisting of the army of the United States, and the militia of the several states when called into the Federal service. The army was divided into two branches, designated as the regular army and the volunteer army, the regular army being designated as the permanent military establishment of the United States, and the

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volunteer army, maintained only during the existence of war, or when war was imminent. (This act was passed a few days before the declaration of war with Spain.)

The volunteer army could be mobilized and the President was authorized to call the militia into active service only after authorization by Congress. Enlistments in the volunteer army were fixed at two years and the army was called into action by proclamation. The Act provided that the enrolments should be made as far as practical from the states, in proportion to their population. All regimental and company commanders in the volunteer army were appointed by the governors of the states, and the President was authorized to receive separate units of militia commissioned by the governors of the respective states. The Secretary of War was authorized to organize a small body of troops, not exceeding 3000, possessing special qualifications, the officers of which were appointed by the Secretary of War. This provision was inserted to authorize the organization of the Rough Riders.

Congress evidently recognized the necessity of some fixed system of training, as it authorized staff officers, commanders of corps, divisions and brigades, to be appointed by the President as officers in the volunteer army without vacating their commissions in the regular army, and further authorized the governors of the different states to appoint regular army officers, to grades of field officers in the volunteer army without vacating their commissions in the regular army. As I remember it, regular army officers were advanced to the grade of lieutenant-colonel, and assigned to duty in the volunteer regiments. The policy adopted by Congress in the Spanish-American War seemed to rely chiefly on militia and volunteers, and the evil of the Civil War was to a small degree corrected by providing that regular army officers might be appointed to the volunteer army without affecting their commissions in the regular army, thus recognizing in a measure the necessity of a fixed policy of training requisite to the development of an army. The burden placed upon the regular army officers, of organizing and training these volunteer units was, however, a heavy one. At the outbreak of the Spanish-American War, our military forces consisted of 27,822 regulars and 114,602 militia. On June 8, 1898, 17,000 men, under General Shafter, landed in Diquire, Cuba, all of whom, with the exception of three regiments, namely the Rough Riders, the Second Massachusetts, and the Seventy-first New York volunteers, were regulars.

The Spanish War is too recent to refer to in detail. Our naval victories stand out prominently in our minds. It may be well for us to remember, however, that there was a great loss of life in the army of our men, due to ignorance in regard to the ordinary rules

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of hygiene and sanitation. I cannot speak from experience with respect to all the national guard regiments which were mustered into the service of the United States, but I know from my experience in one national guard regiment, that not one word did we hear or know of that subject, which is a so fundamental and important part of our military training. In fact, I am not sure we would not have considered it a reflection on our dignity as soldiers, if anyone had presumed to tell us how to keep our bodies and food clean, and avoid contagion.

These brief facts in regard to our military establishment and procedure to meet the emergency of our several wars, have been touched upon for the purpose of emphasizing the errors into which we have fallen, and as several of many reasons for a conservative, uniform support of our National Defense Act, which cures them. That they were errors, was proven by the evil results from which we suffered. Why we have persisted in this policy, or rather this lack of a definite policy, from before the Revolutionary War until 1916, can be explained only on the theory that as a nation, we were committed to a non-militaristic policy, and have always regarded a fixed military policy, however conservative in respect to universal training, as a departure therefrom; but from 1776 to 1916, we had five wars, not including the World War, or a war every twenty-eight years, and each time we were unprepared. Each time our army was created by emergency legislation, rejecting well-known principles of organization, of which we had ample evidence of their value, and adopting principles of organization which must have been founded on reasons other than experience.

When we were confronted by the World War, however, we faced a situation not to be trifled with. We realized we must produce a plan from the best minds of our soldiers and statesmen. The archives of our history must be searched for evidence, the result of our previous experience examined for error. The right of the state and the individual must be submerged for the nation's good. The responsibility must go to those trained to bear it. The crisis was too ominous for expediency, civilization was to be weighed in the balance. And so the National Defense Act was the result, and after one hundred and forty years of a drifting, evasive attitude in respect to our national defense, Congress committed the nation to a policy, and after several years of reflection, after the war had passed, affirmed that policy by passing amendatory acts thereto in 1920. But now, with the passing of years, the same problem appears to be presenting itself in a different form, and apparently for a different reason. We are informed that it is contrary to our ideals to keep up a well-defined and comprehensive military program, however conservative, but having a definite act based on the

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service of the citizens and subservient to their will, the problem suggests itself to us, whether we will permit it to be emasculated by withholding sufficient funds to defeat its operation, or put the spirit and intention of the Act into effect by sufficient appropriations. We approve every move being made for perpetual peace. We feel that a state of war is a reflection on the sanity of man. We believe that the first duty of a soldier is to lead in peaceful overtures. If I felt inclined to voice a criticism of any of the existing plans by which it is hoped to preserve the peace of the world, I would leave it unspoken. I cannot help, however, but feel that peace will not come from compact, the ultimate remedy for a breach of which is force. I adopt Dr. Nicholas Murray Butler's theory that peace dwells only in the heart of man, and I cannot convince myself absolutely that there will be no more war, and if there is a possibility of war, we owe it to the nation, ourselves, and our posterity, that a reasonable insurance be purchased for our protection. We have no right to invite war by allowing ourselves to be totally unprepared.

I appreciate fully the able minds who contend that our place in the leadership of peaceful negotiations and the ideals to which we have always been committed, are inconsistent with an extensive military establishment. But we should have a poise on this question consistent with the size, wealth, economic and envious situation of the nation in which we find ourselves. We are a people of high ideals, strong convictions, intense reactions and contentious assertions, and we are apt, in insisting on our opinions and sometimes demanding their enforcement by law, to swing away from a conservative position, in our anxiety to prove our contention, to one inconsistent with a conservatism and open-mindedness which are necessary to decide a question on its merits.

It is not the purpose of this monograph to prove that it is right and some one is wrong, but to present to the judgment of the people the salient facts of the National Defense Act, and ask if it is not wise to commit ourselves to a conservative operation of the Act based on the preamble of our Constitution as adopted to "Form a more perfect union, establish justice, insure domestic tranquillity, provide for the common defense," etc. It is generally admitted that it is the best system of national defense devised and adopted by us, that it provides a system of war insurance which eliminates a much dreaded development of a militaristic spirit among our citizens, and I wish to inject a further suggestion that the money spent in its operation, in addition to the insurance it provides against war, is, as far as the establishment of the training camps for our citizens is concerned, an economic gain and not an economic loss.

(To be continued in our next issue)

MILITARY COMPETITIONS IN THE NATIONAL GUARD

BY CAPTAIN GENNAD A. GREAVES, F.A.

EVOLUTION (outside of Tennessee) tells of countless competitions. The story of progress in nature is the story of many struggles. The weak ones struggle and perish; the strong ones struggle and live. Nameless myriads of species, tribes and factions of the unfit vanish into oblivion, while the strong, well-equipped, sagacious and hard-to-kill varieties have survived to the present day. This is nature's way of keeping things on an efficient basis. Improvident and wasteful as she is, nature seeks perfection by relentlessly killing off the more imperfect, and resolutely holding on to those that fit the environment and can succeed in eliminating their competitors. In settling these disputes and struggles for supremacy or survival, nature will not bother herself about the details—she merely recalls the paragraph in Evolution Regulations which says in effect, "May the best man win and the Devil take the hindmost."

Sandfiddlers and flamingoes, as well as dromedaries, cooties and snake doctors, are winners in this policy. They turned out to be the best of their breeds. They beat their competitors in the struggle to fit into the environment, and survived. The masterful ant who snatches the dead body of a flea from a weaker insect is engaged in a struggle. He must do his stuff quickly and completely, even at the expense of straining an aching bicuspid, if he would avoid being crunched into eternity by a still stronger or more energetic creature. Even the lazy baboon in the forest (if baboons are lazy) must be up betimes to get to the banana tree (if baboons eat bananas) or some other baboon with a higher efficiency rating will cop all the ripe ones.

Not only in nature, but also in human affairs, do we find that competition is the mainspring of progress and efficiency. Thomas Hobbes, the 17th century philosopher, told us in substance that all the world's a contest and all the people in it merely contestants. Life, as he saw it, was a vast nightmare of contests, every man being unconsciously at war with every other man. Success and life for the one meant failure and death for some ill-starred competitor—not like a tennis game in which each side gets some of the score. But Thomas was wrong, and civilization generally gives a red or a yellow ribbon even to a loser. And the loser may have won a blue ribbon in a previous contest, so altogether his total score deserves to be considered.

The path of history is strewn with much wreckage of cities and

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nations and hairpin factories that lost in some great final struggle. They were not ready for that final contest, or to be more charitable, the other fellow was more ready. Think how this competition idea has done to death many a good hot dog stand that simply didn't understand the contest of advertising. Many such a stand has perished since Socrates sat on the sidewalk munching hot dogs and lecturing passersby to look out for trouble if they could not discern their own faults and remedy them. And by the way, how does a man discover his own faults? Generally by comparing or competing with someone who is a better man than he is.

On the other hand, what of those who have discovered their shortcomings and corrected them? They have survived. They have won the blue ribbon, for the time being at any rate. Look at the winners and think of the morale and prestige involved, whether it is a matter of turning out the best mammoth locomotive, or merely a contest in advertising carpet tacks. The Standard Oil Company, the *Saturday Evening Post*, George Bernard Shaw, Lydia E. Pinkham, Cleopatra (or was it Salome who won that contest?) are some of them. Obviously they have won a blue ribbon apiece. They have eliminated or shelved temporarily their competitors. Otherwise we should not still be hearing of them. There is every reason why anyone who is good at something should demand a contest in his particular line, so that all the world may know he is a winner. Where natural contests do not exist, it is an easy matter to provide an artificially arranged substitute. It is safe to assume that Hannibal in crossing the Alps, with his twenty-mile column of quartermaster issue elephants, did not organize artificial contests in grooming and driving. The title of Master Elephant Driver (or was it mechanic?) simply went to the top kick's chief orderly, or perhaps to some lanky mountaineer who could make his elephant shake a leg. The coveted chevrons of Elephant Hanger Sergeant, or whatever they called him, doubtless went to the old timers who knew best how to administer, in cases of flatulent colic, octagon soap and water, or the equivalent as it then existed, with a stepladder.

But we cannot very well organize contests in scraping icicles off an elephant's tibia, so what can we do in the National Guard Field Artillery in regard to organizing artificial competition? The Chief of Field Artillery each year awards the Knox Trophy to the best all-round battery in the Regular Service. What is there to hinder us from doing the same thing in the National Guard? It is competition that stirs up interest and begets efficiency in the National Guard, just the same as in evolution and history and business. How would it sound in the newspaper headlines: "Battery Q of this City Wins Best National Guard Battery Trophy." What city having

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won that would fail to shout it from the housetops? That will come in due time. We cannot organize so vast a contest at this time, but we can very easily pit one battalion against another within the same regiment, and each battery against the other batteries of the regiment, and thus we have the same principle applied in miniature.

It may be argued that the National Guard is too busy with elementary training to bother with competing with anyone. But be it remembered that pep, exertion, energy, intelligence, and all such virtues will produce good training, whereas, indifference produces poor training. And it is competition that puts indifference out of business. The easiest way to measure results is by having a contest, find out which is superior, which is inferior.

Again it may be urged that the activities of the Field Artillery are too varied. It is all very well to have competitions in sanitation and police of the battery street, and fine for the Infantry to have "fall out manual or arms" competitions, but not for technical Field Artillery—it's too varied and has too many technical ramifications, such as keeping on the aiming point, and knowing the name of the operating lever latch-pin spring, and watching out for sore shoulders, and how to recognize epizootic lymphangitis, and knowing what to do with phi and omega and atmospheric elasticity (and other foggy weather) and all of those things that make the infantryman thank God for the Infantry.

Obviously it is dangerous to judge batteries as best or second best while they pass in review, by the alignment, brass buttons, hubcaps and white halter shanks. The worst on parade may harness, string wire and figure data the quickest. The gun section that messes up the parade may fire the most accurately. So how shall we judge the best battery?

The solution lies in complete analysis of the battery activities, considering each job or duty as a separate activity in which the battery may excel or fail when in competition with another battery. Thus we may have many activities in which a good battery may be nearly perfect, but also some activities in which the men have grown careless and perform poorly. There is a craving in every man's heart for a little simple praise for work well done. Everyone has one ear surreptitiously cocked open to catch a sweet morsel of commendation that may be dispensed by someone entitled to distribute such sweets. Each man who thinks he is good at some little job, be it ever so humble, likes to have his fellowman know of it, and if his fellowman should never find it out, it would not be worth while to be such an expert. The driver who prides himself in good harness adjustment, hopes in his heart the inspecting officer will comment on it. The cannoneer who is good at nomenclature or is fast at fuse setting would like a chance to prove it. The man on

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the detail who is fast and accurate with the B.C. scope wants everyone to know it. How are you going to have everyone know it? Have a competition, and by retreat every man in the regiment knows it. And the man gets paid spiritually for his trouble by having his morale and prestige go instantly skyward. Meanwhile greater efficiency accrues to the credit of his battery as a result of his increased pride in his job and in his achievement, and the losing batteries conceal their embarrassment, but secretly determine never to be caught napping again and particularly resolve never to be the hindermost.

It was with this simple principal in mind, namely, that if a man thinks everyone will hear about it, he will work hard to be good at his job—that many of the usual battery activities of the 111th Field Artillery, Virginia National Guard, were placed on a competitive basis. Under the leadership and energy of Colonel William H. Sands, Norfolk, Virginia, of that regiment, an elaborate schedule of events was worked out, fitting into the regular 1924 drill schedule of the encampment so accurately that no drill was omitted or even interrupted on account of the contests. There were, for example, two hours of the schedule of a certain day devoted to gun drill. It was during this period that each battery was called upon, having been notified weeks in advance, to undergo a test in gun drill for combined speed and accuracy to determine the winner in each battalion. Then during the time for harnessing, each battery was required to harness a team of horses against time, being checked closely for errors and omissions. A similar series of preliminary contests was staged for the men who were drilling with telephones and switchboards. Contests were held for the instrument details in angles and offsets and deflections, and so on until many of the activities had been covered.

In this manner there arose from each battalion a swarm of champions, either individuals or squads, each claiming distinction in a particular line of work or variety of drill. Just before the close of this 1924 encampment at Fort Bragg, during the annual regimental field day, according to a carefully arranged time schedule fitting in with the officers' horse show and the athletic program, the battalion champions met and won or lost the regimental championships in all of the contested subjects. Rules had been mimeographed and time schedules synchronized several months ahead. Blue and red ribbons with rosettes and suitable inscriptions had been made to order in advance, the blue (first place) counting two points, and the red (second place) counting one point toward the winning of the "Best Battery" cup, a very large—but empty—loving cup. This cup is the "Knox Trophy" of the regiment, and the honor of winning it is the highest honor attainable by any battery. When

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the contests are over the battery having the highest score of blue and red ribbons wins the cup. This manner of determining the best battery has never been questioned or disputed, for all concerned recognized the fairness of the award when so many of the phases of battery drill have been covered. Hence there was no dissatisfaction when Battery "B," Norfolk, Virginia, was announced as Best Battery in 1924 at Fort Bragg, and again at Tobyhanna in 1925, where these contests were held successfully for the second time.

There was comparatively little strain on the judges, as all contests had been reduced to the time and accuracy basis. No room was left for differences of opinion as to the merits of any performance. All contestants were assumed to be perfect until proved otherwise, and were given a score of 100 per cent. to start with. It was then a matter of punching a stop-watch and deducting one point for every one-quarter minute (or other amount) overtime, and deducting one for each item found wrong at the finish,—strap not in its keeper, mil off the aiming point, etc., etc. The question of errors in sequence of the performance of duties in such contests as "action rear" and harnessing, for example, was omitted for the reason that it is nearly impossible for a limited number of judges to watch all of the men concerned for sequence of duties.

All the while these contests seek to strike an equilibrium between speed and accuracy. Therefore, the question of exactly what the 100 per cent. time should be is a very important one. And this, of course, is a relative matter and depends on what dispositions are made in advance, and how far the men are placed from the matériel at the start, the roughness of the ground, etc. There is also great danger of placing either too much or too little penalty for overtime. For example "deduct one for each five seconds (or fraction thereof) overtime" might be just right for the Laying-the-piece contest, but would cause a driver to leave half his stuff undone, as it would be cheaper for him to be quick on time and lose a few points on incompleteness. The emphasis on speed and correctness would be better distributed for harnessing if it were: "deduct one for each fifteen seconds overtime." This would place a greater premium on accuracy and less on speed.

The penalty can also be adjusted to suit the state of training. Within untrained regiments the emphasis must be placed almost entirely on accuracy and completeness, while within regiments where the batteries have drilled week after week in their armories throughout the year it will be found that a high premium can be placed on speed without injuring the standard of accuracy and completeness. The slow man is penalized for his slowness, but he has a chance to win if he is more thorough than his speedy opponent. The man who is hopelessly and unnecessarily slow will very likely lose, even

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if he is painfully accurate. To get the blue ribbon he must be fast, but he must not be so fast that his accuracy suffers. He cannot win with either speed or accuracy alone. He must have both.

Arguments have been advanced by some to show that such contests as these should be omitted from the encampment schedule. The first is, that too much emphasis is placed on speed and not enough on accuracy. The answer to this is, deduct less for infractions of overtime. The second is, that errors in sequence in harnessing, action rear, etc., should be made to count. It is highly desirable and it can be arranged to count these errors, but it would require more judges than are ordinarily available in order to watch each man. A chief of section here and there, may take the time and trouble, for example, to make No. 4 screw the rammer staff together and place it against the caisson (in preparation for action) knowing that No. 1 has too many things to do, and that No. 4 is already on that side of the section, but even so, is not this an indication of extraordinary resourcefulness, and why not let such genius reap its reward. It will be found that not many chiefs of section will risk the efficiency of a section by trying to change its habits, and generally the habitual way is the quickest. A third objection is that the men begin to devise many secret inventions in order to circumvent the judges, for example, cutting blankets so they will appear to be folded properly, tacking blankets to the saddle and other resourceful and clandestine devices. These can and should be quickly eliminated by the judges who inspect the equipment before the contest. All contests commence with equipment arranged in accordance with regulations and it is an aimable judge indeed who would fail to notice the blanket under the saddle when it should be on top of the saddle while the harness is still on the pole.

Following is outlined a sample set of these contests as used in the 111th Field Artillery, in case they should prove of interest to anyone other than those for whom they were prepared. Variations in the list have been made each year in order to cover more activities. Each year it has been found impracticable to hold more than ten of these contests on account of the shortness of time. Hence, ten of these subjects are selected annually. For two years these contests have proved interesting and beneficial. Preparations are already under way (March) in each firing battery to carry off the cup during the 1926 encampment.

GENERAL RULES

1. Chief of sections may physically assist if desired.
2. All contests are compulsory for those units whose equipment is the same as specified herein.

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3. Blue ribbon, first prize, counts 2 toward winning the cup. Red ribbon counts 1.

4. All ties will be settled with a smaller time limit after the schedule of events is completed.

5. In scoring, all contestants are given 100 per cent. before starting. Deduction will be made for mistakes and overtime. Fractions of the unit of measure will count as whole units, for example:—"Deduct 1 for each 5 mils off." When 7 mils off, this is a loss of 2 points.

6. No enlisted man is to be disqualified from any contest by reason of rank or duty.

7. Contests commence with articles arranged in accordance with regulations.

8. The commands "Battery Attention" and "AP as Indicated" are *not* necessary in writing or announcing a list of data.

9. Headquarters and service batteries may borrow equipment and enter any contest.

10. Equipment may be borrowed; personnel may not be borrowed.

11. Condition and appearance of personnel will not count. Contestants, however, will be responsible for good and bad functioning of equipment.

12. The question of proper sequence will not be judged in these contests except in the matter of sequence of firing data. Speed and accuracy and final correctness and completeness, only, will count.

13. Contest number 1 (combined efficiency) winner is awarded two blue ribbons, counting four points, and second place winner in this contest is awarded two red ribbons, counting two points.

LIST OF 111TH FIELD ARTILLERY CONTESTS

(Chose 10 for each year)

NO. 1—DETAIL, DRIVERS AND CANNONEERS

Combined Efficiency Contest: (Non-firing battery not excluded, but may borrow material, etc.) Batteries draw for place. Each battery is allowed one-half hour as a maximum time consumed, including judging. One hundred per cent. time (*) minutes. Waiting batteries and personnel must be at least 100 yards distant.

Equipment and Personnel: One captain (battery commander); 1 executive officer; 1 instrument sergeant; 1 range finder corporal (optional); 4 telephone operators; 1 chief of section; 6 drivers, with rolls; 5 cannoneers, with rolls; 1 battery commander's telescope or aiming circle (or both); 1 field glass; range finder optional;

* The time limit set will depend on the state of training of the regiment concerned.

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2 telephones and 1 spare phone, if desired; 100 yards or more of wire; 12 horses in draft; 1 horse for chief of section; 1 gun, limbered; 1 caisson, limbered; carriages completely equipped, horses tied to wheels, harness on poles.

The observation post, gun position and aiming point, are designated in advance to the captain. All personnel and equipment is assembled at the observation post. Instruments are set up and levelled. The target is pointed out to the captain. When he says "target identified" the contest commences. The captain then commands, "Lay wire, harness and hitch, take position to fire" (or similar commands). The captain then proceeds to compute the data, aided by the detail. The horses are harnessed and hitched and driven through an avenue of stakes (pointed out in advance) at a trot; the carriages are put in firing position; data is received from the telephone *only* (shouting data from the observation post will be penalized by the judge,—20 points for each element of data shouted). The chief of section, after the proper data has been set off, commands, "Stand clear for first shot; fire." At the command "fire," an additional gun placed near by fires a blank, at which signal time is taken on the contest.

Scoring: The judge on harnessing will pass judgment immediately after unlimbering. Sequence is not to count, except the sequence of firing data; 1 point will be taken off for each one-quarter minute overtime. Harnessing errors will be determined as in the harnessing contest, below; stake-driving errors will be determined as in the stake-driving contest. Deduct 1 for each item found wrong as a result of going into action and preparing for action; deduct 1 for each mil off the aiming point; 1 for each bubble not exactly level (5 for each bubble at the end of a tube). Deduct 1 for each 10 mils off the correct deflection (as measured by the judge at the gun); 1 for each 10 mils off parallel sheaf. Deduct 1 for each 200 yards off the map range. Deduct 1 for each 5 mils off in site; 1 for each point off the announced corrector; 1 for each 25 yards off the announced fuze-setter range. Deduct 1 for each item of incompleteness, such as tools, rolls, articles that belong in saddle bags, straps, paulins, buckets, etc.

NO. 2—DRIVERS

To Harness a Team of Six Horses: All entries begin at the same time. One hundred per cent. time () minutes. Equipment and Personnel: 1 chief of section; 3 drivers; 6 horses; 1 limbered carriage, with the harness on the pole, horses tied to the wheels, and the drivers standing to heel. The chief of section reports when finished, leaving the horses tied to the wheels.

Scoring: Deduct 1 for each item wrong or omitted (sequence in

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performance not to count). Deduct 1 for each 15 seconds overtime. The adjustment of harness is not to count in this contest.

NO. 3—OFFICER AND DETAIL

Telephone and Data Test: All entries begin at the same time. One hundred per cent. time () minutes. Equipment and Personnel: 1 battery commander's telescope; 1 aiming circle; 1 rangefinder (optional); 1 field glass; 2 telephones; 1 spare telephone, if desired; 100 yards, or more, of wire; tools, paper, pencils; one officer; 2 instrument operators; 4 telephone operators (2 of whom are recorders).

The gun position, aiming point and observation post are indicated in advance. When the officer says "Target identified" the contest commences. Time is again taken when the telephone operator at the guns hands the judge a written message containing the data.

Scoring: Deduct 1 for each 5 mils off in deflection; 1 for each 5 mils off in site; 1 for each 5 mils off parallel sheaf; 1 for each 200 yards off map range; 1 for each one-quarter minute overtime. Commence with instruments already set up and levelled.

NO. 4—CANNONEERS

Nomenclature of 75-mm. Matériel: Each battery is tested separately. No 100 per cent. time. Each battery is allowed approximately 10 minutes, including judging. Equipment and Personnel: 1 chief of section; 5 cannoneers; 1 75-mm. gun in firing position, covers off. Questions will be asked each member of the gun crew and the chief of section. No questions will be passed from one man to another. Deduct 1 for each erroneous answer (an answer that is partly erroneous counts as a wrong answer).

NO. 5—DRIVERS

Stake-driving: Batteries draw for place. Each battery is tested separately. No 100 per cent. time. Equipment and Personnel: 1 chief of section; 3 drivers; 1 limbered, 4 wheeled, artillery carriage, drawn by 6 horses. Go through first at a walk, then at a trot. Deduct 1 for each stake found to be knocked out of plumb, and 1 for each wheel passing outside of an untouched stake. A wheel going outside of or on a stake that has been knocked out of plumb by a horse or a preceding wheel does not count, that is, each stake can cause only one error.

NO. 6—OFFICER AND DETAIL

Road Sketch Mounted: Time limit () minutes. Distance 1 mile. Equipment and Personnel: 1 officer, mounted; 1 sergeant, mounted; 1 horseholder, mounted; pad, pencils; pace scale, if desired; pace tally, if desired; sketching outfit, if desired; clip board, if desired. The scale of the sketch will be 6 inches to the mile, or

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1 over 10,000. Time is taken upon departure and when the sketch is handed to the judge. Deduct 1 for each error discovered in the sketch, and 1 for each minute overtime.

NO. 7—DRIVERS

Nomenclature of Harness: No time limit. Equipment and Personnel: 1 set of wheel harness (artillery or escort wagon); 1 set of lead harness (artillery or escort wagon); 2 drivers. Questions will be asked each driver. Deduct 1 for each erroneous or partly erroneous answer. Drivers will take this test immediately before or after the performance of the stake-driving contest.

NO. 8—DETAIL

To Obtain the Coördinates of the Base Piece: 100 per cent. time limit () minutes. Equipment and Personnel: 1 officer; 1 instrument sergeant, with an assistant; plane table, if desired; 1 map, paper, and pencil. A stake is indicated on the ground. Required: coördinates of the point indicated by the stake. Time is taken when the point is indicated. Time is again taken when the written coördinates are handed to the judge. Deduct 1 for each 25 yards off in X, and the same for Y. Exact coördinates are desired.

NO. 9—HARNESSING

To Harness a Wheel Pair: 100 per cent. time () minutes. Equipment and Personnel: 1 driver; 1 pair of horses; one set of wheel harness, on the pole. Deduct 1 for each item found wrong, and 1 for each one-quarter minute overtime.

NO. 10—CANNONEERS

To Remove a Gun Wheel: 100 per cent. time () seconds. Personnel and Equipment: 1 gun crew; 1 gun, unlimbered in firing position. Deduct 1 for each 5 seconds overtime.

NO. 11—CANNONEERS

To Assemble a Breech Block: 100 per cent. time () minutes. Equipment and Personnel: 2 enlisted men; 1 gun. Deduct 1 for each 5 seconds overtime.

NO. 12—DETAIL

Telephone and Switchboard Speed Test: 100 per cent. time () minutes. Equipment and Personnel: 4 enlisted men; 4 telephones; 1 switchboard; 300 feet of wire in three lines leading to the switchboard, each line approximately 100 feet long. A message is handed the operator at position No. 1, directed to position No. 2, or to No. 3. The switchboard operator makes the connection. Time taken when the finished message is handed to the judge at the

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destination. Deduct 1 for each error in the message, 1 for each one-quarter minute overtime.

NO. 13—CANNONEERS

To Lay the Piece for Range and Deflection: 100 per cent. time () minutes. Equipment and Personnel: 1 gunner and one No. 1 cannoner; 1 gun. Sights, bubble, etc., are thrown off approximately the same amount for each battery. The data should be such that it is not necessary to shift the trail. Deduct 1 for each mil off the aiming point; 1 for each mil off the announced deflection; 1 for each mil off the announced site; 1 for each 25 yards error in range; 10 for each bubble not exactly level; 1 for each 5 seconds overtime.

NO. 14—DRIVERS AND CANNONEERS

Action Rear: 100 per cent. time () minutes. Equipment and Personnel: 1 complete section with its personnel. Deduct 1 for each item found wrong; 1 for each one-quarter minute overtime. The team will be at a walk when the command is given.

NO. 15—DETAIL

To Compute Deflection (with Large Offset): 100 per cent. time () minutes. Equipment and Personnel: 1 enlisted man; 1 battery commander's telescope or aiming circle. Use the battery commander's telescope as the aiming point for the base piece. No obliquity. Deduct 1 for each mil off the target. Deduct 1 for each one-quarter minute overtime.

NO. 16—DRIVERS AND CANNONEERS

To Limber Front and Rear: 100 per cent. time () minutes. Equipment and Personnel: 1 complete section with its personnel. Deduct 1 for each item found wrong; 1 for each one-quarter minute overtime.

NO. 17—CANNONEERS

Reciprocal Laying: 100 per cent. time () minutes. Equipment and Personnel: 2 gun crews with chiefs of section; 2 guns. Determine the accuracy of the laying by checking with an aiming circle. Deduct 1 for each mil of error when compared with the aiming circle figure. (Lay No. 1; have No. 1 lay No. 2; have No. 2 measure the angle to the aiming circle).

NO. 18—DETAIL

Visual Signalling (Wigwag or Blinker for One-half Mile): 100 per cent. time for the message () minutes. Deduct 1 for each error in the message; 1 for each one-quarter minute overtime.

THE USE OF SUB-CALIBRE IN TRAINING

BY CAPTAIN WARD C. GOESSLING, F.A.

THE expense of service ammunition, the wear on the gun, and the necessity for extensive target ranges, prohibit the use of service ammunition in elementary training. All types of heavy ordnance use some form of sub-calibre to simulate, to a degree, service ammunition. The 75's, 2.95's and 3-inch, use a 30-calibre gun which is inserted into the bore of the piece at the breech. Its construction is such that the axis of the bore of the sub-calibre gun is coincident with the axis of the bore of the gun in which it is mounted.

After the War Department had selected the present sub-calibre equipment and placed it in the hands of the field artillery organizations, it apparently gave the matter no further thought. No prescribed or suggested method for the use of this equipment in the training of troops can be found. This lack of a prescribed use for this equipment may be the cause for the quite general belief that the sub-calibre is of slight value in training.

A perusal of the files of the FIELD ARTILLERY JOURNAL discloses the fact that the need for a workable method of training with the sub-calibre has been felt for some time.

There are two types of sub-calibre guns issued to the Field Artillery. I have used only the design of gun the external appearance of which is similar to a round of service ammunition. The other design, due to its construction, is not adapted to use in drill of the gun-squad. This deficiency could be readily corrected by a battery mechanic.

The question is asked: "Why bother with sub-calibre at all?" One of our missions in training is to bring our enlisted men to the highest possible degree of efficiency, not in their own duties alone, but in those of higher grades also. Any and every means that will assist in the accomplishment of this mission must be used. Training with the sub-calibre, simulating service conditions, is one means. The National Guard, the Field Artillery Units of the R.O.T.C. and some organizations of the Regular Army see but little service practice. In these organizations efficient gun-squads are "made" by drill in the gun-park or its equivalent. This type of training is absolutely necessary and can never be dispensed with, but after a time should be broadened to more nearly simulate the use of service ammunition. Sub-calibre is devised to meet this need.

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Sub-calibre practice when properly conducted is drill of the gun-squad with a bullet to prove the accuracy of the laying of the gunner and number one. The firing battery functions as at service practice but the training should not be limited to the firing battery alone. The entire battery should frequently be assembled and should function as a team. Training can be had in the more unusual problems, for example: The firing battery can solve the problem of close defense of the gun position; problems in special fires, such as a rolling barrage, can be practiced. These two and many others are done better on the sub-calibre range than on the drill ground. The ammunition allowance prohibits the use of service ammunition for such problems. For these reasons, go to a great deal of bother with sub-calibre and the resulting training will be well worth it.

The proper use of any armament must be in accord with its characteristics. A comparison of the characteristics of the field gun and the sub-calibre gun and their respective ammunitions is, therefore, not amiss.

The sub-calibre gun, being mounted in the bore of the field gun, becomes an integral part of the field gun insofar as laying is concerned and therefore has no independent characteristics.

It is only in respect to ammunitions that the differences in characteristics become important. The first difference is that the sub-calibre projectile is solid and non-explosive while that of the field gun is explosive. The second is that the projectile of the sub-calibre gun is light and has a comparatively high velocity while that of the field gun is heavy and has a relatively low velocity, therefore their trajectories are not similar. Due to the first difference we cannot illustrate time fire with the sub-calibre and cannot observe its point of impact at service ranges. Due to the second difference the sub-calibre projectile has a very flat trajectory for the ranges at which the point of impact can be observed, so that when firing over fairly level ground service changes in elevation result in changes in the point of impact out of all proportion to service ammunition.

To sum up the foregoing: In using sub-calibre in training, service conditions should exist in the firing battery but sub-calibre conditions are imposed upon the observation.

The following is one method in which the characteristics of the sub-calibre gun and ammunition are applied to training.

The battery is placed in position with the interval between sections reduced to the minimum. The sub-calibre gun is handled by the cannoneers as if it were a drill cartridge except that the highest

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numbered cannoneer in preparing ammunition removes the exploded sub-calibre cartridge case from the sub-calibre gun, and that upon the cannoneer who normally screws fuzes into shell, falls the duty of inserting a sub-calibre cartridge into the sub-calibre gun before the piece is loaded. In order to avoid scaring the breech block the extractor springs should be removed from the base of the sub-calibre gun. If shrapnel is ordered, a drill cartridge should be kept in the fuze setter and the sub-calibre gun should not be served until the fuze on the drill cartridge is set. Each section should be provided with at least two sub-calibre guns. At first glance it may seem that the drill of the gun-squad has been seriously tampered with. I do not believe that efficient training is prohibited as the substituted operations each consume the same time and effort as the operations eliminated by the sub-calibre equipment.

The target is a vertical screen erected one thousand inches in front of the muzzles of the guns. One thousand inches is used because at that distance the sub-calibre projectile is to all intents and purposes on the line of departure, ammunition and atmospheric errors are negligible, and one inch subtends one mil. The range tables will give an idea of the height above the muzzles at which the projectile will strike. With a vertical target, safety precautions and convenience are the only factors which limit the band of ranges or elevations used. The shot holes in the target are absolute proof of the point at which the gun was fired. Actual angles of site and service ranges are used, thereby training the gun-squad. One thousand inches is used rather than a shorter range, because at that range field glasses must be used to locate the point of impact.

The screen is divided into two parts, the sighting panel and the striking screen. Both parts may be as simple or elaborate as desired. Complicated targets are neither necessary nor desirable as they only cause delays during firing and are unnecessary work for the battery. The sighting panel is located directly below the striking screen and need never be hit. The elevation given the gun raises the point of impact, thus the height of the bottom of the striking screen above the bottom of the sighting panel, in inches, becomes the minimum elevation in mils, and the height of the top of the striking screen above the top of the sighting panel becomes the maximum elevation. The top and bottom of the striking screen may be about ninety and twenty inches, respectively, above the sighting panel and in this case the maximum range is about three thousand and the minimum range is about eleven hundred.

A satisfactory striking screen is made by pasting an "L" target to a pistol target frame with the plain side of the paper out.

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Four safety match boxes placed on a board under the striking screen may represent a battery target and serve for a sighting panel.

Elementary training of the gun-squad, following drill in the gun-park in logical sequence, using direct and indirect laying, with and without the gunners' quadrant, can be conducted on this simple target. The entire drill is competitive; the time of each gun-squad can be kept and the accuracy of the laying is recorded on the striking screen. After each problem the gun-squad can be assembled and the results analyzed and errors pointed out. Interest in the drill and esprit is increased.

Assume, for example, that the executive has trained the firing battery for some time and the battery commander desires to determine the progress made. The guns are in position, a timekeeper is detailed for each section. The battery commander gives the executive prepared firing data as follows: Target—that battery. Deflection—plateau 0, drum 110. Shell, Mark I. Fuze—long. Three rounds: 2000; 2200; 2400.

Right 10. 2400; 2200; 2000.

Left 5. 2000; 2200; 2400.

Cease firing.

The executive causes the desired fire to be delivered; the battery commander observes the functioning of the gun-squads; the timekeepers record the time required to lay and fire the first, second and third round at each range. Upon completion of the firing the target is examined to determine the accuracy of the laying, the time of each section is compared to its accuracy, and the comparative speed and accuracy of the gun-squads is determined.

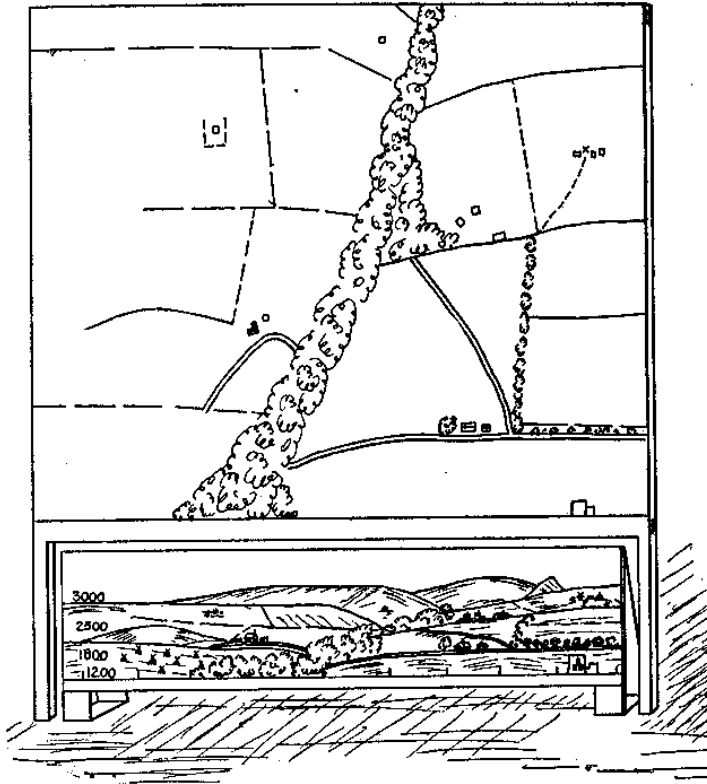
While this use of sub-calibre in training is of sufficient value to recommend its use, it is but one of the forms of training to be derived. Non-commissioned officers can be instructed in the conduct of fire, and officers can be trained in the mechanisms of command required for the conduct of fire.

To carry on this advanced training the sighting panel and the striking screen will have to be improved. A sighting panel is required which illustrates terrain in panorama, with the assumed ranges to several terrain features marked on it. The sighting panel should be the same width as the striking screen and not over twenty-five inches high. The panoramic targets issued by the Ordnance Department to machine-gun units is satisfactory and can be obtained.

The pistol target frame used in elementary training of the gun-squads can be used as a striking panel, or the ranges and deflection shifts permitted by the size of the striking screen may be increased by using a salvaged paulin or wagon sheet painted

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white and mounted on a frame. Any device which will record the point of impact, remain vertical and at about one thousand inches from the muzzles is satisfactory. Upon the striking screen is outlined the terrain features, targets, etc., which appear on the sighting panel. The outline on the striking screen of an object on the sighting panel must be directly above the latter at



A SUB-CALIBRE TARGET

THE SIGHTING PANEL, BELOW, AND THE STRIKING SCREEN, ABOVE, MAY VARY FROM A FORM AS ELABORATE AS THIS, TO ONE IN WHICH THE SIGHTING PANEL IS SIMPLY FOUR SAFETY MATCH BOXES.

a height determined by the thousand-inch ordinate of the assumed range to the object. Artistic design and accurate measurement are unnecessary and waste time.

The commands for the conduct of fire are as prescribed in the regulations. The rules for observation are different from those allowed by service conditions in that terrain sensings cannot be permitted and the shot must be brought to the observer-target line before it is sensible. An imaginary vertical line through the outline

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on the striking screen is the gun-target line. Any angle of observation can be illustrated by drawing a straight line through the outline on the striking screen at any desired angle I to the gun-target line. No line is necessary for axial observation.

Every method and type of fire can be demonstrated, except, as stated before, time fire. Problems, to bring out obscure points, may be fired and critiqued at the target, which registers the result of the firing. The non-commissioned officers are given problems involving the use of all or part of the battery and these problems may be repeated until the desired standard of training is obtained. Throughout the entire practice the gun-squads are receiving further drill, and during all firing with sub-calibre everything should be subordinated to the training of the gun-squads.

To illustrate a test problem for a non-commissioned officer who has been receiving instruction in the conduct of fire:

Sergeant Hill, not of minor tactics fame, is called on to fire. The battery commander states the problem as follows: "I am speaking as the battalion commander of a battalion of infantry, to whose battalion your section, under Lieutenant Clark, has been attached. Your section is in position right over there. Lieutenant Clark is out of action. From your gun and from here we see that part of the front. Machine guns firing from that barn are holding up the advance of my right assault company which is along the railroad line."

Sergeant Hill runs over to the gunner, shows him the target, tells him the situation, and commands:

Target—that barn. Deflection—plateau 0, drum 110. Shrapnel. Corrector 35. One round, 1800. Fire. He observes,—5 right; doubtful. Commands: Left 5; 1800. Sensed,—short. Commands: 2200. Sensed,—over. Commands: 2000. Sensed,—over.

The battery commander informs Sergeant Hill that he has observed three grazes and one low burst.

Sergeant Hill commands: Up 5; 2 rounds; 1900. Sensed,—target and short.

The battery commander informs Sergeant Hill that the first was a graze burst on the barn and the second a low burst.

Sergeant Hill commands: 1900.

The battery commander informs Sergeant Hill that the barn is afire and that the machine-gun crews are retiring along the hedge to the right of the barn.

Sergeant Hill commands: Right 15; up 3; 1900; 2000; 2100.

The battery commander informs Sergeant Hill that a battery firing from somewhere up the wooded valley is ranging on his section.

Sergeant Hill commands: Cease firing; march order; move the

THE USE OF SUB-CALIBRE IN TRAINING

section into that hollow and limber. The battery commander stops the section from moving the carriages; gives the gun-squad "fall out," and critiques the problem.

Every non-commissioned should have the opportunity to fire problems of this type as his prestige is increased, he believes himself to be, and actually is, improved as a non-commissioned officer, and becomes officer matériel in case of emergency.

I believe that there is a need for a prescribed method for applying the sub-calibre equipment to training. Ample time should be allowed the battery commander for the use of sub-calibre. In the last organization with which I served a total of six hours was allowed for sub-calibre practice in the training year.

AIMING STAKES

BY LIEUTENANT GEORGE A. A. JONES, 1ST F. A.

THE laying of field artillery batteries, especially howitzers, by map methods, and by the compass or aiming circle, is leading to considerable use of aiming stakes. Observation of the fire of a battery using aiming stakes has shown that the sheaf is nearly always irregular. This has led to a study of why the sheaf is so irregular.

Training Regulations 430-70, paragraph 28, reads as follows: "Aiming stakes.—Due to location of pieces, fog, smoke, or darkness, it will often be impossible to use a distant aiming point. For this reason, aiming stakes close to the pieces will be set up as soon as the battery is established in position. Whether these stakes or the distant aiming point will be used in laying depends on circumstances. At least one stake, and preferably two, should be used for each piece. Aiming stakes should be at least 50 yards from the sight, preferably, from 100 to 150 yards. When two stakes are used, they must be so placed that the nearer stake is on line between the sight and the farther stake. The use of two stakes is a sure means of detecting and correcting lateral displacement due to recoil of carriage (if stakes are near the line normal to the battery front, whether in front or rear). The stakes should be to the rear for the panoramic sight and to the front for the French sight, model of 1901, and should be placed as nearly as possible on the line normal to the battery front. A piece will often have two aiming or referring points, one for day and one for night use. When the distant point is to the front or rear, it is an advantage to place the aiming stakes on the line between the sight and the distant point. This simplifies the recording of firing data for the various targets upon which the piece may be required to fire."

The unit of angular measurement commonly used for field artillery computations is the mil. For practical purposes it may be taken as the angle formed by one yard at 1000 yards.

When using a single aiming stake the irregularity of the sheaf may be due to any one, or any combination, of the following things: first, displacement of the sight rearward due to recoil of the carriage on firing; second, displacement of the sight laterally due to shifting of the gun trail on deflection changes; and, third, displacement of the sight laterally due to lateral movement of the wheels when firing the piece while on soft or rolling ground.

If the aiming stake is set to the front at deflection 0, when the piece is laid in the centre of its sector, any shift of fire to the left

AIMING STAKES

necessitates the depressing of the muzzle between each round fired so that the gunner may see the aiming stake through the sight. Thus the Y-angle formed by the line of sight through the aiming stake, and the line of piece metal, should be such that the piece may be laid on the left edge of its sector without the muzzle interfering with the line of sight.

Let us see what error will occur when the sight is displaced rearward upon firing, assuming a single aiming stake to be set 50 yards, or 150 feet, from the sight, and to the front.

EXAMPLE NO. 1

The line of sight making an angle Y of 200 mils with the line of piece metal, and the sight being displaced 1 foot rearward. From Diagram A, using the law of tangents $\frac{a-b}{a+b} = \frac{\tan \frac{1}{2}(A-B)}{\tan \frac{1}{2}(A+B)}$, we find that the error will be 1.32 mils. This conclusion is arrived at as follows:

$$A + B = Y = 200 \text{ mils}$$

$$\frac{1}{2}(A + B) = 100 \text{ mils}$$

$$a = 150 \quad b = 1$$

$$a + b = 151 \quad a - b = 149$$

log	149	=	2.17319
colog	151	=	7.82102
log tan	100 mils	=	8.99340
log tan $\frac{1}{2}(A - B)$ = 8.98761			

$$\frac{1}{2}(A - B) = 98.68 \text{ mils}$$

$$\frac{1}{2}(A + B) = 100.00 \text{ mils}$$

$$A = 198.68 \text{ mils}$$

$Y' - A = 200 \text{ mils} - 198.68 \text{ mils} = 1.32 \text{ mils}$, error between first and second round.

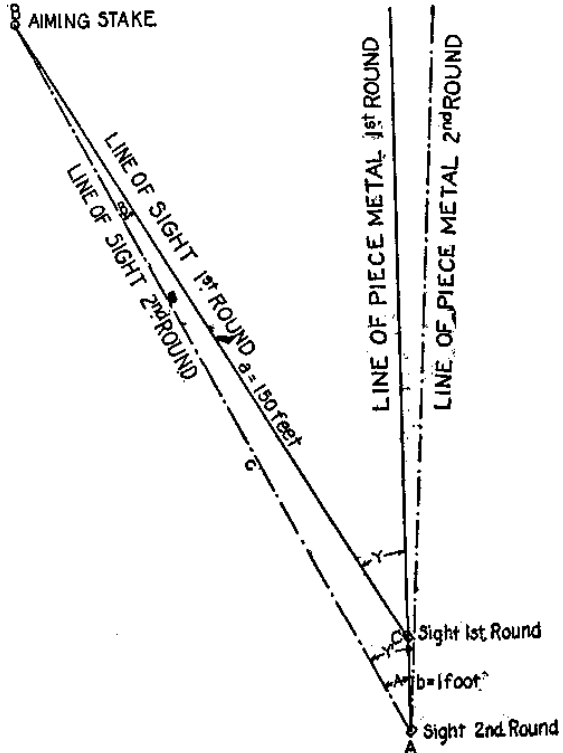


DIAGRAM A

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EXAMPLE NO. 2

The line of sight making an angle Y of 600 mils with the line of piece metal and the sight displaced 1 foot rearward:

$$A + B = Y = 600 \text{ mils}$$

$$\frac{1}{2} (A + B) = 300 \text{ mils}$$

$$a = 150 \quad b = 1$$

$$a + b = 151 \quad a - b = 149$$

$$\log 149 = 2.17139$$

$$\text{colog } 151 = 7.82102$$

$$\underline{\log \tan 300 \text{ mils} = 9.48194}$$

$$\log \tan \frac{1}{2} (A - B) = 9.47615$$

$$\frac{1}{2} (A - B) = 296.25 \text{ mils}$$

$$\frac{1}{2} (A + B) = 300.00 \text{ mils}$$

$$A = 596.25 \text{ mils}$$

$Y' - A = 600 \text{ mils} - 596.25 \text{ mils} = 3.75 \text{ mils}$, error between first and second round.

Likewise it may be shown that when the sight is displaced more than a foot that the error is increased proportionally. The error, when the sight is displaced 2 feet rearward, becoming 2.62 mils when the angle Y is 200 mils, and 7.46 mils when angle Y is 600 mils.

It will be noted that the error in deflection introduced by a *purely rearward* displacement is greater when the aiming stake is 600 mils off the line of metal than when it is 200 mils off this line. This is a general truth, of course. When the aiming stake is *directly* in front of the gun, a purely rearward displacement will cause no error in deflection; the further the stake is to the flank the greater will be the error introduced by a rearward displacement, until the maximum error occurs when the angle Y is 1600 mils, that is, when the aiming stake is directly on the flank.

Now let us see what error will occur when the sight is displaced *laterally* due to the shifting of the piece trail upon a deflection change. When the trail is shifted the axis of rotation is at the

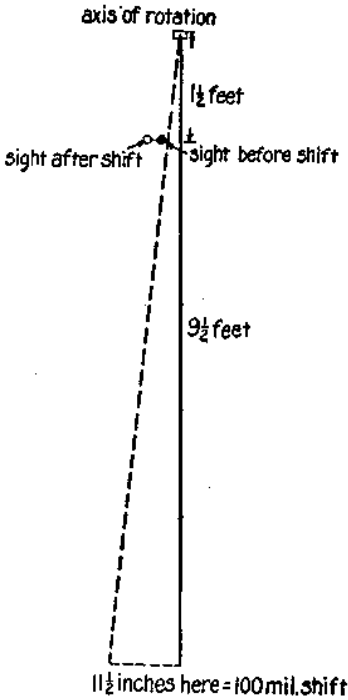


DIAGRAM B

intersection of the axle and the line of piece metal. The sight is not at this axis of rotation, therefore any lateral shift of the gun trail will cause lateral displacement of the sight. Measurements were taken on the American 3-inch gun and found to be as follows: distance from the axle to the sight, 1 foot, 6 inches; distance from the axle to the spade

AIMING STAKES

of the piece trail, 9 feet, 6 inches; and lateral displacement of the trail corresponding to a 100-mil deflection shift, 11½ inches.

From Diagram B, by proportion, we find that when the trail is shifted 100 mils (11½ inches), the sight is displaced laterally 1.8 inches

$$\left(\frac{1.5 \times 11.5}{9.5} = 1.8 \right).$$

Lateral displacements of the sight may be caused by the shifting of the piece during shock of discharge, too, as was mentioned above, as well as by shifting the trail.

If now the aiming stake is 50 yards (1800 inches) away *directly* to the front, we find that this lateral displacement of 1.8 inches causes an error of

$$1 \text{ mil} \left(\frac{1.8}{1.800} = 1 \right).$$

This case, with the aiming stake directly in front (or rear), causes the maximum error for any purely lateral displacement, and this error decreases to zero when angle Y is 1600 mils (when the aiming stake is directly on the flank). By a calculation similar to that used above in computing errors due to rearward displacement, the error due to purely lateral displacement for any angle Y can be found.

The substance of the discussion above is that, when the first round is fired, there is usually both a rearward and lateral displacement of the sight, each of which introduces errors of deflection in the laying for the second round. The resultant error in deflection will be a combination of the errors from the two sources.

If in firing, the displacement of the sights of each piece of the battery were the same, these errors would be the same for all pieces of the battery, and the sheaf would be regular, but this condition cannot be expected. Even in this case, if the aiming stakes of each piece of the battery are not the same distance from the sights, the error occurring due to displacement of the sights will not be the same for each piece, and the sheaf will be irregular.

A series of tests made by having four pieces lay with the same deflection on a distant aiming point, putting out aiming stakes and referring to them, firing several problems, announcing data so that the problems ended without any deflection difference between pieces, then referring back to the distant aiming point, resulted in errors between pieces as high as 10 mils.

If now we take two aiming stakes and place them so that they are in line when looking through the sight, the distance from the sight to the nearest stake being the same as the distance from the nearest stake to the farthest stake, we can arrive at a method to remove these errors occurring when only one aiming stake is used.

It is easily seen that if the farthest stake is twice as far from the sight as the nearest, the error caused by using the farthest stake

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will be only one-half as much as when using the nearest stake. If this is the case, then the angle between the nearest and farthest stake must be equal to the error of the farthest stake.

Thus, when using two aiming stakes, the distance from the sight to the nearest stake being the same as the distance from the nearest stake to the farthest stake, we may form the following rule: "Lay on the farthest stake; without traversing the piece, turn the sight until the line of sight passes through the nearest stake; traverse the piece and lay on the farthest stake."

This rule will correct any error due to the displacement of the sight. This method was tried under the same conditions as the test with the single aiming stake, and when the gunners followed the rule, it was found that the sheaf was regular and that the error between pieces never exceeded 1 mil upon referring to the distant aiming point.

This method has several drawbacks. It was found to be very difficult to train the average gunner to follow the rule. The procedure must be gone through for each displacement of the sight, thus slowing up the firing. In rapid firing it was found that a gunner would often fail to follow the procedure before each round, the error caused on the round when the rule was not followed entering into the rest of the problem; or the gunner would reverse the procedure as laid down in the rule, laying on the nearest stake, turning the sight to the farthest stake, and traversing back to the nearest stake, thus doubling the error instead of correcting it. Furthermore, you cannot check the deflection from the recorder's sheet as the latter does not carry the corrections made by the gunners for the displacements of the sights.

If it were possible to move the piece before each round so that the line of sight passed through both aiming stakes, then the lateral displacement of the sight would leave the line of piece metal parallel to its original position, and the sheaf would be regular. This moving of the piece would slow up the firing and could not always be done if the piece were on slippery ground.

If, instead of moving the piece, we could move the aiming stakes so that the line of sight passing through the stakes would be parallel to its original position, the line of piece metal would remain parallel to its original position, and the sheaf would be regular, there being no deflection error between the pieces.

This very thing has been accomplished by the construction of a T-aiming stake. This consisted of an iron rod about 4½ feet long and 1 inch in diameter, and a board, 2 feet long, an inch thick, and 3 inches wide. This board was provided with clamps so that it

AIMING STAKES

could be clamped to the iron rod. On the face of the board were painted divisions as shown in Diagram C, each division being $1\frac{1}{2}$ inches.

Now if we take two T-aiming stakes and place them so that the line of sight passes through the centre division of each stake, and fire the piece, causing a displacement of the sight, we can move the line of sight parallel to its original position by traversing the piece until the line of sight passes through a similar division on the T-aiming stakes, thus correcting the error due to displacement of the sight.

In a test, using the T-aiming stakes, similar to the tests for the single, and for the two aiming stakes, the sheaf was regular, and upon referring to the distant aiming point all pieces had the same deflection.

The T-aiming stake has the advantage that it is easy to train gunners in its use, does not slow up the fire, any error on one round does not enter into the rest of the problem, stakes can be placed at any Y angle, do not have to have the same distance between stakes as from the sight to the nearest stake, and the deflection may be checked from the recorder's sheet.

The question may be asked as to how these T-aiming stakes can be used at night. Training Regulations 430-70, paragraph 29, says: "Aiming Lights. At night it is necessary to use lights for aiming points. The lights are placed on the aiming stakes. Ordinarily, the lights used will be those issued as part of the battery

equipment, but, when this equipment fails, lanterns, improvised electric lights, or candles may be used. The light should be completely screened except for a narrow vertical slit toward the sight."

The lighting devices, as issued, easily, and usually, get out of order when bumped about while the battery is marching. They permit the use of only one aiming stake per piece, and that at a short distance from the sight. The batteries run down and leave you without lights. Care must be taken, in the service of the piece,

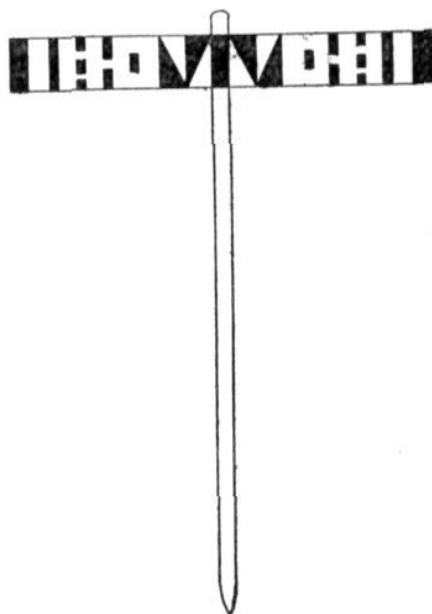


DIAGRAM C
A T-AIMING STAKE

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that the cannoneers do not trip over the wire leading to the lights on the aiming stakes.

Instead of using the lighting devices for the aiming stakes, a strip, $\frac{3}{8}$ of an inch wide and 4 inches long, may be painted on each aiming stake with luminous paint. This strip should then be covered with a transparent piece of celluloid to protect the paint from the weather. This paint will last for several months. The strip is clearly visible at night and makes an excellent point to sight at. This has the advantage that two aiming stakes may be used with each piece and the rule for use of two aiming stakes applied, thus enabling the battery to fire at night with an excellent sheaf; that the lights do not get out of order due to rough travelling; and that no batteries or wires are needed. The divisions of the T-aiming stakes may be likewise painted with luminous paint and the T-aiming stake used for night firing.

CONCLUSIONS

1. The use of a single aiming stake should only be resorted to in an emergency. When it is used, it should be placed as far to the front, or rear, as possible, and normal to the battery front.

2. The use of two aiming stakes, in conjunction with the rule for their use, gives a regular sheaf, but it is difficult to teach gunners to follow the rule; it slows up the fire; stakes must be placed at measured distances; and it does not permit the checking of deflections from the recorder's sheet.

3. The use of T-aiming stakes gives a regular sheaf; it does not slow up the fire; stakes can be placed at any angle and at any distance from each other and the sight; gunners are easily instructed in their use; and the deflection can be checked from the recorder's sheet.

BATTERY DETAILS

BY CAPTAIN J. A. WALLACE, 12TH F.A.

IN HIS annual report rendered June 30, 1924, The Chief of Field Artillery said: "Officers now completing a course at a Special Service School, join their organization filled with high purpose and with a mind fully made up to put into practice the knowledge acquired at the school—and thus in a short time show what a real live and efficient organization is. But they have no more than joined when they find that they have but little more than a skeleton organization to work with. The officer's grand scheme collapses and the average officer becomes discouraged."

Due to the shortage of both men and horses for drill, numerous experiments have been made during the past few years in the formation, transportation, and handling of details, and it has occurred to me that it might be appropriate, and perhaps very helpful to many, to set down what results I have been able to observe in the use of battery detail at reduced strength.

Two considerations chiefly affected the methods finally selected; (1) several instrument men are unnecessary whereas it is very desirable to have more signalmen than are authorized by Tables of Organization; (2) several men in the detail were at first dismounted, due to shortage of horses, and further experiments showed that down to a surprisingly small minimum the more detail men were dismounted the more efficient the detail became.

It is not desired to advocate departures from either the Training Regulations or the Tables of Organization. Those documents prescribe the best ways and means to meet the contingencies of war. Not the least of their virtues is the fact that they are flexible, and this article contains suggestions as to how they may be applied under conditions affected by shortage of available personnel and transportation.

The minimum, desirable number of men for the battery detail I am about to describe, is thirteen. This includes two reel cart drivers and one spring wagon driver and does not include the first sergeant, bugler (orderly for battery commander) and agent, all of whom belong to headquarters. The number thirteen may be compared to seventeen authorized by Tables of Organization and it will be noted four men, or one per gun section, are saved. It will be shown later where two more men may be saved and still do passable training.

To arrive at the number thirteen we deduct the instrument corporal or sergeant, scout corporal, two instrument operators and two

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horse holders, from those authorized by Tables of Organization. We add one telephone operator and one line guard. The duties of the members of the detail are then as follows:

Signal sergeant: In charge of the detail; establishes and maintains signal communications within the battery; responsible to the battery commander for all detail equipment (holds the instrument corporal or sergeant responsible for the care of the instruments).

Signal corporal: In charge of the reel cart; lays telephone lines as directed by the signal sergeant; repairs and maintains telephone lines.

Telephone operator No. 1: Operates the switchboard.

Telephone operator No. 2: Operator at the battery position.

Telephone operator No. 3: Operator at the observation post.

Telephone operator No. 4: Operator at the command post.

Line guard No. 1: Lineman at the observation post.

Line guard No. 2: Lineman at the switchboard (battalion line); operates the reel cart.

Line guard No. 3: Lineman at the switchboard (observation post line).

The working formation of the detail must be varied as the number of men and horses available or desired is reduced. The following is suggested when the desirable minimum number of men and horses is used:

BATTERY COMMANDER'S PARTY

(When present)

Reconnaissance Officer	O	O	Battery Commander
Bugler	O	O	1st Sergeant
Signal Sergeant	O	O	Instrument Sergeant (or Cpl.)

SECOND ECHELON

Signal Corporal	O	
Driver	O	
Driver	O	
Line Guard 2	OOO	Reel Cart
	Operator 3	Operator 1

For the third echelon operators two and four and line guards one and three, ride on carriages of the firing battery. They are instructed that in case one of them is riding on a carriage which falls out for any reason, he will immediately mount another carriage and in any case must arrive at the battery position not later than the firing battery.

The spring wagon carries spare wire and other detail supplies and equipment, and is often used to haul water and lunches for the firing battery. In some cases, when it is desired to have the position completely organized before the guns arrive, the men of the third

BATTERY DETAILS

echelon ride in the spring wagon which marches with the second echelon.

In the marching formation, operator three rides on one of the carriages of the firing battery as the reel cart is comfortable riding for only two men.

A word may be said here about the carrying of the necessary equipment. The battery commander carries a map, protractor, plotting scale, needles, eraser, sitogoniometer (or clinometer—either can be used in solving the problem of the mask), thirty-metre tape, open-sight alidade, and declinator. These are arranged in an issue saddlebag fitted with snaps and carried in place of the near canteen bag. The instrument sergeant carries a flag kit fitted with attachments for marking the gun position, as described below.

The bugler carries an improvised reconnaissance planetable, eighteen inches square. This is not at present an article of issue for this purpose, but as the sketching board is too small for topographical work, and the 18×24 planetable is too cumbersome to carry on horseback or dismounted, I have found the improvised table most convenient for locating the position of the base piece and preparing the initial data, and later as the plotting board at the observation post. The sketching board tripod (now issued as engineer equipment) can be used with this improvised reconnaissance planetable, by utilizing the female portion of the tripod attachment taken from the sketching board.

Operator one carries the switchboard on the footboard between his feet. I have found that a home-made box for carrying the switchboard is very convenient.

Operators two, three and four each carry a telephone and signal lamp. Operators two and four each carry breast reels.

Every man in the detail and headquarters is equipped with pliers and knife.

Line guard one carries the 18×24 planetable with its tripod and leaves it at the command post upon arrival at the battery position. This planetable becomes the plotting board at the command post.

Line guard three carries the executive's aiming circle, and leaves it with the operator at the guns upon arrival at the battery position. He wears the climbers and safety belt.

All equipment may be carried in the instrument chest of the reel cart or in the spring wagon in the marching formation. It is fatal to have any of it there in the working formation. The wagon breaks down, the key to the chest is lost, or the instrument sergeant has it at the observation post, or some similar thing is bound to happen at the most inopportune time. In addition to this the removing and sorting of equipment consumes minutes that seem hours under some circumstances.

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The detail is first taught to thoroughly understand the normal procedure, in which it is only necessary for the battery commander to issue two or three brief orders during the entire reconnaissance and occupation of a position. The application of the normal procedure to special cases is then taken up and it is surprising how quickly the men develop their own resourcefulness.

The normal procedure will be described here in detail. Its application to special cases can be taught only by demonstration and execution in the field, but this is not difficult and only requires time.

In the occupation of position the echelonment of details and batteries will vary according to time, from a few minutes to several hours. In a fast-moving situation the battery commander's party will usually arrive at the vicinity of the battery position five to fifteen minutes ahead of the second echelon. The time between the arrival of the second echelon and the firing battery will vary widely. Occasionally they will arrive simultaneously.

It may be appropriate to describe here a convenient device for holding flags as position-markers, which can be made as follows: A piece of heavy steel wire about one-quarter inch in diameter, is shaped with two loops to fit over the lower end of the staff for each semaphore flag and the wig-wag flag in an issue flag kit. In the travelling position the loops are slipped over the staff so that the projecting end of the wire, about eight inches long, lays along the staff. The flags, with these attachments, can be stuck into almost any kind of ground readily and will stand up straight. One semaphore flag marks the position of the right gun and the other the left gun. The wig-wag flag is placed about forty yards distant, approximately on the line of fire for the right gun. All men in the battery are taught to "read the position" as indicated by the flags. This is a special adaptation of an old French method.

The battery commander, having been assigned the zone for the location of his battery position by the battalion commander, selects the position for the right gun. The signal sergeant hands him the two semaphore flags. He places one flag in the position for the right gun and lines the signal sergeant in about forty yards distant approximately on the line of fire for the right gun. The signal sergeant places the wig-wag flag where he has been lined in. The battery commander places the other flag in the position for the left gun. He will often wish to pace the distances.

The battery commander next tells the signal sergeant the location of the command post. This will usually indicate the approximate location for the telephone central, the exact position of which is decided by the signal sergeant. Where possible the telephone central should be between fifty and one hundred yards to one flank of the battery and slightly to the rear. The command post should be

BATTERY DETAILS

between fifty and one hundred yards from the telephone central, and on the same flank of the battery when convenient.

The battery commander also tells the signal sergeant, as nearly as he can at that time, the location for the observation post. The signal sergeant then goes back to meet the reel cart and guide it to the position.

At this time the battery commander tells the first sergeant the manner of entering the position, *e.g.*, from the left, action left; from the rear, action front, etc. If the first sergeant is a man of training and experience the battery commander leaves the selection of the limber position to him. He will often locate it on his way back to meet the battery. In moving situations the limber position should ordinarily be from four hundred to twelve hundred yards to the rear and preferably to one flank. After receiving any special instructions necessary the first sergeant goes back to meet the battery and guide it into the position.

The battery commander now takes the instrument sergeant to the nearest point from which the enemy's territory can be seen and, selecting a prominent point in the enemy territory and within the battery sector, tells him to lay the base piece on that as a base point. Accompanied by the bugler the battery commander then goes forward to select an observation post. After selecting this point, if he desires to remain there and study the sector, he sends the bugler back to meet the reel cart and guide it to this observation post he has selected.

The battalion communications officer is primarily responsible for the line which he lays to the battery switchboard. The battery observation post line is usually long compared to other lines, is often laid over difficult ground and presents many difficult problems. If it does not go in in time, or goes out after being put in, the battery loses its eyes for the time being. It is evident that we should organize the short lines properly, give them excellent equipment, and then put all our efforts on the observation post line. If this line is in good order, we assist on the battalion line when necessary by sending out one or more men from our end when trouble occurs. If both the line to the guns and the command post line should go out, we can still communicate from the switchboard to the battery position by voice.

As the signal sergeant leads the reel cart up, he tells the signal corporal the location of the observation post as nearly as the battery commander was able to give it to him. He leads the reel cart to the location for the telephone central. Operator one dismounts and he and the signal sergeant grasp the free end of the wire and the reel cart proceeds in the direction of the observation post, laying

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the wire under the supervision of the signal corporal. When the latter approaches the vicinity of the observation post he is careful not to break cover. As soon as necessary he reverses the reel cart and the men pull the wire the remaining distance by hand, leave plenty of slack, and cut the wire. Operator three connects his phone and with good luck should be in communication. The signal corporal returns immediately to the vicinity of the telephone central with the reel cart and line guard two and reports to the signal sergeant. It will often happen that the sergeant has received orders to lay additional lines or to place the reel cart at the disposal of battalion headquarters. If no such orders have been received, the signal corporal and line guard two dismount; the horses of the signal corporal and signal sergeant are turned over to the drivers and the reel cart, lead driver in charge, reports to the first sergeant at the limber position.

When the first sergeant meets the firing battery he reports to the executive and tells the latter the manner of entering the position and any special instructions as to route, etc., that the battery commander has given him. In wartime organizations many national guard batteries, and some regular army batteries for which time has been limited, the gun crews have only been taught to fire fast and accurately with the sections in order of numbers from right to left, that is, with the first section on the right and the second, third and fourth in order. If the battery is on the road in the reverse order desired, the command "last section forward" is passed from head to rear of the column. The last section moves by the left to the head of the column; it is followed by the section which was in front of it, and so on until the sections are in the desired order. A signal for this movement may be adopted within the battery. The movement may be executed at an increased gait without losing time or motion. This is an old French method and is so simple that it seems hardly worth while to spend the time necessary to train gun crews to fire with the sections in the reverse order. The executive must precede the battery into the position by at least one hundred yards,—more if he can conveniently do so.

When the firing battery arrives at the position, the signal sergeant cautions operators two and four as to the location of the telephone central. Each hands the free end of his breast reel wire to the switchboard operator and lays the wire to his post. The lower end of the wire can be attached to the outside of the reel proper so that the operator can attach it to his phone as it is and talk through the wire on the reel. It is thus unnecessary to cut the wire. The operator at the gun position should be especially careful to leave plenty of slack, as it is often necessary for the executive to change his position. Both the operator at the guns and the operator at

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the command post should invariably be able to get communication during the time it takes for the battery to unlimber and prepare for action.

Line guard one, starting at the switchboard, follows the line as quickly as possible to the observation post, making sure only that the line is intact. Upon arrival at the observation post, if the line tests satisfactorily, he starts back making the permanent lay of the line. The wire must be placed flat on the ground or high enough to clear the top of a Liberty truck. Line guard three has started immediately to make the permanent lay of the line, working out from the switchboard. When they meet with the knowledge that the line is intact and properly laid, they return to their posts. Line guard one remains under cover within calling distance of the observation post operator when not otherwise occupied. Line guard three and line guard two remain under cover within calling distance of the switchboard operator when not otherwise occupied.

As soon as all lines are established and intact, line guard one takes the observation post operator's signal lamp and line guard three the gun position operator's lamp. If a relay station is necessary, line guard two occupies it, using the command post operator's lamp. They establish communication by visual signals as a supplementary means. If the observation post line goes out, line guard one and line guard three turn their lamps over to the operators, together with any information they may have with regard to signals, stations, etc., and start out on the line, working from both ends until the line is again intact, when they return to their posts.

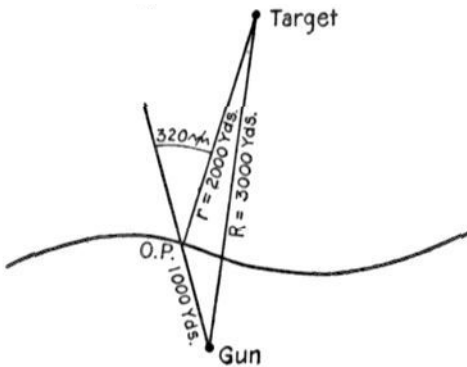
The signal sergeant exercises general supervision over the establishment and maintenance of visual communication as well as those by telephone. When desired he arranges to receive visual signals from battalion headquarters, using either the signal corporal or line guard two. He should remain in the vicinity of the telephone central except in extreme cases of emergency. There he is in touch with all of his system. At the observation post he would be in touch with only a small portion of it. A common fault is for the signal sergeant to eliminate his signal corporal from the picture by taking charge of the reel cart himself.

As soon as the limbers are established in position, the guidon reports to the signal sergeant and is posted with his horse under cover in the vicinity of the command post. He is usually the only reliable means of quick communication with the limbers. In emergencies he may be used as a mounted messenger for other purposes.

In order to obtain defilade, batteries in wartime are invariably placed in position behind a mask such as a crest of a hill. Some batteries grow away from this in manœuvring for positions for actual firing in peacetime due to safety requirements.

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If the battery be behind a crest, the instrument sergeant will usually find a position on this cover from which he can see both the base piece and base point, in which case he can lay very accurately by using the back-sight method. To use this method he sets off 3200 on the aiming circle and sights on the sight of the gun, using the lower motion. This causes the 0-3200 line to pass through the gun and the instrument. He then measures the shift from where the instrument is laid to the base point and applies the reduction factor, obtained by taking r (equal to the observation post-target range) over R (equal to the gun-target range). He applies this shift, right or left as the case may be, to plateau 0, drum 100, and directs the gun to lay on the aiming circle with the deflection obtained.



$$320 \times \frac{r}{R} = 320 \times \frac{2000}{3000} = 320 \times \frac{2}{3} = 213$$

85).

The base piece being laid, the executive forms the sheaf. The most accurate method for this is by using an aiming point directly to the flank and at least two thousand yards distant (provided all pieces are on line). The next most accurate method is by using a distant aiming point not on a flank but with the distance to it *accurately known* and the parallax corrected for obliquity. When a suitable aiming point is not available the other guns are laid by reciprocal laying on the base piece.

During the reconnaissance and occupation of position and until the reel cart is sent back to the limber position, the signal sergeant holds his own horse, ties him under cover, or, if working near the battery commander, turns him over to the bugler.

In handling telephone traffic all messages coming into the battery are received at the command post. Whenever the switchboard operator receives a call from someone who wishes to transmit a message to the battery, he says, "Wait a minute," and plugs the party calling, into the command post and says, "There's your party."

Example:

Plateau 0, drum 100, right 213, equals plateau 14, drum 87, the desired deflection for the base piece.

If the battery is behind a mask such as woods, buildings, etc., the instrument sergeant will find a position at one flank, from which he can see both the base piece and the base point, and lay by the parallel method, using the aiming circle as an aiming point (par. 171, T. R. 430-

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If the battery commander is at the observation post, the command post operator transmits the body of messages to the observation post where only such parts of them as contain data, etc., are recorded. The battery commander can verify details as to time, signatures, etc., and parts of the messages at any time, from the record of messages received at the command post. Messages may be sent from any phone in the battery, but copies of such messages should be given to the command post operator for file at the first opportunity.

The free ends of the wires on the reel cart and both breast reels should be prepared before the detail is required to take the working formation. This is done by leaving from one-half to one inch of the insulation on the end of each wire and preparing a bare space about one inch long. This facilitates hooking in the lines by the switchboard operator. He is the man especially interested and should be held responsible that the wires are always properly prepared.

The wires on the reel cart should have the lower ends tied through the holes provided for the purpose, so that a hundred per cent. test can be made daily by hooking a phone, known to be in good condition, to each end of the line.

When, due to shortage of men, the number of men in the detail has been reduced to thirteen or less, the signal corporal is used as recorder at the battery position and the instrument sergeant at the observation post.

The training of the noncommissioned officers and operators is most important and, for training purposes only, line guard one and three can be dispensed with and their duties performed by the signal corporal and line guard two, respectively.

We rarely find an experienced instrument sergeant who is sufficiently trained to be of much use to the battery commander in the preparation and conduct of fire, but it is highly desirable to have at least one man receiving such training. We usually have a bright youngster available who has made good as a cannoneer and driver during the first few weeks or months of his training and shows possibilities, so we start him off. The more he learns the more useful he will become and when he has sufficient age and training he is worthy of promotion to sergeant.

We must have communications while we are training the instrument sergeant, and at all other times, so that the signal sergeant is really the important man in the detail. Any sergeant who is intelligent, resourceful, and energetic, can handle the work.

All members of the detail will perform their duties more intelligently if they have previously been trained as cannoneers and if possible as drivers. If this is impossible, it is desirable to have them receive such training from time to time after they have joined the detail.

A DISCUSSION OF MACHINE GUN ORGANIZATION AND TRAINING FOR FIELD ARTILLERY

BY MAJOR HARRY J. MALONY, F.A.

IN attempting to put forward for consideration, a schedule of training for the machine-gun crews necessary to operate the weapons with which the field artillery batteries are furnished, we are met with such a succession of paradoxical facts, that what should normally be a simple enough task, is surrounded by contradictions so ramified that some questions of higher organization and logistics become involved. This, moreover, to such an extent as to render the efficient operation of these guns dependent upon a reorganization, amounting to either an increase in battery strength or to the withdrawal of the weapons as part of the battery armament.

Let us first examine our organization tables, to determine what personnel are available to receive the training and who make up the personnel to operate the machine guns in action.

The easiest result at which to arrive is to say that the higher numbered cannoneers, numbers six to nine, and two of the caisson corporals, are the most available. Outside the facts that in peacetime no higher numbered cannoneers ordinarily exist, and that in war-time they are not available for this training, but are quickly used up in replacements in the various details and in the firing batteries, this result might be enough to direct a line of action in training.

The truth of the matter is that we find ourselves in that very dubious state of trying to get something for nothing, and we have obtained the usual result. We are forced to the conclusion that no men are, under our present organization, available for manning machine guns as their principal jobs, for which jobs they may be made available during the entire time in which the firing battery is in action. Likewise their training becomes decidedly secondary to their other battery duties. There are two possible solutions to this situation, which will be pointed out later.

Possible Objectives

It seems logical to assume that machine guns are issued to our batteries for several purposes:

To protect the battery positions and provide a close-in defense with particular attention to the flanks. This requires training against ground personnel—infantry and, perhaps, cavalry.

DISCUSSION OF MACHINE-GUN ORGANIZATION

To protect the battery and the limbers against aerial attack. This requires training in anti-aircraft methods and seems to be the function to be particularly stressed.

A possible protection to the personnel of forward observation posts. The instances requiring such protection may be expected to increase.

Protection for batteries on the march. Considering day marching to be the exception, successful carrying out of this function requires extremely thorough and careful training. There is some danger of the guns becoming more of a menace by reason of disclosure of night movements than their being a source of protection.

Let us go back a moment and contrast the duties with which we have charged our machine guns, with the personnel available and the equipment issued.

As for the personnel, the conclusion has been reached that under our present battery organization it does not exist. What equipment is necessary? We have now issued to each battery, two Browning cal. 30 machine guns, with the regular spare parts and tools, equipped with infantry sights and mounted on the infantry tripod. A suitable AA (anti-aircraft) tripod does not now exist, but a design is being worked out by the Ordnance Department. This equipment is sufficient to enable us to care for close defense of the guns against ground targets (except tanks) and to protect forward observation posts. It is, however, deficient so far as allowing us to carry out our other more important missions of protecting firing batteries and limbers from aerial attack and providing protection while on the march against attack from enemy aircraft.

This situation can be easily remedied by requiring from the Ordnance Department an issue of the following matériel to each battery:

Two AA tripods (new model when satisfactorily tested).

Three sets of forward area sights (one spare).

Such AA fire control instruments as may be designed to be used in connection with the AA sights.

Before leaving this subject of matériel, it is desired to say a few words about the caisson mount. This mount should be discarded and stay so. It immobilizes the gun and crew. It seldom happens that the caisson can be placed in the most desirable position for purely AA defense without rendering the guns and crews fairly easy of detection; and when attacked on the march, makes it necessary to remove the caissons from the column and halt them in order to fight. This is not always possible; in rough and broken terrain, sufficient road clearance possibilities may not exist to permit this.

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Again, above all things, the column must not be halted in order to allow opportunity for such an inadequate defense against serious aircraft attack as two lone machine guns are able to offer.

The question must have already occurred to the reader, as to the relation of these guns issued to batteries, to the area defense provided by the corps anti-aircraft regiment. From a purely academic standpoint, it would seem that this latter unit, with its machine gun and artillery batteries, if it carries out its functions efficiently, would clear the situation to such an extent that the necessity for a battery relying upon its own machine guns for protection of its pieces from enemy aircraft, would be exceptional. From a practical standpoint, this may not be so. No matter how efficiently the AA regiment may be handled, it is purely an *area* defense and in no sense local. Local defense must continue to be provided by the units concerned. It requires no particular stretch of the imagination to realize that when a battery wants local anti-aircraft protection it wants it badly. Failure to obtain it from some source or other is liable to result in complete immobilization of the battery, if indeed it does not result in a complete cessation of fire on the part of the firing battery.

Cannot the corps anti-aircraft regiment, in addition to the area defense with which it is now charged, be also called upon to provide for this local defense by furnishing the machine guns, crews, etc., necessary to assure it? This also, from an academic standpoint, seems plausible and reasonable, but no artilleryman who has ever been harassed by aircraft attack, will have enough confidence in such an arrangement to favor it. His answer is invariably, "I want them where I can get them myself, and the protection of the battery is my function and no one else's." If this arrangement is considered practicable, the machine guns could be taken away from the batteries, to their decided peace-time relief, and the corps unit expanded to permit of such machine-gun protection on call, in all the capacities in which it is desired to have it. This would seem to be one way to solve the problem; tantamount to relieving the Field Artillery of the machine guns. As pointed out above its great disadvantage is to deprive the batteries of control over their protective weapons at all times. For the general case it is thought that this solution will be satisfactory.

The most efficient method is perhaps the most costly one. This is not an unusual condition. It is simple, and consists of combining the twelve machine guns of the artillery regiment into a machine-gun company consisting of three officers and approximately 100 men to function directly under regimental headquarters. The machine-gun company commander should be on the regimental staff. This organization should be formed with the idea of splitting it quickly into

DISCUSSION OF MACHINE-GUN ORGANIZATION

six or less parts (platoons) and of attaching these platoons to the batteries requiring the protection. That case in which all batteries of a regiment require an equal amount of protection, is considered to be very abnormal. The organization is, however, sufficiently flexible to permit a proper tactical distribution to be quickly and easily made.

This organization would have the advantages of being:

Efficiently trained as a unit or group of subordinate units.

Flexible.

Immediately available.

Properly equipped and transported to fulfill the functions required of it.

Another solution proposed is to leave the organization for the two guns now issued to each battery, within the battery, and to provide sufficient additional personnel to allow a logical and efficient service of these weapons. This is considered the easiest to accomplish but the most inefficient and unproductive of the organizations proposed.

Before proceeding to the preparation of the training schedule, it is desired to call attention to the fact that of all present-day machine guns, the cal. 50 Browning is considered to be probably the most effective against aircraft. Its development should be watched by the Field Artillery with a view to adopting it in place of the cal. 30 gun, when its development and its production warrant.

The following training schedule has been prepared on the basis of a gun crew to consist of one noncommissioned officer, one gun pointer, one loader, one ammunition man. No communications are provided. This will require a minimum of eight trained men per battery.

Who Shall Receive Instruction and in What Subjects?

All battery officers.

Each battery shall *maintain* two noncommissioned officers and eight men trained in machine gunnery.

The following subjects will be covered in instruction and the number of hours set opposite each item shall be the minimum time to be devoted to the subject:

	Hours
Drill of the gun squad	4
Mounting, loading, firing, unloading, and dismounting gun.	
Nomenclature	8
Disassembling and assembling. Belt loading machines, care and operation.	
Breakage, jams,	8
and malfunctions, replacement of parts, care of guns.	

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Identification of aircraft	2
Anti-aircraft sights	6
Target practice	20
Ground objectives	<div style="display: inline-block; vertical-align: middle; font-size: 2em;">{</div> <div style="display: inline-block; vertical-align: middle; padding-left: 10px;"> Traversing. Searching, etc., 1000" range and known distance 6000 and 1000 yds. </div>
Aerial objectives—Target balloon or towed target.	
Camouflage and concealment	2
Protection of convoys (methods)	2

Notes for Instructors

The fifty-two hours outlined above, are a minimum for the purpose. A more satisfactory schedule, provided time is available, can be made by expanding the one above.

The first instruction period should start with a summary of safety precautions, should teach by demonstration the positioning of the gun and its preparation for action. Each member of the squad should then be taught to sight with the ordinary infantry sight and allowed to fire. Start your firing instruction with short bursts of five or six rounds, tripod fully clamped. In order to be certain that the bursts *will* be short, remove a cartridge from the feed belt after the required number of rounds before starting your fire.

Begin each instruction period with a short "drill of the gun squad," requiring the mounting and dismounting of the piece. Never close an instruction period without firing. This serves to maintain interest and likewise will check the mechanical condition of the guns. Go over each gun before the first instruction period and make sure that it is in proper mechanical condition. This precaution may save some embarrassment.

A Typical Weekly Schedule, with Four Hour Periods

First Week

Monday—

8:00–10:55.

Mechanism—Principles of operating of gun explained briefly and clearly by the instructor.

Work for Class—Disassembling and assembling. *Thorough* nomenclature.

(Note: It may be thought that the importance of nomenclature is overemphasized. This is not so. In getting nomenclature firmly fixed, the functions of each piece and assembly are invariably sought, and in most cases discovered, by the intelligent soldier. Also disassembling and assembling are necessary in the nomenclature periods. Encourage argument and discussion. These help to sustain interest.)

10:55–12:00.

Explanation of mounting and drill of the gun squad. Safety precautions.

Demonstration of methods of loading, firing and unloading. (Each student is allowed to fire a short burst with clamped tripod.)

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Tuesday—

8:00–9:00.

Drill of gun squad. (Reference, T.R. 435–85.)

Mounting and dismounting gun.

Examine gun.

Prepare for action.

9:00–10:00.

Mechanism—Instruction in assembling and disassembling gun. Precautions necessary to prevent faulty assembly and abuse of parts. Nomenclature continued. (When each member of class can pick out any part mentioned in the list of component parts (Ordnance handbook) and can name any part of the gun picked up at random by the instructor, he will be considered sufficiently instructed in nomenclature.)

10:00–12:00.

Loading machines and how to use them.

Adjustment of loading machines.

Explanation of use of ground sights.

Firing individual, short bursts for accuracy.

Instruction and demonstration of the proper method of cleaning guns.

Wednesday—

8:00–11:00.

Drill of gun squad.

Assembling and disassembling. (Arouse competition by having squads compete against time. Test each assembly by snapping trigger, etc.) Mechanism—Mechanism of piece and function of each part. An easy way to carry this exercise out, is to place one gun on the tripod, leaving the driving spring locked in the bolt. Another gun completely disassembled is placed on a table, the parts being arranged in proper relative positions. As the movement of the gun in firing is explained, it will be illustrated as far as possible on the assembled gun and the student required to show the action by moving pieces of the disassembled gun in such a way as to simulate the movement of the corresponding part in the operation of the gun. Dummy cartridges can be profitably used in this exercise.

11:00–12:00.

Lecture and demonstration of anti-aircraft sights.

Practice in sight-setting (ground sights).

Estimation of ranges.

Firing on 1000" range (fixed tripod).

Thursday—

8:00–10:00.

Drill of gun squad. Mounting and dismounting gun.

Lecture—Jams and stoppages. Each common jam and stoppage to be carefully illustrated and explained with particular emphasis on characteristic symptoms and methods of detection.

Care and preservation of the gun.

10:00–11:00.

Replacement of parts and assemblies. Emphasis on replacement of following: barrel; feed pawl and spring; extractor and cam; driving spring; bolt (assembled).

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11:00–12:00.

Explanation of head space adjustment and method of accomplishing it. (Show by demonstration the results of too tight and too loose adjustments.)

Firing short bursts—traversing.

Sighting exercise with AA sights. (Use airplanes if near an airdrome. Watch your safety precautions.)

Friday—

8:00–11:00.

Detailed inspection of gun to verify its readiness for action—to be performed by each squad. (Each gun will be gone over part by part, faults found evidencing excessive wear, and possible failure will be carefully pointed out and the remedy demonstrated.)

Exercise in assembly, loading and firing for speed.

Saturday—

Lecture—protection of columns on the march.

Concealment and cover—demonstration.

Second Week

Monday—

8:00–10:00.

Identification of aircraft, U. S. types and markings.

Practice with AA sights at airplane silhouettes.

10:10–12:00.

Fire on the 1000" range—traversing.

Tuesday—

8:00–10:00.

Practice with loading machines. Each member of the gun squad to load and fire as rapidly as possible, five belts with five cartridges at each end (against time).

10:10–12:00.

Malfunctions, stoppages and jams. Each gun to be put out of order in such a manner as to produce a predetermined malfunction, the nature of which will be unknown by the man firing the gun. He will be required to get the gun in action and fire a given number of rounds, for some of which defective ammunition will be used, in the shortest possible time.

Wednesday—

8:00–12:00.

Practice on the 1000" range—traversing and searching.

Thursday—

8:00–12:00.

Fire against aerial targets with AA sights and tripods.

Friday—

8:00–12:00.

Fire against ground targets at 600 and 1000 yards.

Saturday—

8:00–12:00.

Fire against aerial targets.

(Note: During all firing periods the instructor should take advantage of opportunities to review all the work passed over.)

DISCUSSION OF MACHINE-GUN ORGANIZATION

The training for officers should, in addition to the above schedule, include twelve hours distributed about as follows:

Selection of positions for machine guns—4.

Preparation of cover and alternate positions—4.

Protection of columns on the march—4.

Substantially this same program has been carried out with many national guard units with success. Interest and the desire to progress and fully understand the guns, is easily aroused, for the guns are in themselves interesting.

One absolute requirement is that the instructors must *know their subject* thoroughly. It is difficult to find in the Field Artillery, sufficient qualified instructors. The instructor, in order to put his instruction clearly by making sufficient preparation, must not be burdened by other duties during the training period.

ADMINISTRATION AND TRAINING IN THE NATIONAL GUARD

BY CAPTAIN JOHN H. CARRIKER, F.A., INSTRUCTOR, WISCONSIN
NATIONAL GUARD

IN seeking a subject that would "bracket" the majority of the field artillery units in the National Guard, it appears that the most "effect" will be obtained at the "Range—Administration." Or perhaps a more commonplace, and at the same time more illuminative subject, would be "Is It Passing the Buck?"

But let us commence at the beginning. In a battery of field artillery, be it gun, headquarters or service, there are many, many things to take care of in addition to the weekly drill. In the majority of batteries that have come under my personal observation, most of these duties are either taken over by the battery commander, under the assumption that he must do so, or they are left for him to do and he does them in person, rather than pass some of this work on to his lieutenants. And this criticism is more applicable to the commanders than to the juniors. The average lieutenant is willing to do the work, but does not wish to be too presumptuous.

Regulations require that a firing battery be divided into the various departments and that a lieutenant be responsible for each division; but this applies to drill only, in far too many instances. For the thousand and one odd duties in addition to the weekly drill, there has been a definite assignment made in only a few instances. The battery commander who performs all these duties in person, is neither fair to himself nor to his officers. It may be possible, in time of peace, for a battery commander to do all the work himself; but it will never be possible under field or service conditions.

Even in the armory some department is almost certain to be neglected. Another condition that often arises when the captain tries to do everything in person, is that he spends most of the time during which his unit is drilling, working in the battery office or perhaps in the supply room, trying to stem the flood of paperwork. This appears to be a habit easy to acquire, and very soon shows itself in the absence of results accomplished during the drill and instruction periods.

We must always keep in mind the fact that the only reason for our peace-time training is the preparation for emergencies, be they strife with another power, or domestic disturbances or disasters. This is vital and must never be placed in the background by any condition or combinations of circumstances. We will not be doing

TRAINING IN THE NATIONAL GUARD

our share in this preparation if we accept the theory, even without realizing that we have done so, that training is in itself the objective, rather than a means to this objective. It may be true that your unit will function better at drill or at the field camps of instruction, if one officer has the same duties, year in and year out. But suppose that you lose one or two of your officers? Did you ever know of a successful football coach who spent all of his time and energy trying to develop exactly eleven men? Or do you ever hear of this same coach going on the field alone to compete against the opposing squad? You will no doubt say that this is a far-fetched example, but the battery commander who attempts to carry all the duties of his organization on his own shoulders, is trying to accomplish something that is just as difficult to bring to a successful conclusion, as the coach who tries to defeat the other team unassisted.

It might be worth while to list some of the duties which can profitably be divided up among the junior officers. Paperwork that pertains to the battery office, pay rolls, service records, current correspondence and reports; care and storage of clothing, equipage and matériel, with the necessary records pertaining thereto; inspection of the wall lockers; inspection and issue of forage; inspection and care of animals or motors; police of armory or camp; mess, canteen, club room, publicity, athletics, social activities, recruiting, and morale. No attempt will be made here to state how many of these duties should be given to any one officer. This will depend upon local conditions. What will require a great deal of time and effort in one unit, will almost take care of itself in another, due to the different situations existing at the different stations. The important thing is to so arrange the assignments, that each officer will have about the same requirements on his time and energies. The next essential is that these duties are rotated among the different juniors, so that each has an opportunity to become familiar with all phases of the work in the battery. Change at least once a year, preferably every six months, if your officer turnover is not too great.

And now come the lieutenants to ask how the "old man" is going to amuse himself while they are doing all his work. Do not worry. He will have plenty to occupy his time supervising the work of all, making certain that each officer performs the duties assigned in a proper manner. Furthermore you are doing only those things which will make you a better field artilleryman—the things which you will have to do yourself, or supervise, when you are a battery commander—acquiring experience which will be priceless to you in your future work in the Service. Approach the subject from this angle, rather than with a question in your mind about doing what, for the moment, may appear to be the duty of someone else. For there is more than a probability, it is almost a certainty,

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that those who are now lieutenants will have an opportunity to command batteries, perhaps battalions, in the event of a major emergency. Then your success or failure will depend to a very great extent upon the thoroughness of your peace-time training. If all your service has been spent in one particular phase of the work of the battery, you may retain your command, by sheer natural ability and hard work; but the chances are great that you will be replaced by another whose training has been more varied and comprehensive.

In closing, just a word of advice to battery commanders who may think these suggestions worth a trial. If at first the results are not what you expect, do not become discouraged and do the work yourself. Be very patient and likewise very persistent and insist that each officer perform the duties assigned in a manner that is satisfactory to both yourself and to your superiors.

THE ACCOMPANYING GUN

BY MAJOR R. C. BATSON, F.A.

IN PREPARING this article the writer has not the boldness to attempt to solve, in a theoretical treatise, a problem which has puzzled military leaders for the past 400 years. Neither is the writer so timid as to hesitate to express his established views on this important subject. If our officers cannot agree upon the proper settlement of the question of the accompanying gun, it is high time for them all to get together and lend their efforts towards settling it to the satisfaction of all who aspire for success in battle.

At this point let us pause for a definition of the term accompanying gun. As gleaned from various authorities it is as follows:—The accompanying gun is a single, division artillery gun, temporarily attached ordinarily to an infantry assault battalion for special use in connection with an attack against a defensive zone and in other situations in which it is expected there will be continuous fighting over a considerably depth and in which, due to difficulties of communication, observation, liaison, etc., the supporting artillery alone would not yield the maximum effectiveness. Such failures of supporting artillery more often occur when the penetration into the hostile line is rapid and deep. These failures may be due to any one of the following causes: loss of mobility on account of casualties; poor roads or traffic congestion; loss of observation; ineffective, long ranges; severance of communication; etc.

Supporting artillery is the rule and the proportion of accompanying artillery is small. In general, there is no fixed rule as to use of accompanying artillery; its proper employment is a phase of the artful handling of artillery. Its use is not altogether confined to attacks against defensive zones. It may become necessary in the defensive, and in open as well as stabilized situations.

During the engagement accompanying guns are to render close support from temporary positions in or near our infantry front lines and overcome local resistance by attacking short range targets which directly interfere with the advance of the assault units. Typical targets are: machine guns, snipers, infantry guns, accompanying guns, tanks and local troop formations. It is not used for counterbattery, as a rule, and rarely employs ranges greater than 2500 yards. Its targets are habitually those against which the special infantry weapons are inadequate. The small dispersion at short ranges and perfect observation of targets and friendly troops,

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makes it possible to fire very close to friendly troops without endangering them. It follows the infantry assault lines by bounds and assumes positions in readiness from which it can rush to firing positions (often using direct fire), accomplish its fire missions quickly, and withdraw to positions in readiness promptly. Ordinarily it is in firing position only a few minutes at a time. The gun commanders strive to remain close to their infantry commanders and, at the same time, reasonably close to the guns. (Voice command is the best).

Due to difficulties of command and ammunition supply, its periods of attachment should be of short duration (generally not more than one day at a time). As distinguished from another form of attached artillery called the accompanying battery, it is usually attached to the infantry assault battalion, while the accompanying battery is ordinarily attached to the infantry brigade or regiment. The accompanying batteries and guns are assigned by order of the division commander. Since the use of the accompanying artillery is exceptional for special situations, such pieces should revert to their proper organizations immediately on completion of the mission contemplated, or when they are no longer useful. Orders should be as explicit as possible as to the time and period of attachment. If orders are not definite, it should be the duty of commanders concerned to initiate measures to return the artillery when no longer useful.

Infantry commanders will generally obtain best results by assigning missions in general to the accompanying gun and leaving to the artillery commander all possible latitude and initiative in the technical execution of his mission. Difficulty of ammunition supply must be kept in mind and none should be wasted. When the artillery accompanying gun commander is notified as to the unit to which he is to be attached, he should immediately get in touch with that commander, if possible, and prepare to get his gun forward promptly. Such guns would not take part in a preparation fire but would be well up in rear of the assault line ready to follow it forward by bounds. So much for what the accompanying gun is; now for further considerations.

First, will we need the accompanying gun in future wars? If so WHAT shall it be and HOW shall we use it?

Listening to and reading the views of various extremists on both sides of the question indicates a sad lack of coördination.

Some artillerymen say, "The use of the accompanying gun is a form of ATTACHMENT and our teachings say attachment of artillery is justified only when FAILURE of our supporting artillery is anticipated. Must we thus admit we are unable to perform our prime mission of SUPPORTING OUR INFANTRY? Why do we have organizations

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for command and supply if we must split them up and parcel guns out to be commanded by infantry officers? Is the infantry officer qualified to command artillery? Look at the failures of the accompanying gun in our World War. Why send such vulnerable targets to the infantry front lines to be annihilated?"

Some infantrymen say,—“We don't need the accompanying gun. They draw enemy fire unnecessarily. Our machine guns, 37-mm. guns and trench mortars will serve the purpose. We are not trained artillerymen. Why should we command artillery? Why not use our tanks? At any rate we are going to develop a howitzer which will be thoroughly adequate.”

History shows that the accompanying gun has been used, with varying success, in all wars for 400 years. In fact all artillery was accompanying artillery for a considerable period after it was first used. They were used in 1527 by the French, Spanish and German armies, and later by Gustavus Adolphus. Frederick The Great stated that their use with his battalions was a success. They were utilized in the Napoleonic wars, in our Civil War, and in the World War.

During the World War the Germans employed the accompanying gun consistently and with success. The French used it considerably. Its use by the United States Army seems to have been generally a failure.

No doubt failures with our troops were due primarily to the inexperience and inefficiency of the artillery officers handling the guns and to a lack of knowledge of the possibilities and limitations of the guns by infantry commanders.

A report of the Inspector General of the A.E.F. on December 11, 1918, is, in part, as follows:—“According to the energy of the artillery officers handling the accompanying gun, the experience under fire of the infantry battalion commander, the liaison between the two, and the terrain, they were used with varying success.”

We must not be too hasty in condemning either the artillery officers or the infantry battalion commanders concerned. Both lacked experience and liaison was poor, but the prime fault was in the system (or *lack* of system) in vogue. These gun commanders were junior officers who had had absurdly limited service with artillery and no training at all in the handling of the accompanying gun. The properly selected officer for this job would have been a man of far greater experience and of immeasurably higher qualifications. He would have kept the infantry commander informed as to what might be expected of his gun. He would have had special training, initiative

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and resourcefulness. The infantry commander would have had confidence in him.

A partial solution to this problem lies in close and more direct support by the division artillery (gun positions and observation farther forward) and in more perfect liaison between artillery and supported infantry. If difficulties of communication and observation become such as to render artillery support ineffective, the artillery must be advanced as far as possible. Where such action is feasible, the necessity for the accompanying guns ceases to exist. Of course, the important functions of command, ammunition supply, etc., are increasingly difficult as we approach nearer to the front lines, but there will be situations where such sacrifices must be made in order to properly accomplish our mission of support.

When the best is done, however, there will be occasions where the accompanying gun must be brought into play. When such contingencies arise we must be prepared to furnish the guns promptly, with properly trained and selected personnel and so equipped as to be able to function efficiently.

The infantry cannot look out for itself in this respect. They are already overloaded with their conglomeration of machine guns, grenades, 37-mm. guns, trench mortars, etc., and to equip them with a new howitzer or other similar weapon and expect them to handle it to replace the accompanying gun, seems somewhat absurd.

The structure and manœuvring features as well as tactical use of the tanks, are such as prohibit their use for accompanying gun missions. Whether or not science will develop a tank suitable for this purpose remains to be seen in the dim future. A tractor-carried or tractor-drawn gun for this purpose is also still problematical. How can we get the necessary mobility with these? A gun or howitzer with the desired power and range is too heavy for pack purposes. The 2.95-inch mountain gun approaches very closely to the ideal for this purpose, but is somewhat lacking in range and fire power. If mountain guns are available, they should be selected for this duty. Occasions for the use of the accompanying gun are so infrequent as not to justify a separate branch for that purpose. Whatever gun is used will involve the difficulties of ammunition supply which have always applied. In the meantime we must be prepared to use to the best advantage that which we have.

Perhaps we spend too much valuable time and effort and too great a proportion of our meagre funds in experimenting with new matériel which, even though it be somewhat superior to what we have, would not be available in sufficient quantities in case of war.

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Why not concentrate upon perfecting ourselves in manipulating that which is at hand? When we are convinced that we positively must have a new type of gun, let us then combine our efforts to develop it and arrange for its quantity production.

There were a few instances in the World War where the accompanying gun was effective and rendered invaluable support. There will be similar opportunities in future wars. Experiments conducted by our troops in France after the World War, proved, beyond a shadow of doubt, that the accompanying gun could destroy, by direct or indirect fire, small targets much more effectively and quickly and with far less ammunition expenditure than could the supporting artillery.

A 75-mm. division gun, properly manned and equipped, can be rushed from some covered position near our infantry front line and quickly crush a machine gun nest, an infantry gun, a tank or other similar targets, which may be holding up and doing considerable damage to our infantry, and then be promptly withdrawn to a position under cover nearby, ready to pounce upon new targets when they appear. Often it will spell disaster for our infantry to wait for liaison messages, calling for fire from supporting artillery, to get through.

A recent field exercise at Fort Sill demonstrated that, under almost ideal conditions, it required an average of nineteen minutes per message to transmit calls by liaison details for fire from supporting artillery. Granting that the sore need for larger liaison details and better equipment for them will be provided, it may be added that most of the messages in that field exercise were transmitted by telephone. We all know what past experiences have been in maintaining telephone lines under fire. Of course, our methods of communication can and will be more improved as time goes on.

Let us make the use of the accompanying gun an important feature of peace training schedules; adopt standard organization and equipment for these guns; combine with the infantry in their training; teach our officers minor infantry tactics; teach infantry officers the possibilities and limitations of the gun; gain the confidence of the infantry by "showing" them we can "produce the goods"; encourage initiative in our junior officers and teach them the art of command by placing them in charge of these guns. There are sufficient records available to guide us in preparing our program of training. There is nothing new or complicated about this. Possibly the Chief of Field Artillery may see fit to have a standard organization and equipment table and a method of training published to the service.

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The following is offered as a suggestion for the standard organization and equipment of an accompanying gun. Three of these guns can be furnished by a battery of division artillery (except telephones and flag sets).

1 Officer	1 75-mm. gun
1 Sergeant	2 Caissons (loaded with 20 per cent. shrapnel, 40 per cent. H.E. shell, 20 per cent. smoke and 20 per cent. gas)
3 Corporals (1 telephone cpl.)	
7 Cannoneers	1 Ration cart with water can
13 Drivers	24 Horses, draft, with harness (1 spare team)
3 Telephonists	2 Horses, draft, with Q.M. harness (for ration cart)
2 Scouts	10 Horses, riding (with draft harness)
	3 Telephones, field, with 2 miles of wire and hand or breast reels
	2 Projector sets

Let us cease quibbling and arguing as to whether or not we should employ the accompanying gun. That will be a matter of decision for future commanders. Certainly our future commanders will employ every available man and gun in whatever they may consider the most effective manner of winning battles. If they see fit to employ accompanying guns, or to sacrifice them, that will be a matter for *them* to decide and it will be the duty of those who handle the guns to have them prepared to function most effectively.

PACK ARTILLERY

BY CAPTAIN FRED B. INGLIS, F.A.

THE development of pack artillery should depend upon the missions which it will be expected to accomplish in future wars. These missions may be stated as:

The normal missions of mountain artillery.

Use as accompanying batteries and guns.

Use as anti-tank guns.

Use as a part of the divisional artillery.

In order to arrive at a clear conception of the value of pack artillery in these various rôles, its advantages and disadvantages should be mentioned.

ADVANTAGES

Great mobility over difficult terrain. It can travel over any terrain practicable for the infantryman, provided he does not use his hands in climbing.

The curved trajectory enables pack artillery (howitzers) to fire from masked positions which cannot be reached by the fire of 75-mm. or other guns; and reduces the depth of dead spaces to less than half those of our present divisional artillery.

The range probable error is comparatively small, and becomes increasingly smaller as the range increases.

The rate of march of pack artillery, four miles per hour, enables it easily to keep up with infantry, and with cavalry in difficult country.

The light weight of the howitzer, and its small size, adapt it to passing through and across trenches, over footbridges, ferrying across streams in small boats or on light rafts, travelling along narrow trails, etc. By the use of drag ropes, the howitzer can be pulled by the gun crew when necessary; and when disassembled the component parts of the weapon can be pulled up or lowered over cliffs and then assembled for firing.

Even in terrain where some roads suitable for 75-mm. guns exist, pack artillery can frequently change position more quickly than can the 75's, as it is not limited to the roads, but can almost invariably travel on a straight line across country to its new position.

DISADVANTAGES OF THE PRESENT HOWITZER

Inferior fire power, due to its slow rate of fire—three rounds per gun per minute, and its comparatively short range, the maximum range being 5000 yards.

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The ammunition carried by the battery is insufficient for prolonged firing, there being only three ammunition mules in each section, or 120 rounds per battery, enough for only twelve minutes' firing at the present maximum rate.

When accompanying an advance or rear guard into action, pack artillery cannot make rapid displacement to the front or rear, as the trot cannot be maintained for more than a few hundred yards. The necessity for rapid movement can to a great extent be obviated, in such cases, by displacing by battery within the battalion.

To enable pack artillery to function more efficiently in carrying out the missions given above, it is believed the lines of development should be as follows:

THE NORMAL MISSIONS OF MOUNTAIN ARTILLERY

In this rôle, our pack artillery, armed with the present 2.95-inch howitzer, might find itself opposed by a mountain howitzer or gun of twice its range and of a higher rate of fire. In order to enable it to meet such a weapon on equal terms, a more rapid rate of fire and increased range are needed. It is believed, however, that too much emphasis should not be placed upon long range for a pack howitzer. It should be remembered that the great value of pack artillery lies in its mobility, and that this quality depends entirely upon the ability of the pack mule to carry the parts of the gun for considerable distances, day after day, over mountain trails and through dense jungle, where the parts of the gun are frequently subjected to falls, or at least to bumps against trees and rocks. For these reasons, in any improvements of design of the pack howitzer, made with a view to securing increased range and a more rapid rate of fire, there should be kept in mind these requirements:—the howitzer must be light (no individual load should weigh more than 240 pounds, less if at all possible); all parts must be rugged, capable of withstanding hard knocks; the gun should be capable of being quickly packed and unpacked, assembled and disassembled; the number of top loads should be reduced to a minimum; the height of top loads should be kept as low as possible; top loads should be kept as short, from front to rear, as possible, a long top load being very hard on the pack mule.

AS ACCOMPANYING BATTERIES AND GUNS

To carry out this mission successfully, the pack howitzer should have a high rate of fire, as its firing positions will frequently be in the open, where it will quickly come under fire, so that it must go into position quickly, fire rapidly, then be gotten out of action and into a concealed position very hurriedly, and there packed and moved under cover to another firing position.

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The pack howitzer is well suited to this purpose; the mules can be brought quietly and quickly up, under cover, and unpacked, and the gun assembled and data calculated; if a direct fire position is to be occupied, the gun can then be run up by hand with little effort, and fire opened very quickly. If suddenly taken under rifle or machine-gun fire, then the gun crew can disassemble it, leave the parts of the piece lying on the ground, and themselves lie down, nearly or entirely concealed, all within the space of a small fraction of a minute.

When used as an accompanying gun, the range of our present 2.95 howitzer is believed to be sufficient, as the accompanying gun will usually be very near its own infantry; and so, at the time its fire is needed, it will be within range of any enemy infantry weapon capable of firing upon its own infantry.

The pack howitzer, because of its small size, can be easily concealed behind bushes, in high grass or weeds, or in small, shallow depressions in the ground. Concealment from air observation is also easily obtained.

As an accompanying gun, it can be shifted very rapidly from one position to another, as the operations involved in going into action and coming out, occupy a very small amount of time. The lieutenant in command of the gun would normally employ direct fire, or else direct the fire from an observation post near enough to the gun to allow voice communication to be used, obviating the laying of wire and the loss of time caused thereby.

Each member of the accompanying gun squad should be entirely capable of performing the duties of any man of the squad; and it is especially desirable that the men comprising these gun squads be large and strong, as the work will be very arduous. The gun squad should be constantly trained in the rapid occupation of position, firing, repacking and moving out; also, in firing on moving targets, both with direct and indirect laying.

A considerable supply of ammunition, over and above that carried by the three ammunition mules normally with the gun section, will be needed, to keep the gun supplied during an action of any considerable length. Extra ammunition mules from the combat train should be attached to the gun section; and liaison with the combat train must be maintained, so that a continuous supply of ammunition may be coming up when needed. Successfully to maintain the ammunition supply with the gun will call for the exercise of forethought, energy and initiative on the part of the personnel of both the gun section and the combat train.

The only equipment needed by the lieutenant commanding the accompanying gun is his field glasses, B.C. rule, and sitogoniometer.

The pack howitzer, so improved in design as to permit of a

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rapid rate of fire, handled by a well-trained gun crew, under an officer trained in the tactics of the accompanying gun, should prove to be an excellent weapon for this purpose. It is believed that, in operations of any extent, pack artillery should be attached or assigned to infantry divisions. A four-battery battalion, with a large combat train, assigned to a division, would give each infantry regiment an accompanying battery, or two guns to each front-line battalion.

Pack artillery had no opportunity for test as to its capabilities as accompanying guns during the Great War. The accompanying gun, as used in France, was seldom very successful in accomplishing its mission. However, it should be remembered that it was a new thing; its tactical handling was not thoroughly understood, and the guns were in the hands of young, inexperienced officers, in whom great zeal could not make up for lack of knowledge and experience. The pack howitzer, however, did not have even this slight chance to prove its worth as an accompanying weapon, as we had none of them in France.

USE AS AN ANTI-TANK GUN

The anti-tank gun will usually occupy a concealed position in, or slightly behind, our front lines. Upon the approach of the enemy tanks the anti-tank gun will be run out into a direct fire position, from which a heavy fire will at once be brought to bear upon the approaching tanks.

To permit of successful use as an anti-tank gun, the pack howitzer should be capable of a much higher rate of fire, such as 12 or 15 rounds per minute, for short periods of time. The small size of the howitzer adapts it to use as an anti-tank gun, as it can be hidden in the front-line position, even in the trenches themselves, with a ramp up which it could be run to place it in its firing position. It also furnishes a small target for enemy machine guns, tanks, and artillery.

The organization suggested under "The accompanying battery, etc.," above, of a four-battery battalion with each infantry division, would, it is believed, be well adapted to furnish a sufficient number of guns for anti-tank defense.

USE AS A PART OF THE DIVISIONAL ARTILLERY

If the four-battery battalion, mentioned above, were a part of the divisional artillery, it could, if not needed for use as accompanying guns or for anti-tank defense, be used to function as a part of the divisional artillery, the batteries being placed well to the front, in close support. They should be especially useful in support of troops

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in the outpost and delaying areas, as they can be quietly and unobtrusively withdrawn, if covered routes are at all available. The pack howitzer should find a considerable use in searching out and destroying enemy trench mortars, firing into trenches, and searching through ravines and behind hills where the 75-mm. guns cannot reach the target because of their flat trajectory.

When used as a part of the divisional artillery, the pack batteries should be placed well to the front, and, if possible, behind masks over which they can fire, but behind which the enemy 75's cannot reach them because of the small angle of fall.

When marching in country having fair roads, the pack mules may be saved a considerable amount of wear and tear if some type of draft is provided for; such as a pair of light shafts, easily and quickly detachable, fastened to the trail of the piece, and a very simple breast collar harness. Two batteries of pack artillery (Batteries D and F, 24th F.A.) adopted this scheme in 1924 on a march from Camp Stotsenburg to southern Luzon and return. These batteries used light *calesa* shafts, and made their own breast collar harness. The scheme was entirely feasible.

In case the infantry of the division is being sent forward in trucks, and artillery is needed at the same time, pack howitzers can be very easily and quickly loaded in trucks, two or more being carried in one truck, depending upon its capacity. As a protection for truck columns on the march, pack howitzers, assembled, can be carried in trucks, each with its ammunition supply and a ramp, and its gun crew in the truck with it. This method could be used for the rapid displacement of a mobile divisional artillery reserve.

CONCLUSIONS

To enable the pack howitzer to perform successfully the missions outlined above, it must have a perfected recoil system, enabling it to fire from a carriage which remains fixed in position after the first shot,—this to obtain an increased rate of fire.

It should be capable of firing at a considerably greater range.

Its design should remain simple, rugged, quickly and easily assembled and disassembled.

The howitzer should be capable of being traversed on the carriage (this will be necessitated by the non-recoiling carriage,—when the spade is fixed in the ground, deflection shifts must be obtained by movement of the gun on its carriage, and not of the trail on the ground).

As to organization: a four-battery battalion should be assigned to the infantry division for use as accompanying batteries and guns and for anti-tank defense, in addition to use as divisional artillery. The ammunition-carrying capacity of the battalion combat train

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should be materially augmented to keep pace with the increased rate of fire and the more numerous missions for the pack artillery in its new rôles.

ITS RÔLE IN MODERN WARFARE, SUCH AS THAT ON THE WESTERN FRONT IN FRANCE, 1918

Pack artillery used in a war against a well-trained, well-equipped foe, fighting in open country, with a road net sufficient to permit the use of light artillery, would be valuable chiefly in its rôle as accompanying gun and anti-tank gun.

Against the same foe, fighting in rough, mountainous, or rocky dry country, with few or no roads, pack artillery would become the only artillery with the division, and so would take upon itself all artillery missions.

Against a poorly trained and poorly equipped foe, pack artillery would increase in value to us as the enemy artillery power diminished.

POSSIBLE USES IN MEXICO AND THE UNITED STATES

In case of a possible invasion of Mexico, pack artillery would be of value, due to both the nature of the terrain and the type of warfare which would probably be employed. Northern Mexico is very dry, barren, rocky and mountainous, with very few roads worthy of the name. Some of the mule's most valuable qualities would here make him more serviceable than the horse; he is a very hardy animal, needs less forage and water than does the horse, is not bothered by changes in his food, and is not particular about it. Where there is good grazing, he can, if given time to graze during the afternoon and night, live very largely upon the country.

Guerrilla warfare would probably be the order of the day, with few if any engagements of large forces. There would probably be raids to capture small bands of the enemy, destroy railroads and supplies; long pursuits of elusive bands; and most of these operations would take place in country well suited to the use of pack artillery. While it is an error to underestimate the enemy, it can at least be stated that the enemy artillery would not exceed ours, in numbers or training.

With well-trained, hardened men and animals, pack artillery should be well suited both to the probable type of warfare and to the country. It can still function efficiently when divided into small units, of proper size to accompany other small units on long marches over rough terrain.

In case it became necessary to land troops from transports, the pack howitzer would be of considerable value in covering the

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landing. It could be fired from the decks of the ships, or even from barges or rowboats, to cover the landing of the infantry. When this was accomplished, the guns could be easily gotten ashore, and could at once open fire again, covering the further advance of the infantry, or the organization of a temporary defensive position.

In the event of night marches, where the object is secrecy of movement, pack artillery would be of great value, due to its ability to march quickly and silently. The pack mule is a calm, quiet animal, and is very dependable in such situations. The pack units are well fitted for night marching also, in that obstacles encountered, either on roads or off them, are of little or no hindrance to the march. A one-man foothold is sufficient for the passage of all the artillery.

In the United States, pack artillery would be of greatest use on terrain similar to that of northern Mexico, for the reasons given under discussion of terrain, above. Its greatest sphere of usefulness would be in the west and southwest, and in other parts of the country where roads are few and poor, and where the country is rough or otherwise difficult for types of artillery other than pack.

On parts of the coast where the road net is poor or lacking, pack artillery would be of great value in support of a beach defense. It would not, however, be of value in swampy areas, as the pack mule, when loaded, can do very little to help himself when bogged down. He can, however, travel well in mud, so long as there is a bottom, as he is sure-footed, strong, and willing to work.

The peace-time training of our pack artillery should be in the southwest, and in rocky, hilly or mountainous country, to keep both men and animals hardened, and accustomed to working in country in which pack artillery would be most likely to operate in time of war.

It is believed that a battery of pack artillery, with its section of the battalion combat train, should be permanently stationed at Fort Sill, as a part of the school troops. This reservation is well suited to the training of pack artillery; and, more important still, the great bulk of our officers, Regular, National Guard and Reserve, who now know nothing of the possibilities and powers of pack artillery, would have the opportunity to learn something at least of the tactics and methods of handling this weapon. Two of our artillery regiments are pack artillery, and while of course the principles of gunnery apply to the pack howitzer just as they do the 75, the guns are of no value if they cannot be placed at the place needed at the proper time. Therefore, the principles of pack transportation should be at least demonstrated, if not actually taught, at the Field Artillery School.

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BY MARTIN GALE

EVERY soldier in the Army has a pat for a dog and a smile for a child. Children are never so happy—and so spoiled—as with soldiers, and dogs congregate around the barracks. It is a rare dog that will not follow the uniforms. Every troop, company, and battery has its own pets, and the unattached camp followers are legion.

Billy joined Battery A while on the march from Fort Jones to summer training camp. He wandered into the bivouac one evening and attached himself to the mess, where they fed him and christened him "Bill." In the morning when the column moved out, Billy followed on foot. He was only a little fellow—a-dog-and-a-half long and a-half-a-dog high—but he trotted along bravely although in an hour he was panting for breath and struggling desperately to keep up. A kindly soldier picked him up and deposited him on the seat of the spring wagon. This was adoption and Billy considered himself an important member of the battery. In camp his self-imposed duty was to guard the mess against the amused visitors; in the morning he would trot to the spring wagon and wait to be put on the seat. From that point of vantage he thoroughly enjoyed the march, yapping in shrill puppy treble at the civilian dogs, or at the end of the long day, comfortably asleep curled up against the driver.

At the cantonment where Battery A spent the summer, Billy who was a bright little chap, quickly learned the routine and became a soldiers' dog. He didn't like drills unless he rode a caisson, which was not often, but every morning he marched with the battery to stables and met them there after drill. At mealtimes he fed from his own plate outside the kitchen door. For civilians he had only dislike or indifference; to anyone in uniform he was cordial. The major he admired at a distance; the battery commander he liked, and his liking was returned—so far that the captain pretended not to know that he slept in barracks. However, the major found this out and spoke to the captain, who promised to see to it the next day. Late in the night fire broke out in Battery A's wooden barrack. Billy, by his barking, aroused the men in time and all escaped, although the building went like a match box. After that nothing was too good for him. He had a bed in the centre of the squad room in the new barrack, the men presented a silver-mounted collar with ceremony, and by permission of the major he rode on a carriage at all drills and reviews—an official member of the battery.

Ryan's career had been checkered. A born wanderer, he had turned his hand to many things. During the war he had served

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creditably in the Navy; afterwards he had enlisted in the Army in the M.T.C. In a year he tired of that and transferred to the Infantry, and in the summer of which I write he applied for a transfer to Battery A.

"He's a good man," said his company commander to the battery commander when they met, "and I'll be sorry to lose him, but he's no good where he is. He's restless and listless. I made him a corporal, then busted him, because he seemed to let go. Maybe you can handle him."

Ryan presented himself to the battery commander who found him a puzzle. At the end of the interview the captain was still undecided when Billy strolled into the office. He ran to Ryan, smelled his legs, barked, and wagged his tail violently.

"Well, if Billy approves we'll take you," said the captain, "and we both expect you to make good."

Ryan stooped to pat the little dog. "I'll try, Sir," he answered.

So began the partnership of Ryan and Billy. They became inseparable. In camp or town you saw them together. Billy deserted his fine bed to sleep on the foot of Ryan's cot; there was nothing a dog could wish for that Billy did not have. When they walked Billy would occasionally jump and caress Ryan's hand with the tip of his pink tongue, and Ryan was forever patting his comrade's back. In the early mornings Billy would anxiously wait for his friend to open an eye before beginning a riotous game of rough-and-tumble all over the bed, and if Ryan slept until reveille, he had the surest of alarm clocks. Billy had not lost any love for Battery A, but he had found the one man in the world for him.

The effect of this comradeship on Ryan was remarkable. In six months he wore two stripes; a year later he was a sergeant. At last he seemed content, yet as the end of his enlistment drew near he became restless again. He had never before spent more than one year in the same place. He became fretful and uneasy. Billy knew that something was wrong and the men, who liked Ryan, sympathized and tried to hold him. They told him he'd get over his fit and settle down, that he'd miss Billy and the battery. It was all useless. The habit of years was too strong and on the day he received his discharge he eluded Billy and hurried off.

Billy searched the post for his companion. He went downtown to all of their familiar haunts; he sniffed at countless legs. At night he slept on Ryan's bed, which the battery decreed should be his. Every one tried to console him, and in time he became his former self, but often at night he would wake from his dreams with glad yelps which turned to low whines as he sensed the empty bed.

A year after Ryan left, the battery once more marched to summer training camp. Soon after their arrival they were reviewed, and

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Billy attended, riding as was his custom on the first section caisson. Afterwards, as they returned to the stables, he uttered a sharp bark and shot like a white streak to the ground and galloped into the gun park. When the battery came in they saw what had drawn him. On the ground sat Ryan in civilian clothes holding Billy in his arms. Ryan was crying, Billy was barking and yelping, his body wriggling with the intensity of his emotion.

The captain rode up and Ryan rose, still holding the little dog.

"I heard that the battery was here, an' I come down to see Billy. I can't do without him. If the captain'll have me, I'm back for good."

FOREIGN MILITARY JOURNALS A CURRENT RÉSUMÉ

FRANCE

Revue D'artillerie, August, 1925

"A RATIONAL Artillery Organization" by Major V. Buchalet. In this article, from the home of the famed "75," can be found the most radical theories on artillery that has come to the reviewer's attention since the World War.

Major Buchalet begins by discussing in detail the various objectives of artillery fire, to wit: infantry and automatic weapons, passive obstacles—such as trenches and blockhouses, enemy artillery, and enemy aircraft. He shows which type of fire and projectile is most appropriate for each of these objectives and proceeds to a discussion of a divisional artillery weapon that will best meet the requirements. His conclusion is that the 75-mm. gun, though capable of a range of 13,500 metres, is far inferior to a light howitzer of 95 mm. firing a projectile of 14 kilograms with a maximum range of 10 kilometres and an angle of elevation of 43°. The advantages claimed for this weapon are: (1) Increased number of available positions, (2) small dead space, (3) double effect per round, (4) suppression of cartridge case with resulting economy in manufacture and transport. It is further claimed that this weapon could be fired at a maximum rate of 6 rounds per minute, and over a prolonged period, due to the low initial velocity of 400 metres per second; it could be fired at a rate of 200 rounds per hour, which is greater than that generally used in the present field gun.

Having adopted this weapon, the writer proceeds to a study of the number of howitzers to be assigned to each division. Referring to the statistics of the World War, he finds that 108 light guns were the normal number in a general engagement. This figure he believes to be equivalent to 52 of his 95-mm. howitzers, and to insure the covering of a division front extended to 3000 metres, he desires to increase this figure to 72 howitzers per division of three regiments of infantry. It is admitted that this figure is far in excess of the organic artillery of any present-day division, but the writer insists that a division should always possess enough artillery for an offensive action, and if it is to be efficient it must be as much a permanent part of the division as the infantry.

Having decided on the divisional artillery, we turn to the corps. Here it is desired to place the 155 howitzers, at present a part of the

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French divisional artillery. The reasons given for this change are that the "155" is expensive and relatively inefficient in a rolling barrage or in successive concentrations which should be closely followed by the infantry. Its chief mission is destruction and counter-battery, both of which are accepted as being in the province of the corps.

Leaving the question of guns, Major Buchalet proceeds to the forms of traction. He is convinced of the necessity of motorization of the army and pleads for a rapid development of a suitable tractor. The reasons given are the usual ones of: greater strategic mobility than can be had with horses; equal tactical mobility; more chauffeurs than drivers available in war-time; less vulnerable to gas; and better adapted to the spurts and lulls of modern warfare.

This article is continued in the September number where the writer takes up organization in the restricted sense of the word. He finds that the battalion has lost its tactical character and is burdened with radio sections, panel sections, orienting details, and supply duties until it has become a technical unit composed of three large platoons. His solution is a six-gun battery of two three-gun platoons with the addition of an elaborate battery commander's detail containing liaison, observation, telephone, radio and machine-gun sections plus a complete supply platoon or combat train. The personnel of such a battery is estimated at 1 captain, 5 lieutenants and 240 enlisted men. This unit would be self-sustaining for supply and communications of all kinds, including direct liaison with airplanes and balloons. In the divisional artillery the battalion would comprise 3 batteries with a headquarters of 4 officers and 50 men commanded by a major. A regiment would be formed with 2 battalions or a total of 36 howitzers, and a brigade, commanded by a full colonel, would comprise 2 regiments.

In general it will be seen that after leaving the battery this organization is not unlike our own. However, the writer does not believe that even this mass of 72 howitzers is sufficient for modern warfare. He therefore wishes to add 2 four-gun batteries of 37-mm. anti-aircraft guns and a battalion of 3 four-gun batteries as accompanying weapons. For this latter purpose it is recommended that a light 75-mm. howitzer be designed having a maximum range of 3000 metres. These would be motor drawn, light enough to be moved by hand for short distances, and in case of stabilization could serve as trench mortars.

The brigade of 95-mm. howitzers, the anti-aircraft battalion and the accompanying howitzer battalion would thus form the divisional artillery to be commanded by a brigadier general who would also act as chief of artillery to the division commander.

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"Liaison" by Colonel Leroy. The writer continues this article begun in the July number and gives a thorough exposition of the phases of war which he thinks are classified under the word "liaison." He points out the manner in which information is conveyed from front to rear by reports of events as seen by returning wounded, artillery observation posts, and by front-line infantry commanders. The system of terrestrial and air observation replaces the high ground from which, in former days, the commander watched the battle. The assembled reports from these observers replace the sweeping view of olden times and on the liaison between these reports he bases his decision. Several pages are devoted to a discussion of the practical duties of an artillery liaison detachment serving with the infantry and of the advantages of having a common command post for the battalion commander of the artillery and the regimental commander of the infantry, at least at the beginning of an attack, although the difficulty of keeping them together as the attack progresses, is admitted.

Revue D'artillerie, September, 1925

"A Rational Artillery Organization" by Major V. Buchalet. This instalment completes the article began in the September number, and is included in the resume above.

"Rapid Method to Determine Ballistic and Atmospheric Corrections" by Lieutenant-Colonel E. Benoit. In order to meet the demand of modern French offensive tactics, which call for sudden and successive artillery concentrations without adjustment, Colonel Benoit claims to have devised an empirical formula by which the ballistic and atmospheric corrections for any successive ranges can be determined with the requisite accuracy by one simple equation in less than a minute, after the corrections of the day for any given range have been calculated in the regular way from the firing tables. It is pointed out that the individual ballistic and atmospheric corrections for a fixed set of conditions vary, respectively, though never directly, with the range,—in other words, each separate correction is a mathematical function of the range. The correction for difference in muzzle velocity (dV_0) increases at a slower rate than the range while most of the other corrections increase more rapidly than the range.

The author begins with the proportion $\frac{C}{R^n} = \frac{C_0}{R_0^n}$, where C_0 is the total ballistic and atmospheric correction for an arbitrary range (7000 metres for the 75) for the given corrections of the day; C the total correction for the range R at which it is desired to shoot at any time thereafter; and n a constant exponent. As a result

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of experiment, the author claims that the English have given a value of 1.2 to n , but that he finds that 1.3 is a closer figure for use with the 75-mm. gun, firing the long boat-tailed shell, model of 1917. His equation thus becomes $C = C_0 \left(\frac{R}{R_0} \right)^{1.3}$. Through the method of similar right triangles he has devised a simple graph by which the above equation can be solved in a few seconds. Based on the graph, a mechanical instrument has been invented for the solution of the same equation.

For use in a transport of fire the formula becomes, $k' = k \left(\frac{D'}{D} \right)^{1.3}$, where D is the map range to the auxiliary target; D' the map range to the new target; k the difference between the gun range and the map range of the auxiliary target; and k' the total correction to be applied to the map range of the new target. Colonel Benoit states that the above method gives him results which are within one probable error of the true corrections obtained from the firing tables, when the deflection shift did not exceed 300 mils. In cases where a greater shift is possible, it would be necessary to calculate the basic correction for different sectors of 300 mils each.

NOTE.—The above method was tried out extensively by the writer of this résumé, using the Mk. IV 75-mm. firing tables. In most cases the results were very accurate and the rapidity most gratifying. Unfortunately in cases where the largest individual correction involved was due to variation of muzzle velocity, dV_0 , the results were unsatisfactory.

Revue D'artillerie, October, 1925

"How an Artilleryman Captured Constantine," by Major G. Besnard. Here is an historical account of the second expedition against the city of Constantine, in 1837, after a rather disastrous defeat the year before. The expedition of only 7000 fighting troops and 33 guns, contained 10 generals, chief of whom were General Vallée, Chief of Artillery, General Damrémont, Governor of Algiers, and the Duke of Nemours, son of Louis-Philippe. The command of the whole expedition seems to have been exercised by those three and in spite of the confusion of responsibility, was successful, largely through the effective employment of the artillery, which silenced the Algerian guns and opened a breach in the walls of the town through which the infantry passed in their assault. The writer closes with a discussion of the best season for operations in North Africa, the organization of expeditions and the amount and type of matériel suitable for such work at the present time, based on an analysis of this campaign.

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"The Question of Metals in Germany During the War," by Lieutenant-Colonel A. Gavard. In great detail, armed with columns of statistics, the writer discusses the the question of basic metals in Germany. Taking up in succession the various metals, he gives: the sources of supply and the amounts furnished by each; the respective tonnage required for various items such as 77-mm. projectiles, field guns, railways and battleships; and the substitutes devised with their quantities. The pages of this number are devoted entirely to steel, but the study is continued in the November and December issues where Colonel Gavard devotes the same care to lead, tin, nickel and other metals. If the figures quoted are exact, this study should be of interest to anyone connected with the industrial preparation for war.

"Chemical Warfare—An Analysis of the German *Der Chemische Krieg*," by Hanslian and Bergendorf. The French Critic of this article presents a résumé of a work which he terms truly "Kolossal." It is divided into four parts.

1. Attack by gas.
2. Defense against gas.
3. The production of smoke.
4. Chemical combat since the war and in the future.

Part I begins with an historic outline of chemical warfare before 1914, together with a reference to its aspect under international conventions. Following this, is an account of the uses of gas in the early days of the war with a full description of each of the German types of gas shells and their contents, used between 1914 and 1918. It is interesting to note, that the Germans first resorted to chemical warfare at Neuve Chappelle on October 27, 1914, in the form of a 105-mm. shrapnel containing a small charge of "dianisidine," which in the form of a dust, produced an irritation of the eyes and nose. The properties and use of the various gases are given in some detail, with the quantities required for effective concentration as well as the means necessary to launch them on the enemy.

Under protection are discussed the types of masks in use in the German army together with the sanitary and disciplinary measures in force to reduce gas casualties.

The credit for the invention of the smoke screen is given to the American Navy, and the authors claim that Germany was always handicapped in this matter, both on sea and land, from lack of sufficient quantities of phosphorus.

The closing pages are given over to an exposition of the efficacy of diplomatic restrictions on the use of gas and an outline of

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the technical progress made since 1918. It would appear that the original book is a veritable mine of information on gas and its uses.

Revue Militaire Française **January and February, 1926**

"Essay on The Tactical Employment of Engineer Troops," by Colonel Baills, is concluded in the January issue. The author discusses the use of engineer troops during the offense, the defense, and the retreat. At least one company of engineer troops marches with each advance guard column and reconnoitres the roads during the advance. When the advance guard is forced to occupy a position, the engineer troops assist in its organization and, if necessary, join in its defense. When the main body engages the enemy, the sappers are used in repairing the roads, particularly the roads necessary for the movement of artillery.

During the retreat the sappers may be divided into two groups,—one group with the rear guard, destroying everything possible, and a group which precedes it and establishes passages over natural obstacles, thus simplifying the retreat of the main body. This advance group at the same time prepares for the ultimate destruction of these passages. These two groups leap-frog each other successively, in such a way that each assures the demolitions that it has prepared. It is necessary to provide motor transportation for these groups when possible.

The author believes that, before the next war, science will increase the possibilities of such defensive units. Even though motor transportation may adopt tracks to avoid torn-up roads, they cannot pass through zones sprinkled with yperite designed to corrode the motors. This is but one example of what may be expected of the engineer troops of the future.

"Napoleon's Offensive Against England," by Colonel Baills, is a study of the Egyptian campaign. The author feels that this campaign is worthy of examination since it was the only direct offensive against England. For some time Napoleon had planned to pass through Egypt and attack England in India. In spite of its ultimate failure this was not a foolhardy expedition, but one carefully planned and worthy of Napoleon's genius.

Captain Daundouz gives a detailed description of "A Night Attack in Morocco." The Riffs habitually hold the crests of this mountainous country, barring the passes by a system of trenches. Held during the daytime, these trenches are occupied at night only by sentinels who give the alarm to the main body. It is very difficult

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to take these strong positions by day, unaided by surprise. Moreover, the terrain is such that the artillery can neither furnish an effective preparation for an attack, nor support the infantry during an attack. An unexpected night attack, on the contrary, has every chance of success, and the trenches can easily be taken from the enemy sentinels. The difficulty lies in holding these positions against the violent enemy counter-attacks.

It was decided in this case, to attack on the night of September 25, 1925, taking all possible measures to surprise the enemy and to resist the ensuing counter-attack. The 75-mm., 155-mm., and the 65-mm. (mountain) batteries took their positions but did not fire a shot during the night. They were not to open up until daybreak, at which time the infantry attack was to be completed. The attack was successful and the Riffs' counter-attack was not launched until 9:30. It was stopped by the combined fire of the artillery and the infantry.

"Instruction of Officers in Seeking Information in Battle" is a practical and interesting study, by Lieutenant-Colonel Paquet, of the function of the G-2 section of the staff in the preparation and execution of a manœuvre. Even though the enemy be merely outlined, the author shows that it is possible, during the course of a terrain exercise, to give the G-2 section a chance to function by giving it the necessary material for its work. For this purpose it is sufficient to place at its disposition some aerial photographs, information from prisoners, and a few enemy documents. To obtain the best results, too much information must not be given from these sources, or from the aerial and terrestrial observers, until the intelligence section has acted with initiative and expressed its needs.

"Reflections on the Riffian Campaign," by Commandant X, is a study of the enemy's "game" or method. The Riffs are only a few thousand in number and possess only a few canon, poorly handled, without mobility, and used only against blockhouses. They are well supplied with small arms ammunition but have difficulty in producing and transporting food supplies. This insufficient matériel is more than offset by their esprit, their savage tenacity, and the fear that they inspire in all Moroccan tribes in front of the French lines. For centuries these few Riffs have terrorized and pillaged the more peaceful natives.

The game of Abd-el-Krim is one of "infiltration and intimidation." A village which gives evidence of sympathy for the French or of a desire to remain neutral is first visited by emissaries of Abd-el-Krim. These agents preach the necessity of a holy war and attempt to convince the populace of French weakness. If the

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village remains rebellious or hesitant, 500 or more regulars of the Riff army appear upon the scene, giving a demonstration of their strength. This is usually sufficient. If not, as a last resort, hostages are taken, and the village pillaged. Even the most stubborn villages submit. They reason that it is better to risk more distant danger of the French canon than to suffer immediate punishment from the Riffs.

In any one sector there are never more than 1000 Riff regulars opposing the French. Troops furnished by the tribes inhabiting the sector increase this force to 4000 rifles, which is the maximum concentrated force that can be fed. Due to the extreme lack of transportation facilities, these troops must live on the country.

Strongly intrenched and well scattered, the Riffs do not fear light artillery or aviation. A heavy concentration of artillery fire or a tank attack impresses these tribesmen, but not enough, however, to drive them from their positions. Lacking the ability to manœuvre, they attempt to hold a thin line by fire power. They fear most of all the turning movements of the French, the surprise attacks on their flanks or rear. A few cavalymen appearing suddenly on their rear with their carabines and one automatic rifle are sufficient to cause a panic. Three well-manœuvred infantry battalions can easily defeat any force the Riffs may concentrate for an engagement.

Thus, due to their method of infiltration and intimidation, the Riffs continue to win strategic success, as they continue to fail tactically. However, to profit by her tactical success, France must continue to advance and vigorously defend the ground gained against native forces which the Riffs are continually stirring up to the attack.

"The Synthesis of Movement," by Commandant Besnard, is a study of troop movement. He takes up all the combatant branches, touching upon their history and their future possibilities. The author remarks that though the cavalry is an expensive arm, vulnerable to fatigue and enemy fire, difficult to supply and to instruct, certain qualities will permit it to play a part in modern warfare for some time: its speed and capacity for movement is double that of the infantry; its ability to circulate everywhere is almost equal to that of the foot soldier.

The aviation can soon be expected to transport entire companies to critical points in the line of battle; it will make possible a saving in troops of occupation in giving them the gift of omnipresence.

Formerly the problem of moving large units was very simple; it rested on one principal: the speed of the whole column was that of the slowest element, that is to say, of the infantry. The cavalry and artillery were slowed up to the speed of the column. To-day,

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this is not the case. A new element, the automobile, has come to revolutionize troop movement. The units of the same speed are grouped. The best roads are reserved for the heaviest or the most necessary transportation. The artillery and horse transportation are assigned poorer roads. The cavalry and infantry must use the paths or open fields. Planning this movement and regulating its delicate mechanism, is a real "puzzle" for the staff to solve.

"Underground Telephone Cables," by Captain Jaubert, is a study of the French commercial telephone system, the necessity of improving it, and its adoption to the needs of national defense.

"An Operation in Mountain Warfare," by Captain Flipo and Major Libor Vitez of the Czecho-Slovakian Army, is the description of an engagement in the Carpathians in 1916 between the 61st Austro-Hungarian division and the 7th Roumanian division. It finally resulted in a very costly victory for the Austro-Hungarian division. Several serious mistakes were made by both commands in failing to secure themselves against surprise attacks upon the flanks and rear. The terrain in this country lent itself very well to such attacks.

In these issues Lieutenant-Colonel Grasset continues his article "Verdun."

ENGLAND

The Journal of the Royal Artillery, January, 1926

Most of this issue is taken up with an excellent description of the unveiling of the Royal Artillery War Memorial. This great memorial, which was erected to commemorate the supreme sacrifice of all those members of all parts of the British artillery who fell in action during the World War, was unveiled by Field Marshal H. R. H. The Duke of Connaught on October 18, 1925, before a very distinguished audience. Such a memorial is only possible where all members of a branch are a part of the same organization, such as The Royal Artillery Regiment of the British Army.

In this number of the Journal, the Duncan Essays are continued. One submitted by Captain R. H. A. Kellie on the subject "Counter-battery Work in Mobile Warfare" is a very excellent presentation of this difficult problem. He points out that a great deal of the counter-battery work will have to be done by the divisional artillery. The great difficulty will arise from the difficulty in obtaining observation of the targets. This will necessitate the use of balloons and aircraft. The limiting factors in the problem are information, ammunition and communication. On account of

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the difficulty of obtaining information, it will be necessary for all arms to report to the artillery headquarters any information which they may obtain. On account of the difficulty of supplying ammunition, it will be impossible to depend upon destruction and the ammunition available must be used for neutralization. The author shows that the use of gas will be exceptional in this work on account of the small amount available.

An article on the important battle of Le Cateau, August 30, 1914, by Brigadier-General C. De Sausmarez, is an excellent presentation of the contentions of those who support the action of General Sir Horace Smith-Dorrien which resulted in bringing about the battle. This is a point which has been very thoroughly discussed by the British, almost from the day of the battle. It will be remembered that General Smith-Dorrien was relieved from command shortly thereafter, presumably on account of his actions in this matter. While the article does not present any startling new information on the subject, it will undoubtedly be of considerable value to those students of the military profession who are making a study of the British participation in the first part of the campaign of 1914.

The Article "Royal Air Force and Army Coöperation," by Major R. G. Cherry, R.A., is a very sound presentation of this much mooted question. It appears that the author was with the air service during the World War and that his deductions are based upon personal experience in the artillery and air service. He reaches the conclusion that the observers of artillery fire should be artillerymen and that the observation service for the artillery should be under their control. In support of his contentions he quotes from the writings of the French General Herr, who is considered to be one of the great artillerymen produced by the World War, as follows: "Artillery should produce and train their own observers, and keep them by looking after their professional advancement. The air service would be responsible for the pilots and the aeroplanes and their administration; but for artillery flights, its rôle should be merely to tell off aeroplanes as aerial observation posts, or as quick means of getting about, just as the automobile service tells off a motor to a staff officer who wants one for a reconnaissance." The author shows that the present system of handling the air service in England is not producing satisfactory results and proposes that the defects should be remedied by training the artillerymen to fly and observe, and to attach permanently to the artillery the squadrons which would operate with them in time of war. He points out that this is especially important where the operations are being conducted in new terrain.

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A Standard Division Gun and Standard Medium and Heavy Tractors

LATE in last December the Model 1923, 75-mm. gun, was adopted as to type, and in March the Caterpillar "30" Tractor and Caterpillar "60" Tractor were adopted as to type and designated as standard for the medium and heavy tractors, respectively, for the army.

The evolution and characteristics of the Model 1923, 75-mm. gun, are discussed in Major Pennell's lecture, published in this issue of the JOURNAL. Since the World War, and up to the present time, the Model 1897 (French Seventy-five) has been our standard for the division gun. This means that, had we become involved in war in 1924, for instance, not only would our division artillery weapon have been the Model 1897, but our immediate manufacturing program for more guns would have been in this Model 1897. Even now, and for many years to come, should any war break out, our artillerymen would go into the field armed with the only light gun of which we have any appreciable supply,—the French Seventy-five.

This adoption of the Model 1923 as a type as noted above, does not mean that extended field tests and experiments to improve the type will stop; they will go on. The particular, present significance of this adoption is from the viewpoint of war production. Being assured of at least an acceptable type of gun, embracing modern requirements, our supply department can now plan the gauges, jigs and fixtures for the production which war would require, and can survey the American manufacturing field with a view to the allocation of war orders. Furthermore, in the manufacture of experimental batteries of this new matériel, any difficulties of manufacture, which may be encountered, will be ironed out, the necessary processes of manufacture determined, the kind and quantity of gauges, jigs and fixtures determined, and the general scheme for production developed.

It may seem peculiar, with one of these new type guns already built, to say that in any war for many years to come our artillerymen would take the field with the French Seventy-five. Our experience with the 155 howitzer, for example, may explain the situation. The 155 howitzer was in use on all the battlefields of Europe before we entered the late war. Immediately upon our entry, the French supplied us with all the plans and specifications for this piece, but it was nearly a year and a half before factories could put one in the

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hands of our soldiers. We hope our experiences in 1917–1918 will shorten this production period in any future war; the standardization of the 1923 Model is one step towards this goal; but, in any event, there will be some appreciable period in which we will only have the French Seventy-five.

The standardization of the medium and heavy tractors has a somewhat similar significance to that of the light field gun. Both these accepted types are commercial tractors at present in commercial production. But piece-time commercial production does not meet war-time demands. Standardization enables our supply departments to work out war production schedules and place war orders. This in turn enables manufacturers to visualize their duty in case of war. In any case in a future war we would find ourselves using, in the early stages, the old five- and ten-ton tractors we have on hand as well as such various commercial tractors as we could procure.

The medium tractor, referred to above, is for use in batteries equipped with the 155-mm. howitzer or other matériel of similar characteristics; the heavy tractor is for use with the 155-mm. G.P.F. gun, the 8-inch howitzer, the 240-mm. howitzer and other matériel with tractive loads of approximately the same characteristics.

124th Field Artillery Horse Show

The second annual Horse Show and Military Tournament was held by the 124th Field Artillery, Illinois National Guard, at its armory at 3401 Wentworth Avenue, Chicago, on February 5th. The 6th Corps Area Commander, Major-General W. S. Graves, most of the heads of department from corps area headquarters, the commanding officers of all national guard regiments in Chicago, the state adjutant general, and the United States property and disbursing officer from Springfield, were guests of honor.

According to reports from Chicago, Colonel T. S. Hammond, commanding, and all the officers and men of the 124th are to be congratulated on staging a three and one-half-hour show that would be a credit to any field artillery regiment in the service. They are now planning to give next year a three-day show in conjunction with the 106th Cavalry, Illinois National Guard.

The performances were all the more remarkable considering the fact that all of the horses in the show, excepting two owned by officers of the regiment, were state, government, and regiment owned horses, used regularly for drill and instruction purposes. They also worked under the handicap of practicing only at night, and that outside of regular drill hours.

Special features of the show, which were most enjoyed by the three thousand spectators crowded into the armory, were the ladies'



A ONE HUNDRED AND TWENTY-FOURTH HELD ARTILLERY INDOOR POLO TEAM
LEFT TO RIGHT: CAPTAIN J. R. LAKER, LIEUTENANT COLONEL H. H. F. GOSSETT, CAPTAIN A. J.
BRADLEY, AND CAPTAIN G. L. FERGUSON.



THE WEST POINT POLO TEAM
LEFT TO RIGHT: CADETS VAN METER, AND MURPHY, MAJOR HOLDERNESS (COACH), AND
CADETS SIMS. AND L. W. JOHNSON.



IN THE EIGHTH FIELD ARTILLERY IN HAWAII
THE MODERN VERSION OF AN OLD ARMY CUSTOM,—BRINGING A NEW BRIDE AND GROOM TO
THEIR HOME IN THE POST, THE UPPER PICTURE SHOWS THE HEAD OF THE COLUMN: THE
LOWER, SHOWS THE CARRIAGE FOR THE BRIDE AND GROOM.

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saddle class, the indoor polo game staged by two teams from the regiment, the fancy riding and section driving exhibitions, and the officers' jumping event. In the jumping event a course of eight, 3½-foot jumps were taken by a class of fifteen officers. None of the officers or mounts in this class had ever had jumping experience previous to this year.

Indoor Polo at the Military Academy

The past winter's indoor polo season at West Point has been one of the most successful that the cadets have ever had. The cadet team won nine of the eleven games played, losing only to Yale and Harvard. The total score for the eleven games was 148 goals, or an average of over 13 per game. This record was made with all games played on the flat, against teams, half of whom had an aggregate handicap of from 11 to 22 goals.

The games and scores were as follows:

Army—13, Squadron A—3.

Army—12, 101st Cavalry—10.

Army—16, Second City Troop of
Philadelphia—2.

Army—18, Governors Island Officers—3.

Army—20, 103rd Field Artillery—3.

Army—17, Ramapo Valley Club—0.

Army—11, New York Athletic Club—1.

Army—13, New York Athletic Club—7.

Army—8, Ramapo Valley Club—1.

Army—12, Yale—14.

Army—8, Harvard—11.

The Horse Supply for the Army

The Remount Service of the Quartermaster Corps has placed twenty-five new stallions in service this spring in furtherance of their efforts to encourage the raising of better type horses throughout the country. This activity on the part of the government has been carried on for about five years now and was made necessary largely by the modern use of motors. As motors came into use, the use and popularity of the horse decreased. But there are many fields, one of which is the army, from which the horse cannot be spared. In the army the Cavalry, of course, depends on its horses; the trains need their mules; and it should not be forgotten that our division artillery is completely horsedrawn, and it is not clear but that it will better remain so indefinitely.

While it is true that the law of supply and demand should provide for the needs of the horse-using public, still the advent of motors so appealed to popular fancy that it became apparent that, first, the quality of the horse supply was suffering and, second, with a supply of scrubs, users would turn from the available supply of scrubs to a means of transportation less desirable than good horses. The result worked to the detriment of the legitimate users of horses. While this is true of all types, it especially applies to the light draft and riding horses.

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Beginning in 1921 the government, through the Remount Service, instituted the system, still in force, to improve the quality of horses. The method pursued is to place pure-bred stallions of proper riding type at the service of farmers and breeders willing to assist in the production of riding horses of the proper quality, and who are located in communities where mares of suitable type are available. The service of stallions is furnished at a nominal fee. Stallions are delivered at government expense to local agents who arrange for service and collect the fees therefore. A local horseman or farmer in good standing in the community and interested in breeding is usually selected as agent.

Beginning with 183 stallions in 1921, increased to 247 in 1922, to 285 in 1923, and 350 in 1924, there were, at the beginning of this year, over 400 excellent stallions on hand, which will be available for the use of farmers and breeders of the nation for the 1926 breeding season. These are scattered in forty-four states. The breeding of these stallions is:

- 352 Thoroughbred.
- 28 Arabian.
- 26 Morgan.
- 4 Standard.
- 2 Saddle.
- 1 Hackney.

It is evident that this effort has both an economic and military value. A great number of undesirable horses are now being raised in the United States. These scrubs bring no price commercially nor are they suitable for the army, and it costs as much to raise them as it does to raise good horses. By raising good horses instead of scrubs we will stop this economic waste; we will have in this country an available supply of riding and light draft horses for use in war; and we will have a supply of a superior type of the light utility horse, so widely used commercially.

Appropriations for the Fiscal Year Beginning July First

The War Department appropriation bill, as finally passed in the Senate-House Conference, cuts the appropriation for pay of enlisted men of the regular army, so that it apparently will be necessary to stop between three and four thousand promotions to enlisted grades and ratings next year. This cut was originally made in the House, but not in the Senate, and was finally agreed to in conference. The conference also struck out a proposed appropriation of \$100,000 for travel pay of regular army instructors on duty with the Organized Reserves.

An amendment, offered by the Senate, to reappropriate \$600,000 from unexpended funds, was passed by the conference. This money is to be expended for horses. One thousand horses so purchased go

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to the National Guard, the remainder to the Regular Army. This should go a long way toward replacing the aged horses now in service, both with the Regular Army and the National Guard.

Field Artillery Board Notes

Guns.—The test of the 4.7-inch gun, M-1920E, has been completed, the report forwarded and approved. The gun was found to be satisfactory in every respect but one. Its stability is excellent, its mobility behind a 10-ton tractor very good, and its accuracy with the normal charge satisfactory. However, with the supercharge, the range dispersion was too great. Further firing will be done to determine whether this actually is true (the first firing was with comparatively few rounds) and, if it is, the cause of it.

A progress report on the 8-inch howitzer-155-mm. gun matériel, M-1920E, has been forwarded and approved. As this matériel embodies the two-load principle for the first time in our service, it was to be expected that considerable difficulty would be experienced with the methods used for shifting the gun tube to and from the transport wagon. Such proved to be the case. The present transport wagon is unsatisfactory. Other minor mechanical troubles were encountered and corrections recommended. Fired as an 8-inch howitzer, the matériel was remarkably accurate. When fired as the 155-mm. gun, however, the ammunition behaved very badly, the fact that seven air bursts with the short fuze were obtained, shows exactly how badly. The 155-mm. gun tube is being refired. In addition, new pneumatic equilibrators and a new type of wooden spade are being tested. On the whole, this matériel is satisfactory.

Tractors.—The 1500-mile test of the various commercial tractors continues. Progress reports on all of them were submitted about February 10th. In these reports, the Best and Holt tractors (now called Caterpillars) were considered satisfactory in various degrees. The Best is a rugged, powerful tractor of excellent mechanical design. The corps tractor, of Ordnance design, also has done some remarkably good work, in one case pulling a 15,000-pound load through a very nasty spot where it seemed a certainty it would stick.

Tables of Basic Allowance and Equipment.—The Board has underway an extensive revision of these tables, it being the intention to put them in such form as will remove them from the cross-word puzzle class. The work is difficult, being made up of a multiplicity of small details, each one important. At the conclusion of this part, an extensive field test will be made of the ability of both a horse-drawn, 75-mm. battery and a motor-drawn, 155-mm howitzer battery to carry the equipment set forth in the tables. This test will

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consist of a ten-day field exercise covering almost all types of battle conditions in which artillery would manœuvre.

Double-heading Test.—A survey of the commercial field in tractors shows that the 10-ton is the heaviest type being manufactured and that there is little possibility of the production of any heavier type, in the future. As some of the matériel loads are already heavier than the ten-ton can handle, a test of the possibilities and efficiency of double-heading has been started.

MINOR TESTS

105-mm. Howitzer Ammunition Boxes.—Four-round and two-round ammunition boxes for the 105-mm. howitzer have been tested and found unsatisfactory, being too weak.

Lanterns for Aiming Stakes.—It is not believed that this test has been mentioned in previous "notes." The electric lighting devices for aiming stakes and sights have proved very unreliable. To take their place on the aiming stakes, oil lanterns were fitted with a tin covering over the globe, a slot being cut in the tin. These proved satisfactory for one aiming stake and are now being tested where two aiming stakes are used. Flashlights were recommended for use at the sights.

Watches.—Elgin wrist and pocket watches of seven and fifteen jewels are being given a six months' test.

Calculator.—The Otis King calculator is in reality a tubular slide rule on which the scale is "spiral-ed" around the tube. It was brought to the attention of the Board by Lieutenant Lepper, 1st Observation Battery. It is under test now.

Panoramic Sight Mountings for 75-mm. Gun.—Two types, "E" and "DD," are still under test. No decision has been reached.