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"LE SOIXANTE-QUINZE."  
By Herbert Haseltine.  
(See *Current Field Artillery Notes*.)

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## SOME ASPECTS OF AMERICAN FIELD ARTILLERY

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DURING the war we advanced and greatly improved our field artillery. But since the war our progress has not been commensurate with our opportunities. We are still advancing in some lines, but in others we show signs of stagnation.

In surveying the situation as a whole, however, it is believed that the present slowness of our progress is due more to conditions beyond the control of the field artillery, than to our own neglect. Still, it is thought that if our problems and their present status are brought before our eyes occasionally, and the unvarnished truth set forth, renewed interest and appreciation of the situation will be shown by those who have the interests of the service at heart.

It is the purpose of this article to present some of the most important questions confronting the field artillery today, to indicate our progress or lack of it, and to endeavor to offer constructive criticism where possible.

Our general situation resulting from the war is about as follows: We have improved our technical and tactical organization, adopted new and more efficient weapons, learned much about traction, both horse and motor, perfected our training methods, and, finally, we have more definite ideas regarding the methods to be used in handling our guns in combat.

### ORGANIZATION

First, let us take up the matter of organization. Before the war our largest unit was the regiment, and its use as a compact unit appeared cumbersome to all, to say the least. We were accustomed to occasional regimental reviews, and several regiments went to the border as units. But, aside from more or less stereotype manœuvres, not much advantage was reaped from this opportunity for field training. The remainder of the army was in much the same condition. Our entire system was based more on peace conditions than on active service requirements.

We learned much from the war, however. For the army as a whole, we have adopted a more practicable and efficient general staff system, we have chiefs of combat arms, we have a tactical and

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strategical distribution of troops rather than a geographical one, and we have recognized that the basic combat unit for peace, as well as war, is the division. It is not intended to say that the function of the division was not appreciated before the war. What is meant is that the necessity for its organization in peace was not sufficiently recognized.

For the field artillery, as regards organization, we have secured the following: a chief of field artillery, the brigade organization, an improved regimental, battalion and battery organization, a recognition of the principle that artillery communications should be in our hands, an organized ammunition service, and finally a field artillery organized reserve.

The benefits resulting from the establishment of the office of the chief of field artillery are many. From the point of view of personnel alone, its usefulness has become indispensable, for our officers are placed primarily with respect to their ability. It directs our schools, and through them, of course, our policies. It is in constant touch with the Ordnance Department, and advises on our new guns and matériel. However, the War Department has hindered its functions somewhat, along one of its most important lines, namely, training. As a part of the new corps area organization the corps commanders control that important function as regards the troops in their respective areas, and exercise it through their division or station commanders. It is not believed that many of the corps commanders have chiefs of artillery on their staffs. The corps is a tactical organization as well as an administrative one. It has important functions as regards the proper training of its troops. It is believed that, with the chief of field artillery more or less cut off from direct supervision over the training of field artillery, it would be a wise policy to place officers on the staffs of the corps commanders, who would perform duties similar in type to those handled by our corps artillery commanders in France. The present organization, with respect to training, is evidently not a success, for our regiments and brigades are not being either uniformly instructed or consistently directed in their training. With a chief of corps artillery, placed as a staff officer to the corps commander, and in constant touch with the chief of field artillery, the training of the field artillery units in the various corps areas would take on a definite aspect. Such a system would be only the continuation of the policy adopted when the office of the chief of field artillery was authorized. Its success and expansion to other arms has been too beneficial to warrant further discussion.

In adopting the brigade organization we made one of our greatest strides forward. It was the basis of all training and operations during the war, and should continue to be so in the future. In

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addition, its value from the point of view of morale is inestimable. There can be no doubt but that its continuation must be assured. The reasons are simple, for it is the tactical unit most suited for handling field artillery in connection with other arms, and the best cadre for training. Since the war, and especially since the Reorganization Act, our brigades seem to have been slowly but surely melting away. It is hard to place the blame, except on Congress. But we should take advantage of what we have left. What few brigades that exist appear to have more administrative than tactical functions. It must be remembered that, primarily, the brigade is a tactical organization, and its tactical duties should be stressed continuously.

When our present regiments are compared with their pre-war type, we find many changes. Along with other additions there have been added the tactical staffs. It is recognized that regimental and battalion commanders have need of various technical assistants, the necessity for whom was not realized until our experience in France. For instance, now we have various officers detailed on operation, ammunition, telephone, wireless, and information duties. Their functions are very necessary and extremely important, but their importance should not be overestimated. In other words, their technical efficiency should not overreach their tactical necessity. Trench warfare methods must not hamper our ability to fight in the open. In France we went through two periods of combat, the first being that of stabilized positions where technical staffs and methods effected an almost mechanical tactical operation, and the second, that of movement, where technical and complicated staff work was too slow, and simplicity and tactical efficiency held sway. It must be held in mind constantly, that simplicity of organization and method will, in the long run, be far more efficient than technical complexity. Accordingly, the principle that staffs exist for the troops should guide and control our ideas whenever staff formation is concerned. At present, these technical staffs are quite neglected, as far as their presence with organizations is concerned. The reasons are multiple, and include such factors as lack of officers and men, properly trained, short strength units, and the lack of necessity for their presence. But, it is believed that the average opinion inclines towards over-staffing. Views are heard continually, dwelling upon the necessity of increased staffs in one form or another. The train of thought seems to be that we are in grave danger of being under-staffed, whereas, it is the opinion of the writer that quite the reverse is true. To cite an example, the new tables of organization for the headquarters of the artillery brigade provide for a message centre, with a detailed personnel. With the brigade functioning alongside of the division, as is contemplated in combat, the necessity for a separate brigade message centre is not clear. With

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a competent sergeant major and the availability of the division message centre, it was the experience of the writer that there was nothing less needed than such a message centre. This example does not seem important, and the number of men involved is not large, but it indicates which way the wind is blowing. Also, the major on the brigade staff is now entitled the "Executive," and there is a lieutenant added as the adjutant. Duplication of work and lost motion is all that is acquired by such an addition.

Another evil resulting from over-staffing finds its expression in the riotous issue of equipment and vehicles. The ratio between men or vehicles, and gun power is changing with each new table of organization, and the guns are on the losing side. It is believed that such a tendency is dangerous unless halted in the near future.

Hence, we arrive naturally at the question of the six-gun battery. Surely, if this complicated organization continues on its headlong way, it behooves us to look to the relative power of our fire. It can be stated quite safely that the infantry is daily achieving more fire power per man. If we must increase our regimental personnel, let there be a punch in the increase. There are many other advantages in the six-gun battery, but it is beyond the scope of this article to deal with them in detail. Mentioning them only, we would have more powerful fire for long periods, an increase of fifty per cent. in fire power, with an increase of probably less than twenty-five per cent. in personnel, no increase in the more highly trained personnel, and more guns per trained man, if we feel that we have an unlimited supply of untrained man-power.

It is thought that this question of increasing our fire power must be given serious consideration by every thoughtful field artillery officer.

Other important questions affecting organization are, the ammunition supply service, and the advisability of inclining towards the French system of using the artillery in "Groups," or "Groupements," in combat.

We have now the battalion ammunition, or combat train. Its benefit is apparent. But the organization of the division and corps ammunition trains, particularly as regards the supply of infantry ammunition, are questions that need much discussion and investigation. On the whole, our duties to the infantry in this respect are but slightly understood; hence, before such questions are taken in hand, we must get in touch with the infantry and understand their problems, as well as our own. Investigation might even show that a separation between the two ammunition supply systems was advisable.<sup>1</sup>

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<sup>1</sup> The artillery ammunition service is no longer charged with the transportation or supply of any ammunition other than that for artillery troops.—*Editor*.

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The nine-battery regiment, with the regimental organization functioning only for administrative purposes, is another idea gleaned from our association with the French who apparently seem well satisfied with it. In this connection, the writer wishes to state that he does not advocate by any means, the blind adoption of foreign methods in vogue, but it is believed that many schemes, successful in Europe, are worthy of investigation and trial by ourselves.

### MATÉRIEL

Let us turn now to the subject of matériel. It is a large one and, perhaps, one of our most important. It divides itself naturally into three parts—weapons, transportation, and technical equipment.

According to our pre-war conceptions, we find our weapons enormously improved. We have the seventy-five, the one hundred and fifty-five gun and howitzer, and the various larger guns and howitzers running up to the fourteen-inch railway rifle. We made a very exhaustive study of the different calibres and their functions immediately after the Armistice, and as a result have a more or less definite idea as to what guns we desire, and the missions to which we expect to assign them.

One of the important decisions of the board making this study was that the howitzer to be used with the division should be of about the same mobility as the seventy-five. Present opinion seems to incline towards a howitzer lighter than the one hundred and fifty-five, the type used in France. This is an important question, and the writer believes that not very much power should be sacrificed for increased mobility. Speed of manœuvre, that is to say, fast gaits, if such an expression can be applied to gasoline vehicles, should not influence excessively the relative mobility desired. Extreme fire power is the main factor desired. It should not matter how it is achieved, provided it can be delivered when required. Before we discard the one hundred and fifty-five, let us find a substitute which has the same power at least. As for its mobility, the writer does not believe that the extreme limits of this howitzer's mobility are either known or appreciated.

The average officer is familiar with it in only a general way. The fact that it has been used in combat in France only, where hard roads abound, weighs against its weight. The four-point seven-rifle weighs practically the same as this howitzer. It is classed as a corps weapon, and yet it is capable of serving alongside the divisional rifle, even when horsed. The howitzer can be, and has been, handled just as expeditiously and freely. The argument that if the division does not have it, at least the corps will, is advanced from many directions. It is insisted that it will be easily available for use by the division. Such an argument on its face admits of the frequent

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necessity of its use by the division. If such is the case, why not give it to the division, and rid ourselves of an item of divided control. Also, anyone in France who endeavored to secure corps artillery fire for a division will appreciate the elusiveness of said assistance. Here again we could study with profit the French liberal detachment of corps artillery for divisional use, as opposed to our own rather rigid retention of the same in the hands of the corps artillery staffs. But, this is rather a matter of organization and combat training than of matériel. The power of the divisional howitzer, though, is vital. It is needed to get into the ground, and also for counter-battery work. Before we drop a well-proven weapon, let us prove the value of the one we desire to substitute for it.

There are being constructed for trial two types of the seventy-five rifle. One has a split trail, allowing an angle of elevation equal to eighty degrees, the other has a box trail allowing thirty degrees elevation. The split trail design, in conformity with the recommendations of the calibre board, contemplates the mounting of the one hundred and five, or similar light howitzer, on the same carriage. It would seem that if this is the only reason for the split trail, its adoption might be obviated by the design of a trail for the light howitzer, which would be similar to that of the one hundred and fifty-five howitzer. It is not believed that the complexity of the split trail warrants its adoption, unless the high angle of elevation is deemed imperative for the divisional rifle.

The notable increase in range in both new types is important. But what is more important, is that either we must use an unfixed ammunition of a type which allows zone fire, or else we must, by reason of the greatly increased powder pressure, wear out our guns very rapidly. It is believed that, unless the question of anti-air craft work by this gun is in doubt, the matter of ammunition outweighs in importance the matter of trail design. Simplicity in gun-carriage design must rule. The American seventy-five, model of nineteen hundred and sixteen, is an example of a good gun's failure, due to the disregard of this principle alone.

Coming to the pack artillery, we find the progress exceedingly satisfactory. The seventy-five millimetre pack howitzer, model of nineteen hundred and twenty, appears to fill the requirements of the calibre board far better than the new models in the larger calibres. If the war had lasted a few months longer, the value of pack artillery as an adjunct to the divisional brigade would have been well tested. At present there is a strong leaning towards this type of artillery as the solution of the accompanying gun question. There is no doubt in the writer's mind as to its superiority for this purpose over the



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six-horse seventy-five gun. A study of the principal characteristics of the pack gun will make this superiority clearly evident.

As regards our other weapons, with the exception of the self-propelled type, nothing definite has been announced recently which would change our war types.

The advent of the tractor has revolutionized our ideas regarding traction. We took it up before the war, used it widely during the war proper, and are endeavoring now to discover its ultimate use. Much can be said in its favor, and much against it. The latest reports as to its practical value indicate that, first, we must have a more highly trained personnel to handle it than we have at present, and, second, that the tractor itself must be improved as to reliability of performance.

We are divided in opinion as to its use. One extreme advocates the use of the tractor for all gun traction, and the other prefers the horse exclusively. At present, the moderate course would seem to be to admit that the tractor has great possibilities but that its complete adoption is not warranted yet for the two reasons stated in the preceding paragraph.

At this point the question of the motorization of the divisional howitzer intrudes itself. Apparently, it has been adopted in principle and fact. A study of the reports on motorization submitted by light regiments, as well as those equipped with howitzers, indicates that their problems are identical. Such being the case, it would seem that the motorization of the howitzers alone indicates an inconsistent policy. If, however, the motorization of these guns is in the nature of an experiment only, then we would appear to be on the right track.

The latest developments of the tractor have produced some rather interesting types, such as the self-propelled mount for various calibres, and the individual tractor designed to take the place of the single mount. Without doubt, the self-propelled mount equipped with wheels for rapid travel on hard roads will become an indispensable type for certain missions. For instance, the present seventy-five of that type would fulfil excellently the rôle of the roving gun, and would be very valuable as an accompanying gun. The adoption of this type, however, to the complete exclusion of the horse, rests upon the solution of the same difficulties and problems as confronts the towing tractor.

With reference to the individual tractor to take the place of the single mount for reconnaissance, there is still much improvement to be made upon the present design. In fact, it is not certain that the present type is the one most suited for this type of work. The heavy weight of the present tractors and their excessive cost militate seriously against them.

The days of gas-driven vehicles for our guns are approaching

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rapidly. The greatest problem is the proper training of our personnel of all ranks. We are not competent now to operate our motor vehicles at their maximum efficiency. If the mechanical progress continues at its present rapid rate, and our instruction does not keep pace, we shall be very derelict in our duty. In addition, let us not forget, that, no matter what the circumstances may be, we must always be prepared and able to fulfil our combat mission, namely, the delivery of our fire when needed. For this reason our experiments must be conducted as such, and our fighting ability remain unimpaired. It is believed that our present policy is somewhat unsound, for within the divisional brigade we have motorized the howitzers and left the rifles horsed. It is a bad principle, for the most recent tests indicate that the tractor is not the equal of the horse as yet for combat purposes.

Turning to the technical equipment, here again we find ourselves in a period of transition. The aeroplane and wireless have opened up many new fields for the field artillery, and have brought in their wake the customary horde of extremists. It is advanced, for instance, that in future combat the battery commander will fight his battery from the air. It may become the place for him after further improvements have taken place, but at present it is believed that his post is still mainly on the ground. We really have the same lesson to learn that the tractor has imposed upon us, namely, to instruct ourselves in the proper use of what we have at present. This training should not interfere with the continued improvement of these very valuable aids, but should supplement their perfection for service conditions.

The wireless undoubtedly is being rapidly improved. The writer understands that the present wireless telephone sets furnished by the Signal Corps for the field artillery have a sending radius of seventy-five miles for conversation, and one hundred and fifty miles for telegraphic messages. This set, known as the SCR-109-A, has been designed and issued for use in communicating with our adjusting planes. In addition, the Signal Corps has produced another type, the SCR-77-A, to be used by the infantry and field artillery for interior and liaison communication. To quote Major Mauborgne of the Signal Corps, "The problem of rapid and dependable communication between attacking infantry and its supporting artillery is probably the most important with which communications personnel have to deal. Many lives have been lost and many attacks have failed to attain their maximum effect on account of the lack of instant and unfailing communication between the combat battalion of infantry and its supporting artillery." The writer concurs most earnestly in this opinion, and desires to add that the same problem arises when defensive infantry is actively attacked in force. The development

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of this type of communication is one of the greatest steps in the science of warfare. Like the auto-motive vehicle, its future appears to have no limits. Its importance can not be overestimated.

Before leaving the discussion of this equipment, though, it would be well to note that there is another factor, namely, the mechanical or electrical production of wireless interference, sometimes known as "jamming the air." Unquestionably, this matter must not be neglected. An enemy will practice it upon us and we shall desire to retaliate. It would seem that the old struggle as exemplified by the contest between the naval gun and the armor plate will be waged in these new fields. It is principally for this reason that it is believed that the post of the battery commander still belongs on the ground.

Our other technical equipment remains about as issued during the war, with the exception that, having been forced by circumstances beyond our control to use the French type of sight on the field guns while in France, we have reverted back to the far superior panoramic sight.

### TRAINING

Our training, or instruction, is susceptible of being divided into two main parts, troop training, and officer training. Let us regard the question of officer instruction first.

We find three schools—the basic at Camp Knox, the battery officer's at Fort Sill, and the field officer's at Camp Bragg. It cannot be denied that they should be combined at one station, and the writer believes that it is the policy of the Chief of Staff, with the concurrence of the Chief of Field Artillery, to effect this consolidation as soon as circumstances will permit. Aside from the economies resulting, many technical and tactical advantages will accrue. There are many parts of the courses of the different schools that will fit in with each other to advantage, and there even are subjects which can be made common to all three. Why not make it the "Field Artillery School," with three courses or departments.<sup>2</sup>

As a general principle, the writer believes that tactics should play a greater rôle in the different school courses, especially in the battery officer's courses, than it does at present. Officers of all ranks in the field artillery are continually forced into situations where the principles of tactics must at least be comprehended, if not actually put to use. As an example, young artillery officers on liaison duty with the infantry in France were actually in command, sometimes, of the infantry units to which attached on account of the infantry officers being casualties. In such situations we must not be found wanting. If we feel that we can disregard the requirements of such emergency situations we should at least remember that the normal performance

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<sup>2</sup> All field artillery schools have been ordered combined at Fort Sill, Oklahoma.—*Editor*.

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of our duties in connection with infantry requires a knowledge of tactics.

Field artillery officers of all ranks should be rotated in appropriate field artillery staff positions as a matter of training. Our new organization and combat missions require much staff work, and unless officers, after studying and mastering the principles at schools, are given an opportunity to practice what they have been taught, our staff functioning will be poor. It is notoriously true that unless theoretical teachings are applied and tested practically, the sudden application of them in emergencies will be inefficient.

Having attended the appropriate schools, served with field artillery units, and had his turn at staff instruction, the field artillery officer's instruction should be rounded out by tours of duty with other arms of the service, principally the infantry. Take the subject of tactics, which, aside from the technical handling of our guns, is our most important study, and consider whether it can be taught efficiently and practically in a school. There is no doubt but that the theory can and must be taught there, but it is held that the application must be practiced, or at least seen working. If we send our junior officers for tours of duty with the lesser infantry units, and our senior men to the larger units, they will secure the instruction first hand, especially if their tours coincide, as they should, with a period of combined training of the various arms. And, as has been advanced recently, we should ask the infantry to reciprocate and send their junior and senior officers to us for like tours. Other benefits of no inconsiderable value would be reaped by the institution of such a scheme, for, in addition to mastering the subject of tactics, we would perceive the problems and difficulties of the infantry, we could disseminate much useful and necessary information regarding our ability and limitations, and finally we would promote enormously the morale and esprit between the two branches of the service. The writer cannot emphasize too strongly the importance of this matter, for he believes that, if we are to perform properly our combat missions, we must come to the adoption of such a practice sooner or later.

Not the least important part of our officer instruction program is that part dealing with the personnel from the National Guard. Thanks to the war the majority of these officers had commissioned service during the period of hostilities. As a result, the field artillery units which are being organized in the National Guard show intelligent handling and interest along technical and tactical lines. Consequently these units more nearly approach satisfactory military organizations than ever before.

The main parts of the instruction program include—close supervision by regular officers at the home stations, a yearly period of camp instruction where the officers, as well as the units receive individual

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training, and thirdly, a short course offered yearly for officers at one of the field artillery schools. It is difficult to perceive, how, under the present laws, this system could be improved upon. If the money could be secured, better armories and local drill fields might be provided, but other than this, due to the civilian pursuits of the personnel, it is not believed that the scope of instruction can be enlarged very greatly.

Our reserve officer problem has two divisions, the training of those at present holding commissions, and the instruction of those preparing to receive commissions. It is contemplated that for those who have commissions an instruction period shall be held at regular intervals. It is desired to make this period as attractive as well as beneficial as possible, and to allow the individual much leeway in attendance. To date Congress has not provided sufficient funds for the institution of this scheme, and until the money is forthcoming not much can be done towards the practical instruction of this class of officers, as the reserve units themselves at present merely exist on paper. There are indications, though, that a few will be ordered to the various training camps as assistant instructors this summer. If such is the case, these men will have at least an opportunity of renewing their acquaintance with military fundamentals.

The Reserve Officers' Training Corps serves as the supply system for the Reserve Officers' Corps. In the field artillery we have units in twenty colleges or universities. The total number of students in training is about seven thousand. Of this seven thousand around four hundred will be commissioned at the end of this school year. This number should increase from now on, as the majority of the units have not reached their maximum production.

This reservoir for reserve officers is bound to prove the solution of this matter, for we are securing men of the best educational and intellectual type in the country. In no other way could we build up a reserve of the character and quality of our American college men. Also, a fact not universally appreciated by the service at large, by having these small outposts of the regular army so prominently placed in our best-known institutions of learning, we can do much to combat the prevalent hostility to the army and the widespread pacifism. In other words, in continuation of the policy of the War Department, much can be done to popularize the military service and combat the numerous and erroneous impressions that are being scattered broadcast.

It is not believed that the service at large understands the type of work being done by these units, or the necessity for keeping up the strength of the reserve. Most of the emergency field artillery officers, who held commissions for the war only, have been offered commissions in the reserve, and it is believed that this source is about exhausted. We must have a reserve, and it should be kept up to

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strength. It should be apparent that for this purpose there is no more suitable type of man than that found in our colleges and universities.

Turning to troop training, we find the situation very bad, due principally to lack of troops. But much can be done if the effort is made, and administration somewhat subordinated to tactical instruction.

As a general rule, the majority of the field artillery units are able to handle their guns in the proper technical manner. But unless we understand how to operate in combat with the infantry, and are able to render the maximum support, we shall fail in our missions. This, it is believed, there is great danger of, unless we adopt more strongly the principle of combined training. There is required the actual contact in the field, and for it no amount of classroom work or paper organization can be substituted satisfactorily. Even with the reduced number of troops present with the divisional organizations efforts should be made to afford opportunities for divisional and brigade manœuvres. Also, even though many of our larger units have been broken up and considerably scattered, it is believed that many of these small units might be combined once a year, by marching, and have a period of combined training as brigades at least. Our dissolution last summer proved that our individual units can cover much territory by marching.

It is necessary that we achieve contact with the infantry in some manner, for unless we do we are in grave danger of having the two arms drift very far apart. The natural course of events tends towards making the individual officers of each arm quite oblivious of their interdependence. We become immersed in our own technical difficulties and training, and neglect the main reasons for our existence. Also, unless the infantry can train with us occasionally, their combat training is liable to lose touch with our ability or limitations. In addition there is a certain spirit of teamwork that only comes after constant practice. No collection of stars, thrown together for the first time, can expect to conquer a team whose individuals are of the same calibre but who have drilled together constantly.

The instruction of our National Guard units has shown great improvement. Most of the organizations are believed to be new, but their progress has been more than satisfactory. Their annual tours of instruction at regular army camps, together with the assistance rendered by the regular officers constantly on duty with them, should make them uniformly efficient.

In this connection, it is believed that we should apply to the National Guard also, the principle of combined training. At present the infantry of the National Guard have their camps entirely separate in locality from those of the field artillery. Inasmuch as the Guard has a definite divisional organization, and apparently it is expected

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that in an emergency this will be their combat organization, would it not be wise to assemble them occasionally before they are expected to go into combat? In the next war we may not have allies who will hold the enemy for a year while we prepare our troops.

It is realized that the necessity of the field artillery having target practice prevents their attendance at the majority of the infantry camps, but it is not known what prevents the infantry from attending the artillery camps, except perhaps the matter of expense. If such is the case, it is believed that in a good many instances at least an infantry brigade could be assembled with the artillery. The writer has never heard this idea advanced before, but he believes it worthy of serious consideration.

To sum up the whole question, one might almost say that the two branches of the service, the infantry and the field artillery, have each a separate course to pursue, without any reference to each other. As a matter of fact, we should be kept together constantly. It is not thought that, after serious consideration, anyone could argue against this principle, but it is believed that the lack of appreciation of the fundamental needs of the two arms prevents as many advantages being reaped as might be, if a concerted effort was made towards combining the two arms for service. Our higher army schools spent much time turning out officers trained in the control of large masses of troops, but the system has failed as yet to turn out individuals who can bring the infantry and artillery together and keep them connected. As a matter of fact, the higher the education becomes, the greater the space increases between the two arms. Would it not be well to concentrate our energies upon this problem rather earnestly, and at least, if we cannot bring about the actual contact, adopt the principle and make a start towards the goal?

The last part of the subject of troop training should include that of the reserve. But as the reserve is just being organized, and as yet appears only on paper, it is rather difficult to size up the situation. From all appearances, though, the initial organization is being made methodically and very efficiently. Great care is being taken regarding the allocation of the various units and the assignment of officers. The divisional organization is being followed. If some way can be found to foster the enrollment of the necessary men in the organizations, a very valuable and important military nucleus will have been formed. And even if only a very few men can be found willing to enroll in these units, at any rate we shall have laid an important foundation for future enrollment and expansion in the event of another emergency. It is believed that this matter should be given the utmost publicity, and that the officers detailed upon this duty of organization, by reason of their required presence and mingling in many civilian communities, should be picked with the greatest care.

A discussion of training should naturally conclude with some

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remarks upon the matter of combat methods. But it is somewhat difficult to comment upon any recent developments in this subject, for the simple reason that the writer is not cognizant of any particular effort being made to either fix or improve our present principles.

Changes are coming, though, and coming principally through the improvements being affected in our matériel. For instance, the wireless telephone will enlarge our horizon considerably. How shall we make the best use of this invention? Will there be battery, battalion or regimental planes? Will the battery commander belong in the air, or will it be the function of the battalion or regimental commander? And what shall be our policy regarding air observers for the artillery? Is their normal post with a certain air unit, or should they belong to a specific artillery unit and only proceed to an air unit for specific missions?

Even in principle the subject of accompanying guns is far from being mastered. We realize their necessity, but we have not decided upon the manner of execution. Two distinct alternatives present themselves at present, pack artillery or one of the self-propelled types. A decision should be made, though, so that training and the development of tactics could be commenced. The fact that the decision would be subject to change should not deter its prompt formulation, for in one degree or another, all our weapons are subject to improvements, resulting in the continual modification of their tactical use. If we wait for perfect types our wait will be endless.

Another question susceptible of discussion is the scope of the functions of the corps artillery. It is well known that at present there are two distinct schools of thought on the handling of these guns. The first would keep their use well within the control of the corps artillery staff, while the other tends towards a liberal loaning of them to the divisional artillery. The writer rather inclines towards the latter school, for it is believed that the divisional artillery is more frequently better informed as to local conditions than the corps headquarters. This is especially true in times of great stress.

The main point, though, is to adopt some policy. A poor policy, in the long run, which is well followed, is better than a vacillating one, or none at all. With a principle adopted, we can at least proceed towards instruction, even though it is only theoretical. Instruction invariably leads to discussion, and intelligent discussion will sooner or later develop any question to its utmost extent.

What we need in the army, in all its branches, is clear thinking and common sense. The world is moving on, and with it our chosen profession, military science. A well-known writer has been touring the country recently, lecturing on the probable scope of future wars.



## SOME ASPECTS OF AMERICAN FIELD ARTILLERY

One of his best points is that, in the future, wars will be waged by populations en masse. For that reason, he believes that civilians will control the conduct of operations and will provide the most efficacious methods of combat. As an example, he cites the last war, stating that the minds of the professional soldiers were atrophied, and that it was not until the civilians mixed in with the war that it really got going and showing improvement. Now, there is a certain amount of truth in the gist of his statements, for if the average professional soldiers were left to their own devices they would wage, undoubtedly, very pleasant, sane, little, civilized wars. It is the result of civilian progress and invention that the majority of the mechanical and chemical horrors have been injected into the art of war. It will be far more true in the future. But the important point for us to pick out is that, by reason of our profession, which places us rather separate from our fellow-citizens, we are inclined to become "set" in our ways. We need not branch out and endeavor to outdo the civilian in the invention of methods of horribleness in destruction, but we must keep our minds awake and alert, we must put more thought on our technic, and we must decide on the essential points, and then keep our feet advancing straight towards them.

Before we close, let us review briefly our present situation. We find ourselves in the midst of considerable upheaval. We have many things in our favor, and yet much to contend with. Our recent experiences of the war are still fresh in our minds. But are we securing the proper results from our trials and tribulations? Is it not a fact that our lessons run the risk of being forgotten before being profited from?

This article, aside from indicating some of the salient aspects of our present situation, has endeavored to point out some of these problems that are in danger of being either neglected or forgotten. It is believed that we must preserve the proper relation between the staff and the line; that the former must be trained so that they realize that they exist only to serve the line. It is thought that our War Department and corps administrative channels should be improved so that there is more cohesion and continuity in our field artillery training. Our mechanical tractive agents are being constantly improved. We should adopt a definite experimental policy which would not impair the fighting value of our too few combat units. The present policy is believed to be indeterminate and injurious to our combat strength. Let us bend more effort towards the tactical broadening of our officers. And, finally, let us achieve contact with the infantry both in thought and action.

When the next emergency arrives, let it find us prepared to make the best use of what we possess. Let us know what we want, but, most of all, let us know what we have and how to use it.

# ARTILLERY OPERATIONS, FIRST ARMY, A. E. F.

May 26, 1922.

*The Editor,*  
*Field Artillery Journal.*

*Sir:*

*During the St. Mihiel and the Meuse-Argonne offensives of the First Army, American Expeditionary Forces in France, the Chief of Artillery and Commanding General of the Army Artillery, Major General Edward F. McGlachlin, Jr., U.S.A., issued a series of critical memoranda relative to the employment of artillery in the Army which had a most beneficial effect in correcting deficiencies and in developing a spirit of coöperation and mutual understanding among all of the arms concerned.*

*These memoranda were prepared personally by General McGlachlin and, in addition to his clear vision and wide and varied experience, were based upon personal visits and inspections of front-line troops and positions, as well as reports of other officers. In the beginning these memoranda dealt with questions affecting the Army Artillery, later the scope was amplified and the distribution included corps and division commanders as well as the artillery commanders of regiments and higher units.*

*Officers of various arms and services who have had an opportunity to read and study these memoranda have expressed the opinion that it was highly desirable that they be published in some form and thus be made available to all of our officers and in particular to our future artillery commanders. With this object in view the writer has attempted to extract pertinent paragraphs from the series without regard to dates of issue and to arrange same for publication by subjects. No attempt has been made to rewrite passages or to modify opinions.*

*When the writer consulted General McGlachlin about publishing this article the latter stated: "That much that appeared was due to suggestions of officers whom he cannot now identify so as to give them credit. He also borrowed from friendly and hostile communiques, reports, and any other sources that came into his hands. His staff should certainly receive its share of any credit for the memoranda, for they were usually, if not always, submitted to it for suggestions before issue."*

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*However, the primary value of these memoranda, at the present time, lies in the fact that they were prepared under stress of battle conditions by the commander of the largest and most powerful artillery component ever organized or employed in battle in the history of our Army.*

JOHN W. GULICK,  
Lieutenant-Colonel, General Staff,  
(Late Chief of Staff, Army Artillery, First Army, A.E.F.)

### I. LIAISON

"The tendency in considering the subject of liaison in the abstract is to attempt to reduce it to a mathematical formula. This is not correct. Liaison is a live thing and can only be attained by live methods suited to its needs. In other words, the mission a unit is to perform determines what liaison it will be necessary for that unit to establish. One cannot lay down hard and fast rules that will govern in all cases, but a rule can be laid down for a system of liaison between artillery units and the infantry they support which forms a frame work fairly permanent in its nature to which from time to time attachments or extensions must be made.

"The artillery element most closely associated with the infantry is the divisional artillery. Its mission is to clear the way for its own infantry. *Its efficiency depends largely on its exact knowledge of the plans of that infantry for the immediate future and of the location of the advance elements of that infantry at any moment*; hence, the closest liaison is essential. This is universally recognized, and quite generally steps are taken to insure such liaison. It calls for personal and telephonic liaison not only with division headquarters, but with the units of the division that are in the attacking line, even to the battalions that actually deliver the assault.

"The corps artillery, of heavier calibres and largely employed for counter-battery work, distant harassing and inter-diction—in other words, its main mission being that of securing freedom of action for the divisional artillery—requires different liaison. Personal and telephone liaison are ordinarily necessary no further down than division headquarters and the headquarters of divisional artillery.

"The army artillery, comprising in general the guns of greater range and howitzers of greater power than those in the corps, finds its principal mission in the zone beyond the normal counter-battery zone of the corps, or in the execution of set fires of destruction against works anywhere in the hostile lines for which the great power is required. Personal and telephone liaison need ordinarily only extend to the corps in whose zone of action it is operating.

*"It is a principle of all artillery that it should be able to reach*

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*with its fire half the normal zone of the next adjoining unit.* This calls for lateral liaison.

"From the above then a type liaison net would be on the following lines:

"(a) Each army artillery grouping; personal and telephone liaison with the next army artillery grouping on its right and left, and with each of the corps in whose zone of action it is operating or may operate.

"(b) Each corps artillery; telephone and personal liaison with the corps artillery on its right and left, with the divisional artillery of its own corps, and with the division headquarters when the division P. C. is not at the same place.

"(c) Each divisional artillery; personal and telephone liaison with the divisional artilleries on its right and left, and with infantry brigades.

"This liaison net will have to be extended in various ways for every operation. Usually it will not be possible to foresee by more than a day or two, or possibly a few hours, just what extension will be required, but the means should be at hand to make any likely extension. *This demands preparation in advance, a fact generally not recognized, or, if recognized, not acted upon.*

"Our text-books on the subject of liaison are rather vague. The word itself is in constant use, but one may suspect more often than not by way of camouflage. Too often at the eleventh hour an officer is snatched from his normal duties and, with wholly inadequate instructions and with no previous training to help him, rushed to some other unit to which he is a stranger and expected to establish and maintain intelligent coöperation. The wonder is not that the results are unsatisfactory, but that good results are never obtained. Instead of being a live, energetic, hard-working person fully informed at every moment of the powers, limitations, locations, missions and tactical operations of his own command and of that to which he is accredited, the liaison officer is more often than not a mere hanger-on who occasionally is asked to transfer a message to his own command, which anybody else could have done as well. *Liaison is so important that the personnel, therefore, both commissioned and enlisted, should be carefully selected, should be permanent, and should be sufficiently numerous to meet all possible or probable needs of the unit and still leave an ample reserve on hand for the replacement of casualties.*" (Memo. October 31, 1918.)

### II. ARTILLERY SUPPORT

"Frequent reference has been made in this series of memoranda to the necessity for close liaison between infantry and artillery, particularly divisional artillery and to the advantages of having the

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artillery well forward, that is, close to the infantry advance, for its effective support. The situation about November first and since seems to have improved in these respects. But from my own observation and from interviews, conversations and letters, I feel sure that the artillery is not yet fighting to the best advantage of the infantry. Leaving aside any discussion of accompanying guns, of roving guns or of infantry batteries, the bulk of the artillery is not yet fighting close enough to the infantry line.

"From a technical point of view forward positions of the artillery result in better observation; shorter lines between observers and guns; greater accuracy of fire, either shell or shrapnel; much greater effect of shrapnel; reduction of the number of changes of position; deeper zone of effect; increased opportunities for enfilade fire; widening of the zone of fire; much easier and more perfect liaison with the infantry; good moral effect upon the infantry; good moral effect upon the artillery itself. Some disadvantages may be loss of defilade; unfavorable angles of fall; longer routes of ammunition supply; longer lines of information from the rear. With the guns well up, however, the lines of information to the rear are not very important. *It is the liaison between the infantry and its supporting artillery which is important, not the liaison between the artillery and the division commander.*

"Before the war the French spoke of an average fighting range of the 75-mm. gun as 2200 metres and we, of ordinary ranges of our 3-inch gun as 2400 yards. I think we would do well to go back to this conception, to cast off the effects of our study of trench warfare, to realize that henceforth the war is to be one of movement even though that movement is sluggish, and to develop our young officers along the lines so long taught and on the principles clearly presented in the field artillery drill regulations of 1916. We have permitted ourselves to be obsessed by the idea of stabilized warfare and are now trying to apply its highly technical and scientific methods to a situation which requires the work of an artist. Brigade commanders with considerable staffs are remaining in dugouts and giving directions from the map based on scarce and late information received over imperfect lines. Subordinates are painfully scaling distances from the map and applying corrections by mathematical computations. *Much better results, many more dead Germans, killed horses and destroyed vehicles would be found if a genuine, energetic effort were made by all concerned to get direct observation and personal knowledge.*

"That the artillery is obtaining very great and important effects upon the enemy cannot be denied. I think we are all proud of it, but it is obtaining these effects at an enormous expenditure of ammunition and of consequent effort, fatigue of men, wastage

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of horseflesh and breaking down of motor trucks, congestion of traffic and wear on roads. So, although I see a great improvement, I believe that the artillery must be pushed closer to the front, that terrestrial observing posts must be manned and kept manned even during bad weather in order to take advantage of every fleeting favorable opportunity to observe, that commanders of all ranks must be closer to their units and that artillery officers and selected soldiers must more intimately accompany the infantry in order that information useful to and understood by the artillery may be sent back. I think that divisional commanders should insist on this.

"Ordinarily I believe a field artillery brigade commander should have his P.C. alongside the divisional commander, but I do not believe that the artillery commander should remain constantly at that P.C. any more than I believe that the divisional commander should be chained to one spot. Not so much, because the useful information to artillery units in mobile warfare should come, if the artillery fighting spirit and sense of sacrifice are sufficiently high, not from the divisional commander's headquarters, but from the infantry lines themselves. It seems probable that in the highly organized warfare of today advances must be by bounds—a period of mobility, a period of stability, and so on. While the lines are stable a set program for the next attack must be worked out, with its involved time tables, computations, arrangements for displacement, establishment of dumps, etc., etc. During this time the personal relations between the brigade and divisional commanders should be most intimate. From the launching of the attack to the next stabilization the greatest endeavors of the brigade commander should be to maintain contact with infantry brigade and even regimental commanders, personally and through his staff. During this time one or two members of his staff can usually handle the information received from the divisional P.C.

"Although criticism is made above it must be said that many considerations extenuate the conditions. On the part of the artillery it should be said that—

"(a) There are more regiments now than there were officers of a year's service eighteen months ago.

"(b) The divisions were not trained in methods of open warfare as was required by advice from A.E.F. or orders at home.

"(c) The numerous officers and soldiers sent to the United States to help train new units were seriously tainted by their experiences of three years in the trenches. Many of them knew no other kind of warfare.

"(d) Popular reading and popular lectures on the war were about trench warfare only. The great body of new officers came

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into the service knowing almost nothing of the military art but fully impressed with the trench idea.

"(e) The trials and struggles of the Allies placed many of the instructors that they sent us somewhat in the position of heroes and their opinions were given too much weight.

"(f) Training in artillery firing has been injuriously affected by the exact methods appropriate to fixed defenses. Art has been forgotten.

"(g) The infantry often fails and sometimes refuses to inform the artillery. It cannot expect teamwork unless it will be a party to it. It has, for example, declined the use of its lines of information, failed to protect guns far forward, hampered movement. Divisions receiving new truckage have neglected artillery units attached to them.

*"I appeal to artillerymen and infantrymen alike to get together not only in conferences, of course, but at the mess, on leave, in Paris, informally anywhere, and talk things over as comrades not as advocates. The faults are not on one side only.*

"Following are extracts from a letter from a valued artillery correspondent:

"\* \* \* we were with the infantry most of the time, as it is at this point that one can best see whether or not the artillery support is effective. It was not. I could recite many instances in support of this statement. For example, we encountered in our wandering an infantry company commander whose company was then held up before the village of \* \* \*. According to his statements, he was using all of the fire power at his disposal to overcome a very stiff machine-gun resistance, but seemed doubtful as to whether he could make a go of it. We asked him why he did not call for artillery support. He replied that he was trying to get artillery support but could not get communication, although he thought it might come later. We passed through Artillery Brigade Headquarters several hours later and General \* \* \* then mentioned that the infantry was calling for artillery fire near \* \* \*. At seven o'clock of this same morning we saw General \* \* \*, commanding an infantry brigade, out with his first line which had been held up. Replying to our questions, he stated that he was held up and needed artillery support but could not get communication. All during the time we were in this vicinity we could see everywhere opportunities for accurately adjusted artillery fire on easy targets. Such fire could have been delivered, even without liaison with the infantry, as

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the position of our own infantry was quite evident. Such fire could have been made even more effective with infantry liaison which could have been obtained without difficulty.

"The conditions observed here were no different, as a general proposition, from those that I have observed everywhere. \* \* \* the lack of close support of the infantry by the artillery, \* \* \* many reports from actual eyewitnesses of the operations from the position of the infantry. I feel certain that if our artillery officers, particularly the brigade, regimental and battalion commanders, would more frequently go to the infantry during these operations and actually see conditions as they exist their ideas in many matters would immediately change. Too many opinions are expressed and methods used based on experience acquired at the end of a telephone line some distance in rear of the scene of action. For example, on this particular day, when we returned to division headquarters, all conversation which we had indicated that everything was going nicely. It is possible that this was camouflage, but I am more inclined to believe that it was due to a lack of knowledge on the part of the commanders in rear of actual conditions on the firing line \* \* \*.

"One infantry brigade commander had the situation quite well sized up, I thought. He said that our artillery was fine in carrying out an operation which could all be planned and laid out beforehand, but that when it was required to act in situations which had not been foreseen and planned beforehand, it fell down. The difficulties that we are encountering today are due simply to the fact that when the infantry encounters, unexpectedly, resistance which requires artillery fire, such fire cannot be obtained promptly and accurately. To meet this condition artillery observers, and above all artillery commanders, must be forward where they can see, and command as a result of seeing. Forward observation is not, however, in itself enough. The guns must be so placed, with respect to observation, that long lines of communication between observers and batteries will not be necessary. This means to bring the guns forward. The only limitation on this is to secure sufficient protection for the guns to prevent annihilation \* \* \*.

"An officer who was with the \* \* \* Division during these same operations was particularly enthusiastic about the work of Colonel \* \* \* regiment of 75's. He stated



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that these guns were constantly up to about 1000 or 1500 metres and that the infantry could call for fire and get it in five minutes or so. This is a condition which I myself have never found in my quite numerous visits to the front during open operations. Needless to say, the infantry were delighted in this case and made splendid progress. I hear that \* \* \* expressed themselves quite forcibly very recently against this idea of moving artillery way up front, stating that it only got shot up and out of hand. My only answer to such ideas is that their artillery is not trained to fight in open warfare (and this type requires more skill than firing a barrage), and that their artillery gets out of hand because they are themselves too far back to keep it in hand." (Memo. No. 12, November 6, 1918.)

### III. ARTILLERY POSITIONS

"1. Referring to paragraph *i* of memorandum from these headquarters of 11 October, divisional artillery is still altogether too far behind the infantry lines. While a certain disposition in depth is advisable for purposes of defense and is sometimes rendered necessary by the nature of the terrain, not only in our own lines, but beyond our own lines as affecting positions of hostile targets, the intention of continuing an offensive imposes the duty on the artillery of being well forward in support of the infantry. Well-advanced positions have the following advantages:

"*a.* They afford a moral support to the infantry.

"*b.* The guns can fire effectively over a deeper zone.

"*c.* The guns can fire effectively over a broader front.

"*d.* The effectiveness of fire in preparation for the attack is much increased.

"*e.* The barrages are more effective and can be carried over greater distances.

"*f.* Lines of information from forward observers are shorter.

"*g.* Runner service is simplified and routes are shortened.

"*h.* Fewer changes of position are necessary.

"*i.* There are more opportunities for good observation from the vicinity of the guns.

*"We must shake ourselves out of the hypnotism of a defensive or stabilized front. In the warfare of slow movement which we have been experiencing and through which we are going now, instances of 75-mm. guns remaining at six, seven and eight kilometres behind the infantry lines constitute a reproach to artillery commanders.*

"It should not be unusual to find light batteries less than from 1800 to 2400 metres in rear of the front lines.

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"2. On the other hand, the presence of guns much nearer than the above distances to the front lines has the following disadvantages:

"a. Serious losses among animals, which cannot be replaced; resulting immobilization.

"b. Greatly increased difficulty of ammunition supply.

"c. Impossibility of firing upon areas in the immediate foreground of the infantry.

"3. There seems to be an idea among officers not of the artillery that what they call 'direct fire' is of some special effect. They usually mean fire by *direct laying*. Except for 'sniping' with single guns, as against machine-gun nests, tanks, moving objects and some other special targets, indirect laying will give the best effect—the most accurate, the best distributed, the most evenly controlled.

"4. Guns in the infantry line with, usually, a small amount of ammunition to fire upon special targets should doubtless be often used. They should be emplaced after special reconnaissance, ordinarily by hand, and at night with precautions to prevent noise and discovery. Often they can be worked forward through woods in the daytime.

"5. It should be remembered that artillery acts by fire alone; that accompanying fire is needed, not physical accompaniment; that no fire can be delivered by guns in movement; that every occupation of position may reduce the period of fire.

"6. Examples from recent operations of violation of every principle stated above could be given. The principles appear, however, in our drill regulations and field service regulations.

"7. The fundamental errors seem to be—

"a. A very general outlook upon all situations in the light of the stabilized warfare of the past few years.

"b. Too great consideration of the defensive.

"c. Very frequent orders by the uninformed to apply specified means instead of to accomplish a definite mission.

"Three major considerations govern the choice of battery positions; suitability for firing mission, accessibility, concealment. The first two speak for themselves, but the third is apparently often misunderstood by battalion and battery commanders.

"There is nothing sacred about concealment in itself. It is simply a means to the end of protecting a battery from enemy fire. If it doesn't do this, it is quite immaterial that the position may be theoretically invisible. The enemy doesn't have to see the battery, all he needs is to know where it is.

"Accordingly little is to be gained by way of concealment if the position chosen is so located as to be in a natural zone of enemy fire. Certain spots are foredoomed to be fired on, whether they are known to contain batteries or not. Perhaps the most conspicuous

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examples of this are the borders of wood facing the enemy and important crossroads. These will be shelled simply because they are what they are, for exactly the same reasons that we shell similar portions of the enemy's territory. Hence, a position located in either of these areas, no matter how adroitly camouflaged and sedulously safeguarded, will receive a certain amount of enemy fire and a particularly close enemy inspection. And, upon the slightest suspicion, this merely general treatment will grow into controlled fire of the greatest severity.

"There are, of course, times when the tactical situation demands a dangerous position, but there are also very many instances where naturally dangerous locations—especially along the borders of woods—are chosen just because they offer at the same time both ready-made concealment and easy fields of fire. Such shortsightedness is highly dangerous. *It is a safe rule in the selection of positions to put oneself in the enemy's P.C. If you were there, would you be apt to fire on or near the contemplated position? If you would be, keep out of it. His mind works like yours.*" (Memos. October 14 and 27, 1918.)

### IV. OBSERVATION

"It is of the utmost importance that observers be sent forward and that suitable observing points be taken advantage of in order that our fire may be more accurate. This is particularly necessary in this climate and at this season when neither aeroplane nor balloon observation can often be depended upon. Observation from the ground is the most effective of all and can surely be obtained much oftener than it has been. Reconnaissances of observing stations should be going on all the time. *Terrestrial observation, the best of all, or aerial observation will result in an enormous saving of ammunition or in an enormously increased effect for the same amount of ammunition. The influence of good observation upon effect reacts upon the question of ammunition supply and that upon the condition of animals and their supply.*

"In the A.I.S. reports of army artillery groupings will be incorporated daily—a complete list of calls upon aviation units for adjustment; the hour; the target; the firing unit; the response; the reason given by aviation unit if the mission is not attempted, or if it is delayed; the opinion of artillery commanders of the reason given; the result if the mission is undertaken; a general statement of the efficiency of aerial observation for the day. At the completion of an operation army artillery unit commanders will submit recommendations tending to improvement of results obtained by aerial observation.

"Prohibition of traffic may often be made very effective with

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comparatively few rounds by damage to routes at sensitive points followed by occasional bursts to prevent repair and by occasional rounds on probable routes around the points of damage.

"With accurate preliminary calculation of firing data corrected up to the minute for meteorological conditions, it is believed that the following should give excellent results:

"*a.* Use all the guns of the battery.

"*b.* Fire twelve rounds in volleys with constant data as rapidly as is consistent with orders and conditions.

"*c.* Let the artillery observer report the centre of burst of the group of rounds.

"*d.* Make a transport of fire.

"This should—

"*a.* Save time.

"*b.* Permit shorter flights.

"*c.* Make powerful concentrations easy and quick.

"Fire whose adjustment is observed is from sixty-five to eight times as effective as fire from calculated data only." (Memo. October 14 and September 25, 1918.)

### V. COMMON ARTILLERY MISTAKES

"Many criticisms of the American use of artillery have been made. The following have been gathered from numerous sources and are stated as briefly as possible. The purpose of publishing them is that officers may ask themselves the question as to whether they have fallen into the mistakes mentioned and may take the proper steps to correct them.

"1. Orders requiring barrages were not received in time to permit the numerous calculations necessary."

It is the duty of artillery officers to inform their superiors of such cases.

"2. Smoke shell are not used sufficiently in barrages."

Their use will diminish the effectiveness of hostile machine guns.

"3. Barrages are too often fired from the map."

Allowance for safety prevents the barrages being placed close enough to protect the line. Serious efforts should be made to adjust barrages by observation beforehand.

"4. Barrages have been started too far in advance of the infantry, which has not been able to overtake them.

"5. On the other hand, when the position of the nearest enemy elements was definitely known barrages have been placed close to our own lines when they might well have been held for the necessary time on a line slightly short of the enemy positions.

"6. Firing has been very largely by map."

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*Such fire cannot have the maximum effect. Observation of fire must be constantly sought.*

"7. Barrages have been used for destructive fire at a tremendous waste of ammunition."

Observation of fire on definite objectives which may impede the infantry advance would obviate the necessity for this.

"8. Shrapnel has been too little used."

Adjustment of height of burst is impossible without observation. Adjustment at normal height of burst is difficult under any circumstances. The inexperienced officer will accomplish effective fire with shrapnel most easily by obtaining bursts half on impact and half in air. The dispersion of shrapnel bullets is particularly effective in the open and in light brush against personnel not definitely located.

"9. Coöperation with, and support of, the infantry has been defective through lack of liaison."

Liaison with the infantry being supported must be direct, positive and multiple. It must be advanced as far as is necessary to determine the situation and needs of the foremost infantry at any time. If the artillery commander can himself be with the infantry commander having knowledge of the situation while retaining complete control of his own command, results will be most satisfactory. If he cannot be in personal touch with the infantry commander he must have visual or wire communication or both.

"10. The use of artillery scouts for protection and observation has been neglected.

"11. Opportunities have been missed for the effective use of single light guns in immediate support of the infantry."

Extremely favorable results have been obtained by guns used as above. Firing usually at short range the cone of dispersion of shrapnel is very deep, and, direct laying being used, very accurate. They have wiped out whole nests of machine guns. Their close support is very encouraging to the infantry. The services of forward pieces is sought by bold artillery soldiers. It develops initiative, cunning and decision.

On the other hand, the indiscriminate use of such guns, the devotion of too many of them to the purpose, weakens the power of the artillery unit and is undesirable. Their use is most applicable in broken and wooded country.

"12. Officers and operators are too loquacious in their use of the telephone."

Messages by telephone should be as carefully thought out as though the telegraph were to be used. They should follow the form as far as possible of the five-paragraph field order.

"13. Officers interested in orders are not often enough assembled to hear them."

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When orders are issued orally to several persons separately they are usually given in varying language and variously interpreted. Whenever it is possible it is most desirable that the recipients of such orders should be assembled and that in well-chosen words the order should be delivered in the five-paragraph form. Discussion afterward will lead to a uniform understanding.

"14. Sufficient reconnaissance to determine a practicable scheme of advance has often not been made."

The availability, condition, location and length of routes should be thoroughly known and carefully weighed, in order to reconcile two conflicting requirements.

First, the necessity of moving forward in order to bring desired objectives within range.

Second, the necessity of being emplaced in order to fire—that is, of not starting a displacement which cannot be carried through in the proper time.

"15. The forward displacement of artillery has not been prompt.

"16. It has been attempted to move more artillery at one time than traffic conditions would permit.

"17. Guns intended to accompany the infantry have not been placed close to the latter before the commencement of the attack.

"18. Means—such as lumber—have not been provided for overcoming obstacles likely to be met by accompanying guns.

"19. The initial positions of batteries have not been far enough forward.

"20. Combat trains have not been provided with ammunition in preparation for an advance."

*During movement one cannot depend upon ammunition dumps. Ammunition must go forward with the guns and the supply must be kept up according to the methods of open warfare.*

"21. Upon moving forward a good balance between light and heavy artillery of the divisional brigades has not always been maintained."

The integrity of regiments is not important in this case.

"22. *Divisional artillery has undertaken missions suitable for army corps and army artillery, both of which were present in sufficient amount.*"

In the present operation the assignment of artillery has been based upon the following general rules:

The divisional artillery is for the purpose of preparation and counter-preparation in support and protection of the divisional infantry.

The army corps artillery for counter-battery work.

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The army artillery for harassing and prohibitive fire and distant counter-battery.

The powers and limitations of the guns have been taken into consideration. Objectives discovered by divisional artillery not consistent with its tasks or outside its proper zone or beyond its power, should be reported with the greatest promptness to the corps chief of artillery or to the commander of one of his groupings or directly to the commander of an army artillery grouping. Ordinarily the channel should be from the unit discovering the objective to the artillery brigade commander to the corps artillery commander, thence to the army artillery grouping or to the army artillery commander, but although this method is sure it is also likely to be slow and any favorable shortcut should be resorted to. (Memo. October 27, 1918.)

### VI. ACCOMPANYING PIECES

"In Vol. III, Drill Regulations for 75 French Gun, September, 1918, appears the following:

"976. Plans for the employment of light artillery may include pieces for the direct accompaniment of infantry battalions and regiments in attack, to reduce strong points and machine-gun nests. Such pieces fire at short range and usually with direct laying.

"Platoon commanders and chiefs of section must be practiced in the conduct of fire under these conditions, as well as in the selection and occupation of positions for immediate action. Exceptional provision must be made for the supply of ammunition.'

"This use of guns is liable to complete neglect for various reasons.

*"Some artillerymen are too narrow-minded and too resentful of what they call a violation of the principle of unity of command to be willing to detach pieces for the purpose.*

"Some infantrymen are too ignorant of the value of such pieces.

"Some artillerymen are too ignorant of the problems which the infantry have to solve to realize the great assistance that can often be thus given.

"Some infantrymen assume command of such guns to the smallest details, ordering them to specified places and directing the method of their use.

"There have been repeated instances on the present front of their effective use, of their abuse and of their neglect.

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*"It should be the pride of the artilleryman to devote his pieces by any effective method to the support of the infantry. That is his whole duty. On the other hand, the infantryman should take advantage of the artilleryman's technical training by assigning him a mission and permitting him to accomplish it. Lack of consideration on either side is fatal to teamwork.*

"Wooded, close and broken country and the warfare of slow movement offer many opportunities for such work, but there is no normal distribution of the guns. Unless a study of the map or, best of all, actual reconnaissance and perfect knowledge of the situation, make it highly probable that single guns will be needed, it is better not to detach them because of the resultant loss of power of the unit to which they belong. Such studies and reconnaissances should preferably be made by infantrymen and artillerymen working together.

"A frequent very valuable use of these guns will be found in local attacks on a semi-stabilized front and in bush-whacking through woods. Often the infantryman will have to help move the guns and carry ammunition.

"A study of the use of captured guns and ammunition in this fashion may be well repaid.

"The mere presence of accompanying pieces frequently has a moral effect upon the infantry quite disproportionate to the services they actually render. Infantry which has been ably supported by artillery soon gets a feeling of confidence in the mere proximity of that arm, which has a direct reaction upon its own performances. Such a feeling is worth a good deal. Conversely, however, lack of artillery support, even when this is not tactically essential, has a depressing effect. When the front line soldier hears enemy shells falling with no reply from his side he wonders where the artillery is, whether it is up, or if it is out of action. Then he wonders what will happen to him if the enemy attack and he has to face it alone. Good infantry commanders, whose troops are under fire, frequently call for return fire just for the heartening effect of hearing one's own shells on their way.

"The first duty of an advance piece, therefore, is to be an advance piece—not to have some good reason why it could not get up. Its mission is to accompany the infantry and help them in their emergencies, not to save horses. Therefore, mobility should be assured and doubly assured. Take an extra caisson, it can be left when empty and its horses keep on. Take an entire extra hitch—horses, drivers, harness—they may be needed in a hurry, and if not the drivers can act as linemen or spare cannoneers. Have all the individual mounted men carry draft harness. It won't hurt their



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mobility and it may move the piece. There will be no chance to send back for anything.

"The second duty is to make the gun 100 per cent. efficient. That means speed in occupying a position and in serving the piece, and accuracy in everything. When the caissons and limbers are empty the gun is dead. The infantry expect magic results from point-blank or short-range fire and magic results can be had if the piece is given a chance. Even a machine gun lacks the sobering effect of repeated shell bursts in the midst of the enemy. *The service of the forward piece should be a post of supreme honor, should be designated in advance, and if possible its crew should have a chance to practice as an entire unit.*

"The following is suggested as the equipment of a forward piece. It can be improved upon, but is believed to contain all essentials:

- 1 Gun, 75 mm.
- 2 Caissons (50 per cent. of H.E. reduced and No. 20 Gas in each)
- 3 Limbers (Shrapnel in 2, H.E. normal in one)
- 1 Ration cart (with can of water)
- 24 Horses, draft (4 six-horse hitches) with harness
- 2 Horses with Q.M. harness (ration cart)
- 10 Horses, riding, with draft harness
- 3 Field telephones
- 1 Blinker
- 3 Sets flags
- 5 Kms. light piano wire
- 3 Picks
- 5 Shovels
- 5 Wire cutters
- 5 Axes
- 2 Days' grain
- 3 Days' rations

"The personnel may include—

- 1 Officer
- 1 Sergeant
- 3 Corporals (1 telephone)
- 6 Cannoneers
- 13 Drivers
- 3 Telephone detail
- 2 Scouts (and signallers)

"These men will assume a hazardous duty. They should be selected upon such a basis." (Memo. October 29, 1918.)

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### VII. ROVING PIECES

"The wandering piece or roving gun is not an infantry gun or an accompanying piece. It is used to—

"*a.* Deceive the enemy.

"*b.* Accomplish special missions.

"It deceives the enemy by firing from a temporary position, from a position other than that of the unit to which it belongs. It may fire only one series from such position or it may return to it from time to time with the purpose of leading the enemy to believe that it is permanently occupied. It remains usually but a very short time, thus avoiding counter-battery. It hits and gets away. In stabilized or semi-stabilized warfare its skillful use may establish a conviction in the hostile mind that much more artillery opposes him than is really the case. This may lead to a great waste of ammunition by the enemy in preparation by counter-battery for an offensive or in counter preparation by counter-battery on the occasion of our attack.

"It accomplishes a special mission in such ways as by moving forward to come within range of a distant objective as, for example, from a defensive position; or by moving backward to obtain a more favorable angle of fall or a suitable least range; or laterally to a place convenient for enfilade fire or for covering a neighboring or different front.

"Great trickiness, ingenuity and skill may be devoted to its use. It is not like the accompanying gun, but depends upon speed and quickness and secrecy and shrewdness. It should occupy likely positions, usually near a road, even a poor road. But it should not fire from a place where counter-battery is likely to injure other friendly troops either at the time of firing or later. Its proper application will afford many opportunities to train personnel in reconnaissance and map reading, study of terrain, observation of fire, tactical judgment, command, care of matériel and animals, use of cover and preparation and conduct of fire. It will develop courage, self-reliance and decision.

"Recently the enemy active positions reported in a restricted area in one day were 29. There was no known tactical reason for this sudden increase from almost nothing of the previous days, neither is there reason to believe that we discovered all of his firing positions. But there is reason for believing that he had not 29 batteries at his disposition in that area and study of the map indicates that some of the positions were not good for the defensive or in accordance with his principles while some would probably not accommodate a battery. Good weather and dry roads may have had something to do with it. It would be very pleasant for him if we were to devote a great number of rounds to beat up vacant lots.

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*"The roving gun is a comparatively new game at which we must be skillful in deceiving the enemy and causing him losses, and in discovering his deceit. But when he plays it the only punishment to apply is by hitting him in the act. To do this we must have good terrestrial observation to bring down fire at once, because his wandering gun is a fugitive target. It is worth severe concentrations but only on the instant."* (Memo. October 31, 1918.)

### VIII. ARMY ARTILLERY

"1. There are—

"Divisional Artillery,

"Army Corps Artillery,

"Army Artillery—

"Tractor-drawn, nearly all 155-mm. G.P.F.

"Railway artillery.

"2. It is increasingly apparent that many officers are not aware of this classification or of the long range and great power of the army artillery.

"3. The 155-mm. G.P.F. gun has an extreme range of almost exactly 10 miles (16 km.) and a traversing arc of 60 degrees (one-sixth of a circle). These are extraordinary characteristics. By virtue of them a single grouping has in one day supported the infantry on the fronts of three army corps. On the other hand, three groupings, widely separated in three corps areas, have coöperated to fire at one time in front of the infantry of the centre corps.

"4. The gun fires a powerful shell with fuses appropriate to various conditions and produces very severe effects.

"5. The gun is made for long-range work. It is accurate for range up to about 12 km., but has considerable and increasing dispersion in range as the latter increases. It is very accurate in direction. So far as its shooting qualities go, it is very suitable for counter-battery up to about 12 km. Beyond this it is the appropriate gun for harassing, interdiction, prohibitive fire, for destruction of large targets like towns, camps, etc., and for enfilading railroads, trenches, ravines, etc. It is not suitable for destruction of dugouts or trench systems.

"6. Unfortunately, the gun's life is only about 3000 rounds, and it cannot be fired rapidly without decreasing this life. The maximum rate of fire permitted is one round in one and a half minutes. Besides, it is expensive and the facilities for replacement and retubing are not sufficient. The normal rate of fire is one round in three minutes. There are several other guns and howitzers suitable for counter-battery at ranges less than 12 km.

"7. In order to save its life and devote it to its best purposes (for which no other gun is at hand) the 155-mm. G.P.F. has since

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September 25th been kept at the disposal of the First Army. But not without exception, for a whole brigade of 72 guns was turned over to an army corps for one operation, and much counter-battery has been undertaken at the request of various corps from time to time.

"8. The gun has other limitations. Its track is very wide—8 feet. It is very mobile, considering its qualities, but it is slow. Its ammunition is heavy and the supply is difficult. It takes several hours to emplace and some time to prepare for travelling. It often stirs a foolish impatience and resentment among military police, traffic regulators and staffs very unworthy of them. The gun has been, and will continue to be, a savior of doughboy lives, and I can vouch for it that those who command and serve it are devoted to the support of the infantry as their first duty. Prisoners' testimony is plentiful as to the great effect of artillery in their back areas. The 155-mm. G.P.F. is the gun that they testify for in the main.

"9. A good many examples could be quoted from the army artillery diary to show failures to use this powerful weapon. For example, fire of army artillery south of parallel 288 was stopped either September 27th or 28th. Yet this parallel was not reached until October 26th and the jumping off line of November 1st was approximately on it. On a certain part of the front, fire was stopped south of parallel 301 on November 2d, but no infantry came near that line even on November 3rd. There seems to be either an overconfidence as to advances to be made not borne out by experience or an unwarranted fear that losses will be suffered from friendly artillery fire. The latter is often claimed by inexperienced troops, rarely proven and often shown to have been utterly impossible. When it does happen it is not because the advance runs into it, but usually through defective ammunition. If shell bursts are in front of the infantry the latter will not run into them. If large areas are to be taken it is ordinarily not worth while to keep artillery fire out of them for fear of injuring a few lost, small patrols.

"10. In the attack of November 1st one corps asked for preparatory fire by 155-mm. G.P.F.'s on objectives about a kilometre in front of its line. The fire was delivered accurately and very effectively by a distant Army Artillery Grouping. Moreover, fire from G.P.F.'s preceded this corps' attack during a whole day, not as a barrage, but according to a predetermined program. See the Boche communique as to the character of the artillery fire and as to the result—a piercing of the Hun artillery position. It is not thought for a moment that the 155-mm. G.P.F. should be credited with more than its fair part in the accomplishment. Divisional and corps artillery certainly did theirs also.

"11. *The Army Artillery P. C. is always open. The army*

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*artillery grouping commanders maintain liaison with corps chiefs of artillery. They are ordered to cooperate freely, undertaking any mission that they can accomplish without interference with a mission assigned by higher authority. They are even authorized to set aside an assigned mission on their own responsibility. If they cannot do what is asked they may refer the matter up or to another grouping. They are willing and anxious to do these things. They know their business, the powers and limitations of their guns. They attempt through officers and runners to keep in touch with the situation in divisions. At least one such army artillery liaison officer went "over the top" with the infantry on November 1st.*

"12. The field of application of long-range guns is broad and deep. Their dispositions are the same. Liaison, either metallic or personal, is therefore difficult, especially laterally. The telephone usually works from front to rear and rear to front. For fugitive targets the army artillery cannot usually be depended upon unless fire is called for by aerial observers. Usually, however, timely fire can be brought upon stationary targets, such as concentrations, works, sensitive points, etc., by use of the telephone. Fire in close support of an advance cannot be made safe except by prearranged schedule, easy to draw up but sometimes requiring several hours' work.

"13. *The army artillery cannot force its amicable intentions upon any corps but it offers its services, describes above its powers and limitations and bespeaks the good will of G-1's and the Military Police in order that its powerful assistance may be devoted to the support of the infantry.*" (Memo. November 4, 1918.)

### IX. AMMUNITION WASTE

*"The ultimate problem of any artillery unit is ammunition. A gun without it is no gun, a battery, no battery—no matter how efficient it may be in other respects. The German is interested only in the receipt of so many pounds of metal aptly located. He doesn't care how well the piece could have been served, if the ammunition had only come through.*

"Too many rounds are lost either at the position or en route to it. If a box of powder is left unprotected and gets wet, it is worse than if the powder had never got there, for in bringing it up someone has spent in vain labor that could have been profitably put on something else. If shells are at hand, but no fuses, the same result happens, and it does not help matters if the fuses were there, but got ground into the mud and lost.

"One regiment recently reported over 300 rounds of powder wet and useless; a battalion, that 10 per cent. of all was either so received or became so before it could be fired. Anywhere along the

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roads one can see charge after charge lying in the mud of the gutters. In the meantime, firing schedules are being curtailed because of difficulty in getting ammunition.

"There is no remedy at the front for powder received wet at the dump, but from there on it is the duty of the artillery to protect it. Have a dry place ready for it at the dump. Come to the dump prepared to protect it on the way back, or draw something that doesn't need protection. Keep it dry at the position. Always have a few metal containers ready to receive charges from wooden containers if these are received. A little care and foresight will save 90 per cent. of the powder now wasted.

"As illustrations of waste there were still lying along the roads of the Third Corps on October 17th, the following:

"*a. MONZEVILLE*—5000 rounds, calibre 75, normal, gas, shrapnel and the 1917 shell; taken from battery positions, coördinates R 6787, probably French.

"*b. MONZEVILLE*—155 G.P.F., 30 cases powder; 300 projectiles salvaged by Third Corps munitions officer and turned over to Corps Artillery, left by 148th F. A.

"*c. MONZEVILLE*—one-half kilometre N.E. on ESNE road, 200 rounds calibre 75 shell, piled by salvage section; organization unknown.

"*d. ESNE*—300 yards east on ESNE, BETHANCOURT road, total of 1500 rounds 155 CS/17 ammunition F.A. and B.; 25 cases of powder; 600 I.A.L. fuses. This ammunition being carried forward by Third Corps. Piled by salvage section.

"*e. MALANCOURT*—2000 rounds calibre 145. Guns taken from sector.

"*f. MONTFAUCON*—500 yards S.E. on CUISY, MONTFAUCON road; 200 calibre 155 CS/17 shells and empty powder cases. Odd lots of 155 G.P.F. and 75's in small quantities.

"On the 18th, October, in the First Corps area, at least 8000 rounds for 75's had been salvaged, at least 10,000 rounds were still scattered about and the following small salvaged dumps existed:

"*a. At First Corps P.C. (coördinates Q 5577)* 100 rounds F.A. and B. shell, calibre 155 CS/17; 20 cases powder, 100 fuses piled by salvage parties—evidently abandoned by corps.

"*b. CHEPPY*—road crossing 1 kilometre east; coördinates L 4629—500 rounds 155 CS/17 shell; 1000-75; organization unknown.

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"c. *VERY*—battery positions in RAVIN DE BARONAU, very well cleaned out (155 H). Old position at L 6175, occupied by 7th F.A. contains 1000 rounds shrapnel, calibre 75; 100 normal 75; 100 model 1917, calibre 75 and 400 I.A.L. fuses.

"d. *VERY*—150 rounds 155 CS/17 shells left by unknown organization in western end of *VERY*.

"e. A considerable number of empty cases all calibres, piled in VARENNES, waiting removal. The usual number of projectiles in cases, both full and empty, are strewn along all the principal roads of area. Many of these are thrown off by trucks becoming stuck, and are never afterward removed. Ammunition train belonging to AISNE grouping is now removing many empties to rear.

"All concerned are again notified that lots of ammunition are prepared in established proportions; that the ammunition must be used in those proportions; that the battle is progressing on so broad a front that ours is only an important incident in it; that special treatment in ammunition supply should not be demanded and need not be expected. If the Boche retires to distant ranges that does not warrant an expenditure merely of long-range ammunition. The guns can be moved up as has so often been urged in these memoranda. Moreover, it is certain that, topography only considered, not enough terrestrial observation is being used, that there is too much map firing and that barrages are too frequently used.

"1. French Ammunition Service replaces expenditures in 75-mm. ammunition, normally, by furnishing one-sixth shrapnel, one-sixth H.E. with reduced charge, and two-thirds H.E. with normal charge. This is the normal replacement regardless of the kind actually expended in operation. G-4 of the First Army demands H.E. to replace actual expenditures and sometimes is successful, but more generally received ammunition according to the above percentages.

"2. Ammunition was placed in this sector at the beginning of these operations on a basis of five days, with approximately the above percentage, but including a considerable quantity of gas shells, No. 4, No. 5 and No. 20. Operations have resulted in shooting up only the No. 20 gas, and the H.E. There has been a consequent accumulation of shrapnel and No. 4 and No. 5 gas shells. The recent decisions of G.Q.G., cutting down the ammunition in the sector from five days of fire to three days of fire, have resulted in a large accumulation of shrapnel. It is estimated by G-4, First Army, that 15 lots of shrapnel have been issued to the corps, and 15 lots remain in the army depots.

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"3. In order to reduce this accumulation which threatens to become acute if H.E. only is expended, all units must use a greater portion of shrapnel and must expend that which has already been issued to corps. Furthermore, G-4 will issue to replace expenditures one-fourth shrapnel until this accumulation is reduced to a safe figure. All organizations must, therefore, actually fire this shrapnel whenever tactical situations allow; otherwise, the accumulation of shrapnel at corps and batteries will become excessive, and for the same reason, shrapnel will continue to accumulate in the army depots.

"4. This situation must be fully understood by chiefs of artillery of corps and divisions and by the operations sections of all staffs, and these must study the best solution of the problem, which is urgent. *The use of shrapnel for harassing, retaliatory and prohibitive work may be made quite effective if properly applied and controlled, and it may be mixed also to good advantage in many barrages.*

"Artillery ammunition, in one instance at least, has been dropped as expended upon being drawn from dumps. This is misleading and unfair to other units. It does not give the exact status of supply and might lead to decisions dangerous to the ultimate success of operations. It might cause a wrong distribution of ammunition in depots and stockages. It is likely to result in unreasonable and unnecessary accumulations at battery positions, to exposure, lack of care and deterioration, and finally to the abandonment in positions difficult to reach.

"There is a common desire to have at battery positions an exaggerated amount of ammunition unwarranted by allied experience of several years or by our own of the past few weeks. Great quantities of ammunition have been left by our batteries changing position. Often it has not been salvaged for many days, after it has been exposed to the weather and consequent deterioration. There is waste of money, labor, time and effect.

"Artillery ammunition dumps have been established in too great numbers and inconveniently in some cases. Munitions officers should study the question with great care, reconciling conflicting demands in their first dispositions after an advance and modifying the locations as roads are improved and the flow of traffic is stabilized. The dumps should be convenient of access from the rear, from the units in action and from positions likely to be occupied during battle; and as nearly coincident with probable future locations of depots as can be predicted. Too wide a dispersion and unstudied locations lead to results similar to those of too unnecessarily large battery dumps, *i.e.*, to abandonment and deterioration." (Memos. October 22 and 7, 1918.)



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### X. TRAFFIC CONTROL AND ROAD DISCIPLINE

"Quite a number of army artillery units have been reported for violation of traffic regulations. The mere fact of a violation is a serious reflection upon the discipline of the units and the qualifications of their officers for command. It must be remembered that roads are governed by police of divisions, of army corps, and of the army, that good order on them is essential to movement and supply and that orders governing traffic are drawn for the general good by those who have a wide knowledge of conditions and of relative importance of various services. *Subordinate commanders do not have this knowledge, are incompetent to judge any but their own requirements and not only at the peril of their own reputations but at the peril of the success of operations violate rules without which teamwork is impossible.*

"Strict obedience of traffic regulations is enjoined upon the army artillery. Its commander has the power to send officers out of the Zone of the Advance and will do so if their services are not creditable.

"1. Complaints are still coming in of violation of traffic orders, by units of army artillery. Some of these date back to movements of September 15th, etc. One division inspector, speaking of the movements during this period, says: 'My observations during the past three days have been that army artillery and army artillery park have continually violated road rules and made traffic at times impossible.' Another instance is under investigation of two units of army artillery completely blocking the road and the commander of one of these units refusing to move in order to relieve the blockade, although directed to do so by a senior officer.

"2. All of this criticism discredits the discipline of the army artillery units concerned and regimental and other commanders are again enjoined that they will, in the future, be held responsible for the misconduct of their subordinates, due to ignorance of orders or traffic regulations.

"3. Artillery trains are long and cumbersome and the greatest care and discipline is necessary in handling them on the road in order that they may not take up more than their fair share of the road space. Careful study of orders and traffic regulations is, therefore, necessary by all and ignorance will no longer be taken as an excuse.

"4. Secrecy of movement may be greatly increased by careful reconnaissance of the route and selections of suitable bivouac on or near the road that may be reached during darkness, and in which the maximum concealment may be obtained. The commander is responsible that such reconnaissance is made.

"Road discipline, by members of the American Expeditionary

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Forces, is not good. Truck drivers are constantly driving in the middle of the road, making it impossible for cars going in the same direction to pass. Look-outs are not maintained and the trucks generally make so much noise that the driver cannot hear the horn of the car back of him. Convoy discipline is not good, due largely to lack of experience on the part of the young officers in charge of same.

"1. Many complaints of unauthorized, or of ineffectively regulated, movements of army artillery units are received. Often these are not specific and cannot either be verified or shown to be mistakes. Often they are inconsistent with demands made upon the army artillery by the one complaining. Sometimes they are entirely unfounded and prove to relate to other troops. Occasionally the army artillery is at fault.

"2. *The army artillery has no precedence over other troops by virtue of its designation. It is part of a team all of whose parts can only work together and to the best advantage under the high command. Too much willingness, too great a desire to 'get to the front,' hypnotism by the battle line, may prove a detriment to operations. Artillery is of no value on the road.*

"3. Matters will improve with experience. Some mistakes reported are—

- "a. Lack of full and clear instructions by senior officers.
- "b. Failure to mark the route.
- "c. Neglect of reconnaissance, both preliminary and immediate.
- "d. Officers leaving the column.
- "e. Carelessness in receiving instructions.
- "f. Failure to use a notebook.
- "g. Bad temper and impatience.
- "h. Lack of energy of officers.
- "i. Neglect to split columns.
- "j. Disregard of traffic regulations.
- "k. Disrespect toward military police.
- "l. The unauthorized use of the name of the  
Commanding General of the Army.

"4. Field officers, by virtue of their age, rank, experience, study and position of responsibility must take the part of leaders and critics. They must detach themselves as far as possible from administrative functions and turn their attention to tactics of artillery fire and movement. They must supervise their troops personally and teach, by precept, suggestion, advice and example, and by critiques whenever a number of officers can be assembled, the principles and practice of field operations, using daily incidents as

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examples. They must encourage bold and quick decision and tenacity of purpose with a well-defined object, and must develop good judgment on the part of their subordinates. They must teach them, without discouraging initiative, that decisions must be in accordance with the common aim and with superior orders. Before giving orders themselves they must calmly estimate the situation and outline clearly what they wish to say. They must require subordinates to use notebooks except when secrecy is necessary. The recipient should be required to repeat his orders, whether written or oral.

"5. *The commanders of all grades of army artillery are directed to play the game with credit to that body and to form good relations with other formations by patience, good humor and comradeship.*" (Memos. September 25th and 27th, and October 1st and 3rd.)

### XI. ARTILLERY UNITS AT REST

- "1. Reanimate the fighting spirit by—
  - Rest
  - Sleep
  - Baths
  - Physical exercises
  - Good food, diversified and plenty
  - Sports
  - Entertainment.
- "2. Renew—
  - Clothing
  - Underwear
  - Equipment
  - Arms.
- "3. Care for animals by—
  - Evacuations
  - Replacements
  - Grooming
  - Grazing
  - Frequent feeding and watering
  - Kind treatment
  - Good shoeing.
- "4. Examine and rearrange personnel.
- "5. Eliminate useless baggage.
- "6. Improve discipline by requiring—
  - Military carriage and deportment
  - Strict forms of courtesy
  - Prompt punishment
  - Snappy marching and standing gun drills.
  - Perfect example by officers.

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- "7. Decentralize duties to develop among all ranks—  
Initiative  
Self-reliance  
Good judgment  
Decision.
- "8. *Older officers must show the young and inexperienced how to accomplish their functions.*
- "9. Attain high efficiency by—  
Short and smart drills, not too many  
Attendance of all ranks  
Exactitude in performance of duties by—  
Individuals  
Units  
Lectures illustrated by past mistakes.
- "10. Increase morale by—  
Explanation of our ideals, the President's notes and speeches  
Examples of success  
Lecture on enemy's bad qualities  
Statement of sacrifices of people at home  
Historical sketches, the good results of all our wars.
- "11. *Inculcate the offensive spirit.*
- "12. *Teach that the shortest way to win is to destroy the hostile army by his losses of—*  
Men  
Matériel.
- "13. Conduct field firing, if possible.
- "14. Exercises of units larger than the battalion are not believed to be necessary.
- "15. Reduce formal inspections, conduct inspections by surprise during exercises." (Memo. October 16, 1918.)

### XII. ARTILLERY CAMOUFLAGE

"I. *In the attacks of September 12th and 26th many positions of the heavy artillery were badly camouflaged because:*

- "1. Many officers failed to appreciate:  
"(a) That the careful camouflage of heavy artillery is essential in order to prevent the disclosing of the preparations for the attack, since this artillery moves into position first, and further to protect the positions in case of reaction by the enemy.  
"(b) That there is, as a rule, plenty of time for the careful camouflage of the heavy artillery positions (from 3 to 8 days).
- "2. These officers were consequently unwilling to make sacrifices

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in order to obtain satisfactory camouflage either in the selection of positions or in furnishing adequate details for the erection and completion of the camouflage.

"3. Many positions were at a considerable distance from the road, resulting in deep tracks impossible of concealment.

"4. The order limiting the selection of gun positions to within 40 yards of the coördinates assigned forced many batteries into positions exceedingly difficult to handle, whereas frequently 100 yards away existed good natural cover. (It is not known where the order originated.)

"5. The camouflage personnel was inadequate.

### *"II. Recommendations.*

#### "1. Selection of Positions.

"(a) Where natural cover is available it is preferable to occupy new positions, in order to avoid taking up positions pinpointed by the enemy. On the other hand, in open country where camouflage is difficult, it is preferable to occupy old positions; there is less risk of changing the terrain.

"(b) Positions should be placed near the roads in order to avoid tracks.

"(c) The order limiting the variation from assigned coördinates to 40 yards should be modified in some way so as to permit greater leeway in the selection of positions. In woods, in brush or in very broken terrain everything pertaining to the battery position should be placed on existing roads or paths to avoid any possibility of new trails; each of these different elements being carefully camouflaged.

"(d) Unless one camouflage cover has been advised for the whole position, the guns should be disposed as irregularly as possible whether in woods or in the open. Four fish-nets in a row, equally spaced, appear photographically as a battery just as much as four guns.

"(e) A camouflaged officer or noncommissioned officer should assist in all reconnaissances (by far the most important stage for good camouflage). Their suggestions with regard to the selection of positions should be followed as closely as compatible with tactical requirements.

#### "2. Camouflage Matériel.

"(a) Camouflaged matériel is issued at the army camouflage dumps only on an order signed by the camouflage personnel attached to the units.

"(b) Each battery should maintain as permanent battery matériel:

- 4 Large nets, issued by the camouflage officer.

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- 100 Stakes, varying in length according to the calibre of the gun.
- 4 Rolls of heavy annealed wire.
- 1 Roll of fine annealed wire.
- 2 Mauls.
- 4 Large wire cutters.
- 4 Small wire cutters.

### REMARKS ON THE CAMOUFLAGE OF ARMY ARTILLERY FOR THE ATTACK OF SEPTEMBER 26TH

#### *"Railroad Guns:*

"It is useless to put camouflage matériel over old epies or over guns on old epies. Heavy guns or epies cannot be concealed unless the whole problem is considered from the beginning with the camouflage in mind. Guns or cars should not be brought into the epie until the last possible moment. Shelter trenches, and so forth, should be carefully concealed to avoid any appearance of activity in the neighborhood. Guns standing on tracks in the garages might be covered by a flat covering of canvas (which could be easily removed) so as to simulate the top of a freight car. Hanging camouflage matériel over these guns does not sufficiently change their forms so as to make them unrecognizable in the photograph.

#### *"Ammunition:*

"In ammunition dumps regular disposal of parcels of ammunition should be avoided. If regularly disposed platforms are constructed they should be covered with flat canvas tops on forms sufficient height from the platforms to cover any ammunition that may be put on the platform. It would be impossible in this way to tell when the dump is filled with ammunition and when it is not.

"Ammunition in the open can best be concealed by distributing it evenly over natural ground forms such as the triangle formed by two paths and by keeping the pile as low as possible. With a little brush or grass the ammunition can be successfully concealed.

#### *"Miscellaneous:*

"It is to be noted that many French units forbid anyone near the guns once the guns are in position. This rule avoids tracks around the position.

"In the recent attack reconnaissance cars and trucks were allowed to stand in the open in towns near the front, and in crossroads in woods.

"Guns, in several instances, were left standing on open roads with simply nets or rolls of camouflage thrown over them. Naturally such camouflage was of no value. When guns are left standing on a road they should be left under natural cover as far as possible.

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They should be spaced at irregular intervals in any case, and when in villages placed as near the buildings as possible.

"Natural camouflage could have been more resorted to. Brush is an excellent material, having a large quantity of inherent shadows. One battery notably, in flat open grass terrain, when artificial camouflage was not available, was covered with an irregular cover of interlaced wire hung with green brush, more sparsely disposed toward the edges. This made an excellent position and lasted as long as needed.

"Ruins and old buildings were not sufficiently taken advantage of for the concealment of the guns.

"One battery preferred to locate its position where it was forced to cut down trees in front, rather than to establish themselves in low brush where no cutting was required for the field of fire. In the woods, the cuts, not the guns are difficult to conceal. Some French batteries obliged to make large cuts in the woods, chopped their trees just enough so that they could be felled at the last minute. The guns in this position, however, should have been, but were not, irregularly spaced.

"Battery commanders should be reminded that the enemy intelligence officers locate positions from the smallest indications. Too much care and pains cannot be taken in the camouflage of their positions and with the camouflage discipline of their men, if they wish to avoid loss of life and revelation of the plans of attack.

"There is now furnished one camouflage man to each army artillery battalion. He should be taken on reconnaissance of position, consulted on the subject of camouflage and given charge of camouflage erection.

"There is no exclusively camouflage section. The success of German camouflage depends largely on rigorous discipline, both in the choice and utilization of positions, and in the disposition of convoys on the roads. The High Command has issued several orders telling officers that their systematic habits are a serious danger in camouflage, if they apply them to putting batteries, munitions and barracks at regular intervals. Irregularity, absence of corners and reducing of shadow, appear to be the fundamental principles of German camouflage. They use less camouflage in the nature of piling branches, etc., than we do. Their nets are of twisted paper and are only lightly sprinkled with branches. They maintain a rigorous discipline in the splitting up of convoys and in avoiding making new paths to and from batteries along wood borders, etc. When enemy machines pass over, the order is either to take to cover or to rest immobile. The camouflage which has been least successful has been the effort to break Germans of their regularity.

*"American Camouflage.* An aviator, 20th Schlachtstaffel, captured

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October 19th, declared that American artillery emplacements are more in the open than theirs, and so regularly arranged as to catch the naked eye. The pilot noticed also many American camp fires. "The secret of successful German camouflage is that every German is disciplined into using the smallest straws on his route as protection." (Memos. 6, 22, 24 and 26 October, 1918.)

### XIII. SECRECY

"Precautions as to secrecy are vital. Many units have been careless in respect of this, and some have ignored even the simplest measures. One commissioned officer has actually disobeyed orders. For his credit and for his personal interest every commander of army artillery units is directed to pay minute attention to the subject. It covers every military activity not only before but after the opening of fire and involves the movements and the conversation of individuals. Its importance extends to future operations. We should be so careful that orders to make a show of activity should be necessary rather than orders to be secret. There will be no toleration of neglect or disobedience.

*"Secrecy carries with it many difficulties. Often these must be overcome by hard and exhausting work. Often they may be surmounted by ingenuity, skill and thoughtfulness. And in any event secrecy will be rewarded by the increased killing of the enemy and by saving the lives of our own men."*

"In the matter of maintaining secrecy, the following note appears in a recent French Army bulletin:

"The statements of natives of Alsace-Lorraine taken prisoner prove that the Germans were made aware of our preparations for the attack of the 19th instant by overhearing indiscreet conversation through their listening posts. The talk overheard was mainly calls and conversation in clear by artillerymen.

"It should be pointed out that indiscreet remarks can be easily overheard, especially in regions where the enemy before retiring was able to leave devices facilitating listening-in. Abandoned telephone lines, the wires of which could be buried, can help the enemy in this." (Memos. September 23 and October 27, 1918.)

### XIV. ORDERS

"In many, if not most, cases firing orders are sent to batteries with the bare statement: 'Fire so many rounds on such coördinates at such and such times.' Nothing is said as to what the target is, or as to the purpose the fire is to serve. This makes fire at the battery a matter of absolute routine, with no more stimulus to careful work than would be given by target practice on a range. Officers and



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men alike become automata, and the accurate, snappy service of the piece inevitably suffers.

"Anything that increases the interest of the soldier increases his efficiency and his value. His greatest interest is exactly the same as that of every officer. 'What is being done to injure the enemy, and what is its success.' If men are told to: 'Fire 10 rounds on Point 32.46,' they will do just that. If they are told: 'There is a wagon train of 14 wagons just approaching Point 32.46, fire 10 rounds on that point,' they will put a maximum of careful effort into every shot. If the shoot is observed to be successful, and a report of its result is sent to the battery, the men will talk of it for days, and half of them will try to get it by the censor when they write home.

"Such interest is worth creating and preserving, even at the cost of a little more labor in giving orders and news. Each unit regards its immediate superior headquarters as equipped with special information and special knowledge, and every such item that comes therefrom is weighed and valued. Most of it can safely be passed down, especially information as to the effect of one's efforts upon the enemy. *Let the men know how the war goes and what they are doing to win it. Frankly to state the facts is the best way to defeat rumor and to prevent false hopes or false fears.*" (Memo. October 22, 1918.)

### XV. ARTILLERY EFFICIENCY

"The Hun is skillful in the use of an inferior mass of artillery. From my knowledge of our older artillery officers of the regular army and of the character of the younger officers of reserves, militia, national army and regulars, I have a strong belief in their capacity to excel all others. They do not excel now. Study, reflection, intimate relations with the infantry, adaptability, boldness, a shaking out of the hypnotism of trench warfare, development of the self-reliance and initiative of noncommissioned officers, care and conservation of men, animals, matériel and ammunition—all of these must be developed. We beat the Boche, as his own evidence assures us, but it is by mass, not by art, and our waste is enormous. His methods are an excellent pattern to be studied and improved upon." (Memo. October 26, 1918.)

# THE 42-CM. MORTAR: FACT AND FANCY

LECTURE BY CAPTAIN BECKER, GERMAN ARMY  
REPRINT FROM ARTILLERISTISCHE MONATSCHEFTE, JULY-AUGUST, 1921\*

WHEN in August, 1914, the first shots of Erdmann's battery destroyed the strong forts of Liege; and when one Belgian or French fortress after another, including even the central redoubt of the Belgian army, the "impregnable" fortified camp of Antwerp, fell to our big guns, not only Germany but the whole world was startled. In the old contest between gun and armor, the gun had scored another victory. Even among our German regular officers, 99 per cent. were entirely surprised by the new weapon. Soon after the fall of Liege, postcards began to appear, authorized by Army headquarters, showing conclusively the effect of the projectiles on armor and concrete.

It is not to be wondered at, then, that a mythology grew up about this weapon, which spread rapidly among the people and concealed the truth. The myths begin even at the cradle of the 42-cm. mortar. It is popularly believed that the Krupps were its sole creators; that Friedrich Krupp had built it secretly, hidden it in a closet, and presented it as a great surprise gift to the German Army on mobilization. As a matter of fact, the Great General Staff had formulated the demand for a piece of artillery which could quickly overcome strong armored concrete works; this piece was developed through several years of constant coöperation between the Artillery Test Commission and the Krupps. The work of the firm was of the utmost value, but so was that of the Commission, and particularly that of its president, Sieger. The credit for the second model, adapted for road transport, is especially due to him. More even than in the development of the gun, the influence of the Commission is to be seen in the development of the proper projectiles, explosives and fuses. Great difficulties were encountered in these, and solved largely through the work of Major Arnold, the Foot Artillery projectile expert.

I, myself, as an assistant in ballistics, did some of the preliminary work on range tables in 1911. Experiments were in progress with the gun, carriage and ammunition, for several years before the war, at the Krupp proving grounds at Meppen, at Kammersdorf, Thorn and Jüterbog. Hundreds of men of the Commission's proving ground battery were instructed in the use of this matériel and were discharged. Many of the civil employes of the proving grounds knew all about it. I remember, for example, a visit to the targets,

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\* Translation by Col. O. L. Spaulding, Jr., Field Artillery, U. S. Army.

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when the driver of my motor car pointed out an unexploded 42-cm. shell lying beside the road. It appeared that he knew its weight, its explosive charge, and its initial velocity. In spite of all this, the secret was absolutely kept, both at home and abroad—greatly to the credit of all those connected either with the Krupps or with the Commission, who had to do with the development of the matériel.

All sorts of fables grew up as to the handling of the gun. Early in 1915 a pamphlet was published, in regular catch-penny form, which told the most extraordinary yarns about the "big Bertha." Even serious papers circulated some of these sotries. One of the big Berlin newspapers printed an account of the action of Solf's battery at Fort Manonviller, fairly accurate for the most part, but saying that "the guns were served by elegant gentlemen in cutaway coats," meaning thereby Krupp's engineers. These Krupp engineers filled everyone's imagination; in the summer of 1915, visitors to my battery before Kovno asked where they were. The actual fact is, that the commanders of the first 42-cm. batteries, at mobilization, were captains from the Artillery Test Commission, to whom the matériel was already familiar. Most of the battery officers were of the active army, assistants to the Commission. In a few cases employes of the Krupps were assigned as battery officers, and even as battery commanders; these, however, were not "Krupp engineers," but retired officers employed by Krupp, who had worked with the matériel on the proving grounds. All the men were regular Prussian artillerymen. In the three batteries first organized on mobilization, about one-third of the men were detailed from the active list of the proving ground battery; two-thirds were reservists, who had served in that battery or at the School of Fire. Later in the war, and especially when more batteries were put in the field, this selected material was not available, and there was even less chance of getting "Krupp engineers" for cannoneers.

It seems not out of place to give here some data on the matériel and ammunition, since the fable writers have touched upon these also. I am sure that, in our present situation, I can not be charged with divulging military secrets.

We had at the outbreak of the war two types of 42-cm. mortars. The older type, the "gamma" model, was the heavier, but the better ballistically. Gun and mount, in firing position, weighed 175 tons. For transport it was divided into several parts, to be carried on railway cars. The heaviest load was 26 tons. A special firing spur had to be built from the nearest permanent track. The gun was mounted and dismounted by means of a special portable crane; either operation required about 36 working hours. Adding the time necessary for building the spurs, it will be seen that days or even weeks were required for getting one of these "gamma" batteries into action.

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The newer type, the M model, had been much lightened, at the expense of its ballistic efficiency. The weight in firing position was 42.6 tons. It also was separated into several loads for transport, but these were adapted to motor transport, and could make 7 kilometres an hour on good roads, or even sometimes move across country. The heaviest vehicle, loaded, weighed 18 tons. This weight caused difficulties at road bridges and culverts, especially in Russia, but these could always be overcome by means of the bridge balks carried along for use in mounting the piece. These were of metal, U-shaped in cross-section, and so designed that they would carry the weight of the heaviest vehicle when supported only at the ends. In the summer of 1915 I succeeded in crossing stretches of Russian swamp with these. It required only a few hours to set up this piece.

Except for the use of cranes, made necessary by the heavy weights of matériel and ammunition to be handled, there was little difference in the service of the piece as compared with lighter guns. The newer model of 42-cm. mortar is an enlarged copy of the 21-cm. Many stories of the peculiarities of service must therefore be added to the list of fables. It was said that the air pressure was so great when the piece was fired that the gun crew had to take cover and fire by electricity. Other journalists went even farther; the improved story was that after loading and laying, the whole gun crew was carried a kilometre to the rear in motor trucks; one man remained behind, lighted a fuse connected with the powder charge, and then followed on a motorcycle. Of course, there is not a spark of truth in all this. The firing was originally done precisely as with other guns; the shields protected the crew, so that they felt the blast less than others standing near. It was not until 1916 that orders were issued requiring that the piece be fired from cover by means of a long lanyard; and this was not on account of the blast, but because there had been several cases of bursts in the bore.

The ballistic qualities, also, were greatly exaggerated. Ranges as high as 100 kilometres were attributed to "big Bertha." Unfortunately, the actual ranges were very modest—14 kilometres with the railway model, and not much over 9 with the newer gun. The mobility of the latter had been purchased at the cost of 30 per cent. of the range.

The weight of the long projectile for the railway gun was 920 kilograms, or about the same as our old field gun in firing position. For the lighter model, the projectile weighed 800 kilograms. The muzzle energies were respectively 9000 and 4000 metric tons.

Extraordinary accuracy was attributed to the big mortars. In deflection this was to a certain extent justified; the guns responded accurately to changes of two minutes of arc. In range they showed

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much the same dispersion as other guns, and this dispersion increased materially during the war by reason of the wear of the guns and the falling off in quality of ammunition. Precise data as to dispersions were scanty before the war, experimental firing being restricted because of the cost of ammunition and the wear on the guns; but enough had been done to permit plotting a dispersion diagram on transparent cross-section paper. I have used such diagrams to calculate the amount of ammunition needed for any given target. They were issued to the extra-heavy batteries and to higher artillery commanders upon mobilization, but I have never seen them used except in my own battery. If they had been, much ammunition would have been saved, and much disappointment avoided.

It has been very commonly reported that the 42-cm. batteries each had a lighter gun for fire adjustment. This was of course not the case; adjustment was made with the heavy calibre.

As shown by many photographs, the 42-cm. shell was effective against the heaviest armor and concrete of the Belgian forts. As typical of this effect, I recall in particular two hits made by my own battery on the Fort of Wavre St. Catherine, in the outer line of forts of Antwerp, on September 29, 1914. On the evening before, I had fired a few rounds at the fort for adjustment. On the morning of the 29th I fired with the second piece, the more accurate, at the heavy guns in the armored cupolas, while using the first piece against the concrete casemates. The conduct of the fire was a pleasure to an artilleryman, especially in the beginning. Half a minute or a minute after the telephone warning "on the way," the projectile could be heard approaching. "The train is coming," my telephone operator used to say. Now it was time to direct the telescope upon the air just above the target; with a little practice the shell could be picked up in the air and the impact itself observed. On this day, I saw my eleventh shot strike fair upon the top of the cupola, where the enemy's guns were actively firing. There was a quick flash, which we had learned at Kummersdorf to recognize as the impact of steel upon steel. Then an appreciable pause, during which the cupola seemed uninjured; then a great explosion. After a few minutes the smoke began to clear, and in place of the cupola we saw a black hole, from which dense smoke was still pouring. Half the cupola stood upright, 50 metres away; the other half had fallen to the ground. The shell, fitted with a delayed action fuse, had exploded inside. When I visited the fort later, I found a clean round hole in the part of the cupola that had been thrown to one side, punched out by the projectile. The head of the shell was found in the demolished tower, still sharp—a striking testimonial to the excellence of the material and workmanship.

A little later, I got another clean hit on the same fort, which

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exploded the magazine. A cloud of smoke shot up a thousand metres; numerous small explosions followed, and the whole fort took fire.

I have mentioned these details, because they concerned my own battery. This bombardment is interesting also because I have a detailed description of it from the other side. The father of one of my cannoneers sent me a copy of the Amsterdam "Algemeen Handelsblad," in which was published a letter from a Belgian artillery officer, who had been in the fort at the time, and who was later wounded at the fall of Antwerp and escaped over the Dutch frontier. It describes very vividly the fearful effect of the German 42-cm. mortars, and gives many details, especially of the effect upon the men of the garrison.

Later on the Belgian forts, especially those of Antwerp, were studied technically by the German engineers. It was found that the surprising effect on concrete work was due to the poor material. A pioneer officer said to me in October, while we were examining one of the captured forts, that the Belgian government had been shamefully defrauded by its contractors. I have not the technical knowledge to form an opinion on this; in any case, the actual effect of the 42-cm. mortars speaks for itself.

It is also said that our 42-cm. shell had little effect upon the French forts, such as Manonviller, Vaux and Douaumont, where good concrete was used. I know personally only Douaumont. This fort was hit only a few times by the 42-cm. shells; so we can not conclude, from the comparatively small amount of damage, that they lacked power. As to the other forts I can offer no opinion.

The shell effect was so great, at the very beginning, that legends soon grew up in regard to this also. Even our own higher commanders were not free from undue optimism, and often assumed that any fort could be demolished with a few shots. When it was not, the poor battery commander was blamed. They were surprised, too, if a work, assaulted after long continued fire, was found to be occupied. For instance, Fort Wavre St. Catherine, whose bombardment has been described above, was not assaulted until two days after the fire had ceased. Patrols then found it occupied; and I promptly heard from General Beseler's headquarters. My battery was turned upon the ruins again; an assault was made as soon as the fire ceased, and the fort was found abandoned. One may readily see, from the pictures of these heaps of ruins, what fine machine-gun nests they make. If the enemy abandons the work during the bombardment, but is given time to reoccupy it before the assault, no amount of destruction will do any good.

The attack on my second target, Fort Koningshoykt at Antwerp, was better managed. I had my observation station in the infantry

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outpost line; as soon as I ceased firing, the infantry followed my last shot into the fort, and occupied it without resistance, before the enemy had time to return.

The nature of the 42-cm. mortar and its projectiles make it particularly adapted to deep targets under strong horizontal cover. Through failure to appreciate this, it was often used against every possible or impossible sort of target, as a sort of maid of all work. Then, when it was used, over the protest of the battery commander, and got no effect, everyone was disappointed. I do not object so much to using it sometimes against field targets, when the weapon is still unfamiliar to the enemy, so that the moral effect is very great. Such fire proved well worth while at the crossing of the Danube in the Servian campaign. On this occasion I was on the left flank; my battery fired only five shots. Three of them fell on the commanding Goritz heights, on the south bank, and drove the cannoneers from the Servian guns in position there; the other two fell in the suburb of Ram, on the south bank, with great moral effect.

On the western front it was different. The enemy soon found that the effect upon shallow targets was mostly moral. I was called upon to fire for weeks upon shelter trenches, and only a few rounds a day were allotted. That this was sheer waste of ammunition I pointed out again and again, but without success; everyone swore by the moral effect, and was greatly disappointed when the poor results justified my protests. Hundreds of rounds were thrown away in firing upon cities and villages, such as Nieuport, Ypres and Dixmude. The 42-cm. shell weighs as much as eight 21-cm., and the eight give vastly more effect than the one against such targets.

The worst case of failure to appreciate the characteristics of the 42-cm. matériel was in February, 1915, when it was proposed to use my battery against English armored ships, which were annoying our right flank in Flanders. One need not be a coast artilleryman to see the uselessness of this. This time, fortunately, my protest had its effect, when backed by the opinion of the chief munitions officer. But I got other extraordinary targets, little less suitable. In Nieuport, a little place on the coast west of Ostend, which was then just behind the enemy's line, there is the so-called Templars' Tower, built in the middle ages, with thick, heavy walls, and giving fine observation over the low Flemish country. There was an old saying that the town was impregnable so long as the tower stood. I was ordered to demolish it. Now at that range my mortars had an angle of fall of almost 70°, so that their target would be only the horizontal section, perhaps ten metres square. The probability of hitting was negligible; but for a flat trajectory the target was an easy one. I discussed the pros and cons at headquarters of the Fourth Army, in the presence of a representative of General Headquarters,

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but to no purpose. To all my objections the answer was, "they surely can't miss such a huge target." I finally offered, if there were no 15-cm. rifles available, to run a heavy field howitzer into the front lines during the night, and destroy the tower at daybreak, with the heaviest charge and flat trajectory, at a range of 2000 metres; but the orders for the 42-cm. mortar stood.

The ammunition allotted for this purpose was 200 rounds. Instead of giving it to me without reservation, so that I could fire it all on a day when conditions were favorable, the division to which I was attached gave it out ten or twenty rounds at a time, over a period of several weeks. I had to fire a few rounds a day at the tower, along with other firing, even some of it into invisible areas, where battery positions were noted on the very bad maps. My continued protests against this waste of ammunition accomplished nothing except to get me disliked by the division commander and the chief of artillery. I might have accomplished something by a little trickery, saving a few rounds on one day and expending it on another; but the artillery commander sometimes counted my shots. Finally the chief munitions officer put a stop to this useless shooting. A year later a battery of 15-cm. Navy rifles knocked down the tower in a few rounds, which might just as well have been done in February of 1915.

Other batteries fared no better. Scharf's battery, near Arras, had to fire its precious ammunition at the supports of the aerial cableways of the mines, because there were supposed to be observers up there. All of which emphasizes the necessity of having first-class artillery advisers at all higher headquarters.

In contrast to these cases of overestimating the 42-cm. mortar, there were also cases of underestimation. Some of these errors have crept even into official documents. In Volume 1 of the "Battles of the World War," published by the National Archives, I read that the two 15-cm. armored turrets of Fort Koningshoeyt were still serviceable after the bombardment. This is not the case. I conducted this fire from an advanced infantry post close to the left shoulder angle of the work, so that I was as well placed to see as the observers at the targets on the Kummersdorf firing ground. Both the 15-cm. turrets fired very actively at first. Just as our own regulations prescribe, the turrets were turned with muzzle to the rear after each shot. Just after one of the turrets had fired, one of our projectiles burst in front of it; this turret never moved again. The second turret continued its fire a short time after this, and then was put out of action in the same way.

Inspection after the capture of the fort showed that both turrets were jammed by injuries to the concrete work. Repair by the troops proved impossible. Later on, I inspected all the Antwerp works in company with one of Krupps' representatives, who was in



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charge of repairs; his employes had to work for days to get these turrets in action again. The writer who speaks of the ineffectiveness of the 42-cm. shells at Antwerp evidently did not see these works until the repairs were well under way. Considering the use that was afterward made of Antwerp as a German fortress, I think the way in which these guns were put out was better than the direct hit, such as described above in connection with Fort Wavre St. Catherine, where the turret was put permanently out of commission.

The attacks on the Belgian fortresses were at the pinnacle of the fame of our 42-cm. mortars. They were used to good purpose later, as against the Russian fortresses in 1915 and before Verdun in 1916. But as the trench lines became more extended and shallower, and better concealed, their effect diminished. Finally they were withdrawn from the front and their crews assigned to other guns.

Here I might make mention of the Austrian 30.5-cm. mortars, which so quickly gained a high reputation. I have seen these mortars on the march and in action, and found them astonishingly well designed and constructed for transport. In firing position, however, if the ground is not exceptionally firm, they have a tendency to get out of level, and fire has to be suspended for repairs. The shell effect is inadequate; at Fort Koningshoykt, for instance, after two days' fire from four of these mortars, the concrete work was not materially injured and the turrets were intact. A few hours of fire from my battery put the work entirely out of action. But in mythology the Austrian mortars have been very much played up, to the prejudice of ours. For instance, in the winter of 1914-15 a set of drawings was placed in the Schönbrunn palace, representing the work of the Austrian mortars. In the spring of 1915 these were reproduced in colors, and issued in a very fine portfolio form, under the title, I think, of "Our Motor-drawn Mortars in Belgium." Among these I was astonished to find several excellent sketches of 42-cm. shell craters. I was told of a similar incident in Russia in 1915.

The 42-cm. mortar was a wonderful tool. Even a poor workman could use it with effect. We who commanded batteries of them will always recall our experiences with pride and satisfaction. In 1914 and 1915, both east and west, they made a unique and decisive contribution to the victories of our incomparable infantry.

# SOME REMARKS ON MOUNTAIN ARTILLERY\*

BY A. MORTUREUX, CAPTAIN OF ARTILLERY, FRENCH ARMY  
REVUE D'ARTILLERIE, APRIL, 1922

THE principles that govern the tactical use of artillery remain practically the same whether applied to a level country or to mountainous regions, but in the mountains the units must have a special organization that gives them the necessary ability to follow the infantry and to support it under all conditions of weather and locality.

It has appeared of importance to find out what are the qualities best suited to the exigencies of modern warfare,<sup>1</sup> in regard to the guns, the composition of the units and system of mountain artillery, on the basis of the experiences of the recent campaign and the opinions of qualified authorities.<sup>2</sup>

For this purpose, we proposed to take up again, in this account, ideas and facts that are generally known,<sup>3</sup> examining the following points:

- 1—Limitations of the mountains; consequences and remedies;
- 2—Part played by mountain artillery and its use;
- 3—Principal problems of firing in the mountains;
- 4—Organization of the system and the guns for mountain artillery;
- 5—Study of the principal recent mountain artillery guns.

## CHAPTER I

### LIMITATIONS IMPOSED BY THE MOUNTAINS—CONSEQUENCES AND REMEDIES

Just as the sea compels mariners to take into account its capricious and powerful elements, the mountains of certain regions impose their tyranny upon the troops that confront them.

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\* Translation through courtesy of Military Intelligence Division, General Staff, U. S. Army.

<sup>1</sup> The use of mountain artillery in the colonies is not taken into consideration; a few examples will be borrowed from colonial warfare, however, to strengthen the argument.

<sup>2</sup> Principal documents consulted: "The War in the Vosges," by Colonel Frisch (1914); "Lectures to the Officers of the Garrison of Grenoble," by Lieutenant-Colonel Coppolani (1920); Reports of the Central Artillery Commission (1920); General Summary of the Reports of the Officers of the 1st Regiment of Mountain Artillery on the Lessons to be Learned from the War.

<sup>3</sup> Most of the principles of mountain warfare applied to artillery have remained practically the same since the origin of the arm. To grasp this idea, read in the *Artillery Memorial (Memorial de l'artillerie)* an article by Captain Sevelinges that appeared in 1844 and the note on mountain artillery that appeared in 1852, Volume VII.

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The march and the existence of columns are dependent there on the number and the nature of the ways of communication.

Roads, mule tracks, footpaths, are the required passages that dictate to the commander the composition, organization and march of the columns. "The mountains are a sieve that sifts."

For this reason, questions of liaison, of command and of supply become complicated; each column may be called on to maintain either its own existence or the conduct of the battle for some time by its own resources.

Moreover, certain inhospitable positions will not allow the artillery to deploy for firing as required by the situation at the time. Battalion commanders have regretted many a time that they could not bring into action on the same uneven spot of ground the three batteries at their disposal.

The 1912 drill regulations made the following mention of the limitations of the mountains, known and dreaded for a long time: "The scarcity of roads for communication, the roughness of the terrain, the poverty of the country in regard to provisions and quarters, prohibit the use of large forces in one theatre of operations. The size of the forces that can act on the same battlefield is still further restricted by the difficulty or the impossibility of establishing permanent liaison between the columns and of insuring simultaneousness of their action and convergence of their efforts."<sup>4</sup>

If the mountains have their limitations, they also offer very special advantages to the defender; however, a trained and bold assailant, understanding how to use the resources of the terrain (escarpments, defilades) and of the weather (fog), can gain many advantages by surprise attacks.

Without denying the austere and capricious character of the mountains, it may be asked if aviation, wireless telegraphy and mechanical means (caterpillar vehicles, telpheric lines) will not be from now on new auxiliaries for remedying the isolation of the columns and aiding them in the difficulties of supply and combat.

The airplane can, in fact, insure the far and rapid transmission of information and can bring supplies or support an attack. From now on, the column that has a wireless sending outfit at its disposal will no longer be isolated.

Examples of such services are numerous.

One of the most recent date appears to be that of the fighting that took place in Morocco at Bou-Knadel (50 km. east of Fez) during the latter part of January, 1920.

The mobile group was given the mission of getting possession of

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<sup>4</sup> The examples and the facts of the recent war have frequently developed in the opposite way from these ideas. As we shall see the mountain 65-mm. units were often engaged on the same front in large groups.

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a position held by large forces of Moroccans. A long ridge on which the enemy barred our way, this position commanded a wide valley. After artillery preparation, several assaults were made; our losses were heavy and our efforts fruitless. In fact, the Moroccan forces remained on the reverse slope of the position on a very abrupt counterslope, only their observers remaining on the fighting crest. Our preparation fire left them unscathed, because the main body of the enemy's forces was sheltered by the dead angle of the trajectories of our 65-mm. batteries, in position 1500 metres behind our infantry.

The commander of the mobile group asked for the aid of airplanes. A squadron of these arrived on the second day following and dropped bombs along the steep slopes to which the masses of the enemy were clinging. Our troops attacked at the same time; the Moroccans were put to flight, and the position was left in our possession.

If certain limitations can sometimes be overcome, there is one which imposes its tyranny most imperiously in the mountains; the weight of the articles carried and their bulk.

The tactical unit, the battery, must transport its guns, ammunition, subsistence and baggage.

In order for it to preserve its power to manoeuvre, in spite of its impedimenta, it is necessary for the whole load to be broken up into parts and distributed among the pack animals. The longitudinal and lateral dimensions of each load must permit passing along paths on steep slopes and turning sharp corners; these reduced dimensions are known by experience.

The result of this is much greater fatigue for the animals.

The only alleviation of this necessity for pack transportation is changing the load to vehicles when the ground is suitable for this; hauling enables us, in fact, to have the load of several mules pulled by one and to let all the animals rest in turn. However, this process of substitution cannot be extended to all the loads, but it is to be recommended for the artillery matériel, which is, if not the heaviest, at least the hardest to transport.

It is also to be noted that the mules for carrying food and ammunition get a rest when the contents of their bags or boxes is consumed.

For the sake of lightening the burdens of the pack animals, gunners and drivers in the French mountain batteries have been made to march on foot and to carry their own packs, even up to the present.

This exertion sometimes surpasses human endurance, when the man is depressed by successive days of marching and fighting.

It appears that it might be possible to provide two or three take-down two-wheel carts, each transportable on the backs of two mules. On mule trails, the men would carry their packs; as soon as it became possible, the carts would be assembled and used to carry the packs.

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Almost all the post-war reports contain a request for some carts of the araba type for each unit.

The necessity of marching in Indian file greatly increases the length of the columns and the time taken for covering a given distance, experience has shown the number of pack animals that cannot be exceeded without burdening the tactical unit, the battery.

The total load for a battery being carefully made up, weighed and distributed, the number of mules is given by dividing the total weight by the useful weight.

The useful weight is that that can be added to that of the furniture. Depending on the strength of the animal and the nature of the load, the total weight that can be carried by a mule of our French breeds varies between 150 and 180 kg. (330 and 380 lbs.).

Having given the weight of the regulation furniture, about 110 kg. (242 lbs.) is left for the useful weight. Consequently the importance of having light furniture that does not, however, injure the animal, is apparent. Let us give in this connection the weights of several pack-saddles:

French artillery pack-saddle .....	35 kg. (76 lbs.)
Universal pack-saddle .....	33 kg. (76 lbs.)
Schneider pack-saddle .....	30 kg. (66 lbs.)
Hotchkiss pack-saddle .....	29 kg. (54 lbs.)
Tisserand pack-saddle .....	23 kg. (51 lbs.)
Schneider pack-saddle, Greek Army model .....	25 kg. (55 lbs.)
Bulgarian pack-saddle (wood) .....	20 kg. (44 lbs.)
Austrian metal pack-saddle, Scholler system, used by the Bulgarians.....	22 kg. (48 lbs.)
Austrian pack-saddle (Skoda) .....	22 kg. (48 lbs.)
Lefebvre pack-saddle (St. Chamond guns) .....	20 kg. (44 lbs.)
Macedonian wooden pack-saddle for small horses .....	11 kg. (24 lbs.)

The regulation French pack-saddles are strong, easily repaired and cause few sores, but a simple comparison shows the handicap of weight that they have in comparison with others, which, perhaps, are of equally good quality too.

The heaviest loads correspond in general to the burdens that are best balanced on the pack-saddles, that is, those in which the centre of gravity is closest to that of the mule. Example: Load of two ammunition chests of the same weight.

The lightest loads should be those that it is hard to balance well. The gun parts come in this class; when placed on the pack-saddle,

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they produce a play that in the long run tires the animal and makes it sore. Hence it is necessary to arrange them so that they will make

				Mules	Horses	Cartridges
Firing battery	1st section	1st piece	4 gun mules 4 mules for am. chests 2 instrument mules 1 tool mule	11	1	8 × 9 = 72
		2nd piece	4 gun mules 4 mules for am. chests 1 tool mule	9	1	8 × 9 = 72
	2nd section	3rd piece	same	9	1	8 × 9 = 72
		4th piece	same	9	2	8 × 9 = 72
	3rd section (unit of 1st supply)	5th piece	12 mules for am. chests 2 mules	14	1	12 × 18 = 216
First wagon line (supply)		6th piece	same	14	1	12 × 18 = 216
	4th section	7th piece	12 mules cacolets* baggage instruments forge	12	1	
Regimental train		8th piece	10 horses hitched to carts 8 mules material for protection against gas oats food		10	
	9th piece		11 horses pulling 3 carts and 1 transport wagon		11	
Total.....				86	29	720

\* Arm chairs suspended on either side of a mule, used by persons not too severely wounded; the other form is a bed laid at length along the mule's back.—*Editor.*

a good pack, the disadvantages indicated above being reduced to the minimum.

As a supplement to the preceding remarks, we will give a general outline of the composition of the 65-mm. mountain battery that has been sanctioned by experience.

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Such a battery is served by 3 officers, 15 sergeants, 12 corporals and 181 privates.

It is not possible to organize the battalion of mountain artillery according to the type adopted for the battalions of field artillery, three firing batteries and a common supply column for the three batteries.

The supplying of the battalions and batteries of 65-mm. mountain guns is insured by special units called "mixed ammunition sections." These sections compose the second line of supply. Each section of this type transports infantry ammunition, cartridges for the 65-mm. mountain guns, fireworks, spare tools.

It includes two columns, one of pack-mules, the other of draft animals.

Its strength is about 124 men, 35 mules, 92 horses. A repair shop for artillery matériel, called "maintenance shop," having about ten workmen and special equipment, is assigned to each mixed section.

The supply of ammunition is insured by the first line of supply of the battery and the pack-mule column, each of which, as a rule, covers half the distance between the wagons of the mixed section and the firing battery.

### CHAPTER II

#### PART PLAYED BY MOUNTAIN ARTILLERY AND ITS USE

The designations "plain warfare" and "mountain warfare" are dangerous; when taken literally or in opposition to each other, they are too exclusive and too categorical. There is an abundance of examples, and such terminology is to be condemned; thus in France mountain warfare has never been anything but a special case in the great struggles that we have had to go through. However, in the whole range of regions where the ground is broken, there are certain ones in which field artillery would be either incapable of following the infantry or disabled, unable to operate or at the mercy of hostile artillery differently organized. Inversely, mountain artillery transported by pack animals constitutes an artillery that can go anywhere, while still having its place beside the field artillery. In a period of movement, it is a particularly valuable aid to the command, since its organization makes it independent of the roads; its agility in manoeuvring enables it, in fact, to avoid jams at cross-roads and to go around obstacles and torn-up places.

But it may be said that mountainous regions can be avoided and that the decisive part of modern wars is fought in the plains and valleys, great natural highways on which lie the industrial groups, vital centres that each belligerent tries to strike at the same time that he is endeavoring to beat the enemy in the open country.

We can respond to such an objection that one of the aims of war

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is also to prevent the enemy from crossing the frontier, and that these are sometimes mountainous regions in which it is easier to wear him out and stop him. Mountain chains may be strategic bastions and dikes of resistance. Besides, the war may extend its effects to the colonies or into unexpected theatres of operations, unprovided with systems of roads and railways. Did not the mountains of Macedonia, Albania, Transylvania and Cilicia see the appearance of our troops?

Lastly, even in ordinary times, colonial warfare is the cause of expeditions into wild and broken country.

If, from the standpoint of mountain warfare, the matériel (guns, packs, furniture, etc.) must be arranged in a special way, the men likewise must be specially trained, educated and selected. As Pouvillon rightly says, "the mountains depress the weak and exalt the strong."

Officers and men of the mountain units should be mountaineers who are capable of sustaining the fatigues of the march, the inclemency of the weather, and high altitudes; if marching is followed by combat, it is undeniable that they must possess high qualities of endurance and morale.

The author of the article on mountain artillery that appeared in 1852 in Volume VII of the *Memorial de l'artillerie*, wrote:

"We assign to the mountain batteries men born in localities in which the mule is generally employed. The gunners must be hardy and of high enough stature to be able to load the mortar on the pack. The drivers should be trained in marching, accustomed to driving mules and familiar with the care of these animals." The principles of such recruiting are still to be respected.

It was on the basis of these principles that France, Italy, Austria, Japan and some other countries long ago established special corps for which the recruits were carefully selected. These corps had, from their establishment, been given training and armament fitting them for their rôle of mountain warfare.

The dash and the esprit de corps of our Alpine troops are celebrated, and rightly so.

When this selection disappeared, the efficiency became less; after having observed this, the author of the article entitled "Artillery in the Operations in the Orient in the Fall of 1918,"<sup>5</sup> wrote: "The men for mountain artillery must be specially selected and trained. This is true for all times, though the scarcity of men has not always allowed us to respect this truth."

The Germans, obliged to create mountain units for their fronts in Serbia, the Carpathians, etc., were greatly disappointed in regard

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<sup>5</sup> Articles published in the *Bulletin des renseignements de l'artillerie*, number for August-September, 1919.



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to this. The author of the article "Die Gebirgsartillerie" (Mountain Artillery), which appeared in the *Artilleristische Monatshefte* of January 15, 1922, writes:

"The replacement of the men in the mountain artillery caused very serious difficulty. The replacements were not selected with enough care from the physical standpoint, and it was impossible to train them sufficiently for service in the mountains. The bond between the gunners of the batteries and the replacement personnel was loose. These faults led to an extraordinarily large loss among gun crews, who could not stand the hardships of the front, and partly also bad feeling among the replacements. In certain units, the number of men sent back from the front amounted to from 50 to 75 per cent. of their strength, beside the losses caused by fire."

On all fronts on which French units of mountain artillery appeared, they acted with their usual honor and successfully performed the tasks entrusted to them.

The reading of the war diaries of our regiments of mountain artillery is particularly instructive in regard to this. These are the principal theatres of their exploits, briefly summed up:

Alsace (August, 1914): Capture of Belmont, Raon-l'Étape.

Lorraine (1914): Fights of Demptal, Clezenteine, Seranville, and Vallois, where the batteries supporting the Fifteenth Division stopped the enemy's advance.

The Vosges (August, 1914): Defiles of Bonhomme and Journaux. The Sixth Battery of the First Mountain Artillery Regiment held the Honneck and stopped the enemy, who was trying to advance by the Schlucht defile. The First and Seventh Batteries delayed the march of the enemy at the Hautes-Huttes, and the Weistein defile and stopped it at Rosenberg.

September, 1914: Fights of Hautes-Huttes, defile of Loulbach and Roseling; fights of the Garde Forest, Censes, Batrimoutier, Noix-le-Prêtre, etc., in the course of which the enemy was driven from the valley of the Fave to beyond Provencheres.

October, 1914: Actions of the peak of Violu.

January, 1915: Hartmannsweilerkopf, loss and recapture of Reischackerkopf and the Bärenkopf.

June, 1915: Capture of the Braunkopf and of Metzeral.

July and August, 1915: Strong attacks on the Lingekopf.

Woëvre: Flirey sector.

Argonne (1914-1915-1916): The mountain batteries were used there as accompanying batteries and were given firing duties at short range or for enfilading fire. They performed wonders at the Four de Paris and at Vauquois on objectives that escaped the fire of the field artillery.

Champagne (September, 1915): Six batteries were used there as accompanying batteries and suffered severe losses.

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Verdun (1916): Twelve batteries arrived and occupied numerous positions at Tavannes, Bras, Fleury, Saint-Michel, Mort-Homme, etc. The curved fire of the guns was utilized to the best advantage for sweeping the lowlands. The batteries participated by intensive fire in a number of barrages and by enfilading fires on ravines or on troops marching to the attack.

A single battalion fired 80,000 rounds in a few weeks. On July 15, in the attack on Fleury, one piece was sent forward to use direct fire; the enemy was surprised and gave way; the mission was performed and the infantrymen applauded. On July 4th, Laplanne's battalion, composed of batteries of the First and Second Mountain Artillery Regiments, destroyed a Boche battalion on the slopes west of Douaumont. In the attack of December 15th, a battery started out with our infantry and got as far as the Helly Ravine, where it fired several times.

Aisne: One battalion of the Second Mountain Artillery Regiment took part in the attacks on the Chemin des Dames on April 17th. The batteries started out behind the infantry. Only certain guns succeeded in directing enfilade fire on the trenches, without much success. The losses were serious.

Dardanelles: Some batteries were placed in the front line and took part in all the attacks.

Army of the Orient (1915): Advance and retreat of the batteries accompanied General Bailloud's division, which came to the aid of the Serbians; affairs at Demir-Kapou, Guevgueli, Bogorodika, Smoll. Numerous operations on the Macedonian front in 1916 and 1917. In the spring of 1918, some units played a brilliant part with the Greek army in the taking of Skra and Liegen. In September 1918, they played a star part in the pursuit of the Bulgarians after the breaking of the Macedonian front.

Italy (November-December, 1917): Groups of mountain artillery helped to dam the Austro-Boche advance on the Piave, at Mount Tumba, at the Grappa range. With the other units of the XII Corps, they kept vigilant watch and then participated in the general offensive that brought about the Armistice.

Syria-Cilicia: Batteries formed part of all the columns and played an important part in the fighting; let us cite the following affairs, from a number of surveillance and reprisal operations; combat of Tel-Kala (December, 1918), to relieve a battalion of zouaves; affair of Marache, in which a battalion of the 412th Infantry Regiment was relieved (February, 1919); a column of Merdj-el-Ayoum (Valley of the Jordan), combat of Mtelleh (January 7, 1920); Debievre column (January, 1920), combats of Harine-el-Hammen and the environs of Antioch; Andrea column that relieved Aintab, combat of Ratjou (April 11th).

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End of April, 1920: In the valley of the Euphrates, combats of Djerarblousser, Arab, Poumard, Serour and the defile of Urfa.

May 28, 1920: Combat of Bozanti (Cilicia).

June 28, 1920: Capture and loss of the post of Tel-Klerad.

July, 1920: Combats in the environs of Jaffa.

August, 1920: Battle for the possession of Aleppo.

The manœuvring qualities of our mountain artillery units are brought out by the author of the article already quoted, which appeared in the *Bulletin des Renseignements de l'artillerie* of September, 1919:

"The mountain battalion of the artillery of the 17th Division (3rd of the 13th Mountain Artillery Regiment) took up the pursuit on September 15th and continued it until September 22nd, in close liaison with the Timok division. During this time, the group executed by platoons numerous fires for silencing machine guns, counter-battery (two fires at 5000-5500) and sprinkling of woods occupied by the enemy's rear-guards.

"The movements of the batteries were generally made by platoons. Advancing at the same gait as extremely eager infantry that was specially trained for marching, was difficult.

"The mountain battalion of the 122nd Division (5th battalion of the 1st Mountain Artillery Regiment) took up the pursuit with the 1st Yugoslav Infantry Division, continued it with the 21st Serbian Infantry Regiment and ended it on the 30th after sixteen days of forced marches by day and night and after going into battery numerous times, in particular at Sokol (altitude 2000 metres). The longest march was 70 km. in twenty-four hours.

"During these hard marches the battalion lost one-tenth of its number of animals; one-quarter of its number was temporarily unfit for duty *because of bad sores due to the packs.*"

From the tactical standpoint, the use of mountain artillery was not always that provided for by the pre-war regulations.

With regard to the character of operations in the mountains, the Regulations of November 14, 1912, were worded as follows:

"It will frequently occur in mountain warfare that the battery of four pieces will be divided into two platoons, each having a separate mission."

This idea was based on experience gained in colonial wars; it also laid great stress on the limitations imposed by the mountains. The adoption of the rapid-fire gun had caused the acceptance of the principle that it is preferable to employ a few guns abundantly supplied with ammunition rather than a large number of guns scantily supplied.

In consequence, the autonomous platoon of two guns had been created and its use was the ordinary practice. While such a unit is, in the colonies, more easily handled and more supple, in better proportion

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to the amount of ammunition that a column can transport, this is no longer the case in theatres of operations in which two adversaries are fighting who are abundantly supplied with artillery. Under the influence of events, the necessity for concentrating fire led us to unite mountain batteries in groups of some size; they formed divisional artillery, assigned to chasseur divisions on the same footing as the field artillery units. When circumstances required, the mountains themselves were conquered. On the other hand, the subdivision of mountain artillery units remained the rule in certain sectors. At other times, mountain artillery units were given the mission of accompanying the infantry to the attack.

The reports of the participants as to the lessons to be drawn from the war unanimously condemn the duty of acting as accompanying batteries and the abuse of the practice of subdivision.

Accompaniment of infantry under fire always remained fruitless and cost terrible losses.

Subdivision of the units is perfectly admissible in special cases, when it comes to defending the flank of an advanced line, a crossing, a position, for example; the mountain guns, thanks to their reduced dimensions, can easily be placed in small casemates or among inequalities of the terrain.

Apart from this case, subdivision is not to be generally used, because it involves grave disadvantages; weakness of fire, difficulty in liaison, embarrassment to the commanding officer.

Lastly, one other argument condemns the duty of acting as accompanying batteries and the exaggerated parcelling out of the mountain units; the death of a mule belonging to the gun delays or prevents the arrival of one of the parts of the gun at the position, so that one whole piece is useless and does not take part in the action.

If any other cause puts one or two pieces out of action the work of the whole platoon quickly becomes useless.

From the technical standpoint, the firing missions that devolved upon our mountain batteries were, in general, the following: Barrage, accompaniment, neutralization, harassing, and enfilade fire.

The only destructive fire in which they could coöperate was that against wire entanglements. However, the frequency of destruction fire became ever greater; each side, because of the power of artillery fire, strove to utilize irregularities of the terrain to the best advantage and to protect itself as much as possible, in the mountains as well as on level ground.

But destruction requires a powerful projectile, fitted with a delay action fuse, striking the objective at a high angle of impact and with the greatest possible power of penetration; the latter depends on the remaining velocity and the weight of the projectile.

As we shall see in detail in the study of the gun, the mountain 65-mm. is not built for such work; enemy guns, such as those of the

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Austrians, have shown themselves much better suited to it. In the post-war reports, our mountain artillerists deplore the fact that the efficiency of their guns was so limited in the way of power (range and efficiency of the projectiles). On stabilized fronts, it is true, heavy guns came to the support of the mountain artillery; thus it is that even 370-mm. mortars coöperated in saturating the Hartmannsweilerkopf position.

In a period of stabilization, there is no effort that cannot be made to deck the crests and the steep-sided ravines with powerful guns. In the course of time, railways, roads, and telpheric systems<sup>6</sup> are constructed and mechanical means (tractors, caterpillar vehicles, etc.) are made use of. The Italians accomplished wonders along this line, even in Macedonia and Albania.

On the other hand, mountain artillery regains all its advantages in a period of movement, particularly in broken country. In order that its efficiency may then reach the maximum, it must, while maintaining its manœuvring qualities, be armed with powerful guns that will enable it to perform properly all the firing missions that are given it and to make the most of opportunities to destroy the enemy. It will not be enough for the projectile to be efficacious; the artillerymen must have the means for sending it a long distance. This brings up the question of range, which we shall consider later on. Lacking such a gun, our artillerymen often regretted that they could not exploit favorable situations or get the desired results.

However, they cannot be accused of not having been equal to their tasks, for they always made the most of the qualities of the mountain 65-mm.: lightness, ease in handling, wide horizontal field of fire,<sup>7</sup> and rapidity of fire, the inadequacy of the guns in the way of power was thus compensated for by the merits of those who served them. But still these latter feel a certain bitterness. Backed up by their experiences in the war, they do not hesitate to ask for guns and methods of fire that will allow them to act with efficacy and to solve the following problems:

- (a) Firing with precision;
- (b) Securing effects at long ranges (power);
- (c) Sweeping the terrain by means of high angles of fall, with close-up action on the terrain in the dead angle of the covering mass.

These are the problems that we are now going to take up.

*(To be continued.)*

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<sup>6</sup> See the article on aerial cableways in "Genie civil," numbers of November 20 and 27, 1920.

<sup>7</sup> The horizontal field of fire of the 65-mm. corresponding to the traverse on the axle is only 100 mils, but changes of target are made with very great rapidity by means of the following manœuvre, which is permitted by the lightness of the gun, 4 men raise the wheels and turn the gun around, with the trail-spade as a pivot.

## OVER SIGNAL MOUNTAIN, FORT SILL, OKLAHOMA, WITH A MOTORIZED BATTERY OF FIELD ARTILLERY

[EDITOR'S NOTE:—*With the advent of the motor and its application to field artillery draft, difficult and varied have been the problems requiring solution. Not the least of these problems has been the proper care and driving of the tractors while on the march. Many a truck and tractor has gone off the road, held up the column or necessitated towing in for want of properly trained personnel.*

*As an example of what may be expected from men who have received thorough training, the following account, based upon the report of Captain Albert E. Higgins, Field Artillery, of a recent practice march made by a provisional motorized battery of 75-mm. guns under his command, should prove of interest to our readers.]*

One of the departments of the Field Artillery School at Fort Sill, Oklahoma, known as the Enlisted Specialists School, has for its object the instruction and training of selected men sent there from the field artillery arm of the army. This school is subdivided into courses, each one of which is designed to fit the student for some special duty in connection with his profession. The Motor Section has for its purpose the instruction and training of motor mechanics in all that pertains to the repair and operation of motor vehicles.

The Motor Section of the Enlisted Specialists School, during the course of instruction, rebuilt twelve five-ton artillery tractors. These tractors were received by the School in all stages of disrepair and thoroughly overhauled as a part of the regular instruction in the shops of the Field Artillery School. Upon completing the shop course on these machines, a thorough schedule of road marching and march discipline was carried out, and the tractors driven with loads under as near field conditions as possible.

January 11th, a provisional battery of 75-mm. matériel was formed with the students as drivers, and the men taught to handle and take care of their machines while on the march. All parts of the Fort Sill reservation were visited, including Dodge Hill, Chatto Ridge, Medicine Bluffs and Cache Creek; in fact everywhere hard going, difficult hills, or bad fords could be found.

During this period of training the road speed of the leading tractor was limited to three miles per hour, stress being laid upon the fact that this must not be exceeded. The average distance marched was from ten to twelve miles per day.

## OVER SIGNAL MOUNTAIN WITH A MOTORIZED BATTERY

Approximately three hundred and forty miles were covered by the battery without a single case of serious trouble. The battery commander states: "The only trouble of any kind has been a broken fan-belt and one broken steering clutch spring-lock."

At the conclusion of this test it was decided to climb Signal Mountain (elevation approximately 1740 feet), which, as far as was known, had never been attempted by a battery of field artillery.

In connection with what follows it should be noted that the tractors and equipment used were not especially groomed or built up for the trip, but had been in service as stated above.

The first trip over the mountain was made February 27, 1922. All twelve tractors were running smoothly; ten were pulling the 75-mm. guns and caissons, and two were running light. One of these carried the repair matériel consisting of jacks, blocks and tackle, heavy pinch-bars, etc., for use in case anyone "fell off the mountain."

The battery left the motor park at 10:00 A.M. and arrived at the base of the mountain, six miles distant, at 12:10 P.M.; one halt of five minutes' duration being made at the end of the first hour's march. It is interesting to note that the rate of march prescribed (three miles per hour) was very well maintained.

After a half of an hour for the noon meal, the climb commenced at 1:00 P.M. The route traversed to the summit was approximately one and one-quarter miles, with a descent of three-quarters of a mile on the other side.

The trail up the mountain is very rough in places, of a rock formation, and, on the worst slopes, of a loose gravelly nature. Some fear was felt that the tracks would slip in this sort of going, but such was not the case. At one place on the ascent there is a rock pass (see photograph) which is quite narrow, rough and with very small clearances, the passage of which required skillful driving to avoid trouble.

The last rise to the "Blockhouse" is very steep and rough, with loose gravel. The photographs do not begin to give an idea of how very steep it actually is. There is but one place where it is possible for a vehicle to pass the Blockhouse and the clearance there is very small. The Pass is guarded at the top by a large rock, which if struck would undoubtedly put that side of the tractor out of the running. The drivers, in addition to having to make a very bad hill, had also to "shoot" pretty straight in order to get through without hitting the rock or getting into trouble.

All tractors made the climb in low gear, and were ordered to keep a distance of five yards between vehicles. The leading tractor and gun reached the Blockhouse located at the summit at 1:35 P.M., and the last tractor passed this point ten minutes later. All tractors

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functioned perfectly and showed immense reserve power on the worst slopes.

The face of the mountain upon which the descent was made is very steep, rough and rocky. The guns and carriages skidded badly from time to time, but otherwise no trouble was experienced.

After passing the top of the mountain the descent is gradual for only about one hundred yards, when it becomes quite steep, the slope being rough and covered with loose rock. The tractors looked like so many flies crawling down a wall. It was at this point that the guns and carriages skidded badly.

A halt of ten minutes was made upon completion of the descent for the purpose of looking over the machines and equipment, after which the march was resumed and the battery reached park at 5:00 P.M., without any incident worthy of note. All tractors were in good running order and ready to make the trip again.

The distance marched, including the climb over the mountain, was seventeen miles, and was made in five hours and thirty minutes.

The battery made a second trip on March 7th, for the purpose of obtaining a series of photographs, some of which illustrate this article. No photographs were taken on the first trip on account of the weather, which was very bad; a dark cold day with a gale blowing, and slight mist or rain.

The second trip was identical with the first, except for weather, no trouble of any kind being experienced and every tractor functioning perfectly. This second trip was made in a little better time than the first, as no stop was made at the top of the mountain for reconnaissance as on the first trip. The climb over the mountain being made in an even hour.

It is interesting to note that the distance of about five yards (see illustrations) was maintained by all vehicles without the slightest difficulty throughout both trips. The rate of march of three miles per hour for the leading tractor, however, necessitated the rear one running from four to five miles a good part of the time. It is this comparatively slow, even road speed that makes for success; high speed cannot help but break down the machines.

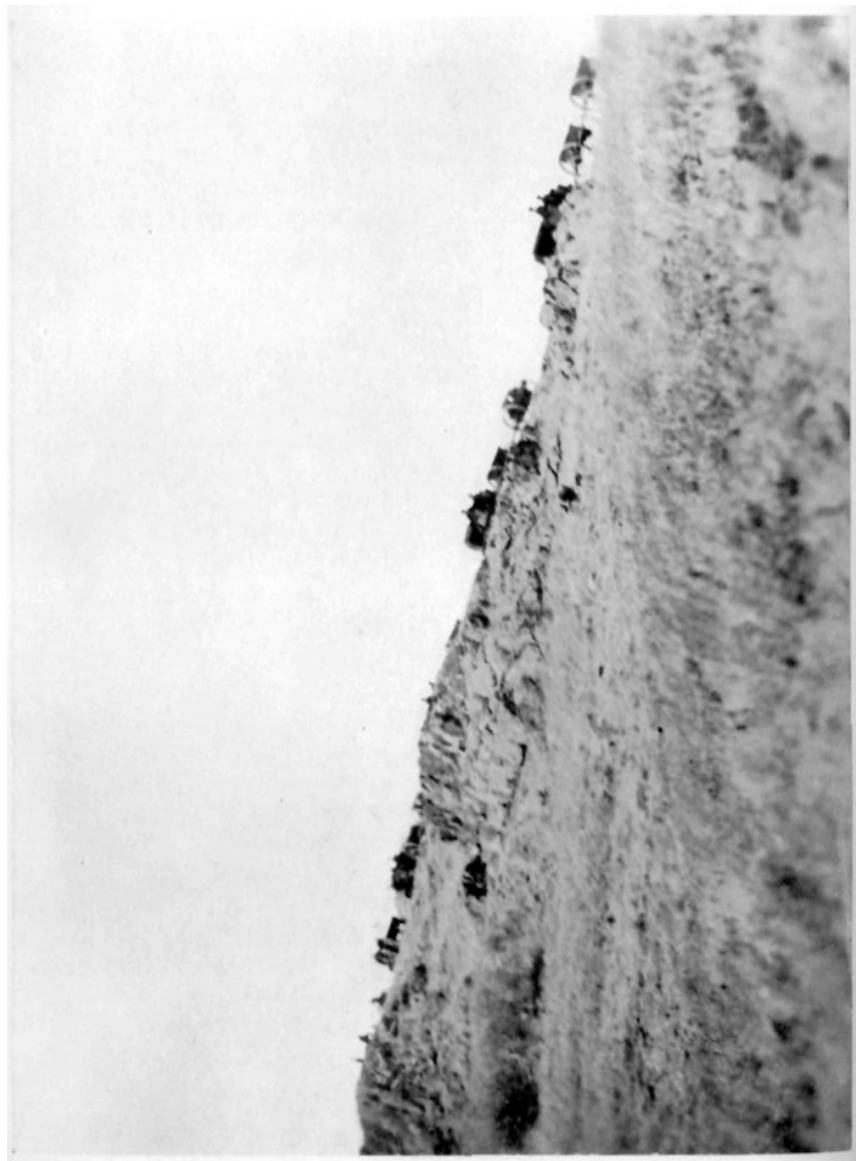
During all the marches made by this provisional battery, not a single machine dropped out of the column due to trouble of any kind; all of them were out the day following each of these climbs, marched the prescribed four hours about the reservation, and have been out on the road every day since.

In conclusion, Captain Higgins states that these tests furnish interesting proof that the tractors will give excellent service if the rate of march is kept down, and they are properly cared for as to lubrication and daily maintenance. No cases of stuck track or track





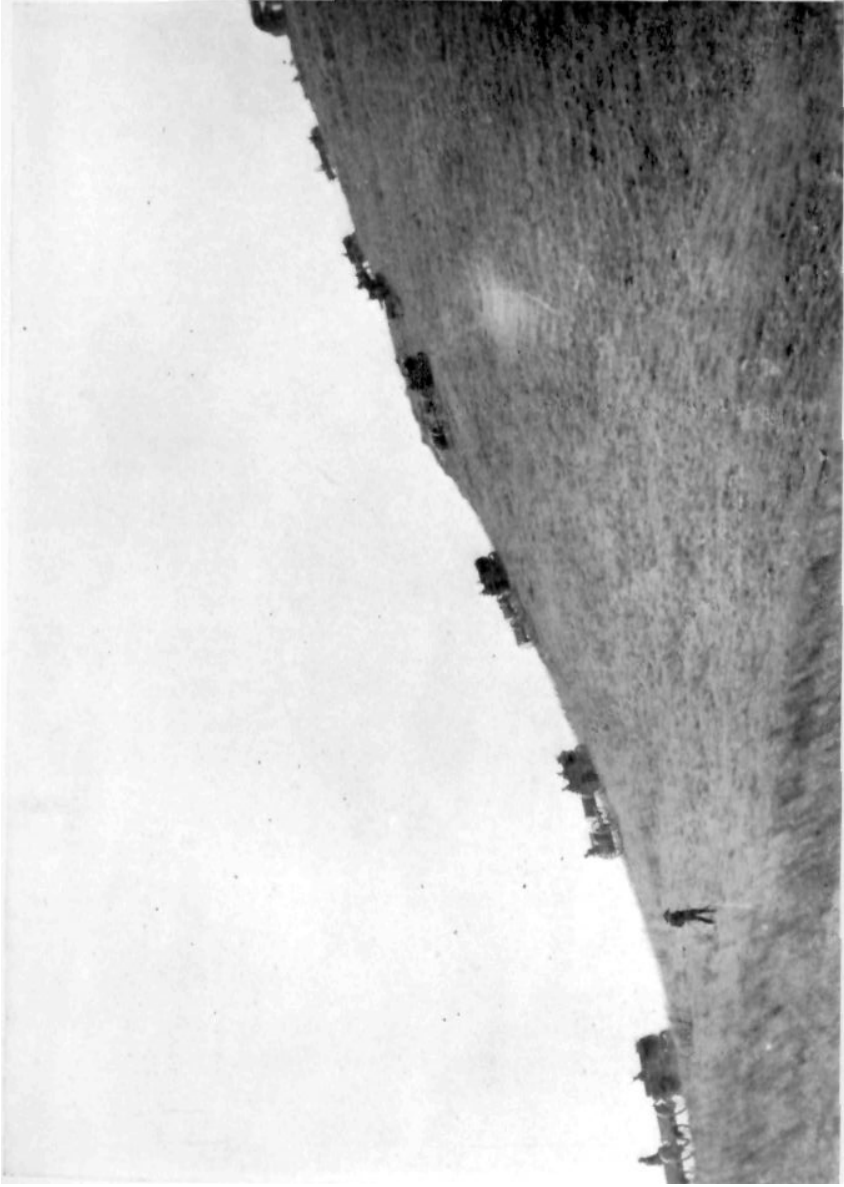
ON THE ASCENT.  
Note tractors coming up over lip of hill at right of photograph, giving some idea of steepness of slope. Distances well maintained.



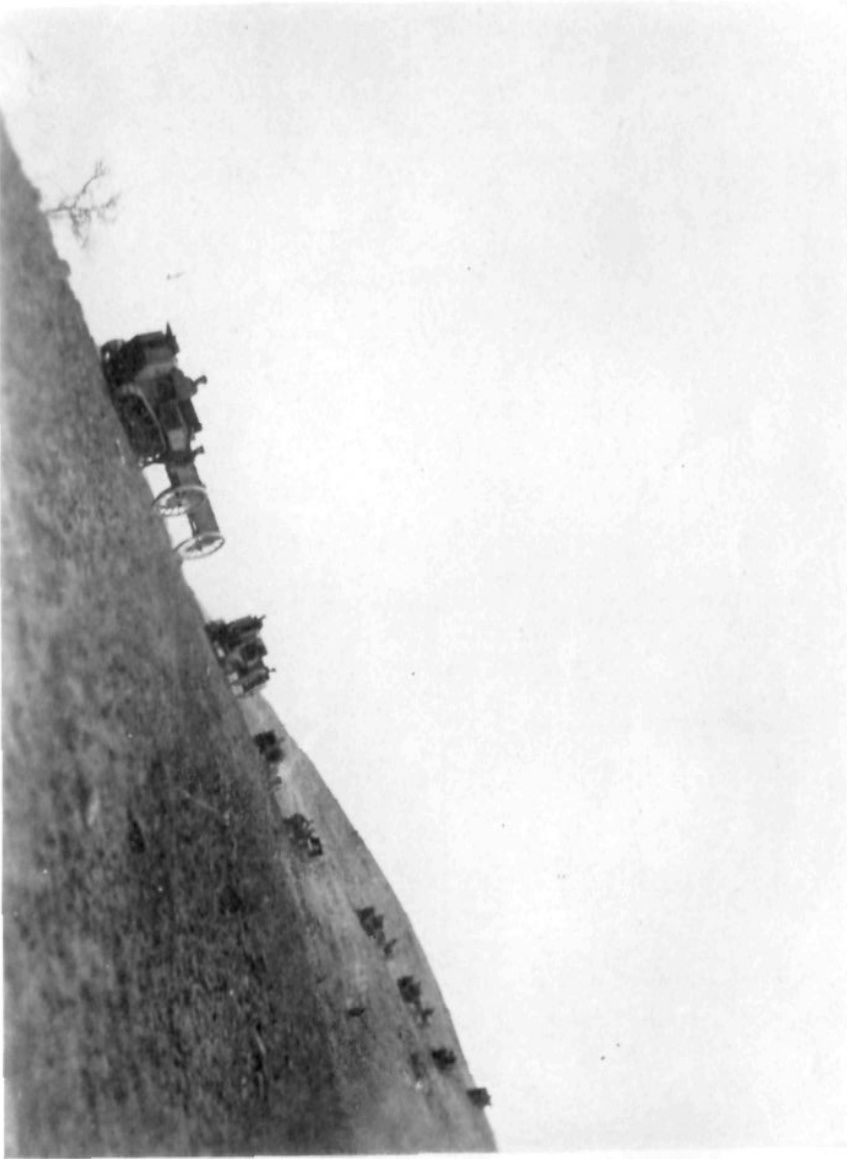
A difficult, narrow rock pass near the summit. Formation still maintained.



ANOTHER VIEW ON THE ASCENT.  
Rear of battery approaching the summit.

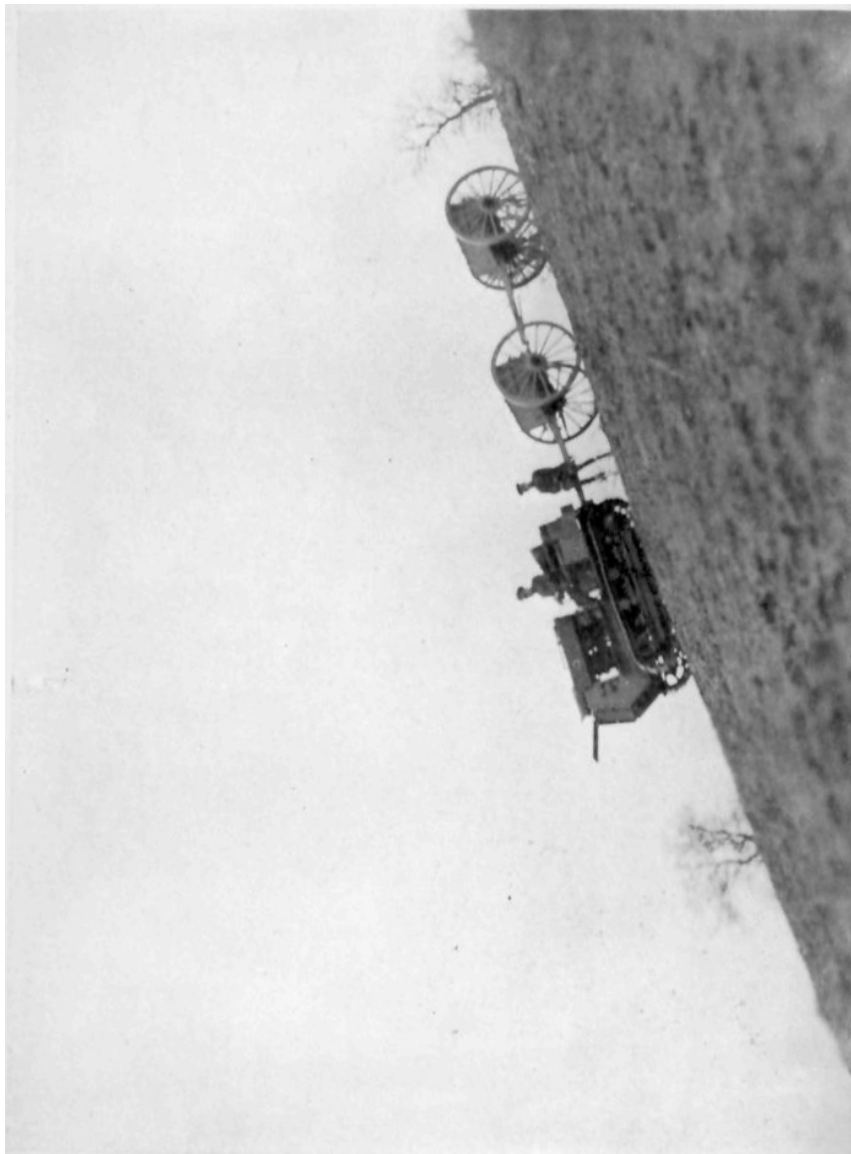


**ON THE ASCENT.**  
Photograph shows distances well maintained even on this difficult slope. View shows middle of column, leading elements have already passed over the top.



THE DESCENT.

Battery descending the mountain just after leaving the Blockhouse shown in other photographs.



TRACTOR AND CAISSON ON THE DESCENT.

It was necessary to have a cannoneer ready to shut off gasoline from supply tanks to prevent flooding of the vacuum tanks.

## OVER SIGNAL MOUNTAIN WITH A MOTORIZED BATTERY

rollers occurred at any time; in fact, these tractors have given a well-nigh perfect performance at all times.

The men who are driving them, who rebuilt and take care of them, are all enlisted men sent to the School from the different field artillery organizations throughout the service for instruction in motor mechanics. This work is part of their regular course of instruction.

The illustrations accompanying this article were selected from a series of photographs which form a sort of continuous picture of the climb. No halt was made in going over the mountain on the second trip, so that the different views show at all times the positions of the tractors and carriages during the entire march, the photographer taking a picture then running ahead to get another.

# EVOLUTION IN OFFENSIVE METHODS\*

LECTURES TO SWISS OFFICERS  
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## PART I

### EVOLUTION IN OFFENSIVE METHODS

THE operations of the last war examined as a whole might be classified into two relatively short periods on the western front of open warfare divided by a much longer period of static warfare. Distinct as they appear at first sight it must not be thought that in each one of them the aspect of the struggle remained constant; on the contrary there was frequent change in the doctrine and technique, the objectives of attack and their method of execution, the tactics of attack as well as the armament of the troops. All these factors have never ceased to develop, gravitating around the old principles of war, which do not change, and the reason? Simply that the war took place at a time that was particularly fruitful from a scientific and industrial point of view. One may say that each month and almost each day brought some new invention into being in the realm of chemistry and physics.

But the newly discovered weapons only kept their value for a limited period, that which the enemy needed to find the antidote and construct the necessary means of defence. For which with rapid modern industrial development a few months sufficed.

This partly accounts for the rapidity with which the minor tactics changed.

It is in this way that we saw the revival of all the weapons of antiquity (even including the catapult and arbalest) whilst at the same time artillery continually extended the limits, the variety of its calibre, its range and the power of its guns. We have revived the grenades, flames and liquid fire of the Middle Ages, and at the same time we have made use for gas shells of all the latest inventions in chemistry. We have developed to the utmost the defensive organisation of the ground, adapting concrete and all the developments of permanent fortifications to Field Work and at the same time we have reintroduced all the details of ancient siege warfare.

And finally we ended the war, as we began it, that is to say without a strand of wire entanglements, without a trench, and almost entirely with the aid of our 75-mm. gun.

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\* Reprint from *The Journal of the Royal Artillery*, March, 1922.



## EVOLUTION IN OFFENSIVE METHODS

The object of this lecture is in fact to explain in a general way the evolution of our methods of warfare and more especially of our offensive tactics, during this war; to point out particularly how in the French Army as well as in the German Army, this evolution was directed more and more towards "the effort to obtain surprise," and finally to show how during the course of this rapid evolution, the ever changing problems confronting the Artillery were dealt with in the never ceasing struggle between gun and armour.

*The Problem of the Break Through.*—The last war brought to grips, not only armies of limited strength but nations in arms, who threw into the struggle their whole resources in men and material; this great accumulation of resources thrown into action resulted in an ever increasing extension of the battle front beyond previous experience. Each adversary sought the necessary space for manœuvre with a view to outflanking the wing of the other and their fronts were extended from the sea to Switzerland and where two insurmountable obstacles were found for flanks to rest on.

On the other hand, fire power, which from the beginning was a revelation to all, soon assumed gigantic proportions, as much in the perfections effected in weapons in use as in the new weapons continually appearing. In the face of this *powerful force*, to which the only immediate and possible *resistance* was "fortification," troops went to ground, and it was thus that after the first few months of the campaign, open warfare gave place upon our front to a true war of siege and position. The "Froot" was born and static warfare commenced, a war of engineers rather than soldiers, a murderous inchoate period of stagnation when the problem of the "break through" tended to dominate all others.

During these three years, it was in vain that the two adversaries sought by repeated offensives to effect the "evenement" in the Napoleonic sense, that is to say the demoralising blow, which would threaten the enemy lines of communication and force him by threat alone to retreat or be defeated.

As there were no more wings and no more flanks, it was sought to create them by frontal attacks.

This then was the aim of all offensive actions during three years; break through the enemy front, break through sufficiently rapidly and effect a sufficient gap, that the enemy should be unable to mend his line in the time needed to imperil his communications.

Up to 1918 both sides had failed, and the old axiom of Napoleon, "The Breach once made, the equilibrium of forces once broken, all else becomes useless" was at fault. Why?

1. Because where the break through was effected it was *too narrow*, it could not be enlarged step by step as in open warfare, either because the means were lacking when the work was to be done,

## THE FIELD ARTILLERY JOURNAL

or perhaps more because on account of the close intersection of defensive works and the power of resistance, their defensive organisations permitted the enemy quickly to limit the effects of a local reverse.

2. Or because before the complete break through on the first line of positions, the enemy withdrew and was able to retire upon other prepared positions to the rear, which permitted him to shorten his front and to put up again an effective resistance. And then all had to be begun again; for each new position fresh and methodical preparations were necessary for regaining touch, for reestablishing the state of siege on the old principles, and with the same delays.

A close study of the principles on which our great offensives were based, and the main instructions which showed their various stages, will carry conviction that our higher command were not blind to these considerations.

*The Experience of the First Winter (1914-15).*—During the first winter of the period of stabilisation we undertook petty local actions as much for maintaining the offensive spirit of the troops as to wear down the enemy. On account of the mediocrity of our resources in artillery and the inadequacy of our munition supply, these actions were usually confined to very small frontages (often only of battalions) and of which the result was often the bare capture of a few observation posts.

Nevertheless one of them carried out in Champagne between 15th February and 8th March, 1915, assumed the importance of a veritable battle, as much from the size of the forces engaged, as by the duration of its development. Although eventually it attained appreciably material results (ground gained, prisoners, enemy losses) it had no influence upon the general trend of the operations. There was no doubt about it. The fact was approved and had to be admitted. Infantry was entirely powerless before barbed wire obstacles covered by machine-gun fire, and to hurl it against positions intact was a useless sacrifice.

It is true that preliminary attempts had been made previously to disorganise these positions, by preceding these attacks by an artillery bombardment, which however, was reduced to a very short duration, partly for the sake of economy in munitions, and partly to produce surprise effect. But the assailants themselves had been the first to realise the inadequacy of this shortened artillery preparation.

Hence it was impossible to go on fighting thus with men against material, and to waste our strength in local engagements which, though indeed glorious, were too small to bring about a decision.

What was necessary was to force the enemy to retire beyond our frontiers, and to that end to break his front, and through the gap thus produced to pass sufficient troops able to so manœuvre as to take his defensive lines in reverse whilst the cavalry pushed on over unfortified

## EVOLUTION IN OFFENSIVE METHODS

country up to the great railways which fed his armies. To arrive at this result our higher command concluded that<sup>1</sup> it was necessary first of all to plan operations more methodically and more in accordance with the conditions of the new forms of war, and to this end not to attack except after carefully organised preparations, to abandon isolated attacks which were more costly and less productive than a concerted attack. Secondly, to attack on as broad a front as possible. To endeavour to utilise the factor of surprise by mounting operations with suddenness and speed; to precede these attacks by long and detailed artillery preparation designed for the destruction of the elements of the enemy defences. Finally, to endeavour to exploit successes by the pushing in of reserves held in readiness. These were the principles on which the Memorandum of the 19th April, 1915, on "the object and the conditions of a concerted offensive action," was based, a Memorandum which in truth constituted the first complete document laying down the whole as well as the details of the conditions of the new method of attack—a method which was going to be inaugurated by the master-stroke of the 9th May, 1915, in Artois.

### *The Year 1915. The Battle of the 9th May in Artois*

The higher command had decided that an offensive of great extent was to be undertaken, in coöperation with the British Army, by the 10th Army in the direction of Lens. Chiefly with the object of pinning down large German forces on our front and thereby assisting the work of our Russian Allies on the Eastern Front.

The General who commanded the army corps entrusted with the principal task was in a word General Petain, who was one of the first to discern that misguided force would lead to nothing, and that under new conditions it was necessary to employ new means and new methods. Under his direction the operation was prepared for a period of three weeks with minute care:

(1.) The artillery preparation properly so-called, hitherto conducted without method and without accuracy, was controlled by a detailed programme. The destructive bombardments were supervised and observation of shoots scrupulously carried out. This lasted nearly six days.<sup>2</sup>

(2.) The preparation of the battle area was an innovation: The assailing troops, square with their objectives, attacking from jumping-off trenches, pushed up to start with, to about 150 metres from the enemy, would only have to cover a minimum of open ground. Reserves and supports were kept sheltered in special assembly trenches.

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<sup>1</sup> Extract from Notes issued by G.H.Q. in February and April, 1916, notably Memorandum of the 10th April on the protection of attacks.

<sup>2</sup> The intention was four; it was extended to six on account of the weather.

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A vast network of communication trenches both "up" and "down" connected the assembly and the reserve trenches with dumps of munitions, rations and tools, and with aid-posts.

(3.) The artillery had pushed its gun positions as far forward as possible; its changes of position were pre-arranged and its communications with the infantry were made certain of.

(4.) Finally, the forces employed were of some magnitude: 3 army corps and 350 heavy guns attacked on a front of 15 kilometres.

On the 9th May there was a brilliant success: In a few hours our assaulting waves swept over the enemy positions on a frontage of 6 kilometres to a depth of three kilometres; the enemy front was pierced. But this almost un hoped for success outran our foresight, and could not be thoroughly exploited on account of a lack of reserves ready to hand at the critical moment. The enemy had time to stop the breach.

This operation led to the following conclusions:

- (1.) The piercing of the enemy line was possible.
- (2.) The operations must be organised and prepared in the greatest detail.
- (3.) If it succeeds the success occurs with such speed that it is necessary to have brought up beforehand, in direct contact with the attacking army corps, the force that is detailed to exploit the success.
- (4.) It must be carried out on a big front, so that the enemy will not be able to rake the attackers with the cross-fire of his artillery.
- (5.) A long and accurate artillery preparation is necessary to make certain of the destruction of enemy defences. A makeshift attack with a short preparation against a fortified area is doomed to certain failure.
- (6.) Finally, progress is more assured over open ground than in close or inhabited country; strong points formed of villages being particularly difficult to attack under the limited power of our artillery support at that time. From this time onwards we shall see a constant evolution taking place in our offensive methods. From this month of May, 1915, in which the genius of a great foot-soldier, General Petain, crystallised for the first time the pattern of the "break-through" battle of which the successors were only variations, one may say that each of our great offensives has marked a stage of these developments, and from each of these our higher command has learnt fresh lessons and drawn new conclusions.

In this way from year to year there appeared those notable instructions of our G.H.Q. on the offensive, instructions which were,

## EVOLUTION IN OFFENSIVE METHODS

however, only in force for a short time, since it sufficed for the introduction of a new weapon, a hitherto unknown method of tactics, either invented by us or our adversaries, for this entire edifice to crumble.

*Champagne, September, 1915*

Use was made of these lessons, and for three months the experience gained was utilised in perfecting the detailed method. This time an operation of much greater extent than the preceding ones was involved. We did not only reckon on a tactical success, but the breaking of enemy lines on such a front that we would be able to push through into open country masses of cavalry followed by several army corps. The most favourable country appeared to be the plain of Champagne, a region where a rapid advance was unlikely to encounter many natural obstacles. But the difficulties were not less great on account of the multiplicity of defences built up by the enemy, owing to successive positions which it was proposed to carry by a single assault. Further, the second position, 5 or 6 kilometres in rear of the first, was particularly difficult to deal with since it was sited on a rear slope which was completely hidden from the view of our ground observers. General Petain, promoted to the command of an army, was to carry out the operation with 30 infantry divisions and 7 cavalry divisions, supported by 1200 75-mm. guns and 850 heavy guns on a front of 25 kilometres from the Main de Messiges to the village of Auberive. This formidable operation was moreover coördinated with the Franco-British offensive in Artois and to be supported in case of immediate success by the 5th French Army between Craonne and the Aisne.

Every condition which promised success had been utilised: The attacking infantry divisions had been rested and trained in a back area for several weeks; every measure had been taken to bring out the factor of surprise by the concealment of preparations, by the distribution of false news, and by abnormal activity on fronts other than those of the attack, etc. Instead of the few assaulting waves of the month of May, the attacking troops were disposed in depth to a very considerable extent; in each attacking sector the army corps of the first line was backed up by another in reserve, whilst the front army corps itself only put a division of infantry into the front line. Instead of close objectives, distant objectives had been assigned to the troops, to such an extent as to go beyond the entire system of German organisation for defence. In a word, the infantry was asked to go as far as possible. Briefly, great results were hoped for, and rightly so; three-quarters of the French forces were to be engaged with a support of 2000 heavy guns and 3000 75-mm. guns in this general offensive of September. The attack was launched in Champagne

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on the morning of the 25th September, but in spite of a complete initial success, in spite of the capture of considerable areas of ground and the taking of 15,000 prisoners and 100 guns, by that very evening the attempt to break through had failed, and the operation did not give the results hoped for because the execution itself was at fault:

(1.) The prolonged assault that the troops were called upon to make was not everywhere carried out with calmness and method, and after an irregular advance of three or four kilometres, certain units were completely disorganised, comprising only a gang of men who had lost all tactical cohesion, and at the mercy of the smallest counter-attack.

(2.) In consequence of the disorderly form taken by the attack, the close liaison between the artillery and the attacking troops was but very imperfect in spite of all the preparations taken to that end. And so this great lesson was evolved by General Petain, commanding the second army. One must henceforth make up one's mind to subordinate to the infantry during the attack, the action of the supporting artillery.

(3.) In consequence of the lessons of Artois, the army reserves had been brought up into close contact with the assailing troops, whom they followed automatically. Hence they came under the same murderous bombardments, suffered heavy losses, and having no elbow-room, were incapable of manœuvre.

(4.) Artillery preparation against the second position on account of the distance could only be carried out by the long-range heavy guns; the observation of the shoots was difficult, and zone-fire carried out was inefficacious. Owing to the Germans having sited their trenches on a rear slope, the wire was uncut, and it was in vain that our troops, having with difficulty arrived within a few hundred metres of the second position, made every effort to break through them. It was necessary really in order to carry through this task to have accurate fire; this entailed time for fresh methodical preparation, selection of observation posts, and organisation of communications, consequently a lull in the operations was necessary. Thus the enemy had profited from the lessons of our offensives of the month of May, and had found the antidote. In his report made in the month of November, 1915, General Petain set out in these words the lesson of the occurrences and explained thus all the difficulties of the problem: "The battle of Champagne demonstrates the difficulty, if not the impossibility in the present state of armament, with the preparatory methods and the forces opposed to us, to carry with one rush successive enemy positions. The material strength of these positions rests above all in the obstacles provided. As long as these are not destroyed the best-laid infantry attacks even when most

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energetically carried out are doomed to failure. When an attack is going well, a few hours suffice to take the first positions, but once these positions have been taken one must carry on with taking the next. This attack cannot be carried out except after a long fresh preparation. The Germans will take advantage of the respite thus given to them to bring up troops and guns and to prepare a third position in rear against which the attack must be launched on the same principles, comprising the same stages, and encountering the same difficulties. These successive attacks will cause us a considerable waste of man-power, an unheard-of expenditure of ammunition, and neither this waste of man-power nor this expenditure of munitions seems to offer any hope of compelling the definite retreat of the enemy, unless it so happens that after the second blow of the battering ram there be no fresh troops to oppose us."

General Petain then drew this conclusion therefrom that the general plan of operations must necessarily comprise two successive phases:

(1.) The wearing down of the enemy. (2.) The decision.

(1.) *The wearing down of the enemy* can only be arrived at by a general Allied Offensive, which should only aim at the capture of *objectives limited in depth, and without endeavouring to carry out a break through*. Above all the point is to wear down the enemy by attacks with limited effectives and by bringing all known means of destruction to bear against him, to make him suffer such losses that it will subsequently be possible to force a decision. *Therefore the principal part will be played by the gun and by destructive weapons, and not by the infantry*. "The essential conditions of such a thrust are the possession by each army of the maximum amount of heavy artillery of every calibre and an almost unlimited supply of ammunition."

(2.) *The Decision*.—When this attrition of the enemy is judged to have been sufficient, then and only then will one pass to the decisive phase, which will be carried out at several well-chosen points and on fronts of at least 20 kilometres, and in the form of successive assaults. It is absolutely necessary to arrange for lulls between successive efforts, firstly, because the infantry that has made the first effort must be relieved, secondly, and principally, because the artillery after an advance must build up a minute organisation of its fire direction and carry out fresh preparatory work.

"*Two contradictory conditions will then present themselves*. On the one hand, the necessity of holding up the attack to carry on with fresh preparation, and on the other hand, the necessity to act with speed in order to give the enemy as little breathing space as possible."

Thus the axiom became firmly established: Destroy entrenchments and obstacles by the gun. Do not send the infantry into the

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battle except after a long, careful and violent artillery preparation, which will have rendered the enemy position "ripe for the assault," as the Germans say; "*the artillery conquers and the infantry consolidates,*" that was the formula.

In this way the basic principles of the Memorandum of the 16th January, 1916, *on the object and the conditions of a concerted offensive battle* were fixed, and that of the 16th January, 1916, *on higher formations in the offensive battle*.

To sum up, in 1915, the infantry had been required to go forward to the greatest extent possible. Henceforward this advance was to be regulated in accordance with the limits imposed by the artillery.

### *Year 1916—Verdun. The Somme*

The year 1916 is identified with the two great battles of Verdun and the Somme.

*Verdun.*—At the time of their attack at Verdun, the German Great General Staff flattered themselves that they possessed the password for the victorious offensive; it was on material rather than on the gallantry of the troops that they depended for the force capable of overthrowing the barrier. After having accumulated masses of artillery and of munitions and of colossal guns, they replaced preparations lasting several days such as we had carried out during the preceding years, by a bombardment of but a few hours' duration, but of unexampled violence, and one which more by its moral and surprise effect than by its material destruction, was to destroy the capacity for resistance of our defence.

The initial success between the 21st and 24th February may have fulfilled their expectations, yet nevertheless, the German higher command showed itself incapable of exploiting a situation that the very impetus of its success had created unexpectedly.

It was in vain that it multiplied its further attacks carried out by masses of men, all its efforts remained fruitless, and after four months of titanic combat, if the result were reckoned by the gain of a depth of 12 kilometres of ground, it was at the cost of 500,000 men and they failed to take Verdun.

*The Somme.*—During this time the French higher command had realised that it could not ease the German pressure on the Meuse except by launching a major offensive elsewhere, and so it staged in coöperation with the British Army, the great operation of the Somme; in this a break through on a front of 40 kilometres was hoped for, and by overrunning the open country in the direction of Cambrai, to reach the great artery which fed all the northern German front.

It seemed that this operation presented itself to us under the most favourable auspices, for we had learnt a great deal during the uninterrupted struggle of four months before Verdun: *Artillery spotting by*



## EVOLUTION IN OFFENSIVE METHODS

*aircraft*, aeroplane photography, and observation had been perfected to a great extent, and now enable an exact and swift control to be maintained over bombardments.

*Means of communication* between artillery and infantry had been developed.

*Our new equipments* began to be delivered from the workshops, and our higher command had acquired the art of handling great masses of artillery.

*Last but not least, the innovation of the creeping barrage* enabled the infantry to be continuously and thoroughly protected during its advance. Moreover we had provided a better equipment for infantry in such formations as we had been able to withdraw from the Verdun battle.

To start with, the number of machine guns had been considerably augmented; in June, 1916, each battalion was provided with a company of 8 guns. At the same time the machine rifle, a weapon lighter than the machine gun and more powerful than the rifle, had been taken into use, and this, though normally supplied with only 200 rounds, could fire up to 140 rounds a minute at critical moments.

It was at this period too that the 37-mm. gun with a useful range of 1500 metres was first issued to the infantry, and it was designed to destroy machine guns in action by direct fire.

*In the matter of grenades* which had been abundant at Verdun we had learnt in time to select from the numerous patterns the best for retention, and also after the middle of 1916 our troops were equipped with the *V.B. grenade*, which was fired by means of a discharged cup attached to the rifle and enabled useful barrage fire to be put up to 150 to 180 metres range. *It was thus a regular little artillery for the section or with the company.*

The battle which started on the 1st of July by an application of the method of breaking through by artillery on an even greater scale than formerly, justified at the start all our hopes by an advance which for the time was astounding. But there again we were deceived by events. *Developing the procedure of defence in depth* by which they had resisted our offensive of 1915, the Germans succeeded in preventing the breaking of their front, by their "*elastic defence*" which allowed the attacker to enter the ground, but which forced upon him enormous expenditure of ammunition and an endless succession of attacks. And in spite of almost continuous progress, after six months of efforts and of sacrifices, we had not succeeded in reaching Peronne, barely 10 kilometres from the jumping-off line.

*The Nature of and Lessons Drawn from These Two Battles.*—These two battles of Verdun and the Somme show themselves, as we shall see, to be very much of the same description. Attacks on fronts that were still too restricted, even with material means which

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had already become very powerful, directed against the same point or against points very close to each other, *a struggle of attrition both on the one side and the other characterised by certain success, it is true, but not a decisive one.* The trench barrier had in places been slightly pushed back, but only to become thicker and tougher, since the slowness of movement allowed the enemy to bring up his reserves. It is true that the first blow when well prepared and well backed up by artillery always succeeded, since the enemy, though warned of the imminence of the attack was always surprised to start with as regards the hour of launching the attack, but it is also a fact that after a few days the defence succeeded in bringing up powerful forces quite equal to those of the attacker. It is true that this struggle pinned the enemy down, and it is on this account that the two battles of Verdun and the Somme really constitute one, in spite of outward appearance.

The stubbornness of the defence of Verdun and the wearing down of the Germans which was its result, paved the way for our success on the Somme; conversely the successes on the Somme paved the way in their turn for those of October and December at Verdun. *Whatever else happened, two points were well emphasized by these offensives of 1916.*

(1.) *Each time that the Memorandum of the 16th January had been applied* within the scope of its application, important successes had been brought off; for example, the first Colonial Army Corps at the beginning of July; the 7th Army Corps at Bouchavesne; Mangin's Army Group at Douaumont and at Louvemont (24th October and 15th December, 1916).

(2.) *Conversely, there was a fatal tendency in other operations* to reduce the extent of the frontage of attack; to choose too close objectives and to increase the pause between two successive assaults; the opportunity thereby given to the enemy to rally and to re-organise new lines of defence as fast as our advance progressed.

*To sum up, these tactics, had not given a decisive result because they could not be properly applied.*

*Neither with the first effort* since the artillery preparation could not reach the whole depth of the enemy defensive organisations.

*Nor in the long run,* since the superior power of the attack diminished in proportion as that of the defence increased and so everything degenerated into a war of attrition of both sides.

These different considerations led G.Q.G. to cancel the Memorandum of 16th January and to replace it by that of the 16th December, 1916 (on the object and the conditions of a concerted offensive battle).

Previous fundamental principles still remained the same, since the battle of the Somme did not cast any doubts on the principles on which

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the tactics were founded. But it was considered essential to emphasise further the following points:

(1.) *Attacks must be carried out on as broad a front as possible, and this is the only way that one can hope to reach distant objectives.*

(2.) *Attacks must be designed for the capture of the enemy's artillery position.* To this end the artillery must be pushed forward as far as possible, so as to enable an effective preparation against all the positions on which it can be brought to bear.

(3.) *Successive attacks must be made with the shortest interval, in order to exploit to the utmost results achieved.* The changes of artillery positions must consequently be pre-arranged.

(4.) *Finally, there is a need to pre-arrange and to plan out exploitation of successes more thoroughly than before, and to organise it in such a way that it will be more speedy and more effective.*

### *The Year 1917*

*The Spring Offensive (16th April).*—The doctrines thus enunciated appeared in 1917 to be capable of expansion. Our modern artillery equipments which commenced to be issued enabled the duration of preparation to be reduced, and lent themselves to quick and easy changes of position.

The increase in the number of guns, the increase in calibre, improvements in the shape of shells of which the supply became inexhaustible, more shattering explosives, gas shells, special gun carriages, the perfecting of means of observation and of fire control, everything was put in hand to make the gun a more and more accurate and powerful weapon. More trench mortars were provided, and the depth of the zones attacked by the artillery became very great. *Then the possibilities of breaking the enemy line on a wide front again came to the fore, and so the famous offensive of the spring of 1917 was mounted in the sector of the Aisne with the support of 2000 heavy guns, of which 700 were modern, backed by more than 1500 trench mortars.* This grandiose operation disappointed all our hopes again; there is no doubt that a too great edifice had been planned, and the result called for, as much as the methods to bring it about, were not yet in harmony with the material means then at our disposal, notwithstanding their amplitude. Its check seemed to be due, as far as artillery in particular was concerned.

(1.) To the too numerous objectives allotted to the artillery in view of the number of its guns and of their allotment of ammunition.

(2.) To its lack of guns with high trajectory fire, when the majority of the targets were such as could not be attacked by low trajectory fire.

(3.) Finally, to the absence of any element of surprise.

## THE FIELD ARTILLERY JOURNAL

In fact, the contending forces had got into a state of equal balance and the means employed could not yet give decisive results by the complete breaking of the enemy front.

### *Attacks with Limited Objectives of the End of the Year 1917*

After our great offensive of the spring had proved abortive, General Petain, who had, on the 17th May, assumed command of the French armies, judged that, in consequence of the even balance of the opposing forces, and of the nearly complete defection of the Russian Army, it would be wiser to postpone the decisive battle for the time being, and to wait the completion of the developments that were being effected for our artillery till our troops were equipped with tanks now being built, and till America would be in a position to give us her valuable help by the dispatch of her ample man-power.

Without restricting our aggressive policy in the least he resolved therefore to attempt only the *wearing down of German* strength whilst husbanding our own resources by means of *attacks with limited objectives*, launched by surprise, with varying elements of time and space, and planned with big factors, especially artillery in sectors which the enemy was particularly desirous of holding.<sup>3</sup>

This need of employing operations on different and extended fronts called for as corollary, the preparation and organisation of numerous battle areas, and it was this that was *named the organisation of the front*.

It is on these ideas that the attacks of the second half of the year 1917 were planned: *The operations of the first army and of the British at Messines and in Flanders; attack of the 20th of August at Verdun; attack on Malmaison, 23rd October*.

Well carried-out, carefully mounted, and well equipped for their purpose, they arrived fully at the desired goal; they yielded more than they cost and contributed greatly to the retention of the initiative in our hands.<sup>4</sup>

*The operation of Malmaison in particular*, mounted, it is true, with very powerful material factors, but with a limited objective and on a restricted front (12 km.) afforded results of a strategic nature which we could scarcely have dared to hope for, thanks to the judicious choice of the selected point of attack; the enemy had indeed to abandon the whole crest of the Chemin des Dames, so bitterly fought for since the 16th April, and to withdraw their whole line to the north of the valley of the Ailette. Further since the enemy was waiting for

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<sup>3</sup> Summary of the introductions No. 1 of G.Q.G. (19th May, 1917).

<sup>4</sup> The operation of Verdun brought in 9000 prisoners, 30 guns, and 250 machine guns. The operation of Malmaison brought in 12,000 prisoners, 200 guns, and 750 machine guns.

## EVOLUTION IN OFFENSIVE METHODS

us, surprise was non-existent, and thus it is proved that the tactics were sound.

### *The Formula for the Break-through Battle towards the End of 1917*

At this period the problem of the break-through battle may be considered as virtually solved, and the solution was summed up in two Memoranda still in force: That of the 31st October, 1917, on the offensive, and that of the 20th December, 1917, on the defensive.

*The doctrine of battle on the whole front is thus defined by these Memoranda:*

"The battle comprises defensive actions and offensive actions closely bound up with one another.

"In the first the higher command, whilst maintaining constant pressure on the enemy, groups and re-organises its forces and its resources of every kind with a view to future major attacks.

"In the second it develops attacks, employing to the full the means which it has collected."

*The Principles.*—The general principle of 1915 and 1916 remains unaltered; the enemy front must be broken; but it will be broken by taking advantage of the chaos produced in the general dispositions of the enemy by offensive actions launched with suddenness and in an unexpected form, which will permit *the element of surprise to be made use of.*

"These offensive actions will first of all take the form of attacks with defined and limited objectives; they will be renewed and altered in the shortest possible time and on the greatest possible front in order to break up the fortified protection of the enemy. They will lead up to operations with a larger and larger scope, wherein the decisive phase of the battle and the pursuit of the hostile armies will in turn be envisaged." In this way armies must: *attack carefully* selected points with a view to the capture of limited objectives, so as to wear down the enemy.

*To Renew and To Vary These Attacks without Respite.* Never losing the benefit of the factors of surprise, speed, and superiority of material till weakness and disorganisation show themselves.

To prepare from that moment the development of attacks and pursuit.

An offensive action may comprise *several* successive or simultaneous *attacks*, each attack being itself of several days' duration, and including several phases. But when offensive action comprises the development of several attacks, the intervals of time which separate them must be reduced to a minimum. The attacks must succeed each other with but a few days' interval; and it is for this reason that each attack will as a rule be given no more than the capture

## THE FIELD ARTILLERY JOURNAL

of a single enemy position as a task. The essential conditions of success are—

1. Superiority of force.
2. Complete preparation.
3. Surprise.

This is the problem clearly set throughout the whole of the Memorandum.

In addition to the *superiority of means*, otherwise described as power, and the complete *preparation*, which are in any case two essential conditions for the success of an attack, we must seek out above all, *surprise*, and thereafter swiftness in bringing our forces to bear and speed in execution. For *surprise and speed in execution*, are not these what were lacking in our offensives from the outset of the Campaign?

In view of the form that the war had taken it was evidently less easy to make use of the factor of surprise in 1917 than in 1806. And yet it was more necessary than ever, since an attack that designed to break an undefined and continuous front was certainly doomed to failure if the enemy forestalled its preparation. It is true that since the commencement of static warfare, the higher command had repeatedly in many Notes or Memoranda bearing on attacks, never ceased to draw the attention of units and formations to this question.

In actual practice the effort to bring in superior force to the exclusion of all else had tended to make us neglect the factor of surprise to a certain extent, because there are in these two, certain materially contradictory conditions.

Force, that is to say superiority of strength, implies considerable material and preparations which last for months, and which leave their mark on the ground, and consequently inform the enemy if not of the actual moment, at least of the probable zone of a great attack. *Surprise*, on the contrary, calls for the most rapid and secret coördination of all these immense means, as armies have at their disposal increasingly numerous methods of intelligence, which are accurate and impossible to counter.

It would be in vain to provide the whole front with roads, railways, spurs for super-heavy guns, battery emplacements, telephonic network; the enemy would always find a hundred ways to ferret out the offensive intentions of the adversary from the moment that they began to show themselves in a prepared sector which up to then had been quiet.

Besides espionage, the necessity for the final preparation will give him the information; activity on the roads and railways, more artillery registration, new wireless stations, etc., and above all the question of secrecy is involved, which is so difficult to keep when

## EVOLUTION IN OFFENSIVE METHODS

several hundreds of thousands of characters and indiscreet persons must take part in such an operation.

### *Cambrai and Riga*

Two operations carried out towards the end of this same year, 1917, only confirmed our higher command in this line of thought. We speak of the operations of Cambrai and of Riga, of which the leading points are pretty well identical; concealment up to the last moment of the real point of attack; speed and complete secrecy of preparatory measures; a short violent artillery preparation; employment on a large scale of comparatively new material means (gas shells at Riga and tanks at Cambrai).

At Cambrai on the 20th November, thanks to the employment of 360 tanks brought up under cover of fog, two British army corps without the slightest artillery preparation, and without having alarmed the enemy in the least degree by movement of troops, threw themselves to the assault of German positions and overwhelmed them on the first day to a depth of 9 kilometres.

Never had we been so near a complete break through of the enemy front on the Western Front. But as exploitation had not been prearranged, this astounding success remained barren. The lesson learnt was none the less clear: the tank (or assault car) which was recognised to be but the true accompanying artillery of the infantry, emphasised itself as the prime weapon of surprise. At Riga on the 3rd September, it is true on a still more restricted front, only 4½ kilometre, General von Hutier completely overwhelmed the Russian positions, thanks to a complete surprise effect, and to the intensive use of gas-shells. It appeared thus to be proved that long artillery preparations, calculated for the destruction of the greater part of the defensive works, were not essential to the success of attacks, and that these attacks could succeed without any artillery preparation at all, or after one of very short duration designed for neutralising fire (counter-battery work).

### *Development of Ideas about the Defensive towards the End of 1917*

These two operations deeply stirred military opinion since at the first glance they seemed staged on a new plan, for it seemed very probable that the Germans would apply against our front an amplified form of the experimental tactics successfully carried out by them on the eastern front. One could no longer lay down as a law that one could always reckon on being warned in time of a sudden offensive of considerable extent, and it became necessary to recognise that against the power and the abruptness of the methods employed, the defensive could no longer avoid with certainty the breaking of its fronts, at any rate as far as the front line was concerned. The most

## THE FIELD ARTILLERY JOURNAL

it could do was to hope to prevent the enemy from exploiting first successes, and above all from capturing neighbouring positions by attacks from the rear.

During the end of the winter of 1917-1918, various new, instructions emanated from G.Q.G. to guide the armies, in view of the great defensive battle which everyone foresaw, and these modified but slightly the teaching of the Memorandum of 20th December, 1917.

The idea underlying these doctrines is that one must be prepared to fight the battle in a deep and previously arranged zone; one should only devote to the defence of the first position the necessary means to break or at least to check the first enemy rush, and to guarantee in all cases the concentration of the main body upon the real battle position.

This position where the battle will be fought is defined for us by the line of resistance, that is to say, the line on which the enemy must be stopped at all costs, and of which the safety must be guaranteed, and which will be chosen in such a way that the enemy will not be able to attack it except after having suffered a previous disorganisation of his attacking formation. In short, the ground between the line of resistance and the front line forms the margin of safety on which the army command relies to enable it to bring up the bulk of its forces into the battle, and the infantry divisions which are in the line at the moment of the enemy attack are in reality entrusted with the task of covering the position.

Thus the enemy assault will not necessarily be stopped by the front line nowadays, but by another one behind it (the line of resistance), which is unknown to the attacker. In this way we oppose the defensive surprise to surprise in the offensive. These principles, born of the genius of General Petain, were destined to be brilliantly and definitely justified in the defensive battle of the 4th Army (Gouraud) in Champagne on the 15th July, 1918, a battle in which the last of the great German offensives spent itself, and one which was for us an undoubtable victory; but our higher command had not been content with planning only the counter-stroke, but slowly and patiently forged the weapon of the final offensive of liberation by guiding the troops with even more determination than ever to seek for and ensure surprise in the attack. We shall see how this was done.

*(To be concluded.)*



# CURRENT FIELD ARTILLERY NOTES

## Le Soixante-quinze

(SEE FRONTISPIECE)

[EDITOR'S NOTE:—By the courtesy of Major M. Churchill, General Staff, U. S. Army, the JOURNAL received the kind permission of the sculptor Herbert Haseltine, to reproduce the photograph which appears as the frontispiece of this issue. In subsequent issues we expect to reproduce other examples of his fine work. A short sketch of Mr. Haseltine and his work follows.]

HERBERT HASELTINE was the pupil of the late Aimé Morot. A number of the bronzes and plaster models shown in the present exhibition<sup>1</sup> were exhibited at the Salon des Artistes Français, the Royal Academy, London, and at the International Exhibitions in London, Venice, Brussels, Ghent, etc., between the years of 1906 and 1914. In 1906 he received honourable mention at the Salon for his group "Riding Off." In 1908 he was commanded by the late King Edward VII to execute a bronze of his charger "Kildare" a small model of which is included in this exhibition.<sup>1</sup> In 1909 he went to America to make a group of the "Meadowbrook Team," winner of the International Polo Cup that year. His bronze, "Un Puyazo" was purchased by the Museum of the Hispanic Society of America. In 1914 he received a commission from this Museum to execute an equestrian statue of His Majesty the King of Spain. This was begun in Madrid in the late spring of that year, and was shown as a sketch in London, together with Mr. Haseltine's other works at an exhibition he held in June and July. Work was then interrupted by the war, as during 1914-15-16, Mr. Haseltine was attached to the American Embassy in Paris. When America came into the war, he joined the American Army, where he was one of the first organizers of the camouflage section. In 1920 he held an exhibition of all his pre-war and post-war work at the Gallery Georges Petit, in Paris. The "Field Artillery" group was shown under the name of "Le Soixante-quinze," and "Les Revenants," representing gassed, wounded and worn-out horses at the war, was purchased by the French Government for the Luxembourg Museum. Through the kindness of the Duke of Alba and of Don Antonio Miura (the breeder of Spain's most celebrated fighting bulls), Mr. Haseltine was able to work for several months at the latter's "Ganaderia." Don Antonio afforded him every facility and assistance in modelling the various groups which are shown in this exhibition.<sup>1</sup>

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<sup>1</sup> Exhibition held at Messrs Thos. Agnew & Sons' Galleries, 43 Old Bond Street, London, June-July, 1921.

## Bearings for the Joints of the Pantograph of the Jasper-Ward Terrain Board

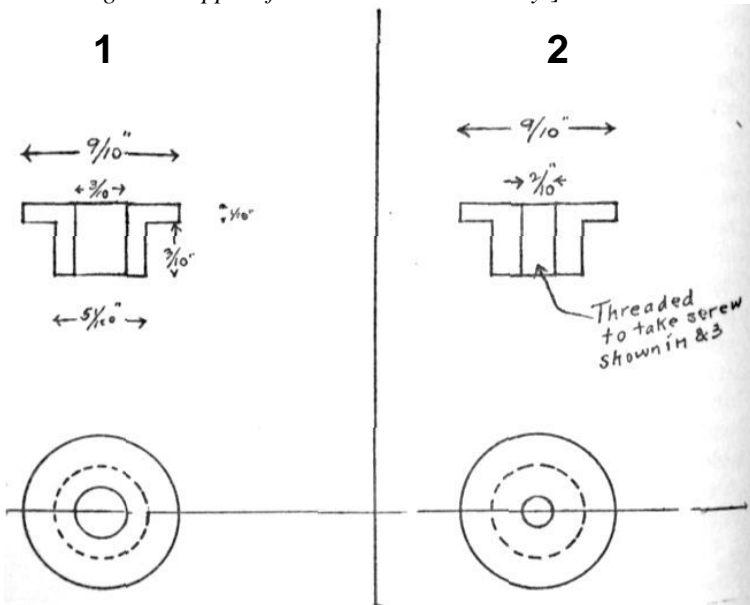
[EDITOR'S NOTE:—In the January-February, 1921, number of the JOURNAL there appeared an article on the "Jasper-Ward Terrain Board" by Major Orlando Ward, Field Artillery.

In an editorial note on this article we said: "This terrain board has been recommended by the Field Artillery Board, Fort Sill, Oklahoma, as being an ingenious and highly developed means for the instruction of students in the conduct of fire. The Chief of Field Artillery recommends its installation in each of the Field Artillery Units of the R.O.T.C., and elsewhere in the service, where an indoor terrain board can be used."

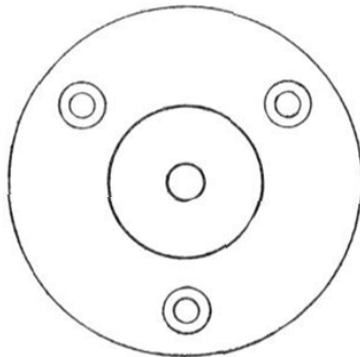
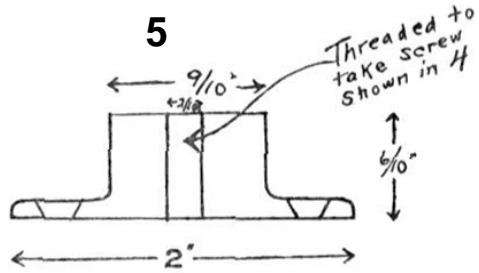
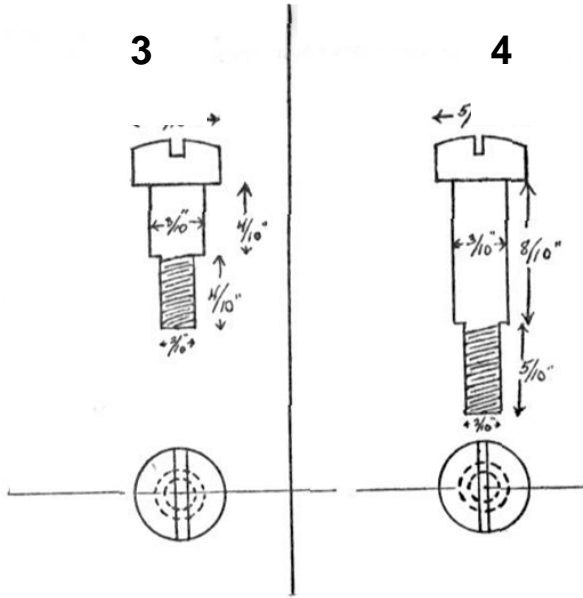
Recently we received a communication from Major James B. Bereth, 123rd Field Artillery, Illinois National Guard, informing us that in constructing one of these boards, as explained in the above mentioned issue of the JOURNAL, he had experienced some trouble in devising a suitable bearing for the joints of the pantograph.

He found, however, that the 124th Field Artillery, of Chicago, Illinois, had constructed one of these boards with a suitable joint which he copied in constructing the one for his battalion, and very kindly enclosed drawings of these bearings with the hope that they may be of use to anyone constructing one of these boards.

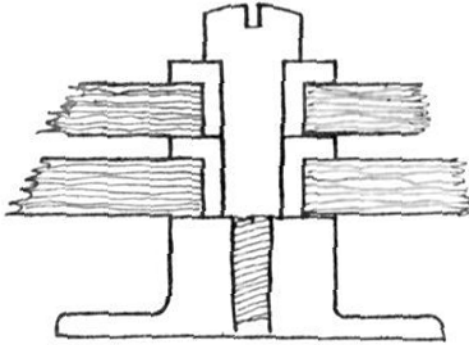
He further informed us that he understands that the bearing was devised by Captain George M. Hepple of the 124th Field Artillery.]



CURRENT FIELD ARTILLERY NOTES

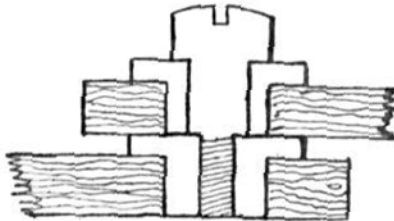


**6**



Assembly of Main Pivot Joint.,

**7**



Assembly of other Joints

## CURRENT FIELD ARTILLERY NOTES

### Ordnance Notes\*

#### TRANSMISSION FOR DIVISIONAL TRACTOR, MODEL OF 1920

The transmission designed for the divisional tractor, Model of 1920, presents some interesting features of construction and operation. It provides four forward and two reverse speeds by shifting only three gears and has the added feature of allowing the opposite tracks to be driven positively at different speeds. This gives an advantage in steering over the conventional method of merely disengaging the power from one track or stopping it by means of a brake, although steering in the conventional manner is still possible with this new transmission.

For simplicity in describing its construction and operation, only two diagrammatic views of the gearing are given herewith, Fig. 1 being a plan and Fig. 2 an end view. Referring to Fig. 1, power enters the transmission from the motor by shaft 1, its proper relation to the two power outlet shafts 2 and 3 being shown in the end view. Shaft 1 is splined and carries two sliding sleeves, one of which carries the gears 8 and 9, the other carrying gear 10. In order to show the proper meshing of gears 8, 9 and 10, shaft 1 must be shown out of true position in Fig. 1. The shifting of gears 8, 9 and 10 is done by a hand lever through shifting forks in the conventional way, the usual interlock mechanism preventing the engaging of more than one shifting gear at a time.

Shaft 3 carries a loosely mounted sleeve to which are attached the three gears 11, 12, 13 and the driving elements of the clutch 4. Shaft 3 also carries another loosely mounted sleeve to which are attached gear 14 and the driving elements of the clutch 7. The driven elements of clutches 4 and 7 are secured to shaft 3.

Shaft 2 carries two loosely mounted sleeves, one of which carries gear 17 and the driving elements of the clutch 6, the other sleeve carrying gears 15 and 16 and the driving elements of the clutch 5. The driven elements of both clutches 5 and 6 are secured to the shaft 2.

Gears 14 and 17 are the same size, gears 11 and 15 are the same size and gears 13 and 16 are the same size. From the diagram it is apparent that the driving elements of all clutches are in motion if any one is, clutches 4 and 5 rotating at the same speed and clutches 6 and 7 rotating at the same speed which is higher than that of the other clutches due to the ratio of gears 11 and 15 to 14 and 17. It will be noted, however, that the direction of rotation of clutches 4 and 7 is opposite to that of 5 and 6, but through the arrangement of the bevel gears 18 and 19 the drive sprockets 20 are driven in the same direction.

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\* Reprint from *Army Ordnance*, May-June, 1922.

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Clutches 4 and 7 are operated by one hand lever at the left of the driver and clutches 5 and 6 by one hand lever at the right of the driver. The operating mechanism is so arranged that with the levers vertical both clutches are disengaged, and the engagement of either clutch on a shaft is accomplished without affecting the other one. Pulling the right hand lever back engages clutch 5, while pushing it forward engages clutch 6. Similarly, pulling the left hand lever back engages clutch 4, while pushing it forward engages clutch 7.

The various speeds are obtained as follows:

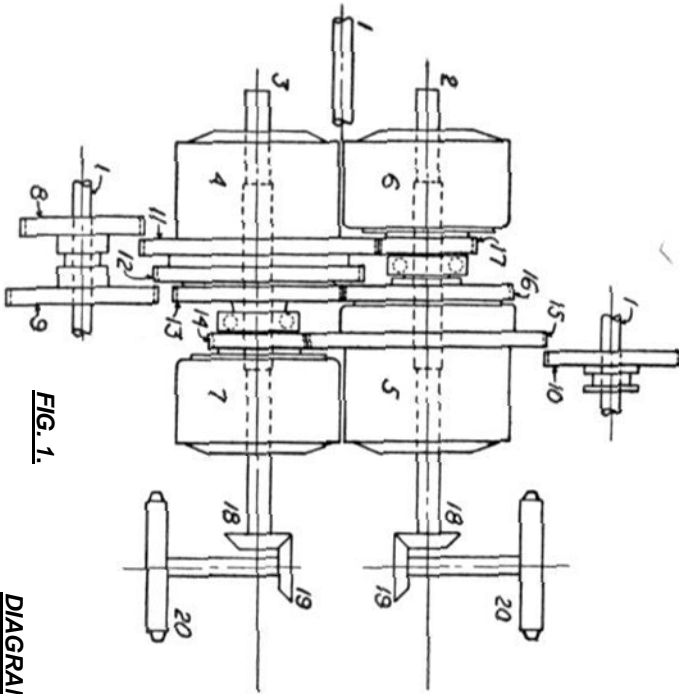
(a) Low or First Speed: Gear 8 is slid into mesh with gear 11 by means of the gear shift lever mentioned above, and clutches 4 and 5 are engaged by pulling back both clutch levers. The drive coming in by shaft 1 is then transmitted through gear 8 to gear 11, then through the sleeve to gear 13 and the driving elements of clutch 4. Gear 13 being the same size as gear 16 the sleeve carrying the driving elements of clutch 5 is driven at same rate as clutch 4. Clutches 4 and 5 being engaged the drive is transmitted to shafts 3 and 2 and thence to the sprockets.

(b) Second Speed: With gear 8 still in mesh with gear 11, both clutch hand levers are pushed forward disengaging clutches 4 and 5 and engaging clutches 6 and 7. The drive is now transmitted from shaft 1 through gear 8 to gear 11 and through gear 11 to gear 17 and the driving elements of clutch 6, and also through gear 13 to gear 16, through the sleeve to gear 15 and thence to gear 14 and the driving elements of clutch 7. Clutches 6 and 7 being engaged, the drive is transmitted to shafts 3 and 2 and thence to the sprockets. It can be seen from the diagram that the speed of shafts 3 and 2 is increased over that of low speed due to the step up from gears 11 and 15 to gears 17 and 14.

(c) Third Speed: Gear 8, is slid out of mesh with gear 11 and gear 9 is slid into mesh with gear 12. Both clutch hand levers are pulled back engaging clutches 4 and 5. The path of the drive is now similar to that for first speed except that, owing to the higher reduction from gear 9 to gear 12, the speed of shafts 2 and 3 is correspondingly greater.

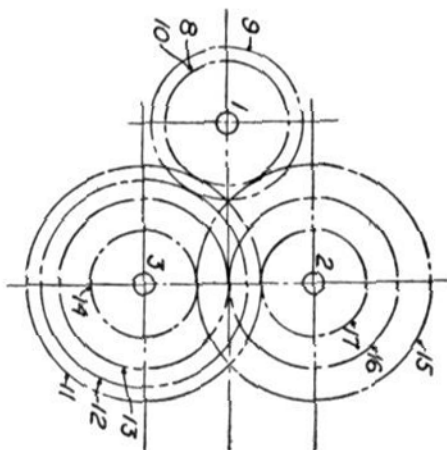
(d) Fourth Speed: With gear 9 still in mesh with gear 12, both clutch hand levers are pushed forward disengaging clutches 4 and 5 and engaging clutches 6 and 7. This produces an increase in the speed of shafts 2 and 3 proportionate to the increase of 2d speed over 1st, the path of the drive being similar to that of 2d speed except for the difference in the drive from shaft 1.

(e) Low Reverse: By means of the gear shift hand lever, gear 10 is slid into mesh with gear 15, and both clutch hand levers are pulled back, engaging clutches 4 and 5. The drive is now transmitted from shaft 1 through gear 10 to gear 15 and through its



**FIG. 1.**

**DIAGRAM OF TRANSMISSION GEARING  
FOR  
DIVISIONAL TRACTOR, MODEL OF 1920.**



**FIG. 2.**

## THE FIELD ARTILLERY JOURNAL

sleeve to gear 16 and the driving elements of clutch 5. Gears 16 and 13 being the same size, the sleeve carrying gear 13 and the driving elements of clutch 4 are driven at the same speed as those of clutch 5. Clutches 4 and 5 being engaged, the shafts 2 and 3 are driven, but, as may be seen by following the drive on the diagram, the resultant direction is opposite to that of the forward speeds.

(f) High Reverse: With gear 10 still in mesh with gear 15, both clutch hand levers are pushed forward, disengaging clutches 4 and 5 and engaging clutches 6 and 7. The drive is now transmitted from gear 15 to gear 14 and the driving elements of clutch 7, and also through sleeve to gear 16, then to gear 13, through sleeve to gear 11 and then to gear 17 and the driving elements of clutch 6. Clutches 6 and 7 being engaged, the shafts 2 and 3 are driven in the same direction as for low reverse but at a higher speed, due to the higher reduction from gears 15 and 11 to gears 14 and 17. Since gears 8 and 10 are the same size, the gear reductions in low and high reverse are the same as in low and second forward speeds respectively.

It is apparent from the description that, with any of the gears 8, 9 or 10 in mesh, by having the clutch hand lever on one side pushed forward while that on the other side is pulled back, the tracks on opposite sides may be driven at different speeds, the ratio of the speed of one track to the other being constant. It is equally apparent that either track may be allowed to run free while the other is driven either fast or slow. This transmission, however, does not provide for driving one track forward and the other backward.

### "HARMLESS" AMMUNITION

The Ordnance Department has recently completed experiments with what might be called "harmless ammunition." In their effort to economize, the Army ammunition authorities have made up a lot of ammunition that looks real and appears in every way similar to live matériel but lacks the explosive element. This line of imitation matériel is marked with a special blue color to show the initiated that it is not the real article. It is used just like the real ammunition even the explosion being simulated.

As an example, the new practice hand grenade, instead of containing the deadly TNT, is loaded with sawdust, powdered chalk, or pumice stone. When thrown in the usual way this grenade, instead of bursting into a hundred flying fragments, explodes with a modified pop and displays a large cloud of white smoke. After the smoke has cleared away, however, the whole grenade will be found lying on the ground in perfectly good condition for reloading and reuse.

In the same way the Department has perfected an imitation trench mortar shell. In a picture this shell could not be distinguished



## CURRENT FIELD ARTILLERY NOTES

from the live article, but a color photo would show it to have the distinctive blue color to reassure the user that it is non-explosive. This ammunition is assembled and fired from the trench mortar exactly as high explosive ammunition. But there is no danger at the target except in case of a direct hit, for when it explodes it is all noise and smoke with no fragments at all. The recovered shell may be used over and over again.

Practice ammunition of this sort will be issued to simulate the action of all kinds of grenades, airplane drop bombs and small calibre artillery shell. By issue of this ammunition, together with simple instructions on how to reload it, the Ordnance Department will effect a considerable saving in time of peace as well as in training camps in event of war.

### PANORAMIC SIGHT CASE

Spring suspended sight cases, for carrying the panoramic sight with the carriage, have a socket in which the dovetail on the shank is placed. The upper part of the sight is retained by a flat spring of irregular outline. This spring has always been an undesirable feature, as it is somewhat difficult to manufacture and occasionally breaks when in use.

A new fastening has been designed which eliminates the spring and holds the sight in place by a bell crank which is locked as the cover of the case is closed.

Cases equipped with this fastening will accommodate panoramic sights, Models of 1904, 1915 and 1917.

# EDITORIAL

WE have been requested to bring to the attention of our readers the following worthy project:

MEMORIAL CROSS  
TO  
OUR DEAD WHO REMAIN IN FRANCE  
TO BE ERECTED IN  
ARLINGTON NATIONAL CEMETERY  
WASHINGTON, D. C.  
BY THE  
ARGONNE UNIT  
OF THE  
AMERICAN WOMEN'S LEGION

The War Department has designated the site and the Commission of Fine Arts has approved the simple design of a white marble cross, which is to stand in Arlington National Cemetery among the grant's of those who fell in the Great War.

It is appropriate that subscriptions should be as widespread as possible in order that all who wish to make part of this Memorial their own, may do so, irrespective of the amount contributed.

The Argonne Unit of the American Women's Legion has undertaken the necessary management with the approval of the Secretary of War, and invites subscriptions to the end that the requisite \$2500 may be collected in time to erect the monument by Armistice Day of 1922.

Subscriptions will be acknowledged and should be sent by postal money order or check to

MISS N. R. MACOMB, Treasurer  
1314 N Street, Northwest,  
Washington, D. C.

or

ARGONNE UNIT MEMORIAL,  
National Savings & Trust Co.,  
15th and New York Ave.,  
Washington, D. C.

Committee:

Miss Abbie B. McCammon, Chairman  
Mrs. Wm. M. Black  
Mrs. Alex. Rodgers  
Miss N. R. Macomb

## EDITORIAL

We have also been requested to publish the following communication received from the Army Relief Society, 120 East 36th Street, New York:

June 26, 1922.

THE EDITOR, THE FIELD ARTILLERY JOURNAL,  
Washington, D. C.

The Army Relief Society, founded in March, 1900, for the purpose of providing relief for the widows and orphans of the officers and enlisted men of the Regular Army, has in the past twenty-two years accomplished, through small donations, much good to many worthy widows and orphans of the officers and enlisted men of the Regular Army. Their work is done in such a quiet and unostentatious way that very few citizens and very few members of the Army itself have knowledge of what the Society is doing.

The President of the Society is Mrs. Henry L. Stimson, wife of a former Secretary of War, and its list of officials includes many men and women prominent in Army and civilian life.

The following letter addressed to Major General C. J. Bailey contains much information that will be of interest to those who have at heart the welfare of the Army:

"120 East 36th St., N. Y.,  
"June 9, 1922.

"MY DEAR GENERAL BAILEY:

"I beg to acknowledge with many thanks the receipt of your kind note of June 2nd enclosing three checks totalling \$2357.25, the net proceeds of the championship boxing contests of the Third Corps Area for the year 1922. This splendid gift to the Army Relief Society is most welcome and is highly appreciated.

"The demands upon our funds are greater than ever before. Our Budget for the coming year calls for a disbursement of \$48,000. We are starting the year with a balance in the bank of \$32,041.57. To this may be added about \$11,000, the income receivable during the year from our investments. That will bring our total to \$43,041.57, leaving about \$5000 yet to be raised if we are not to curtail our work. You will therefore readily see what a help this fine contribution from the Third Corps Area will be in meeting this deficiency. Last year the Army Relief Society disbursed \$47,552.73. All but \$858.85 of this sum was spent in actual aid. The \$858.85 covered the expense of printing and distributing three thousand annual reports, so that you see practically all the money contributed goes to help the widows and orphans of the Regular Army, as we have no office or overhead expenses. Our list of beneficiaries at present comprises an equal number of the families of officers and enlisted men, and we have met every demand for aid.

## THE FIELD ARTILLERY JOURNAL

At the time of the terrible accident at Langley Field in the aviation a request by telegraph to the Society from the Commanding Officer for \$2000 to be used in behalf of the widows of the men who were killed was made available for their use within twenty-four hours.

"I find often so little is known in the Army of the details of our work that I have taken the liberty of telling you about it, at the risk of repeating what you may know already. But we do appreciate and value so much the coöperation of the Army in our work, not only by contributing to our funds, but by giving us the opportunity to help in emergencies, that I hope you will express to all those who were instrumental in raising the money you have so kindly given, the hearty thanks of all the Officers and Board of Managers of the Army Relief Society.

"Believe me, my dear General,

"Very gratefully yours,

"MABEL W. STIMSON (MRS. HENRY L.)

"President of the Army Relief Society."