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THE FIELD ARTILLERY JOURNAL

EDITED BY

ARTHUR F. CASSELS

LIEUTENANT-COLONEL (FIELD ARTILLERY), UNITED STATES ARMY, RETIRED

THE UNITED STATES FIELD ARTILLERY ASSOCIATION
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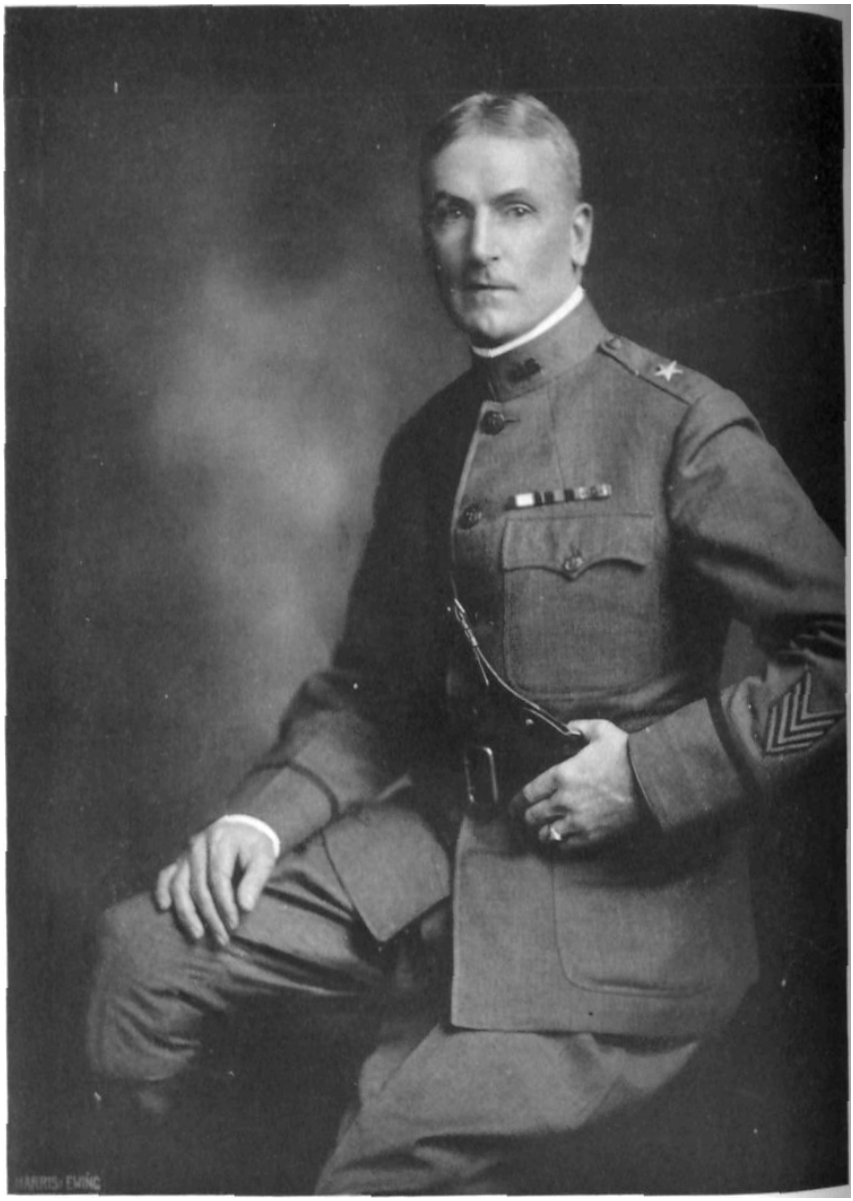

BRIGADIER GENERAL WILLIAM M. CRUIKSHANK, U. S. A.

Adjutant 1st Division, A. E. F., June 4, 1917, to January 15, 1918; Attached to 51st F. A. Brigade, 26th Division, January 19, to May 3, 1918; Commanding 2nd F. A. Brigade, 2nd Division, May 4, to May 15, and 3rd F. A. Erigade, 3rd Division, May 22, to October 29, 1918; Promoted Brigadier-General June 26th, 1918; Operations: Marne Defensive, Aine-Marne Offensive, Saint Mihiel Offensive, Meuse-Argonne Offensive, Chief of Artillery, 4th Corps, October 30, 1918, to January 1, 1919.

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THE FIELD ARTILLERY

OF THE

"ARMY OF THE UNITED STATES"

BY MAJOR WILLIAM BRYDEN, GENERAL STAFF, U. S. ARMY.

AWARDED FIRST PRIZE, FIELD ARTILLERY JOURNAL PRIZE ESSAY COMPETITION, 1921.

THE war is over. The temporary forces have disappeared. Congress after much deliberation has decided upon the kind of peace-time Army the country is to have. The War Department, step by step, is putting into effect the expressed desires of Congress; the Regular Army and the National Guard are in the midst of reorganization, and the Organized Reserves are about to be born. Surely a look into the possible future of the Field Artillery is both timely and advisable, and should be of interest to all who hope to have a part in the work before us.

It is not intended to prophesy herein what is actually going to happen in the Field Artillery within the next few years, for a reasonably definite military policy such as is contained in the Act of June 4, 1920, is a new thing for this country, and recent events and statements already lead one to suspect that at least a part of Congress did not mean all that it said when the above-mentioned Act was passed. It is intended rather to discuss merely what is *possible* under the laws and plans which now exist.

As for the laws, all that need be mentioned for a general understanding of the present military policy are the following extracts from Sections 1 and 3 of the National Defense Act as amended by the Act of June 4, 1920:

> "The Army of the United States shall consist of Regular Army, the National Guard while in the service of the United States, and the Organized Reserves, including the Officers' Reserve Corps and the Enlisted Reserve Corps."
>
> "The organized peace establishment, including the Regular Army, the National Guard and the Organized Reserves, shall include all of those divisions and other military organizations necessary to form the basis for a

> complete and immediate mobilization for the national defense in the event of a national emergency declared by Congress. The Army shall at all times be organized so far as practicable into brigades, divisions and army corps, and whenever the President may deem it expedient, into armies."

These sentences cannot be read too often, for therein lies the whole story—what our Army shall be, and for what it shall be maintained. All other provisions of the National Defense Act are subordinate to the fundamental statements quoted above and, generally speaking, all our plans and all our efforts must hereafter be directed toward the realization of *a united Army fully prepared for a complete and immediate mobilization*.

The announced plans of the War Department, evolved in accordance with the above contemplate, in addition to the necessary coast defense troops and overseas garrisons, a "complete and immediate mobilization" of fifty-four infantry divisions plus the auxiliary and special troops necessary to complete and maintain six field armies of three army corps each.

A general allocation of these armies has also been made in the proportion of 1:2:3 to the Regular Army, the National Guard and the Organized Reserves, respectively, which allocation is evidently based not only on the legal maximum strength of the Regular Army (280,000 enlisted men), the legal minimum strength of the National Guard after June 30, 1924 (800 enlisted men per Senator and Representative), and the unlimited strength of the Organized Reserves, but also on the announced missions of these three components of the Army, which are as follows:

The Regular Army.

(a) To provide adequate garrisons in peace and in war for our overseas possessions.

(b) To provide adequate peace garrisons for the coast defenses within the continental limits of the United States.

(c) To provide adequate personnel for the development and training of the National Guard and the Organized Reserves.

(d) To provide the necessary personnel for the overhead of the Army of the United States, wherein the duties are of a continuing nature.

(e) To provide an adequate, organized, balanced and effective expeditionary force, which shall be available for emergencies, within the continental limits of the United States or elsewhere, and which will serve as a model for the organization, discipline and training of the National Guard and the Organized Reserves.

(f) The Regular Army is the first line component of the Army of the United States in peace and in war.

The National Guard.

(a) In time of peace, to provide an adequate, organized and effective force, which shall be available in minor emergencies for employment within the limits of the United States, by the States or by the United States.

(b) In time of war or major emergencies, when Congress has authorized the use of troops in excess of those of the Regular Army, to provide an adequate, balanced and effective component of the Army of the United States for employment by the United States without restrictions.

(c) The National Guard is the second line component of the Army of the United States in peace and in war.

The Organized Reserves.

(a) To provide a trained, organized and balanced force which may be readily expanded into an adequate war component of the Army of the United States to meet any major emergency requiring the use of troops in excess of those of the Regular Army and the National Guard.

(b) The Organized Reserves form the third line component of the Army of the United States in war.

So much for the plans in general. Let us now see in more or less detail, what all this means in terms of Field Artillery.

Referring to the recently approved basic tables of organization, it appears that the Field Artillery units involved in the mobilization of six field armies are as follows:

TABLE I

DIVISION ARTILLERY

For 1 Infantry Division.	For 54 Infantry Divisions.
1 Brigade, of	54 Brigades, comprising
[1]2 Regiments (75-mm. gun, animal drawn).	108 Regiments (75-mm. gun, animal drawn).
1 Ammunition Train.	54 Ammunition Trains.

[1] When the field howitzer as recommended by the Calibre Board of about the same mobility as the 75-mm. gun has been developed, the organization of field artillery brigades with infantry divisions will be fixed at three regiments, one to be armed with the new howitzer.

CORPS ARTILLERY

For 1 Army Corps.	For 18 Army Corps.
1 Corps Artillery Headquarters.	18 Corps Artillery Headquarters.
1 Brigade, of	18 Brigades, comprising
3 Regiments (155-mm. howitzer).	54 Regiments (155-mm. howitzer).
[2]1 Regiment (155-mm. gun).	[2]18 Regiments (155-mm. gun).
1 Observation Battalion.	18 Observation Battalions.
1 Ammunition Train.	18 Ammunition Trains.

CAVALRY DIVISION ARTILLERY

For 1 Cavalry Division.	For 12 Cavalry Divisions.
1 Battalion (75-mm. gun, horse).	12 Battalions (75-mm. gun, horse).

ARMY ARTILLERY

For 1 Army.	For 6 Armies
1 Artillery Headquarters.	6 Army Artillery Headquarters.
1 Ammunition Train.	6 Ammunition Trains.

(Combatant organizations from G.H.Q. Reserve.)

G.H.Q. RESERVE ARTILLERY

For 1 Army.	For 6 Armies.
1 Brigade, of	6 Brigades, comprising
3 Regiments (75-mm. gun, motorized).	18 Regiments (75-mm. gun, motorized).
1 Ammunition Train.	6 Ammunition Trains.
1 Brigade, of	6 Brigades, comprising
3 Regiments (75-mm. gun, portée).	18 Regiments (75-mm. gun, portée).
	1 Regiment (75-mm. howitzer, pack).
1 Brigade, of	6 Brigades, comprising
2 Regiments (155-mm. gun).	12 Regiments (155-mm. gun).
2 Regiments (240-mm. howitzer).	[3]12 Regiments (240-mm. howitzer).
[4]1 Regiment (6″ gun).	6 Regiments (6″ gun).
2 Ammunition Trains.	12 Ammunition Trains.

[2] If 155-mm. guns are used as corps artillery, they will be manned by Coast Artillery Corps personnel; but if the development of the 4.7″ gun proves to be satisfactory for corps artillery to replace the 155-mm. gun, then the entire corps artillery will be manned by Field Artillery personnel.

[3] Some of these regiments will probably be armed with 8″ instead of 240-mm. howitzers.

[4] This type has not yet been developed.

(Organizations of trench mortars and railway artillery pertaining to fuel armies being *movable* rather than *mobile* artillery and assigned to the Coast Artillery Corps are not listed herein.)

In addition to the organizations pertaining to the six field armies, there will be in both peace and war the field artillery of the overseas garrisons. Based on present conditions in the overseas possessions, on the types heretofore maintained therein, and on the types now available, the following estimate (Table II) of the field artillery components of these garrisons, which would be desirable and permissible with a Regular Army of 280,000 men, appears to be reasonable:

TABLE II

ESTIMATE OF FIELD ARTILLERY FOR OVERSEAS GARRISONS

UNITS	PHILIPPINE DEPT.	HAWAIIAN DEPT.	PANAMA CANAL DEPT.	TOTAL
Brigade Headquarters.	1	1	1	3
Regiments (75-mm, gun, A. D.).*	1	—	1	2
Regiments (75-mm. howitzer, pack).	1	—	1	2
Regiments (75-mm. gun, motorized)	—	2	—	2
Regiments (155-mm. howitzer)	—	1	—	1
Ammunition Trains	1	—	1	2

* Animal drawn.

In the plans for reorganization, it was decided to assign in time of peace to the Coast Artillery Corps all the G.H.Q. Reserve Artillery listed in Table I other than organizations of 75's, and to the Field Artillery, all division artillery, all corps artillery except as noted, and all organizations of 75's in the G.H.Q. Reserve Artillery.

No reason was given for thus dividing, in time of peace, the mobile artillery of the field army, but it was evidently an expedient necessitated by the legal restrictions on the numerical strengths of these two branches in the Regular Army, for the principle is clearly recognized that when in time of war the heavier types of mobile artillery are called upon to fight, they will operate under corps or possibly army artillery headquarters which are Field Artillery organizations, and furthermore, it is obvious that, from the standpoint of efficiency, it is essential that the development of training and fighting methods for these types be carried on in time of peace in the branch of the Army that will be charged with their use in war. But more of this at another time. For the present, and for the purposes of this paper, the decision as stated is an established fact, and the types of mobile artillery comprised in the field armies and now assigned to the Coast Artillery Corps in time of peace, will not be considered herein, further than in the summary (Table III) given below.

A summation of the organizations shown in the two tables above

gives then the approximate number of Field Artillery units which, under present plans, are to be organized and maintained in some form or other in anticipation of a "complete and immediate mobilization for the national defense."

As a step in the work of reorganization, the War Department has published tables showing the number of these Field Artillery units which it is intended to maintain in the Regular Army. Similarly, the recently approved tables of allotments of National Guard troops give the number ultimately to be maintained in the National Guard. The remaining units pertaining to the six field armies must then necessarily be allotted to the Organized Reserves.

Table III below sets forth the above-mentioned summation and allotments and affords a basis, approximately correct, upon which to continue our survey of what the Field Artillery will be if all turns out as planned:

THE ORGANIZED RESERVES

Considering first the Organized Reserves, we are confronted with the very natural question, "What are they?" At present they are not, but within the next few months some of these new military units will have been established. Corps Area Commanders have already been furnished copies of the new "Regulations for the Organized Reserves" as well as lists of the number and types of units to be located within their commands, and they are now busy with plans for the actual work of organization.

Many persons who have given more or less thought to the Organized Reserves feel that their conception was a distinct step towards a state of real preparedness, and that the scheme is undoubtedly deserving of a fair trial. Others, however, have been heard to express frankly the opinion that organizations such as these can be of no military value, that they will be only "paper" outfits, etc.; all of which brings up the question of what must be accomplished in this experiment to achieve a reasonable success. To expect this force to be mobilized on one day and to fight effectively on the next is absurd. If, however, the scheme is looked upon primarily as a means of speeding up mobilization and training to a far greater extent than was possible in this country during the World War, the proposition may appear more worthy of serious consideration. So before passing judgment on this untried component of the Army let us see what the law and the War Department expect of it.

The law authorized the President to form any or all members of the Enlisted Reserve Corps into tactical organizations similar to those of the Regular Army, similarly armed, uniformed, and equipped, and composed, so far as practicable, of men residing in the

TABLE III

TYPES	UNITS			UNITS ALLOTTED TO				
						ORGANIZED RESERVES		
	With Six Armies	Overseas	Total	Regular Army	National Guard	With First Three Armies	With Second Three Armies	Total
Division Artillery								
Brigade Hdqrs	54	3	57	12	18	—	27	27
Regiments (75-mm. gun, A. D.)	108	2	110	20	36r	—	54	54
Ammunition Trains	54	2	36	11	18	—	27	27
Corps Artillery								
Corps Artillery Hdqrs	18	—	18	—	2	7	9	16
Brigade Hdqrs	18	—	18	3	6	—	9	9
Regts. (155-mm. how)	54	1	55	7	21	—	27	27
*Regts. (155-mm. gun)	18	—	*18	—	5	4	9	13
Observation Battalions	18	—	18	3	3	3	9	12
Ammunition Trains	18	—	18	3	6	—	9	9
Cavalry Division, Artillery								
Battalions (75-mm. gun, horse)	12	—	12	2	2	2	6	8
Army Artillery								
Army Artillery Hdqrs	6	—	6	—	—	3	3	6
Ammunition Trains	6	—	6	—	2	1	3	4
(Combatant organizations from G. H. Q. Reserve.)								
G. H. Q. Reserve Artillery								
Brigade Hdqrs	12	—	12	—	—	6	6	12
Regts. (75-mm. gun. motorized)	18	2	20	2	7	2	9	11
Regts. (75-mm. gun. portée)	18	—	18	—	4	5	9	14
Regts. (75-mm. howitzer, pack)	1	2	3	3	—	—	—	—
Ammunition Trains	6	—	6	—	—	3	3	6
*Brigade Hdqrs	6	—	*6	2	—	1	3	4
*Regts. (155-mm. gun)	12	—	*12	2	1	3	6	9
*Regts. (240-mm. how.)	12	—	*12	2	—	4	6	10
*Regts. (6″ gun)	6	—	*6	—	1	2	3	5
*Ammunition Trains	12	—	*12	2	—	4	6	10

* Assigned to Coast Artillery Corps in time of peace.

same locality, to officer them by the assignment of Reserve officers or officers of the Regular Army, active or retired, and to detail such personnel of the Army as may be necessary for the administration of such organizations and the care of Government property issued to them.

It is also prescribed that members of the Enlisted Reserve Corps may be placed on active duty, as individuals or organizations, in the discretion of the President, but, except in time of a national emergency expressly declared by Congress no reservist shall be ordered to active duty in excess of the number permissible under appropriations made for this specific purpose, nor for a longer period than fifteen days in any one calendar year without his own consent.

In the case of members of the Officers' Reserve Corps, it is prescribed that, so far as practicable, they shall be assigned to units in the locality of their places of residence, and in their case also there is a prohibition against their being employed on active duty for more than fifteen days per year without their consent.

There is, therefore, sufficient legal authority for the Organized Reserves to be composed of real live units, maintained at war strength, fully armed, uniformed and equipped, trained actively for fifteen days each year, and furnished with officers and enlisted men of the Regular Army sufficient in number to attend to administration, supply and maintenance, to give such voluntary instruction as may be feasible, and to initiate such activities, military, social, or athletic, as will hold the interest not only of the members but of the local public as well.

The War Department, however, realizing that funds, men with sufficient military or technical training to permit their enlistment in the Enlisted Reserve Corps, and Regular Army personnel, will be more or less limited, is planning to organize this force on a more modest scale than that portrayed above. For example, although Reserve officers will, so far as practicable, be assigned to organizations up to the prescribed war strength, the immediate goal in the enrolment of enlisted men will be only the strength necessary to develop the prescribed numbers and grades of noncommissioned officers and specialists. Furthermore, with respect to the training period, it is not expected that *all* units of the Organized Reserves will be mobilized annually, but that probably only one of the three divisions within a corps area, and a proper proportion of corps, army, and special troops will be mobilized and given organization training each year, while all or a part of the officers and enlisted men of the remaining units will be assembled and trained as individuals in the work of their respective branches.

Regular Army organizations will be maintained in time of peace at effective strength, and, to be worthy of the name, must be able

to mobilize at once upon the outbreak of war and proceed forthwith to the combat zone. National Guard organizations will be maintained in peace at reduced strength and, to justify their greater maintenance cost to the Federal government, as compared with that of the corresponding units of the Organized Reserves, must be able in an emergency to reach effective strength at once by calling to active duty the National Guard Reserves, mobilize quickly, and follow the Regular Army promptly into the theatre of operations without the necessity of a more or less extended period of training in camps within the Zone of the Interior. Neither of these components of the Army can expect to fill their ranks to war strength until after the initial deployment, or at least until after reaching concentration areas, where they will be in position to act as a covering force.

The Organized Reserves, as has been stated, will in peace be maintained complete to war strength as far as officers are concerned, and with sufficient enlisted men to permit the development of the prescribed war strength allowances of noncommissioned officers and specialists. Both officers and enlisted men will necessarily have had *some* military training. Upon the outbreak of war the organizations must be able to assemble quickly in training camps, and there undergo intensive training in anticipation of the receipt of their full quotas of men through the operation of the draft, the existence of which may, after our experience therewith during the World War, be safely assumed in an emergency such as would require the employment of the Organized Reserves. With such a foundation to start with, these organizations will be more than ready to take the drafted men in hand upon their arrival, and will be able to transform them into reasonably effective soldiers within a much shorter time than was possible during the recent war. And when this has been done the Organized Reserves will have justified their existence.

It is evident, therefore, that this force need not be highly trained in time of peace, but it is necessary that the officers and enlisted men enrolled therein be mentally, morally and physically capable of rapidly developing fitness for their several positions and duties under a course of intensive training. Consequently the qualifications for membership in the Officers' Reserve Corps and the Enlisted Reserve Corps must be kept sufficiently high to assure the accumulation therein of officer, noncommissioned and specialist material which will not be found wanting when the emergency is upon us.

So much for a general idea of the Organized Reserves. The scheme has its defects and is incomplete, but to those of us who took part in the organization of National Army divisions in 1917, no words need be wasted in attempting to tell what even a partial realization of the above scheme would have meant at that time!

Now to turn to the Field Artillery. In Table III above are

shown the Field Artillery units to be organized and maintained in the Organized Reserves, and in the new tables of organization can be found the number and grades of officers needed for the several types of units when at war strength. From these two sources it is possible to determine the approximate number of officers needed with the Field Artillery of the Organized Reserves. (In cases where the new tables of organization have not yet been published, the number and grades of officers have been estimated.) All of these officers will not be from the reserve. In time of peace there will be an average of at least one from the Regular Army on duty with each of the Reserve units listed in Table III, and these officers will have definite war assignments in the organizations and will remain with them upon the outbreak of war. Other Regular Army officers will probably be assigned to Reserve units upon mobilization in order to fill posts for which there are no qualified Reserve officers, but there is nothing definite upon which to base an estimate as to their number, since it depends entirely upon the extent to which the Officers' Reserve Corps can be developed. We will therefore take one Regular Army officer per listed unit as the number by which our estimate of Reserve officers may be reduced.

However, the Reserve Field Artillery officers mentioned above are not the only ones that will be needed in the "complete and immediate mobilization."

Assuming that the Regular Army will contain the full number of Field Artillery officers authorized by the Act of June 4, 1920, it is estimated (Table VI) that a total of 1085 Reserve officers will be required to bring the Field Artillery units of the Regular Army up to war strength, and to replace Regular Army officers detached therefrom for duty at schools and other activities in the Zone of the Interior.

In the case of the National Guard, also, when called into Federal service and raised to war strength, a total of 1366 Reserve officers will be needed for assignment thereto.

Finally, in addition to the Reserve officers assigned to organizations, a considerable number will be needed to assist in the establishment, and later in the operation, of such activities in the Zone of the Interior as are directly under the control of the Chief of Field Artillery. An estimate of the minimum number of Reserve officers required for such assignments is as follows:

Activity	*Reserve Officers*
Office, Chief of Field Artillery	10
Field Artillery Schools (Training School, School of Fire Staff School) for staffs, instructors, etc.	400

Field Artillery Replacement Depots for staffs, instructors, etc.	650
Field Artillery Brigade Training Centres for staffs, instructors, etc.	120
Total	1180

We now have data from which to obtain an estimate of the *minimum* requirements in Reserve Field Artillery officers for the *first* mobilization in a big war. But the bare minimum requirements will carry no margin of safety, yet losses will be incurred immediately upon mobilization. Sickness, death, discharge, transfer, failure to report, and detached service will all cause vacancies which must be filled, and an increase in our estimate of ten per cent, to cover this initial wastage and other requirements not foreseen is believed to be not excessive.

In Table IV below is shown a summary of the Reserve Field Artillery officers, not including National Guard officers holding reserve commissions, that would be needed in the "complete and immediate mobilization." The total given is an approximation at best, but it serves to give a reasonably accurate idea of requirements in Reserve officers and by comparison with the actual number of such officers holding Field Artillery commissions on February 28, 1921, it directs attention to the magnitude of the procurement problem which is confronting us now.

In time of peace, appointments as Reserve Field Artillery officers are by law limited to

(a) Former officers of the Army;

(b) Graduates of the Reserve Officers' Training Corps;

(c) Warrant officers and enlisted men of the Regular Army, National Guard and Enlisted Reserve Corps, and

(d) Persons who served in the Army at some time between April 6, 1917, and November 11, 1918.

Of the above sources from which Reserve officers may be obtained, excellent material is plentiful in (a) and (d) at present, but the supply therein is necessarily diminishing day by day. However, there were 22,393 Field Artillery officers in the Army on November 11, 1918, of whom not more than 1500 can be accounted for now in the Regular Army and the National Guard, and when the news has gone out that the Organized Reserves are not all fiction, it should be possible to complete, from the remaining 20,000 odd, the 13,807 officers needed in the Field Artillery Officers' Reserve Corps.

To sources (b) and (c) then will fall the problem of maintenance which will call for the commissioning of about 1300 officers annually.

TABLE IV

F. A. UNITS. ORGANIZED RESERVES		OFFICERS REQUIRED							
Number Allotted	Types	General Officers	Colonels	Lieutenant Colonels	Majors	Captains	First Lieutenants	Second Lieutenants	Total
	Division Artillery								
27	Brigade Hdqrs.	27	–	–	27	81	108	81	324
54	Regts. (75-mm. gun. A. D.)	–	54	54	108	810	1134	1296	3456
27	Ammunition Trains	–	–	–	27	81	27	27	162
	Corps Artillery								
16	Corps Artillery Hdqrs.	16	–	16	64	64	–	–	160
9	Brigade Hdqrs.	9	–	–	9	27	36	27	108
27	Regts. (155-mm. how.)	–	27	27	81	459	783	702	2079
12	Observation Battalions	–	–	–	12	72	72	48	204
9	Ammunition Trains	–	–	9	9	72	108	108	306
	Cavalry Division, Artillery								
8	Battalions (75-mm. gun. horse)	–	–	–	8	40	72	80	200
	Army Artillery								
6	Army Artillery Hdqrs.	6	12	42	42	48	60	–	210
4	Ammunition Trains	–	–	–	4	12	36	32	84
	G. H. Q. Reserve Artillery								
12	Brigade Hdqrs.	12	–	–	12	36	48	36	144
11	Regt. (75-mm. gun. motorized)	–	11	11	22	165	231	264	704
14	Regt. (75-mm. gun. portée)	–	14	14	28	210	294	336	896
6	Ammunition Trains	–	–	–	6	18	54	48	126
242	Officers required with O. R. units in peace and war	70	118	173	459	2159	3063	3085	9163
Total	Regular Army officers required with O. R. units in peace and war	–	–	–	–	–	–	–	242
	Reserve officers required with O. R. units in peace and war	–	–	–	–	–	–	–	8921
	Reserve officers required with R. A. units in war (Table VI)	–	–	–	–	–	–	–	1085
	Reserve officers required with N. G. units in war (Table V)	–	–	–	–	–	–	–	1366
	Reserve officers required with other F. A. activities in war	–	–	–	–	–	–	–	1180
	10 per cent. to cover wastage incident to mobilization and unforeseen requirements	–	–	–	–	–	–	–	1255
	Reserve officers required for mobilization, exclusive of N. G. officers holding reserve commissions	–	–	–	–	–	–	–	13807
	Strength. Field Artillery O. R. C. on Feb, 28, 1921, exclusive of N. G. officers holding reserve commissions	–	32	56	317	859	1336	4638	7238

At present, Field Artillery units of the Reserve Officers' Training Corps are in existence in twenty of the leading universities and colleges throughout the country, and it is hoped that within a few years, the annual output of these units will have grown to not less than 900 Reserve officers per year. The remainder of the annual requirements will, then, have to be provided through the training camps which are authorized by law for the military instruction and training, with a view to their appointment as Reserve officers or noncommissioned officers, of such warrant officers, enlisted men, and civilians as may be selected upon their own application.

It is not intended to lengthen this paper by investigating requirements and sources of procurement in the case of enlisted personnel. It might be noted in passing, however, that the training camps mentioned above provide a means of giving the untrained civilian sufficient military training to permit his enlistment in the Enlisted Reserve Corps.

The problem of procurement for the Officers' and the Enlisted Reserve Corps in time of peace looms very large, and its satisfactory solution without a lowering of qualification standards is a task that will require wise policies and persuasive publicity.

From the standpoint of the Regular Army officer, duty with a unit of the Organized Reserves should be very desirable, especially at this time when the scheme is new, the regulations quite general, and initiative, ingenuity and resourcefulness may have full swing. For the same reasons, it is obvious that Regular Army officers should be selected for this duty with the greatest care, especially at this time when the actual work of organization is about to commence.

It does not require much imagination to picture the many ways open to a tactful, energetic officer engaged in the work of building up or maintaining a Reserve unit. Except during the annual period of active duty, military training will necessarily occupy a minor place in his day's work. The establishment of cordial relations with local officials and local bodies, such as Boards of Trade, Rotary Clubs, American Legion Posts, National Guard organizations, Reserve Officers' Associations, etc., will be all-important, while the initiation of and participation in social and athletic events by the unit will help gain members and friends and will give it a standing in the community.

From the standpoint of the civilian of military age, enrolment in one of these units will reserve for him in the next war a place practically of his own choosing. The uncertainties of the draft and of the classification boards will not concern him. In time of peace he will be able to select, within limits, the branch of the service with which he prefers to serve in war. He will join a command in which he is sure to find congenial comrades when in the field. He will be

able to earn promotions by applying himself sufficiently, and thus by his own efforts he will, in a way, determine the rank that he will take among his fellows. Is all this worth while? Ask those who in the recent war were caught in the sweep of the draft, assigned to this, transferred to that, attached to something else, and consequently lived as privates among strangers and in organizations which had nothing in common with the "folks back home."

The establishment on a sound basis of workable reserve organizations is new and without precedent in this country, and enviable reputations are now awaiting the officers and enlisted men, Regular or Reserve, who successfully lead the way therein. Fortunate indeed, will be those of the Regular service who are chosen for this duty. The results of their efforts in this venture will be of the utmost importance in the determination of future policies, and, consequently, their work can not be too wisely planned nor too carefully executed.

THE NATIONAL GUARD

Unlike the Organized Reserves, the National Guard is not new, and we are all more or less familiar with this force—the second line component of the Army of the United States.

The Act of June 4, 1920, made but few changes in the Act of June 3, 1916, with respect to the National Guard, but one which *was* made will have far-reaching effects and will undoubtedly bring about a healthier feeling of comradeship between the personnel of the Regular Army and the National Guard than has ever existed before in time of peace. Prior to the passage of the Act of June 4, 1920, all policies and regulations of the National Guard were prepared in the Militia Bureau for the approval of the Secretary of War without reference to the General Staff, and the result was that the National Guard was looked upon by many Regular Army officers as a more or less independent organization in which the Regular Army had but little interest. Section 5 of the above-mentioned Act, however, now prescribes in part that all policies and regulations affecting the organization, distribution and training of the National Guard and the Organized Reserves, shall be prepared by committees of appropriate branches or divisions of the War Department General Staff, to which shall be added an equal number of Reserve officers, including Reserve officers who hold or have held commissions in the National Guard. As a result, the body charged with the preparation of policies for the Regular Army is charged just as emphatically with a similar responsibility in the case of the National Guard, and the development and training of this force to the fullest extent permissible by law and by the Constitution, is now just as much the duty of the Regular Army as is its own development and training.

In Table V below are shown the number and types of Field Artillery units which it is planned to maintain in the National Guard; also an estimate of the requirements in officers therefor, and certain other data:

On April 6, 1917. the date war was declared, the Field Artillery of the National Guard consisted of only six regiments, nineteen separate battalions and seventy-nine separate batteries. During the war, through the expansion of the above units, the transfer of National Guard units of Cavalry, Infantry, Coast Artillery and Signal Corps, and the assignment of reserve and drafted personnel, fifty-one regiments of National Guard Field Artillery were organized. Comparing these figures with the number of organizations now allotted, it would appear that the Field Artillery of the National Guard has been handed a rather large peace-time order. On the other hand, when the total National Guard allotments comprising all combat branches are examined, it is seen that the proportion of Field Artillery allotted is no greater than it should be if the National Guard, when employed by the United States in conjunction with the Regular Army, is to be a balanced component of the Army of the United States. Furthermore, the total enlisted strength of all National Guard allotments is not as great as the *minimum* strength prescribed by law for that service after June 30, 1924.

In some States there will be more or less difficulty encountered, it is feared, in organizing Field Artillery units on account of the greater expense involved and the lack of suitable armories. But these difficulties must be overcome, otherwise the old story of disrupting infantry to form auxiliaries will be repeated as soon as an emergency arises. Infantry may be the "queen of battle," but in modern war the queen does not venture far without her attendants, the most necessary of whom is the Field Artillery.

It is realized that in the minor emergencies for which National Guard units are called out within their respective States, Field Artillery, as well as certain other auxiliaries, have little, if any, place. Consequently the War Department has announced that such types of units shall receive, in addition to their regular training, a limited amount of infantry drill and of instruction in the use of the rifle or pistol in order that they may be capable of rendering satisfactory service to the States.

This provision should in itself tend to make State authorities look more favorably upon Field Artillery units, but in order to achieve anything like success in the development of the present plans, the States must be made to appreciate the full meaning of the dual mission of the National Guard; to understand that the Federal government is depending upon this force as the second increment of its Army in peace and war, and to realize the dread of disruption

TABLE V

F. A. UNITS, NATIONAL GUARD		OFFICERS REQUIRED. WAR STRENGTH SHOWN IN ( ).								UNITS RECOGNIZED UP TO MARCH, 1921
Number allotted	Types	General Officers	Colonels	Lt. Colonels	Majors	Captains	First Lieutenants	Second Lieutenants	Total	
	Division Artillery	18	–	–	18	54	54	36	180	1
		(18)	–	–	(18)	(54)	(72)	(54)	(216)	–
18	Brigade Hdqrs	–	36	36	72	504	756	360	1764	4
36	Regts. (75-mm. gun. A. D.)	–	(36)	(36)	(72)	(540)	(756)	(864)	(2304)	–
	Battalions	–	–	–	–	–	–	–	–	12
	Batteries	–	–	–	–	–	–	–	–	31
18	Ammunition Trains	–	–	–	–	18	18	18	54	–
	Corps Artillery	–	–	–	(28)	(54)	(18)	(18)	(108)	–
2	Corps Artillery Hdqrs	2	–	2	8	8	–	–	20	–
		(2)	–	(2)	(8)	(8)	–	–	(20)	–
6	Brigade Headquarters	6	–	–	6	18	18	12	60	–
		(6)	–	–	(6)	(18)	(24)	(18)	(72)	–
21	Regiments (155-mm. how.)	–	21	21	63	336	504	252	1197	–
		–	(21)	(21)	(63)	(357)	(609)	(546)	(1617)	–
	Battalions	–	–	–	–	–	–	–	–	2
	Batteries	–	–	–	–	–	–	–	–	7
	Observation Batteries	–	–	–	–	3	6	3	12	–
3	(Observation Battalions)	–	–	–	(3)	(18)	(18)	(12)	(51)	–
6	Ammunition Trains	–	–	–	6	36	48	30	120	–
		–	–	(6)	(6)	(48)	(72)	(72)	(204)	–
	Cavalry Division Artillery	–	–	–	2	10	16	12	40	–
2	Battalions (75-mm. gun. horse)	–	–	–	(2)	(10)	(18)	(20)	(50)	–
	Army Artillery	–	–	–	2	6	18	16	42	–
2	Ammunition Trains	–	–	–	(2)	(12)	(18)	(16)	(48)	–
	G. H. Q. Reserve Artillery	–	7	7	14	98	147	70	343	–
7	Regiments (75-mm. gun. motorized)	–	(7)	(7)	(14)	(105)	(147)	(168)	(448)	–
4		–	4	4	8	56	84	40	196	–
125	Regts. (75-mm. gun. portée)	–	(4)	(4)	(8)	(60)	(84)	(96)	(256)	–
Total	Officers required with N. G. units in war	(26)	(68)	(76)	(220)	(1284)	(1836)	(1884)	(5394)	–
	National Guard officers required with N. G. units in peace	26	68	70	199	1147	1669	849	4028	–
	Reserve officers required with N. G. units in war	–	–	–	–	–	–	–	1366	–
	Regular Army officers required with N. G. units in peace	–	–	–	–	–	–	–	125	–
	National Guard officers of recognized P. A. units holding reserve commissions, February, 1921	–	2	2	13	95	118	119	349	–

upon mobilization that is firmly implanted in the heart of every National Guardsman who served in the World War.

The National Guard Reserve provides a means whereby the enlisted strength of a National Guard organization may, in an emergency, be quickly increased. For each type of unit there has been prescribed a minimum number below which, in time of peace, the active enlisted strength should not fall. Men enlisted in the National Guard Reserve may be assigned to organizations which have enlisted this minimum active strength, but the number of reservists is not to exceed the number of active enlisted men in any organization, nor can the total enlisted strength, active and reserve, exceed the prescribed war strength. It is possible therefore for a National Guard organization, in time of peace, to have its full war strength of enlisted men all enrolled and available for an emergency. Such a strength will seldom, if ever, be attained, and consequently any war strength increment of enlisted men which may be necessary upon mobilization must be procured through voluntary enlistments or the draft.

As far as officers are concerned, the National Guard Reserve is practically nothing more than a means whereby State authorities can keep in touch with officers who have become surplus for some reason or other. It is not contemplated that the officers needed to bring National Guard organizations to war strength will be obtained from the National Guard Reserve. When the necessity for such an increase arises, the National Guard will have been drafted into the service of the United States, and it will then very properly complete its quota of commissioned personnel from the same source as will the other Federal-forces—that is, from the Officers' Reserve Corps. As shown in the above table, approximately 1366 Reserve officers will be needed to bring to war strength the Field Artillery units which have been allotted to the National Guard.

The duties of Regular Army officers detailed in time of peace with the National Guard will be about the same as heretofore. The added responsibility which the Regular Army will feel for the National Guard will doubtless cause the inspector-instructor to seek better results by emphasizing his work as instructor and minimizing that as inspector. If, as some people hope, his title should be changed to merely "Instructor," it will be possible for him to become more closely identified with the organization with which he is detailed, and the relations between himself and the National Guard personnel will be more open and frank than is possible when working in the shadow of the inspector's pencil. Furthermore, the fact that the instructor, as well as the results of his instruction, will be subject to inspection by others will by no means act as a deterrent to him in the performance of his duty.

The minimum number of Regular Army officers that will be needed with Field Artillery units of the National Guard is about 125—an average of one per unit listed in Table V above. Upon mobilization a Regular Army officer detailed as inspector-instructor will accompany his National Guard organization to its mobilization point and, in the absence of other orders, will report to the commanding officer there for further instructions.

There is hard work ahead for all concerned in the development of the Field Artillery of the National Guard. The program which has been laid down is not an easy one, and the expectation that National Guard units will, in an emergency, mobilize quickly and be ready to follow the Regular Army promptly to the theatre of operations without a period of duty in training camps, indicates that the peace-time training must be more thorough and complete than heretofore.

THE REGULAR ARMY

The several missions of the Regular Army, which have already been stated above, lead one to believe that in the future the work of the Field Artillery will be plentiful and even more varied and interesting than it was before the war. For purposes of discussion this work may be classified as follows:

(a) Duty with Field Artillery activities included in the overhead of the Army;

(b) Duty with the expeditionary force of the Regular Army, and with the overseas garrisons;

(c) Duty with the National Guard, the Organized Reserves and the Reserve Officers' Training Corps.

The office of the Chief of Field Artillery, the Field Artillery Schools and the Field Artillery Board are the principal Field Artillery activities included in the overhead of the Army.

Over all of these the Chief of Field Artillery exercises direct supervision and control. He is charged also with the duty of furnishing the Chief of Staff with information and advice on all questions affecting the Field Artillery. He does not *command* the various troop units, but he controls their development and progress to a very great extent. For example, he formulates and develops the tactical doctrine of the Field Artillery in accordance with the War Department doctrine which requires training for offensive combat, and he prepares, for the approval of the Secretary of War previous to distribution throughout the service, the necessary manuals, regulations, training memoranda, etc., relating to the employment, instruction and training of Field Artillery and to the care and use of matériel and equipment. He coöperates with the chiefs of supply services in developing the armament and equipment of the Field Artillery, and

with the Chief of the Personnel Bureau of The Adjutant General's Office, and informs himself by personal visits, or by those of his representatives, of actual conditions within the tactical units and other activities of the Field Artillery.

The office of Chief of Field Artillery was established during the stress of war apparently on account of the fact that the control which the General Staff at that time was capable of exercising over the Field Artillery was not sufficiently centralized to accomplish the desired results in organization and training. Upon its establishment, affairs in the Field Artillery at once took a turn for the better. Improvement continued as time went on, and now Congress has put its seal of approval on the work accomplished by the decree that the office shall be permanent.

The Field Artillery Schools afford an effective means whereby the Chief can develop and standardize, in accordance with his own ideas, the instruction and training of officers in the technic and tactics of Field Artillery. At the present time when over 65 per cent. of the Field Artillery officers of the Regular Army have been commissioned within the last four years, there is certainly great need for just such a standardizing agency, and the sooner all of us are indoctrinated with the ideas of the Chief as expressed through the schools, the better it will be for the Field Artillery.

Before there was a Chief, it was possible, for example, for a commanding officer to require graduates of the School of Fire who joined his command to discard methods of fire taught at the school and to substitute therefore others more to his liking. This was actually and consistently done in one regiment with the result that the minds of junior officers were confused, and much time was wasted in useless arguments on a relatively unimportant detail.

Now the school methods are the Chief's methods, and as such they will be followed throughout the service without question. Of course there will still be differences of opinion and it is well that there should be, for through them comes progress. But the point to be noted is that a man who feels that he has a just criticism of existing conditions and also a remedy therefor should put the matter up to the Chief, who can bring about any needed change, rather than uselessly to disparage the work of an authorized school and spread confusion in the service, as was done in the case mentioned above.

Briefly, the schools now authorized and the courses planned for are as follows:

(a) Field Artillery School, Camp Knox, Kentucky (Basic Course).

In peace there will be at this school:

A course designed to take Regular Army officers upon their initial

entry into the service and qualify them so that they may function intelligently when assigned to duty with troops;

A similar course for officers of the National Guard and the Organized Reserves; and

A course for noncommissioned officers preparatory to their detail as instructors with units of the National Guard and the Organized Reserves.

Of these courses the first is already organized and operating.

Upon mobilization, this school will undoubtedly become a Field Artillery Officers' Training School similar to the one which was operating so successfully at Camp Taylor, Kentucky, at the time of the signing of the armistice.

(b) Field Artillery School, Fort Sill, Oklahoma.

In peace there will be at this school:

A course designed to cover the technical and tactical training necessary to qualify Regular Army officers as all-round battery officers;

A similar course for officers of the National Guard and the Organized Reserves;

A course for airplane observers;

Courses for commissioned specialists in communications, counter-battery, motor transportation and research work; and

Courses for enlisted specialists.

Of these the first three and the last are already organized and operating.

Upon mobilization the Officers' Section of this school will undoubtedly expand and carry on its work as a School of Fire similar to the one which was in operation at the same place during the war. The Enlisted Section will probably become a replacement depot for enlisted specialists.

(c) Field Artillery School, Camp Bragg, N. C. (Advanced Course).

In peace there will be at this school:

A course designed to qualify Regular Army officers in the command and staff functions of the higher Field Artillery tactical units;

A similar course for officers of the National Guard and the Organized Reserves; and

A Centre of Artillery Studies similar to the one that was organized at Treves, Germany, after the signing of the armistice.

Of these the first is now being organized.

In war this school will probably expand and continue to work along the same lines as in peace.

As a part of the authorized school system, there should be mentioned the provision of law that permits the detail of Regular Army

officers as students at such technical, professional and other educational institutions, or as students, observers or investigators at such industrial plants and other places, as shall be best suited to enable these officers to acquire a knowledge of, or experience in, the specialties in which it is deemed necessary that they perfect themselves.

In these days it is more or less the fashion to be bored at the thought of schools. Nevertheless, the special service schools are absolutely necessary if there is to be any uniformity or any progress in the work of the Field Artillery, and it is the duty of every officer either to attend the schools as a student, or, if that is impracticable, to acquaint himself with the various courses in order that he may do his part in the standardization and consequent simplification and improvement of training methods.

The Field Artillery Board is located at Fort Sill, Oklahoma, and its members include:

The Commandant, Field Artillery School, Fort Sill, Oklahoma;

An officer of the Ordnance Department who has specialized on Field Artillery matériel; and

Five officers of Field Artillery, one of whom is at Washington, D. C., in the office of the Chief of Field Artillery.

The Board considers such subjects pertaining to Field Artillery as may be referred to it by the Chief, and also has authority to originate and submit recommendations looking to the improvement of the Field Artillery. Its work touches every phase of the Field Artillery game. From the standpoint of the practical field artilleryman it tests and reports upon new types of armament, ammunition, artillery vehicles, motor transportation, horse equipment, personal equipment, fire control instruments, etc. It also prepares new editions of drill regulations, instruction manuals, tables of equipment and tables of organization.

The Board and the Field Artillery School work in close touch with each other to their mutual advantage. In its tests, the Board is frequently obliged to utilize the personnel, troops and installations of the school while the latter is informed of the latest developments in matériel, equipment, etc., by its participation in the varied tasks of the former.

The nature of its work is such that the more efficiently and completely the Board performs its duties in time of peace, the less use will there be for it to function in time of war. It is very probable then that the Board will cease to operate in war, and that questions which would normally be referred to it will be answered in the Matériel Section of the office of the Chief of Field Artillery, and any necessary field tests will be carried out under the commandant of the school at Fort Sill or elsewhere.

It is essential that the education of the Field Artillery officer of the Regular Army be based on experience gained by actual service with good Field Artillery troops. Furthermore, opportunities for duty with troops should recur so frequently that there will be no chance for the officer to lose confidence in his ability, or be unable properly to command and instruct, in accordance with up-to-date principles, a Field Artillery unit appropriate to his rank.

The statement in existing orders to the effect that officers are not available for detached service after completion of a course at a special service school until after serving one year with troops of their branch of the service is a wise provision, but will it be complied with? If we are to reap in full the benefits of our well-conceived school system, something of this kind must be done. A tour of duty with troops at a time when the graduate officer is imbued with the teachings of the school will permit him to put in practice the things he has learned, thereby clinching them in his mind, while at the same time, the more or less theoretical school methods will be put to the test of actual use with ordinary, as distinguished from school, troops.

In Table VI below are listed the Field Artillery units of the Regular Army which it is planned to maintain in the expeditionary force and the overseas garrisons:

Comparing the number of officers authorized by law with the number who will actually be on duty with Regular Army units would give some idea of the amount of troop duty which an officer could expect, if it were practicable at the present time to obtain reasonably accurate estimates of these figures. But such is not the case.

The total number of Field Artillery officers authorized by law is indeterminate. In addition to the Chief of Field Artillery and the 1900 officers indicated in the law who will be used by him for assignment to Regular Army troop units, to special service schools as instructors and students, to general service schools as students, and to other activities pertaining particularly to the Field Artillery, there are the officers detailed for duty with other branches of the Army, and also those carried on the Detached Officers' List, including those on duty with the National Guard, the Organized Reserves, the Reserve Officers' Training Corps, the general service school faculties and other activities of general concern to the entire Army.

In spite of the fact that exact figures are not obtainable, it is evident that the number of officers serving with Regular Army Field Artillery units will never equal the authorized peace strength, and that the amount of troop duty which might otherwise be expected, will be appreciably reduced.

Mobilization plans will require that units of the Regular Army be ready at any time to proceed to a theatre of operations and fight

TABLE VI

F. A. UNITS, REGULAR ARMY		OFFICERS REQUIRED. WAR STRENGTH SHOWN IN ( ).										
Number	Types	General Officers	Colonels	Lieutenant Colonels	Lieutenant Colonels or Majors	Majors	Captains	Captains or Lieutenants	First Lieutenants	Lieutenants	Second Lieutenants	Total
	Division Artillery											
12	Brigade Hdqrs, including one at war strength	12	—	—	11	1	—	98	—	—	—	122
		(12)	—	—	—	(12)	(36)	—	(48)	—	(36)	(144)
20	Regts. (75-mm. gun, A. D) including two at war strength	—	20	—	60	—	156	174	—	600	—	1010
		—	(20)	(20)	—	(40)	(300)	—	(420)	—	(480)	(1280)
11	Ammunition Trains, including one at war strength	—	—	—	—	1	13	—	—	22	—	36
		—	—	—	—	(11)	(33)	—	(11)	—	(11)	(66)
	Corps Artillery											
3	Brigade Hdqrs	3	—	—	3	—	—	24	—	—	—	30
		(3)	—	—	—	(3)	(9)	—	(12)	—	(9)	(36)
7	Regts. (155-mm. how.)	—	(7)	—	28	—	42	119	—	203	—	399
		—	7	7	—	(21)	(119)	—	(203)	—	(182)	(539)
3	Observation Batteries	—	—	—	—	—	3	—	—	9	—	12
	(Observation Battalions)	—	—	—	—	(3)	(18)	—	(18)	—	(12)	(51)
3	Ammunition Trains	—	—	—	—	—	3	—	—	6	—	9
		—	—	(3)	—	(3)	(24)	—	(36)	—	(36)	(102)
	Cavalry Division Artillery											
2	Battalions (75-mm. gun. horse)	—	—	—	2	—	6	8	—	24	—	40
		—	—	—	—	(2)	(10)	—	(18)	—	(20)	(50)
	G. H. Q. Reserve Artillery											
2	Regts. (75-mm. gun. motorized)	—	2	—	6	—	14	16	—	60	—	98
		—	(2)	(2)	—	(4)	(30)	—	(42)	—	(48)	(128)
3	Regts. (75-mm. gun. pack)	—	3	—	9	—	21	24	—	90	—	147
		—	(3)	(3)	—	(6)	(45)	—	(63)	—	(72)	(192)
	Officers required with R. A. units in war	(15)	(32)	(35)	—	(105)	(624)	—	(871)	—	(906)	(2588)
	Officers required with R. A. units in peace	15	32	—	119	2	258	463	—	1014	—	1903
	Reserve officers required to fill R. A. units to war strength	—	—	—	—	—	—	—	—	—	—	685
	Reserve officers required to replace R. A. officers detached upon mobilization	—	—	—	—	—	—	—	—	—	—	400
	Reserve officers required with R. A. units in war	—	—	—	—	—	—	—	—	—	—	1085

effectively without delay. It is also expected that they be fit at all times to serve as models for the organization, discipline and training of the National Guard and the Organized Reserves.

Either of these considerations demand that such units be maintained at an effective strength. This is especially true in the case of the Field Artillery battery where the amount of matériel and the number of animals to be cared for does not necessarily vary with the enlisted strength. An under-manned and, consequently, overworked battery can neither be a model nor can it fight effectively. When an organization is maintained below effective strength it might as well be skeletonized, and the place for a skeletonized unit is in the Organized Reserves rather than in the Regular Army.

Duty with the National Guard and the Organized Reserves has already been touched upon sufficiently for the purposes of this paper. In connection with this subject, however, we cannot emphasize too strongly the necessity for care in the selection of officers for this duty. To the inhabitants of the locality in which an officer on such duty is serving, he is the personification of the Regular Army. As *he* is, so is the Regular Army; hence the importance of detailing only such officers as can best represent that body and impart its spirit and ideals.

As was seen above the Reserve Officers' Training Corps is to be a big factor in the procurement of commissioned personnel for the Officers' Reserve Corps in time of peace. At present, 58 Regular Army officers are carrying on the training of the Field Artillery units now established in twenty colleges and universities. As these units increase in strength the number of officers detailed therewith will also increase until an estimated maximum of about 85 is reached. The present intention is that the enrolment will be increased by building up the units already in existence rather than by extending the work into a greater number of institutions and establishing new units there.

What will happen to the Field Artillery Reserve Officers' Training Corps units upon mobilization is not known definitely, but it is reasonable to suppose that as many members as are considered qualified will be commissioned at once; that those who are considered suitable officer material but are not sufficiently trained, will proceed, together with most of the officers on duty with them, to the location of the Field Artillery Officers' Training School, there to become respectively the first class and the corps of instructors at that establishment. The remaining students may then be held at the institutions to continue their studies until they are needed at the Officers' Training School, at the schools for enlisted specialists, or elsewhere.

In the preceding pages an attempt has been made, based on announced plans of the War Department, but supplemented by estimates

and personal opinions, to show what the Field Artillery *may* become under existing legislation. To attempt to state at this time what will actually happen would be more difficult and of little value. The principal point to be noted is that there is a plan, a goal, an objective, towards which we should move, slowly perhaps, but with never a backward step.

The rate of advance towards the realization of the plan depends primarily upon the desires of the country as expressed by Congress in appropriated funds, and in keeping the law unchanged until there has been a real opportunity to prove or disprove its worth. Progress will also depend very greatly upon the War Department's adherence, for a similar period, to its basic plans. After it is learned to what extent the plans for the Regular Army, the National Guard and the Organized Reserves can be carried out, a regrouping of tactical units and a consequent revision of the allotments thereof will undoubtedly be necessary, but a vacillating policy will lead to little or nothing of value. Finally, the energizing influence behind the development of all components of the Army must come from the Regular Army personnel. Given a definite plan and the word to go ahead, that influence will be found in abundance, for the Regular Army is not in the habit of failing to carry out, loyally and energetically, the duties assigned it by the War Department.

With respect to the possibility of changes in the law, Congress has already decided that, for the time being, the authorized enlisted strength of the Regular Army shall be 175,000 instead of 280,000. This temporary restriction need cause no change in the basic plans, but, until it is removed, it will obviously reduce the Field Artillery troops which it was expected would be maintained, by thirteen or fourteen regiments. However, in view of the fact that at present there are only about 1150 Field Artillery officers in the Regular Army, this reduction in enlisted strength may not be unwelcome for a year or two.

It has also been attempted to indicate herein, for the possible information and benefit of the many recently commissioned Field Artillery officers of the Regular Army, the various existing or contemplated activities of their branch, and their relations to each other—in other words, the Field Artillery set-up.

It is possible also that a realization of the various kinds of duty which may fall to the Field Artilleryman without going even beyond the limits of his branch of the service will help these officers to appreciate that the professional attainments expected in time of peace cover a wider field than those demanded in war. There developed, during the war, a decided tendency towards specialization within the branch. This was unavoidable as there was not time in which to make each officer an all-round Field Artilleryman. In

time of peace, however, it is essential that the officer possess at least a good working knowledge of all parts of the Field Artillery machine. The branch will always need specialists in motors, ballistics, etc., but the Army needs specialists in Field Artillery!

For the present, the Regular Army is passing through a period of dissatisfaction and unrest, but conditions, normal for time of peace, cannot be far away. Their arrival will be expedited, however, if we can stop dreaming of the past, forget our grievances, and get to work again.

We know the general plan, the work has started, and there is enough of it for all. Each one of us can find a place in which our efforts will be effective whether or not we have heard Boche bullets sing. Gold chevrons and medals lend prestige, but even a hero must continue to "deliver the goods." There is still hope for those of us who fought the war on this side of the Atlantic. Therefore, regardless of our past service, regardless of our present status, Regular, Guardsman, or Reserve, we must get together as Field Artillerymen, toss our heads free of the clouds, or the fogs perhaps, plant our feet on solid ground, put our shoulders to the wheels, and we will soon be pounding the path of progress while "the caissons go rolling along."

RADIO COMMUNICATION FOR THE FIELD ARTILLERY

BY MAJOR JOSEPH O. MAUBORGNE,
SIGNAL CORPS, U.S.ARMY

THE United States entered the World War with no radio communication specifically provided for the use of the Field Artillery, either for communication with airplanes, or for connecting up the various Field Artillery units. The American Expeditionary Forces were supplied with French radio equipment upon their arrival in France. That given to our Field Artillery units was very simple and consisted, so far as the battalions were concerned, of small receiving sets similar to our present SCR-54 set. These sets were able to receive within the range of waves transmitted by the spark transmitting set mounted on planes assigned to the Field Artillery. They might also receive from the small spark sets issued to the Infantry regiments, although this channel of communication was seldom used.

ARTILLERY RADIO IN THE INFANTRY DIVISION

Development of radio communication for the Field Artillery was immediately inaugurated in the Signal Corps Research Laboratories in France and in this country. This development might be classified under three different heads since there are three different classes of radio service demanded by the Field Artillery.

First, for fire control communication between the artillery battalion and the airplane, the original set developed was the SCR-73 mounted on the plane which transmitted only. Messages from the SCR-73 were received by the battalion with a receiving set known as the SCR-54, later replaced by the SCR-54-A. Little need be said concerning the SCR-73 since it has been replaced by later types. It will be of interest to know, however, that it was a non-synchronous, rotary-gap spark transmitting set. No reception was possible on the plane and panels were used by the Artillery to reply or acknowledge.

The importance of two-way communication between the plane and the battalion has led to considerable research, and the further advantage of making this communication telephonic rather than telegraphic has resulted in the development of the radio telephone sets, SCR-67, SCR-68 and SCR-109. The SCR-67, with its counterpart on the plane, the SCR-68, is a set designed to transmit and receive radio telephone messages on wave-lengths varying from 250 to 450 metres. Although these sets were successful, yet their

lack of power and short transmitting range led to the development of a larger and more powerful ground set known as the SCR-109, and later the SCR-109-A, a photograph of which is shown in Fig. 1. Telephonic conversation can be carried on between SCR-109-A sets up to 75 miles, and undamped wave telegraph transmission up to 450 miles. Both of these distances can be attained in daylight. The Field Artillery within the division, however, is provided with a shorter antennæ than that used for gaining these extreme distances and the working range is, therefore, appreciably shortened. This set is a distinct improvement over the former SCR-67-A set, however, which can be heard by an airplane receiving set for a distance of only about one and a half to three miles. This range was not considered sufficient for the work of the Field Artillery which demands telephonic communication up to fifteen miles.

A corresponding set is now under development for the reglage plane.* This will be known as the SCR-135. It is designed to have a telephone range of from 80 to 100 miles and a telegraph range from 200 to 250 miles.

With its latest improvements the SCR-109-A set complete with its batteries, will weigh about 400 pounds. The power for the set is derived from a dynamotor driven by a 12-volt storage battery made up of three 4-volt units. Each SCR-109 set is supplied with three sets of such batteries so that one set of batteries may be charging, one set in use and one set in transit to or from the charging station. The wave-length range of the transmitter is from 300 to 500 metres while its receiving range of wave-length is from 300 to 1100 metres. The receiving apparatus of this set can receive both spark or undamped wave telegraph signals as well as radio telephone conversation.

The second field of development is that for filling the need of a powerful ground set to be used in the Field Artillery brigade net, shown in Fig. 2. Here we find that the same SCR-109-A at the artillery brigade and regiments ably meets this second requirement in addition to acting in the capacity of a reglage set. Thus the Field Artillery regiments may listen in on the reglage work between the planes and the artillery battalions. While it will be possible for the regiment to communicate with its battalion by means of the SCR-109-A, yet this will be the exception rather than the rule, since the set at the battalion is designed primarily for communication with the plane and it should not be diverted from this duty.

The third line of development is quite different from the other two. Radio communication between the Infantry and the Field Artillery was very unsatisfactory with the radio equipment which we received from the French Army. *The problem of rapid and*

* Plane adjusting artillery fire.—Editor.

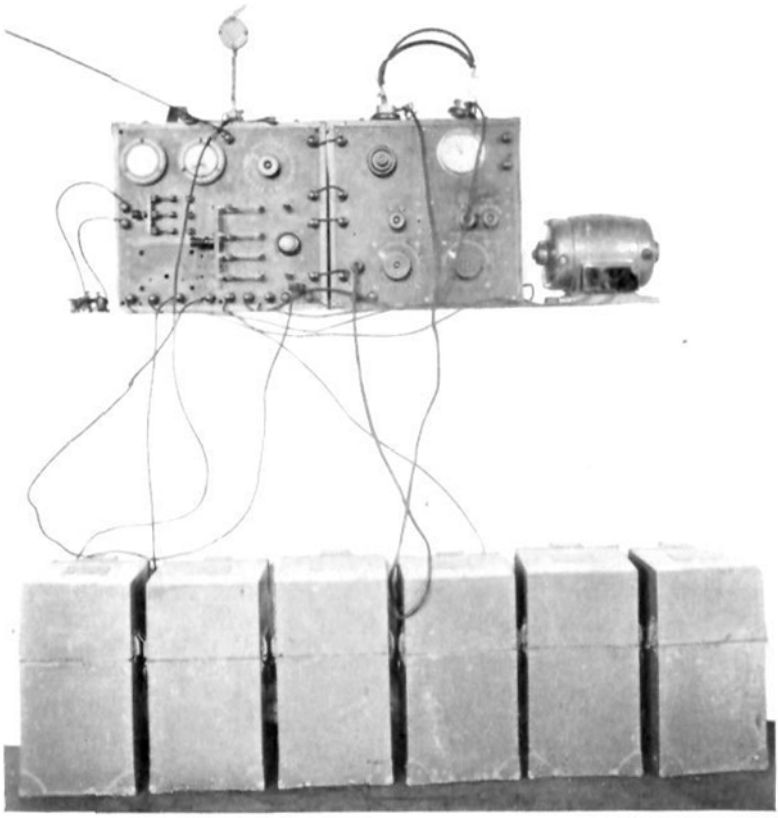


FIG. 1. SCR-109-A RADIO TELEPHONE AND TELEGRAPH SET

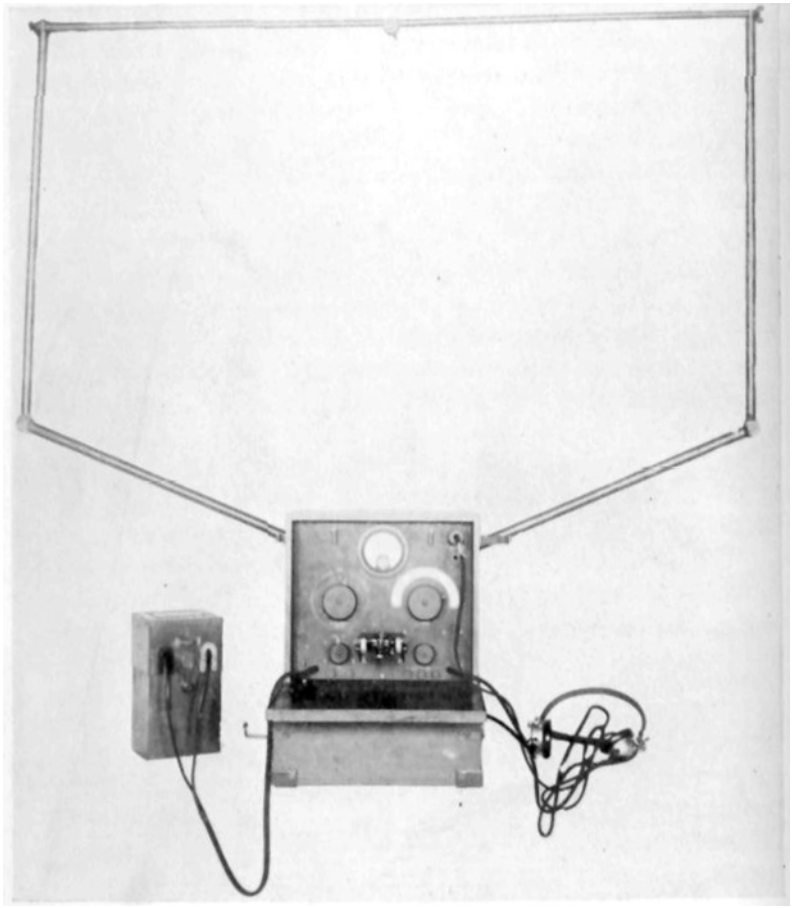
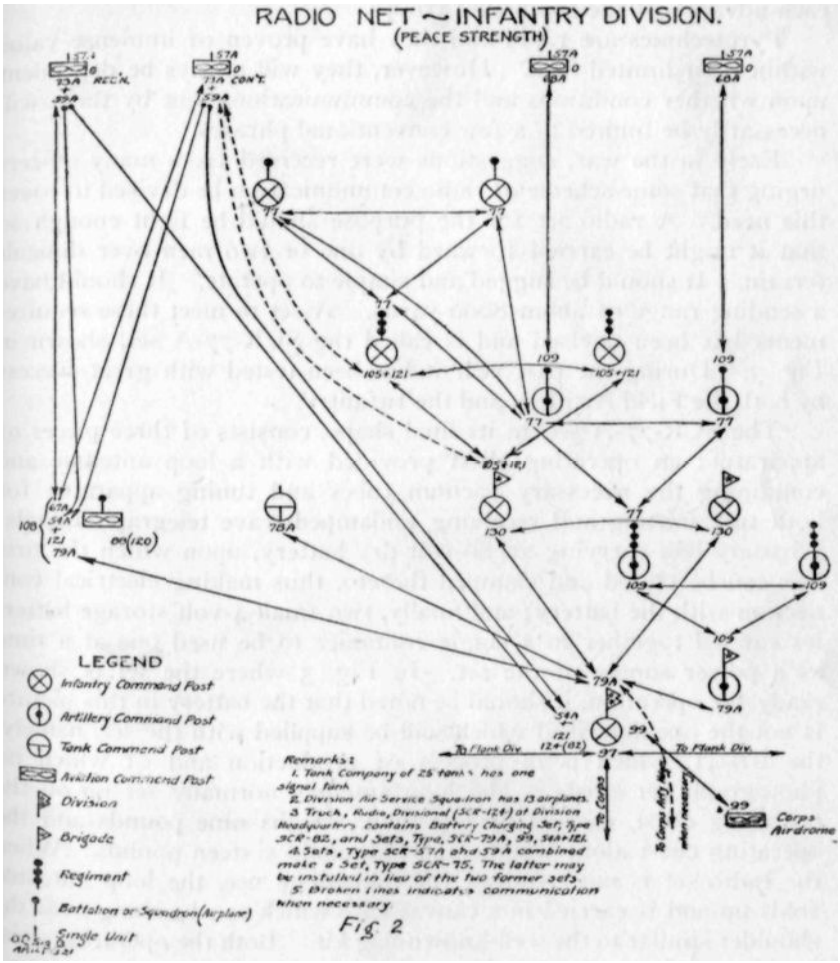


FIG. 3.—SCR-77-A SET SET UP FOR OPERATION, SET BOX RESTING UPON THE BATTERY BOX

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 success on account of the lack of instant and unfailing communication between the combat battalion of infantry and its supporting artillery.[1] The telephone personnel are at a disadvantage in



attempting to extend their lines, to keep up with the advancing infantry and in maintaining those lines under fire. How these lines were extended and were maintained under darkness and other adverse conditions is a story of heroism and valor which need not be mentioned in this article, but

[1]Our italics,—Editor.

the fact remains that such lines are subject to many interruptions and that interruptions are costly both in men and in time. Runners are too slow to be suitable for carrying back such urgent messages as demands for barrage or demands for a lengthening of the range or a call for fire upon a newly discovered enemy centre of resistance. Pigeons are almost out of the question on account of the time required to establish a loft and its consequent inability to follow each advance of the combatant troops.

Pyrotechnics are rapid and they have proven of immense value within their limited field. However, they will always be dependent upon whether conditions and the communications sent by them will necessarily be limited to a few conventional phrases.

Early in the war, suggestions were received from many officers urging that some scheme of radio communication be devised to cover this need. A radio set for the purpose should be light enough so that it might be carried forward by one or two men over difficult terrain. It should be rugged and simple to operate. It should have a sending range of about 8000 yards. A set to meet these requirements has been devised and is called the SCR-77-A set, shown in Fig. 3. During the past year it has been tested with great success by both the Field Artillery and the Infantry.

The SCR-77-A set, in its final shape, consists of three pieces of apparatus; an operating chest provided with a loop antennæ and containing the necessary vacuum tubes and tuning apparatus for both transmitting and receiving undamped wave telegraph signals; a battery box carrying an 80-volt dry battery, upon which the first box can be placed and clamped thereto, thus making electrical connection with the battery; and finally, two small 4-volt storage batteries carried together in a single container to be used one at a time as a power supply of the set. In Fig. 3 where the set is shown ready for operation, it should be noted that the battery in this picture is not the one described which will be supplied with the set, namely, the BB-41, which is in process of production and of which no photograph yet exists. The loop antennæ normally set up on the operating chest, carried by one man, weighs nine pounds and the operating chest alone weighs approximately sixteen pounds. When the radio set is not required for immediate use, the loop antennæ folds up and is carried in a canvas case which can be slung over the shoulder similar to the well-known flag kit. Both the operating chest proper and the dry battery box are provided with straps for carrying these boxes like haversacks. The dry battery box weighs about sixteen and a half pounds, and the dry battery therewith should furnish about ten or twelve hours service. Then it should be replaced. Three 4-volt storage batteries are supplied by the Signal Corps with each set, two to be carried fully charged with the set, the other

FIG. 4.—SCR-77-A SET. METHOD OF CARRYING WHEN EMPLOYING TWO MEN
This photograph shows loop in its carrying bag and one BB-41 battery

FIG. 4A—SCR-77-A SET. SHOWN AS TO BE CARRIED BY TWO MEN

to be left back at the charging plant to replace the first one discharged. The two batteries carried by the second man, in the case of Infantry, together with the carrying case with which they are provided, together weigh about 22 pounds. In the case of Field Artillery, these sets can, of course, be transported on a caisson or wagon when desired. Fig. 4 and Fig. 4a show a photograph of the set prepared for transportation by two men.

The SCR-77-A loop set will provide accurate communication up to 8000 yards, and 10,000 yards may be reached under favorable circumstances. The decrease in range from 10,000 yards to 8000 yards was made as a concession to the Infantry who did not desire greater weight or a larger loop. In addition, this undamped wave loop radio telegraph set affords very rapid telegraphic communication for the reason that it is provided with a break-in feature by which the transmission from the distant station can be interrupted at any instant by a station with which it is communicating. The SCR-77-A set is now ready for manufacture and should be in the hands of troops within six months.

This loop set will work from a dugout, provided that no part of the dugout is closer than two feet to the antennæ, since the proximity of a wall or any object closer than this changes the capacity of the antennæ and throws the set out of tune with other sets of the same kind, and hence cannot be heard by them.

One SCR-77-A set is issued to each regiment and battalion of artillery assigned to the Infantry Division (Fig. 2). Each regiment of Infantry is furnished with five of these sets, one with each battalion, one for use at regimental headquarters, and one spare. The set has a range of nine distinct wave-lengths so that each combat Infantry battalion and each regimental headquarters of Infantry, as well as each Artillery battalion and regimental headquarters is assigned a wave-length on which it "stands by" listening for a call from other sets. Another set desiring to call, sets its transmitter for the pre-assigned wave-length of the called station and transmits on that wave-length if no other station is found to be working with the called station.

The SCR-77-A sets within the Infantry and Artillery regiments form nets as shown by Fig. 2. Lateral communication between supporting artillery units is entirely practicable with these sets. It will be noted that the Artillery regiment is furnished an SCR-77-A set. This enables the regiment to become part of the system which will include the combat infantry and its supporting artillery battalions.

As mentioned before, the normal method of communication between the Artillery regiment and its battalions will be by means of the SCR-77-A set rather than by means of the SCR-109-A, on account of the fact that the SCR-109-A should be reserved for work with airplanes.

There is yet another radio set which has been furnished to the Artillery. This is the SCR-79-A set which links the Artillery brigade with Infantry Division Headquarters. This communication will probably be exceptional as in most cases the brigade headquarters of Artillery will be very close to the Infantry division.[2]

An interesting development has been made with regard to the linking of radio to wire telephone lines. A plan is being worked out by which received radio messages, coming in at the Artillery battalion, may be automatically transposed to the telephone system and thus to the firing battery. This will give instant communication between the battery commander and the observer in the plane. The present arrangement contemplates an operator on watch at the radio telephone set at battalion headquarters who will throw the received-transmit switch of the radio set at proper points in the conversation. Automatic switching, or more probably, duplex radio telephony, will replace this manual method before many years have passed.[3]

ARTILLERY NET. CAVALRY DIVISION

It will be noted from an inspection of Fig. 5, representing the radio net of the Cavalry Division, that the SCR-109 telephone set is, in that case, supplied to each battery of horse artillery for communication not only with the airplanes, which may be told off for fire control duty, but with the battalion headquarters in rear, as well as to cavalry division headquarters. In this connection, when first designed, the SCR-127 pack set, which is issued to all cavalry organizations down to and including the cavalry squadron, did not

[2]The 79-A sets with which Brigade Headquarters of Divisional and Corps Artillery Brigades are equipped, offer possibilities of communication which are not normal and therefore not shown on Figs. 2 and 6. Thus it will be possible, should occasion arise, to get direct radio communication between Corps and Divisional Brigade Headquarters, and between Divisional Brigade Headquarters and Corps Artillery Headquarters within the range of the set.—Editor.

[3]The radio equipment for artillery of an Infantry Division, recently recommended by the Office of the Chief of Field Artillery and approved by the Secretary of War, is as follows: One SCR-109 set to each brigade, regiment and battalion; 1 SCR-77-A set to each regiment and battalion; 1 SCR-79-A set to each brigade. This equipment will replace that specified in Circulars 178 and 180, W. D. 1920, which is the following: One SCR-54-A set to each battalion; 1 SCR-105 set to each brigade and regiment; 1 SCR-121 (low-frequency amplifier) set to each brigade, regiment and battalion; 1 SCR-67-A set (telephone) to each regiment; 1 SCR-77 set to each regiment and battalion; 1 SCR-79-A set to each brigade. It will be readily seen that the above results in a simplification of equipment used and of the instruction of operating personnel. For a Corps Artillery Brigade, the radio equipment for *Field Artillery* units will be: One SCR-109 set to each brigade, regiment and battalion; 1 SCR-79-A set to each brigade, the equipment previously authorized for a regiment of 155-mm. howitzers (see Circular 179, W. D. 1920) being the same as for a 75-mm. regiment.—Editor.

have a wave-length range sufficient to permit it to overlap the wave-length ranges of the SCR-109 set, but at the request of the Cavalry, this very desirable change is being introduced in the pack sets of this type now under production.

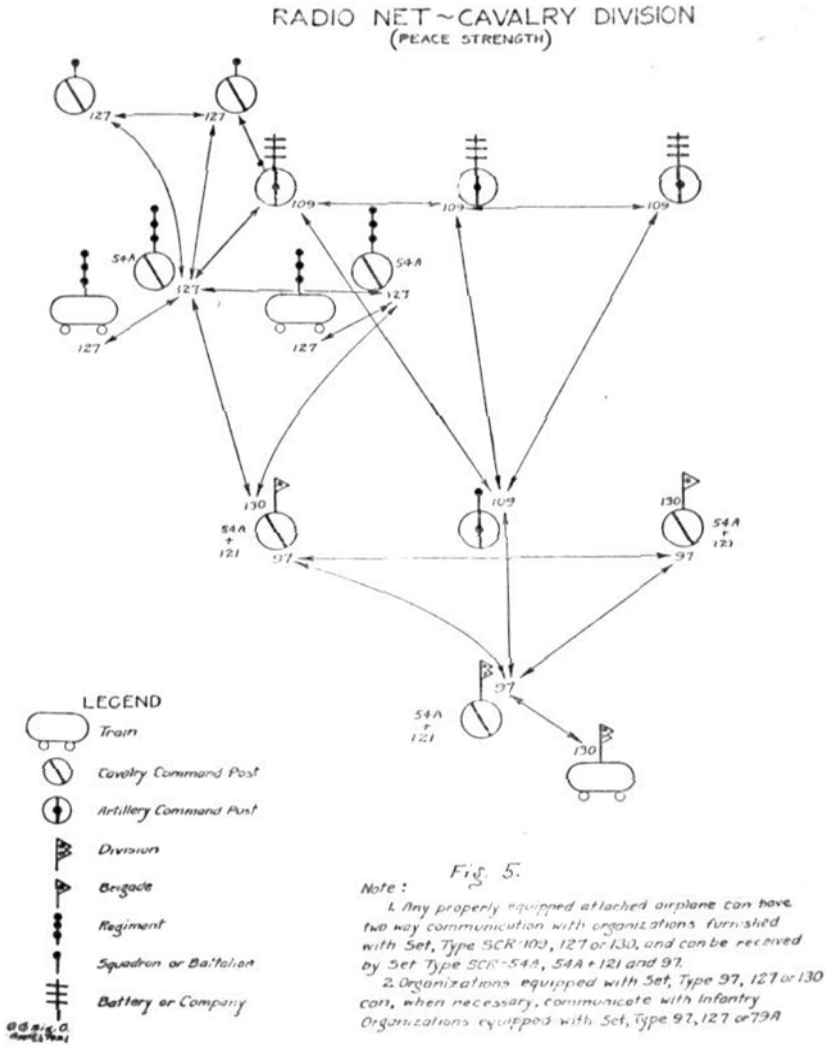
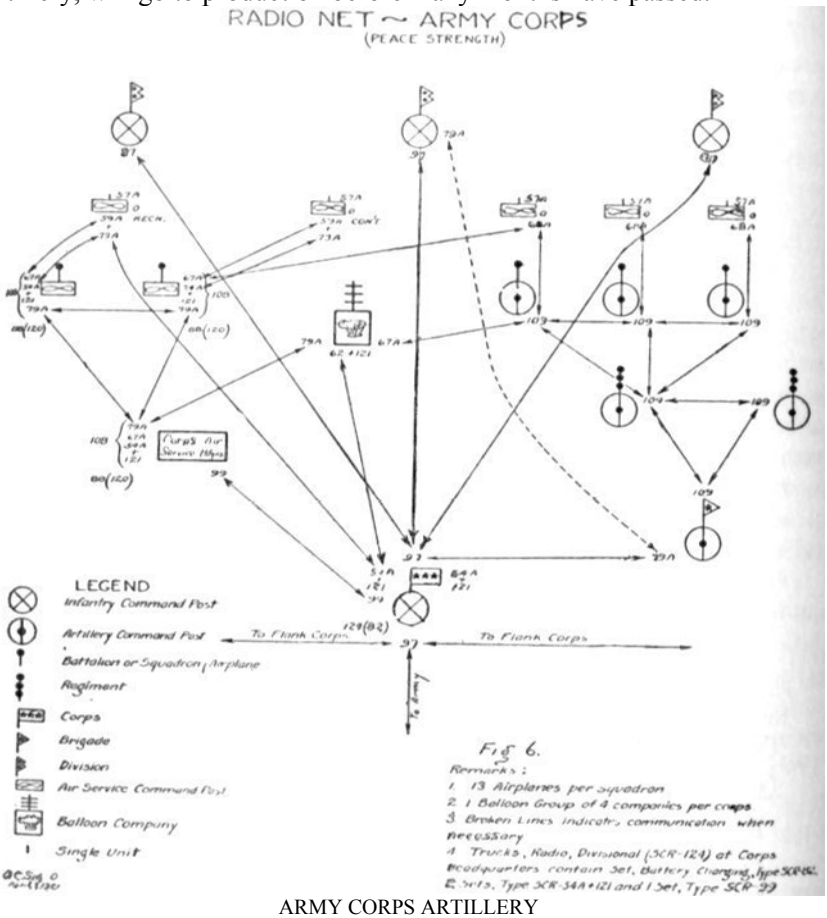


Fig. 5.

MOUNTAIN ARTILLERY

When the needs of the pack mountain artillery were considered, it was seen at once that the SCR-109-A set could not well be issued to and carried by such an organization, since the SCR-109-A set cannot be packed on mule back without detriment to the set as at

present constructed. This pointed out the desirability of designing a packable set, similar to the SCR-109-A set, and it can be stated that the design of this new packable telephone set, called the SCR-136, is well advanced, and that this set already recommended for issue to mountain artillery, will go to production before many months have passed.



ARMY CORPS ARTILLERY

From a diagram, Fig. 6, illustrating the radio net of the Army Corps, it is seen that Artillery organizations of the Corps are equipped with the same apparatus as the Artillery Brigade forming part of the Infantry Division, except that battalions and regiments are not equipped with the SCR-77-A loop radio telegraph set. The principles underlying the assignment of sets and their uses to organizations of Army Corps artillery are identical with those described above for assignment to the SCR-109-A sets of the Infantry divisional artillery brigade.

Liaison Between Infantry and Artillery*

IMPRESSIONS OF A FIELD ARTILLERY OFFICER

FIRST PART—PRESENTATION OF THE PROBLEM OF LIAISON—PRINCIPLES TO BE USED IN SOLVING IT

I. THE UNFORESEEN IN BATTLE. THE NECESSITY FOR INITIATIVE. THE NECESSITY FOR LIAISON TO THE FLANK

SUPERIORS cannot foresee everything in battle. Before preparing an operation order, it is necessary to look forward, as much as possible, to consider the obstacles and difficulties that the troops will meet in carrying out their mission; it is necessary to visualize the probable reaction of the enemy. The commander issues orders according to the best of his information as to the troops available, the material available and the fighting value of the enemy; according to the worth of the infantry, the artillery power, the number of his tanks, and the number of his aero squadrons; according to conditions within his organization as to the service of observation and liaison; according to the study of enemy defensive works, and even of the ground itself, which can be utilized more or less skillfully by the enemy.

But on the battlefield a commander meets the will of the enemy, whose one constant aim is evidently to discover his plans and to defeat their accomplishment, either by stubborn resistance or by active manœuvre.

Consequently, subordinate commanders cannot expect that their action will be governed at every instant, step by step, by orders. They should not be surprised at not receiving orders in some grave situation. They should not blame their superiors. They should only blame themselves if in place of having taken the initiative, as their duty to their chief dictates, they have waited for orders, inactive and in vain. Chapter Five of Combat Regulations for Artillery says: "An officer must not avoid responsibility in meeting an unexpected and critical situation." Whatever the conditions, he should have contemplated nonreceipt of orders. As the regulations say in another place, "No responsible person should fail to think." If the officer does receive orders, his superiors have made his task easy in thinking for him. He has only to execute their plans.

Superiors must then count on the initiative of subordinates. It

* Translated from *Revue d'Artillerie,* July-August, 1920, by Major J. N. Greely, Gen. Staff, U. S. Army.

is necessary, however, to make sure that these initiatives do not interfere with each other, in order that they may be productive of good results. The individual initiatives of subordinate commanders must be coordinated according to circumstances. This is the reason for liaisons to the flank in the same arm and between the various arms of a division or larger unit. The fact that an initiative taken by one commander might interfere with that taken by another commander demands that liaison be obtained between neighboring units or between units of different arms under the same command.

Liaison Regulations for all arms state clearly: "The fact that mechanical communications have broken down does not excuse a commander for being ignorant of important changes in the situation which have occurred within his organization or in neighboring units, and for not having exercised the necessary personal action on the conduct of events."

We will only treat here of liaison between the infantry and the artillery that supports it.

II. NECESSITY FOR MUTUAL ACQUAINTANCESHIP BETWEEN INFANTRYMEN AND ARTILLERYMEN. PERMAMENT LIAISON

The infantryman and the artilleryman often do not see eye to eye. The liaison officer working between them has the delicate task of making each understand how the other looks at things.

His work will be made much easier if the two arms know each other well, particularly if the infantry is working with its own divisional artillery.

We shall see that a subordinate commander often has to take the initiative to act wisely. No matter to what arm he belongs, he should be thoroughly informed as to the mission, the method of combat, the armament, and the living conditions of the other arms.

Here are some of the things about which a company commander ought to be thoroughly informed: The mobility; the opportunities for adjusting fire; the rapidity of fire possible to the different calibres of artillery that prepares the way for him and that protects his position; the fatigue incidental to artillery fire; the problem of supply; the construction of positions; the time that must elapse between the initiative of reconnaissance of a new position and the opening of fire on completion of the movement. He must understand that "a barrage cannot be calculated as quickly as the command, 'Eyes left!' can be executed." As one of my battalion commanders said: "Only when a company commander thoroughly understands the difficulties that beset the artilleryman can he calm his men and make them understand the situation as it exists."

In like manner neither the commander of the artillery battalion, who lays down the artillery plan, nor the battery commander, who

has to execute the plan and who follows from his observation post the progress of the infantry, can carry out their mission unless they are perfectly clear on certain essentials.

Such are: the value in the defense of obstacles which may appear; the offensive power of their own infantry; the supreme importance of high morale in that arm. Technical ability is not as important in the infantry as in the artillery. But it takes time, experience, and thought to understand the mentality of the infantryman and the help that he asks from the artilleryman. This mutual acquaintanceship and comprehension, this complete understanding, is absolutely necessary between the infantryman and the artilleryman behind him. It is the largest part, if it is not the whole, of liaison. The result is that the divisional infantry has only praise for its artillery, that the artillery has the greatest confidence in the success of the attacks which it supports. This spirit is a big factor in obtaining victory. It should, then, be sought after always, as nothing should be neglected which may lead to the success of operations. This understanding is brought about in two ways:

First, above all, by the development of *esprit de corps*, that which promotes pride in the organization to which one belongs, pride in its uniform, in its morale, in its fighting ability, in its history. This pride does not involve contempt of other units. It is not necessary to scorn others in order to be proud of oneself. The infantryman tries to demonstrate that he always has the same fighting value; the artilleryman tries to show that, even under punishment, he can deliver effective fire and promptly answer any call for fire.

Secondly, during the long weeks when a division is not engaged in a sector where it is attacking, the bonds between the two arms should be constantly tightened. Commanders should not forget to put aside some time for the study of the regulations of other arms.

The manual on the handling of small units in attack and the manual of the platoon leader include all essentials that an infantry officer has to know. But frequent visits are necessary to supplement by conversation with well-informed men the knowledge drawn from books.

Whether in cantonment or in sector the artillery officer studies on the ground the defences of a position, the problem of placing machine guns, the location of communication trenches and of wire, the system of communication with the front line. His infantry comrade comes to see him at his command post, assists him in putting on a shoot, in the details of the response to a call for barrage, in various adjustments within the battery, in adjusting under bad conditions of visibility and in a high wind, in the supply of manpower from a heavy artillery munitions dump. This sort of work

ought to be taken up by everybody. It will bear fruit in battle. It is not the work of one officer specially designated, it is indispensable for all officers of the sister arms.

III. LIAISON IN BATTLE. FIRST, THE PERMANENT LIAISON DETACHMENT; SECOND, DETAILS IN THE SERVICE OF INFORMATION

There will come on a moment when the division commander can no longer count on the permanent understanding between his subordinates and on his orders to secure unity of action. At that moment artillerymen should send to their brother infantrymen liaison agents in whom they have absolute confidence. Indeed, they are obliged to turn the conduct of affairs entirely over to these agents if they are to be of any value.

Pre-war field service regulations, which enunciated the principle that control should never escape from the high command in battle, attempt to solve the problem of liaison in an ideally simple manner. They say, "The division commander maintains liaison between the two arms by the missions which he assigns them."

Artillery has over infantry one great advantage—it is always in hand to some extent, even while engaged. It can be given different missions, such as superposition or concentration; its principal mission never can be changed without having to move it. From the viewpoint of the high command, therefore, it has the same status as troops in reserve, and remains a very powerful weapon. It has even an advantage over troops in reserve, in that it can be engaged and still remain available. The regulations try to preserve in all divisional artillery that essential quality of being always available. Even advance batteries are under the exclusive control of the division commander.

Unfortunately, war shows that liaisons are maintained with difficulty, no matter how numerous they may be, either by the command or by the artillery. In order not to throw away many chances for attaining success, the division commander has to allow much initiative. In his orders he acknowledges the existence of circumstances not provided for. He must have confidence in the ability of his principal subordinates to deal with them. Even the regulations acknowledge this frankly. "The officer charged with carrying out a mission, who unexpectedly finds himself under unforeseen circumstances, is no longer bound by orders, which have ceased to be applicable. On his own initiative he should take the necessary measures to carry out the intentions of the superior command, in spite of all obstacles. He should report his action as soon as possible."

In order to take advantage of all the unexpected opportunities

presented in battle, in order to meet immediately any attempt at surprise by the enemy, the artillery must get into action immediately, as soon as information is furnished by the vigilant infantryman. When the infantryman calls on the guns for help, the artilleryman must do something to satisfy him, instinctively, and without any haggling. This is not the time to interpose objections based on the fact that the infantryman does not command the artilleryman, and to refuse the fire asked for until orders are received from higher artillery commanders. When the order does come, the opportunity may be gone, the operation that the infantry battalion commander wished to undertake on his own initiative may become dangerous or be checked, on account of the lack of decision of some superior. It is precisely to do away with numerous intermediaries in military channels that the artilleryman gets into personal touch with the infantryman. The artilleryman must recognize that he cannot always know the tactical reasons for the request for help that the infantryman suddenly makes of him. Even from his observation post he cannot see all that the infantryman sees—all the obstacles directly in front or on the flank that crop up in action. He cannot know what infantry reconnaissance has revealed. It should be understood that the artillery is not under the command of the infantry. The artillery plan includes other fires beyond those asked by the infantry. It is only in emergency, to do away with delays, that the artillery is put at the disposition of the infantry.

The question may be asked as to whether the infantry battalion commander must be thoroughly informed on the use of artillery in order to wisely request important fire by himself, and directly. He must! If he is not thoroughly informed, and if the artillery battalion commander has not complete confidence in the infantryman he supports, results will be negligible, and many opportunities will be lost. Here again we find the advantage in infantry's being supported by artillery that it knows.

Unfortunately this is not always the case. The work of liaison agents then becomes much more difficult. The artillery commander who sends them out ought in such cases to know them well, and to place great confidence in them. He must depend on them to let him know what actuated the request for fire and the necessity for fire. Artillery liaison agents who are always close to the infantry commander who gets information know the situation as well as he does. They can give valuable advice to their battalion or regimental commander, who should not hesitate to ask it. In consequence, the artillery commander should not send out on liaison the first officer at hand—generally some recruit. It is therefore apparent that there

is need for a permanent liaison officer with the commander of the infantry that the artillery supports.

We shall see later in detail the difficulties that the liaison officer must surmount in order to get results. Attached to an infantry commander often for days at a time, he will find two important obstacles in his way.

In the first place, he cannot be completely informed as to the changing plan of action of the artillery he represents. This naturally lessens his value to the infantry, but he should not be in the position of a liaison officer I knew of who on being relieved was unable to find his battalion, which had changed position without notifying him.

In the second place, under certain circumstances he will not have the advantage of being able to act himself on information that he receives. Countless times liaison officers have regretted not having even one solitary piece which they might be able to fire themselves on a target which they were the only artillerymen to see. Artillery noncommissioned officers have often been told by infantry officers that if they cannot direct fire themselves they should be replaced by officers. The noncommissioned officer who can merely convey exact information to his battalion commander will often not suffice. Often an officer is needed. It is, of course, necessary to make a distinction between unobserved fire launched at the request of the infantry and fire ordered and observed. There is a world of difference between the two. Others do not always recognize as the field artillery does that *unobserved fire should only be a last resort*.

The liaison officer cannot be always counted on to direct fire on targets seen from the infantry observation post. He is not always free to do so, his other duties as liaison agent not leaving him enough time free. The information secured by the liaison officer should then be utilized by an artillery observer. The fellow-officers of the liaison agent should come to see him, keep in touch with him. They should keep him informed of what is happening in his battalion or regiment. They should make a special point of hunting him up when they have changed position, as well as when he has moved himself. Furthermore, one of them, preferably the orienting officer, should run out from the battalion post of command a line which he can use for adjustment, or he can use existing lines to fire on targets pointed out to him by the infantry, and to adjust the batteries of his battalion. The other officers who go out with the orienting officer, and scouts sent back by him on returning to the battalion command post after having been with the infantry, should report on the condition of the infantry, on its position, on its orders and plans, on its wishes. Their visit with the infantry is analogous to a visit

to the front line in a war of position. This assistance, which can be given to the advanced observer, was provided for in the liaison regulations for all arms, published December 12, 1916. They describe for the first time the duties of "the liaison and observation detachment." We shall investigate later the evolution of the liaison detachment, which no longer comprised observers whose duty it was to adjust. It is undeniable that observation is the most effective means by which the artilleryman can instantaneously support infantry. Liaison is perfect when the artilleryman can see and fire without delay on the target pointed out by the infantryman.

We are going to see what each individual must do to attain this result.

SECOND PART—APPLICATION OF THE ABOVE PRINCIPLES IN VARIOUS GENERAL CASES

I. WHAT REGULATIONS SAY ON THE SUBJECT OF LIAISON AND OBSERVATION

Every young artillery officer should train himself in the rôle of liaison agent with the infantry, a rôle admirably fitted to youth, but not to the inexperience that goes with youth. Naturally the young officer will first seek in regulations the principles which will guide him in carrying out his mission.

The regulations on liaison for all arms, both those of December 12, 1916, and December 28, 1917, lay down exactly what the liaison officer should do before an attack, as well as the instructions he should get from his chief on leaving, and from the infantry commander on arriving. They also list the methods of communication which can be used.

There is one important difference between the two editions. After Verdun and the Somme of 1916, the detachment was called "the liaison and observation detachment." It included observers charged with speedy adjustment during the operation, involving use of observations and means of communication which are not available to battery commanders until later. The detachment was thus able to speed up the sure and effective aid which artillery could give to infantry throughout an operation.

The regulations of December 28, 1917, on the other hand, definitely separated the liaison detachment and the advanced observation party. "In theory," they say, "the liaison detachment is not concerned with the observation of fire." Liaison duty *per se* is enough to occupy the liaison detachment. In carrying out advanced observation it might get better results. But, on the other hand, the liaison officer should not be a "maid of all work," nor should his presence in the zone of observation relieve battery commanders of their primary duty, the observation of their fire for adjustment and for effect.

Neglect of this duty is not often found among pre-war field artillery officers. They were trained in times of peace to believe that the battery commander belongs in his observation post and are not likely to abandon it to others. On the other hand, officers trained during the war in the different firing schools or in the "get rich quick" school at Fontainebleau are more likely to possess a supreme confidence in their firing calculations, and to fail to recognize any need for observation.

I have witnessed a great deal of firing, the data for which was prepared by various officers. My opinion is that the most of such officers as these were very far from "crowning" the target.

"It is necessary to see," Major Vellicus, who was killed by the enemy in 1918, was in 1914 a Captain of the 60th regiment of artillery. (Howitzers.) I was one of the platoon of student officers in whom he inculcated this principle. He was so vivid, so convincing, that I am sure that many of my fellows will remember hearing him say, "It is necessary to see."

Heavy artillerymen, naturally enough, have less need for observation than field artillerymen. Targets which cannot be seen from ground observations are more frequent with them. They must then rely on their calculation of fire, and they tend to place great confidence in it. They readily accept any adjustment which the liaison officer may offer to make, but they do not often recognize the need for watching their own fire from the observation post which that officer utilizes. I have seen example after example of this sort during the offensive in Flanders in 1917.

No matter how carefully a young officer has studied regulations, he will be apprehensive the first time he is sent out on liaison, there will be so many questionable points which will trouble him. This is natural enough. He must realize that heretofore he has been directed by his captain or other superior and that he has had only to obey, while in this new mission he himself must command. He is suddenly going to find himself in command of a detachment made up of men whom he generally does not know and who do not know each other. What an outfit! And he has to work with this outfit, poorly equipped and in the face of great obstacles! Just the same he must go out cheerfully, full of his young enthusiasm, full of daring!

Let us see what he must try to do under varying circumstances:

First, fixed defensive (example: Verdun, 1916);

Second, defensive in withdrawal (example: Retreat from the Chemin des Dames, May 27–June 1, 1918);

Third, preparation for an offensive (example: Flanders, 1917);

Fourth, attack with limited objective (example: Flanders, 1917);

or an attack that is checked (example: Plessier–Julen, Aisne, July 20–29, 1918);

Fifth, successful attack (example: withdrawal of the enemy on the Vesle, August 2, 1918).

At the same time let us try to lay down how all artillerymen, outside of the liaison detachment, should act to complete liaison in each one of these cases.

II. THE FIXED DEFENSIVE

One of the very important cases under this class is that of a calm sector. I say, very important, for "Trench warfare is not a picnic nor is it a tour of interior guard. It is one phase of continuous battle. The enemy should always feel that he is facing vigilant opposition" (Liaison Regulations for all arms, the chapter on Observation).

In a defensive sector friendly troops have not the initiative; their conduct depends on what the enemy does. Endurance, stubbornness, and fortitude are more needed than imagination, quick thinking, and dash. The duty of the liaison detachment should be to let the infantry know that they can count upon an assured and substantial support. This requires that the artillery, which this detachment represents, be watchful and unselfish; that it respond immediately; that it work effectively when its support is asked by the troops that are receiving or are about to receive the brunt of the attack.

Methods of Communication.—Battalion and battery commanders should try to insure the speediest transmission of requests for fire, which are always urgent. In this respect, the duty of the batteries lies first in maintaining a working telephonic connection with the battalion command post. The direct line may be supplemented if possible by emergency lines passing through other batteries or some other command post of the battalion. In addition to this means of communication the battery is responsible for a vigilant watch for rockets and visual signals, the lookout post being preferably at the battery position. The battalion commander has more to do—but he also has more means than the battery commander. He may be asked for immediate support of the infantry, either by his colonel or by the infantry itself. He must then make sure that the request will reach him, no matter from which of these two directions it comes.

By far the most convenient means of communication is the telephone. It gives excellent service but requires great effort on the part of the telephone personnel to keep it working. Most of the requests for fire will reach the battalion command post by telephone, but it must not be assumed that the telephone will work automatically. Right here I would like to pay tribute to the innumerable

examples of devotion which I have seen given by field artillery telephonists.

The system kept up by the telephonist from battalion headquarters is long, and every line which goes to make it up is very important. There is a line to the infantry regiment, often another one to the assault battalion, lines to observatories, to the artillery regiment, to the three batteries, to neighboring battalions. The line to the infantry regiment should be kept up by men from the battalion command post and not by the liaison detachment, which is only responsible for lines forward of the infantry regimental command post. This is one instance of a principle on which I shall have more to say later. The principle is: Rear elements are responsible for maintaining communications to the front. If possible, the battalion commander supplements this means of communication by some form of visual signaling. The character of the ground often prohibits use of this method except by relays. Nor can it be relied upon when the enemy artillery is very active, as signals are often lost in the smoke of bursting shells. On the other hand, it does not require of the personnel such a tremendous effort as is necessary to keep the telephone working.

The battalion commander will find his wireless receiving set very useful. It will pick up many messages from the infantry and from the infantry aeroplane. This method was not in use at the beginning of the defence of Verdun as Howitzer battalions were not given sets until the beginning of the Somme offensive.

But there were enemy bombardments later in the war which recalled those of Verdun, and during these bombardments the value of this means of communication in the defense was established.

Requests for barrage by rockets are always answered immediately except in case of fog. This is a very certain means of communication. Its weakness lies in the necessity for relays on account of the fog or other concealing feature. In consequence a rocket sent up from a relay may appear to come from some point in the first line which interests other batteries and call down unnecessary fire from such batteries.

However, this inconvenience is more than compensated for by the simplicity and effectiveness of this method of calling for barrage. Finally there is one means of communication which must not be forgotten, that is couriers, on foot, on horseback, or on bicycle. This example seems to me a good one. On June 2, 1918, the enemy had been checked at the edge of the Aetz Woods, and we were trying to stabilize there. My battalion commander had sent two of us out to hunt observatories near some infantry command post. Incidentally we were charged with getting in touch with the

commanding officers of the infantry which we were supporting. On arriving at the regimental command post we found both our liaison officer and the infantry telephone operator trying to get a barrage. Each of them had gotten the necessary connections, but neither of them was able to make himself understood. The sector was quiet. It was almost incomprehensible that neither of them was able to get the other end of the line to understand such a simple word which is so familiar to all telephone operators—barrage!! The only explanation possible was fatigue or some unfortunate breakdown on the part of the personnel. As we had come mounted I sent my comrade back at a gallop to call down the barrage requested. He arrived at the battalion before the message had been received over the wire.

When the liaison officer comes from an artillery outfit that looks out for its infantry liaison is already assured in large part. The liaison officer tries to clearly and completely inform the infantry colonel by answering all the questions he may ask about the artillery. He should then be up on the firing books of his battalion or regiment, not only so far as concerns barrage, but also as to counter-preparation, concentration, interdiction, and harrassing fire. He should emphasize these as infantry officers too often believe that they can obtain barrage only by direct call on the artillery. I remember that I was able to comfort easily a battalion commander in Flanders in October, 1917. The sector had been stabilized for some time but was still active. I was laying a telephone line close to his command post when a violent enemy artillery fire came down. I asked a moment of hospitality of him, indeed his command post was completely filled in the "wink of an eye." The unhappy major had been asking for some time for counter-battery work which had not been given. He was suffering for his men. I proposed to him a fire that I believed could be delivered easily and rapidly—a concentration on a point which he believed sensitive—the sound of our 75 shells going over the lines which promptly followed, visibly soothed him.

Organization of the Detachment.—When should the liaison officer be on the defensive?

I do not think that he should be in front of the infantry colonel. It is hard for the artillery personnel to keep up communications that far forward. Furthermore, he will not get much more information if with the first line battalion commander. He has an important rôle in keeping up morale which we will touch on, but the poverty of communications to the rear forbids his attempting too much.

In theory he remains then with the colonel. Since the regimental observation post will be near the command post, the artillery-man

will often go there. He will study the sector, so as to be able to quickly orient his fellows who come forward to observe their fire. The infantry regimental observation post can frequently be used by artillerymen. This was frequently the case in 1916, with observation posts on the right bank of the Meuse, between Bras and Donaumont, known to so many artillerymen who served in that vicinity. The howitzers gave substantial aid throughout this period, which was glorified by the work of the 75's.

The liaison officer sets a noncommissioned scout to watching the battlefield, and interests him in this work. This is an opportunity to get acquainted with this personal representative and to find out what he can expect of him. He must remember that the French soldier often works better with his own lieutenant than with a strange captain. The liaison officer generally comes from the battalion staff. Noncommissioned scouts and liaison agents, telephone men and signal men come from battalion or battery headquarters detachments. The liaison officer must take command of this mob and make it in a little unit with a fighting value. He must not only exercise considerable authority himself over a scattered command, but he must make sure that his small post commanders have sufficient authority to do their work. For instance, a sergeant in command of a joint visual signaling and telephone relay post at which centre four lines has to handle four or five men whom he may have seen before, casually, but never in battle. He may often have a divisional cavalryman or two, excellent couriers and perhaps courageous linesmen, but men who he has never even seen before. The noncommissioned officers sent out on liaison to the infantry should not be men who are unfitted for command in the batteries. More than that—I think their work more important than commanding a piece in the firing battery, manned by a section that has worked together for a long time.

Necessary Reconnaissance.—All personnel should reconnoitre the battalion and regimental command posts of the infantry regiment which the artillery is supporting, the brigade and divisional telephone and visual signaling posts, the relays, and the infantry observation posts, also used to receive signals. All should be familiar with the trenches and trails which they will have to use, night or day, in laying lines or carrying messages. The liaison officer keeps his men informed in varying degree, according to their capability, as he estimates it. In so doing he should study their intelligence, their curiosity, their willingness. This is the time to obtain moral ascendency over them by the care and thoroughness with which he goes about his work. He makes sure that the battalion details have their abridged code books, an essential on which he will have to count, and that his

noncommissioned officers have their maps, glasses, and compasses. He must remember that the more the French soldier knows of the plans of his superiors, the more spirit he will put into carrying out his mission; and that some one of his subordinates is perfectly capable of replacing him, at least momentarily. He ought to provide for his own disappearance at any time—no one must be indispensable.

Installations.—After going over the work of the infantry, the liaison officer must begin to think of the work he has to do himself. He hunts up an observation post near the infantry command post, which may be indeed the infantry observation post. Here he stations a reliable noncommissioned officer, as he can no more be continually on the lookout than can the infantry commander. Even if his artillery superiors are sure that he will give them all the information he gets, he will nevertheless be constantly called to the telephone. He also locates his own command post, and arranges with the infantry regimental staff for enough space for his personnel. The artillery and infantry command posts may be the same. But a convenient place just a little ways off from the infantry is better for the artillery as it obviates confusion in telephoning. He then seeks positions for visual signaling, sending posts close to infantry command posts. These reconnaissances are followed by taking up such work as may not have been completed by predecessors before the liaison detachment arrived. All necessary lines are carefully laid and marked, with field wire if possible, as the light wire does not stand up well under the concussion of heavy shell bursts. Visual signaling is tried out under different conditions of visibility.

Finally, the liaison officer must see that he is properly represented by noncommissioned officers, with the commander of the first line battalion or the commanders of the two first line battalions.

Before they go out he must make sure that they know the missions of the battalion or regiment, that they can explain them on the map, and that they know what means of communication are available. He also visits them, and indeed, if possible, installs them, taking care to make them known to the battalion commanders. He will thus be present at the questioning which they are generally put through on arrival, and will smooth out possible misunderstandings which can so discourage both battalion commanders and noncommissioned officers. How many liaison sergeants have stayed with battalion commanders for four-day tours without being used, because they were not believed capable of helping out? And why? Because they went out without instructions from their organization orienting officers, without the liaison officer who sent them having made sure that they were in shape to carry out their mission; or perhaps, because they had been unable to answer the first question the battalion commander

put to them and he had concluded that they knew nothing. The result is deplorable—no service; dissatisfaction and lack of confidence on the part of the infantry; a feeling of futile sacrifice on the part of the artillery personnel.

When the liaison officer can accompany his noncommissioned agent to the battalion command post, he will often be able to secure better living conditions for his personnel in the post, which is a matter of considerable importance. A battalion command post is generally improvised and the artillerymen, few as they are, can only increase the crowding. The noncommissioned officer only needs one or two men for use as runner or signalman. He should not have to keep up the lines. That duty falls on the liaison officer, as maintenance to the front is the duty of the rear.

The liaison officer goes over with this noncommissioned officer the same things that he has gone over with the noncommissioned observer at the infantry regimental observation post. He studies the ground with him, and makes him reconnoitre important points marked on the map. A good sergeant is thus ready to orient artillery officers sent to him by the liaison officers when they come forward to look over the forward zone and, some times, to adjust fire on important points not seen from their regular observatories.

Lastly, after he has established all communications, the liaison officer sends his battalion or regimental commander a written report, showing system of communications, positions of command and observation posts, with notes as to their artillery value, and including all information he can gather.

Adjustments.—In adjusting from infantry observation posts which they do not use habitually, artillerymen often use liaison lines. This simplifies communication without interrupting liaison, if it is understood that liaison has priority.

Further, if a battery commander comes to an infantry battalion observation post to adjust fire, and his own line goes out, he will never be refused the use of the infantry system, with the understanding that if a message is to be sent his communication will be immediately interrupted. An officer of infantry is always glad to help an artilleryman to do his work.

Of course artillerymen take every opportunity to ascertain the wishes of infantry commanders, and to keep them informed of changes which have taken place since the liaison officer joined them. The artillerymen can often throw light on orders received from the rear. I can remember talking things over with an infantry battalion commander and his captain adjutant at Varennes (?) on the right bank of the Oise, after the enemy attack of March 21, 1918. They had received, the evening before, a list of reprisal fires with

ways to obtain them. They told me they did not understand what it was all about. They were very intelligent officers, but what was very simple to me as an artilleryman, was all Greek to them.

Before taking up the case of the defensive in withdrawal, I would like to emphasize a matter which concerns all who send personnel to the liaison detachment, that of food. During the days that they are away from the battery, the men must eat and eat well, for their work is very heavy. They should then carry plenty of cold food. No matter how hospitable the infantry may be they cannot provide more than soup and coffee—if they can provide that!

THIRD PART–THE DEFENSIVE IN A WITHDRAWAL

Let us study an extreme case, where an infantry division has to cover a retreat.

Between such a case and one in which the enemy is checked there are an infinity of the intermediary problems which admit of an equal number of solutions.

In the first case infantry is no longer connected with the command and with artillery by telephone. The laying, and above all the recovery, of lines is too slow. Command posts change too rapidly to risk immediate loss of all the wire supply of infantry and artillery regiments. There remain: Wireless; ground wireless; rockets; visual signaling; mounted, bicycle and foot couriers.

The wireless antennæ of artillery battalions and regiments are always ready—or can be made so in a few minutes—and can receive messages from aeroplanes, even in case the infantry sending station has not been set up on account of the lack of time.

Rockets will still have immense value when the infantry has enough of them. The liaison detachment can carry on a horse or a bicycle a 24-centimetre projector and visual signaling panels, which it can utilize if it knows the direction of possible receiving stations, such as battery or artillery battalion observation posts. Even if it does not know exactly, it can take a chance on signaling in the probable direction of observations, throwing a beam into the air as a shipwrecked sailor throws a bottle into the ocean. It may be seen by one of the artillerymen always on the lookout.

This incident may bear me out. During the retreat from the Chemin des Dames, May 29, 1918, I was charged with watching for the appearance of the enemy over a crest on a certain limited front. The enemy infantry appeared in many successive groups, and I was not always the first to get in a rafale on them. Each new detachment was promptly saluted by four or five batteries from the regiment. My comrades had their own sectors to watch, but they did not neglect mine. I am sure that if our retreating troops had made proper signals we would have seen and understood them.

Finally, in this kind of fighting mounted and bicycle couriers will principally be used. A light battery can easily use five or six cyclists, particularly in good weather.

The information that a liaison officer will send to his battalion commander, that the scouts will seek from the infantry, will have to do principally with the location of the infantry and with contemplated movements. When our infantry is going to counter-attack, it will let the artillery know what help it needs.

The chief difficulty for both battalion commander and liaison officer is the uncertainty as to the location of troops. The battalion commander hardly ever knows where the extreme front infantry units are; the liaison officer often does not know where the batteries are. This compels the battalion commander to keep in touch by the frequent sending out of scouts, or even of a staff officer, to hunt up the infantry and the liaison officer. This is especially necessary when the batteries have occupied new positions.

It is a very difficult problem. However, the commanding officer of a French artillery battalion has many noncommissioned officers who can do this work. Racial characteristics are particularly valuable in this phase of war.

Preparation for an Offensive.—The liaison detachment has a good deal to do before the attack is launched; it is consequently made up some time in advance.

The officer in command immediately gets in touch with the infantry commanders. He volunteers to explain the plan of engagement and to discuss details about which there may be some question.

If the regiment which is to attack is not in line he may have to visit the infantry officers in their cantonments. It is absolutely necessary that infantry and artillery officers go over the artillery plan together.

The liaison officer should know enough to be able, in most cases, to raise questions on doubtful matters, without loss of time in corresponding by code with his artillery chief. He must be able to answer most questions himself, without passing them on. He must be a real liaison agent, not a mere means of transmission.

In the construction of works preparatory to a minor operation he should show the infantry commander the line he should not pass before H hour, and the one beyond which no personnel should remain during the heavy artillery fire for destruction.

On August 16, 1917, in Flanders, I had an experience which shows the confidence the infantryman may have in the artilleryman he finds actually at his side. An attack had been checked. The infantry had lost heavily and had been relieved the same night by another unit which was to resume the attack in the morning. The

assault battalion commander sent out a liaison officer who came to me. I was indeed the advanced observer of the artillery regiment and consequently very close to him. The battalion commander asked me to put in writing what howitzer and heavy artillery preparation I considered necessary for a successful attack. I protested my incompetence, but he insisted, wanting to make a complete report to his colonel. That major knew how to use a liaison officer.

Organization of the Detachment.—The commanding officer of the liaison detachment must also get in touch with the personnel designated for the detachment. He should not wait until the last day to get together his noncommissioned officers and telephone men and find out what he can expect to get out of them. During the necessary reconnaissances and during the progress of necessary preparations for the attack, the liaison officer should try to get a line on the abilities of the men he will command. He may even seek the opinion of battalion orienting and telephone officers, on the men they have provided. This study of personnel, necessarily superficial and especially so if he has not had the same details before, is nevertheless important in organizing the detachment: the right man must be in the right place. The assignment of duties for D day depends on the artillery plan, on the ground, and on the relative position of infantry and artillery command posts and observation posts.

Reconnaissance.—Next, what sort of reconnaissance should the liaison detachment make before the attack? First of all, the personnel should be thoroughly informed as to the jumping off position. A reconnaissance should be made of such observation posts, initial and successive command posts, as lie within the lines of telephone and visual signaling stations, of all centrals and relays, of the projected halting places for lines pushed out by the infantry brigade telephone detachment. It cannot count too much on the signal corps lines. During the August, 1917, offensive in Flanders, a howitzer battalion found fifteen days after the last attack made that a central was still in immediate proximity to its command post. Finally, everyone must be familiar with trenches, communication trenches and trails. as in the defensive. (Chap. II.)

Installation.—As soon as he has reconnoitred existing means the commanding officer of the liaison detachment draws up his plans for new installations preceding D day. He acts on the principle that an observation post planned near an infantry command post should coincide with it if possible. He then seeks visual signaling posts near infantry regimental and battalion command posts which can communicate with artillery battalion and battery command posts. He especially tries to provide for visual liaison throughout the operations. To do this he has to study infantry orders relative to placing

of successive command posts, and to study the terrain by maps. He tells his subordinates everything he has done, and gives them the successive objectives if possible.

Next comes the labor of installation. The liaison officer carefully puts down telephone lines; he pushes at least one line up to the jumping off trench and provides for a trouble shooter's post to insure its functioning at H hour. This post can serve for a relay where the line is prolonged. He tests all visual posts which he can set up before D day, and all the apparatus which will go forward. He sees that all his men have their codes, and all his noncommissioned officers their maps, field glasses and compasses.

Finally, he makes up the various detachments with the telephone and other signaling material that they need. By study of the plan of engagement he can provide for a visual post somewhere behind the infantry battalion command post which can be easily seen by many artillery, observation posts. A detachment made up in advance can work in this post.

No detail should be neglected. The greater the number of problems which have been foreseen and solved, the more easily will the unforeseen problem be solved.

The liaison officer who has done all the above can add one more string to his bow. He can get into closest touch with the officer charged with advanced observation. The mission of the latter in an attack is to find new artillery observation posts and to utilize them as soon as possible in making adjustments. He should be an experienced artilleryman with an aptitude for utilizing terrain and for conduct of fire. Of course he must be connected with the batteries to adjust them. The logical means would be a second liaison detachment. But it is difficult to make one up from the authorized personnel of a howitzer battalion. The original liaison detachment leaves only six or seven telephonists of all ranks at the battalion command post, and they have there all that they can do.

If the battalion or regimental commander can make up the two detachments by drawing on the divisional cavalry squadron, they will be especially effective in giving mutual aid. The observer can help the liaison officer greatly, and *vice versa;* liaison is maintained largely by observation.

To sum up, we find that many of the sound principles formulated by experience in the defense of a sector can be advantageously applied in beginning an attack.

(1) *The attack with limited objectives and the attack that is checked.*

(2) *The continued advance.*

It may be asked why such different kind of operations as the

first two are bracketed together. The first kind is simple to provide for. But of an attack that is checked, it may be asked." At H hour how is the commanding officer of the liaison detachment to know whether the attack will be checked or not? And how long after the line has remained fixed should it be considered that the attack has been checked?" The point I make is that a liaison officer should foresee a possible check, and prepare to strengthen his liaisons, at the same time looking forward to the resumption of the attack. This is the case that we are going to study. It is clear that an attack with limited objectives offers no more complications; indeed, if the objective is intentionally limited, the liaison detachment does not have to bother about another advance.

Let us look at the liaison detachment at H hour. A large part of the detachment goes off with the assault battalion commander. The commander must be very energetic, very brave, very daring. It is an officer's job. But, should a second artillery officer be detached? Or should the infantry colonel have none with him? A second officer should be detached! The regulations governing small units in attack are definite, and leave no doubt as to the necessity of an artillery officer with the colonel. "The colonel's most important mission is to assure his infantry of effective help from the artillery." The artillery battalion or regimental commander should then send to the infantry colonel a good artillery officer who will properly represent the artillery with the infantry commander. Toward the end of the war it was even contemplated sending battery commanders on this duty on account of the scarcity of artillery lieutenants worthy of the name. The rôle of this officer, who is commander of the whole liaison detachment has been indicated in preceding chapters. The officer with the assault battalion commander must be a very daring officer, who carries his men along with him. Let us study his rôle.

The little group, which we might call the flying detachment, which follows on the heels of the assault battalion, has a big job to maintain communication throughout the advance.

Telephone communication constitutes by far the most difficult task. Starting from a post in the jumping off trench, the flying detachment has to lay wire as fast as the infantry advances and at the same time carry considerable weight, as we shall see.

Furthermore, it is very desirable to lay field wire at the start of an advance. The lighter wire can be used. I have talked easily over it at a distance of six kilometres when the wire lay on muddy, even marshy, ground. This was in Flanders in October, 1917. But it is nothing like as desirable as the field wire, and on D day will be often broken by bombardment close to the jumping off line. The detachment must then carry many kilometres of field wire, in addition

to light wire to be used if the advance continues. In any large advance considerations of carrying power force the use of light wire. It is more useful in such cases, also, as the enemy artillery is either overrun or driven out of position, and its fire lessens greatly.

The detachment also has to carry phones, signal lamps, panels, bicycles—with a reserve of each to provide against breakdowns and destruction by fire. Finally, each man carries field equipment, blanket, tent cloth and four days' rations. He must be well trained to be able to get around under such weights.

In laying lines, the commander of the flying detachment advances by successive lengths of wire separated by relays, which are generally situated at the successive battalion command posts. This facilitates repair of wire from rear to front. Fifteen hundred metres is a good length for segments of wire.

In spite of all trouble shooters can do, telephonic communication with the flying detachment; *i.e.*, with the battalion commander, is often uncertain. But, while it is the most convenient school, there remain others, which are ample for the dispatch of really urgent messages. The commanders of the posts therefore do not have to sacrifice themselves in an effort to keep the phone working, without attempting to use other means, particularly the battalion ground wireless and the regimental wireless.

In case the advance is not continued the liaison detachment still has work to do. The liaison groups improve their lines and stations, and try out visual signaling. The liaison officers proceed to check and complete their information as to the location and situation of the infantry, and report thereon to their artillery commanders.

The advanced officer observer reconnoitres new good observation posts, and studies the terrain. He also makes new adjustments, both for the batteries remaining in position, whose firing data have become obsolete, and for the batteries which have advanced. He should orient battalion and battery commanders who come forward into conquered territory, hunting for battery positions and above all, for observation posts. Everyone should work toward providing effective support during the consolidation of new positions to meet almost inevitable counter-attack. Consequently the liaison officer must immediately inform his artillery commander of the new position of the front lines, on which to base the imperative mission of barrage.

We have treated of the mission of the liaison detachment during the advance. I want to add a word as to how all artillerymen should complete and perfect the liaison established.

Infantrymen try to get the utmost out of artillerymen. Here is what a high ranking infantryman said at an Army School early in

1917: "Artillery fire should precede the infantryman, destroying everything that appears before him up to the last movement. Active, intelligent, capable observers are detailed for the action. They should be able to make adjustments." The artillery cannot actually do this. But it can strive toward this ideal, by continuous observation by battery commanders during the advance, and by close liaison with the advanced officer observer.

I have often heard good artillery officers, even at the end of the war, say that observation was useless during an attack; that shots could not be distinguished; that the "chain" even, of various shots in a barrage, could not be seen; that the rolling barrage could not be checked to deliver some other fire. Nevertheless I am convinced of the necessity for battery commanders remaining in observation with telephone at hand. I will give two examples which seem to me to establish this necessity.

On April 16, 1917, on the Craome plateau, the regiment which my battalion was supporting was able to take the enemy trenches only after a hand-to-hand grenade fight. My comrades and I followed the fighting, and were able to keep our fire exactly in front of it. This we could only have done with continuous observation.

Again, on July 21, 1918, the division was attacking the village of Plessier-Huleu (Aisne). The elements covering the right flank were a little behind. The enemy perceived this and put on an improvised counter-attack. I was following the attack from my observation post with a fellow battery commander. We had noticed the reconnaissance which preceded the counter-attack, and had each assumed direct command of one piece, so that when the former attack of about a battalion appeared we were able to meet it immediately with fire, soon reinforced by two complete batteries. We did not hesitate to drop out of the barrage, already far ahead of the infantry, to check this counter-attack. If we had not seen this counter-attack mounted, from our observation post, it might not have been checked in time.

There remains the case of a continuous advance. From our point of view it differs from the preceding only in the necessity for changing means of communication. The impossibility of relaying telephone wires fast enough and the frequent changes of position of the artillery make necessary reversion to the means used in retreat: wireless, ground wireless, rockets, visual signaling, runners, cyclists and horsemen.

On the other hand, the executives, the battery commanders, and the orienting officer, should frequently get in close touch with the infantry, particularly when occupying a new position. The front line changes constantly, and the liaison officer must know where to send

his message and then to direct his signals. "What we need is orienting officers who can start things moving," as an officer of my regiment told the young officers whom he was training for the field in 1917.

CONCLUSION

To sum up: The direct result of giving artillery the mission of supporting infantry is to make necessary liaison between them. The artillerymen must do their best to aid the infantry as much as possible. To do this a detachment is charged with letting the guns know the condition and requirements of the front lines. In addition, the executives, the battalion and battery commanders, who never know enough of what the infantry is doing, go frequently to visit it and look over the battlefield so as to best aid the infantry by delivering observed fire at opportune moments.

The principal difficulties for all are not technical. What is essential is the will to maintain liaison, the will to give the infantrymen the most effective aid.

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The Technical Training of Artillery Officers

BY LIEUTENANT-GENERAL H. ROHNE GERMAN ARMY

(Abridged Translation from Artilleristische Monatshefte May-June, 1919, by Colonel O. L. Spaulding, General Staff, U. S. Army.)

[*Editor's Note.—In the* FIELD ARTILLERY JOURNAL *for July-August, 1920, there appeared the translation of an article by an anonymous author entitled "The German Artillery in the War," published in the Artilleristische Monatshefte, for January, 1920. In his first paragraph the author refers to a previous discussion in the September, 1919, issue of that magazine which was based upon certain editorial comment appearing in the May-June, 1919, issue. He also refers to two other articles: one known as the "Seeger Treatise," which was unknown to him when he wrote his reply to the above-mentioned editorial comment, and the other as "The German Artillery in the World War According to Its Own Judgment," which appeared in the Swiss Journal of Artillery and Engineering.*

In our September-October, 1920, issue we published a translation of an article entitled "The German and French Field Artillery at the Beginning of the War," by Major General Isbert, German Army, which appeared in the Monatshefte for February, 1920. This article was also written in reply to the editorial comment in the May-June, 1919, number.

We were unable to get hold of the article which started these discussions, as well as the first article written by the anonymous author who signs himself "M," until recently. We now present them to our readers with the hope that they will prove of interest, and in this connection it may be well to state that the editor of the Artilleristische Monatshefte is Lieutenant General Rohne who needs no introduction to our older officers of field artillery as he has for years been conceded to be one of the greatest students of artillery and a writer of distinction.]

In an article published in October, 1913, I said that the lack of encouragement of technical study by our officers had caused our artillery to fall behind the French. This assertion caused an active controversy. A few months later the war broke out, and showed clearly that the French were ahead of us, not only in armament, but—what was more serious—in their handling of it. Our field artillery did hold its own, partly on account of the superiority of our heavy artillery, but also because it learned rapidly, and the French advantage

gradually diminished. During the war, on account of the censorship, it was impossible to discuss the matter; but it is of importance to the development of our arm, and deserves careful consideration.

Prussian artillery officers seem always to have been behind those of other German states in scientific attainments; Scharnhorst expressed himself to this effect even before 1790, after visits to all the states. He was then in the Hanoverian service; but his criticisms seem to have led Frederick William II to found his "Military Academy for Artillery," which was opened in 1791 but was broken up at the outbreak of war in 1806. Scharnhorst was transferred to the Prussian artillery in 1801, but had no direct influence on the training of artillery, since he was assigned as director of instruction for young infantry and cavalry officers. The theoretically trained officer had to encounter strong prejudices of the "practical soldiers," who insisted that any good noncommissioned officer was of more value.

After Jena, the task of reorganizing the army fell to Scharnhorst. One of his ideas was the establishment of the Artillery Experiment Commission in 1809; this made it possible for a junior officer to get suggestions considered.

In 1816, upon recommendation of Prince August and General v. Rauch, the Inspectors General of Artillery and Engineers, the "Artillery and Engineer School" was established. This school was intended to give officers of these arms not only their special technical instruction, but also that general military education which infantry and cavalry ensigns secured in their divisional schools. Unfortunately, the course of instruction was not well planned, and gives the impression that less thought was given to the officers who were to serve the guns than to those who were to make, issue, and care for them. Thus tactics was excluded from the course of instruction, and that with the approval of the Artillery Experiment Commission! On the other hand, not less than thirty hours a week were devoted to instruction in drawing of all kinds, including mechanical and topographical. The reason for this appears to have been that the drawing instructor, Captain Burg, was an exceptionally good man, and enjoyed the high favor of Prince August, while the instructors in the more strictly military subjects were hardly above average. But artillery officers gradually became a class apart from others, and the arm itself came to be considered as secondary.

The methods of instruction were not satisfactory; Prince August tried to introduce applicatory methods, but was unsuccessful on account of the expense involved. In 1830 Major v. Radowitz secured the introduction of tactics into the course, but with only three

hours per week allotted. Naturally, the young officers took but little interest in subjects that seemed to be considered as unimportant for their profession.

From 1854 to 1872 General v. Peucker, a highly trained artillerist, was Inspector General of Training. He had noted that the Artillery and Engineer School was not getting results equal to those of the War Schools; and in 1865, after the retirement of General v. Hahn (who, as Inspector General of the Prussian Artillery, had opposed the introduction of rifled guns, and minimized the importance of the technical training of officers), succeeded in establishing the policy that candidates for artillery commissions should go to the War Schools, as in the other arms. The course at the Artillery and Engineer School had been three years for all officers; after 1868 this was reduced to one, only a few specially selected officers being retained for advanced courses. It thus became possible to give a better course to these advanced students, and one year was found sufficient for officers seeking line duty.

General v. Hindersin, who succeeded v. Hahn in 1864, encouraged scientific work by artillery officers in every way. He had the best of the routine studies prepared by officers of all grades sent to him, and published the names of the authors. He also made it a point to attend the conferences of the Guard artillery officers, which were held every two weeks; this alone was enough to stimulate officers to take part in them. He required officers to study the artillery of foreign powers, and made the results of these studies available to all. One might say that this could be done better and with less trouble by the Experiment Commission or by the General Staff; but his idea was to arouse the interest of all officers, and for this purpose he thought it best to encourage them to do the work themselves. Unfortunately, his successors did not carry on this idea, and the result was that our officers went into the war with a positively horrifying ignorance of the enemy's methods. Hindersin's greatest achievement, however, was the establishment of the School of Fire, which directed the attention of officers to the prime mission of their arm shooting.

He was not at all satisfied with the work of the Artillery and Engineer School, and did not hesitate to say so. From my own experience I can say that Captain Roerdansz, later Inspector General of Foot Artillery, was the only instructor who roused real interest in his students, by calling for original work from them. He insisted upon the introduction of applicatory methods, but unfortunately this recommendation was not approved by General v. Podbielski, who had succeeded General v. Hindersin as Inspector General, and the new method was introduced for the first year course only.

About this time an important change was made, which had long been desired by almost all artillery officers—the definite and complete separation of the Field and Fortress Artillery. The improvements in matériel had greatly increased the requirements as to technical knowledge, and it was felt that the average officer could not be expected to have the necessary familiarity with all the numerous types and classes of weapon, requiring different management. It was also hoped that the field artillery could be brought into closer relations with the infantry and cavalry. These expectations were fulfilled in part only. The Foot Artillery, as the Fortress Artillery was now called, profited decidedly, its officers making great improvement both theoretically and practically; but the Field Artillery failed to do so. The Foot Artillery laid stress upon effect; the Field Artillery upon mobility. The strange result was, that the Field Artillery, an arm which can fight only at a halt, received drill regulations closely resembling those of the cavalry, which fights only in motion.

But technical training came to be more and more neglected in the Field Artillery, and in about 1889 attendance at the Artillery and Engineer School by officers of that arm ceased entirely; they received only a four months' course of instruction at the School of Fire at Jüterbog. This was well enough to prepare young officers for duty in the regiments, but could not be considered as adequate for all purposes. This was soon recognized; but instead of renewing the requirement that all lieutenants should go to the Artillery and Engineer School, an order issued in 1896 granted admission to only thirty, voluntarily applying for a one-year course. In 1897 a second-year course was added, for twenty selected officers.

In 1906, this school was consolidated with the Technical Military Academy. Attendance at this school for at least a year was compulsory for lieutenants of Foot Artillery, but for Field Artillery and the other arms optional. The number of volunteers was small, and the influence of the school upon the service at large was slight.

The other States of the Empire paid more attention than did Prussia to the technical instruction of artillery officers. Bavaria had a separate artillery school, and maintained it up to the beginning of the war. As illustrating the backwardness of Prussia and of the Field Artillery in particular, it is interesting to note that between 1875 and 1908 six successive presidents of the Experiment Commission were officers of the Foot Artillery; and three between 1890 and 1903 had received their training in Hanover and Bavaria.

Since private industry has become interested in the manufacture of war matériel, an officer is seldom called upon to design guns and other equipment himself; but he must have enough technical training to insure that his demands are not unreasonable, and to enable

him to pass a sound opinion on designs submitted. He should be able to judge whether a suggestion received is worthy of test; often suggestions are made which rest upon false assumptions, or contain nothing new, and one must be thoroughly familiar with the subject in order to decide. Again, it is a matter requiring expert knowledge to arrange the details of a test, so that the result may be attained with the minimum expenditure of time, energy, and money.

Every test is a question asked of Nature, who always gives the right answer; but one must put his question in proper form, and must be able to understand the answer—which implies sufficient knowledge to observe with the mental as well as the physical eye. And every observed phenomenon must be considered in connection with others.

The empiric does not discriminate as to the degree of reliability of his observations; but this is necessary. For example, in firing for the construction of range tables, after allowing for the error of the moment there will still remain some uncertainty as to the initial velocity, range, dispersion, etc.; and the number of rounds to be fired must be fixed with regard to the degree of accuracy required in the results, and also with regard to the ranges in question.

The instructor at the School of Fire should have in mind not only the instruction of his students, but also the progress of the art. He should realize that a bracket is not absolutely reliable, but should understand the effects of dispersion and of uncertainties of observation. It is easy to show that a bracket determined by only one shot at each limit is uncertain, and often requires verification. In almost all countries except Germany the regulations require two clearly observed shots at each limit.

Simple firing methods and early effect are desirable. This can be attained only if one applies the rules of fire intelligently, instead of following them slavishly; and this implies that one understands his rules thoroughly, and that the regulations leave him sufficient freedom. Thus, to cover an area uniformly, range changes of 1.75 times the mean dispersion are sufficiently small. In service firing the dispersion will be 50 per cent. or 100 per cent. greater than the range tables show; range changes of 50 metres should then suffice, and it is certainly simpler to use only the fifty's and not the twenty-five's. With time shrapnel, the greater depth of the cone of dispersion makes hundred metre changes sufficient. All foreign regulations recommended the larger changes. And so the very theory which the "practical soldier" affects to despise tends to simplify firing methods.

The indisputable superiority of the French field artillery over ours at the beginning of the war is due in no small part to the better

mathematical and scientific training of their higher officers, who are mostly graduates of the École Polytechnique. To name only a few of the officers who have specially distinguished themselves in technical work, one thinks at once of Charbonnier, Vallier, Gossot, Lionville, Jacob, and, perhaps most conspicuous of all, Percin and Langlois. These two generals had to a marked degree the talent of inspiring others to independent work, as for example Bourguet, Rouquerol, LeRond, Challéat, Aubrat, Maillard and Palocque.

In many technical matters the French artillery was far ahead of the German; they were the leaders in the introduction of the combination fuze, smokeless powder, high-explosive shell, the rapid-fire gun, and the independent line of sight. They were the first to appreciate the advantages of the sharp-pointed projectile and of the boattail. They quickly recognized the influence of the new discoveries upon artillery organization and tactics, and decided upon covered positions and indirect fire, when the Germans hesitated. They reduced the battery strength to four guns, rightly judging that a few guns with ample ammunition were worth more than many guns with scanty ammunition. They solved the difficulties of calculating deflections and clearing the mask. They laid stress upon opening fire by surprise, and upon early effect; they recognized that this generally excluded accurate adjustment, so systematized fire upon a definite zone. They were ahead of us in adjustments with time fuzes.

The war clearly demonstrated the value of theoretical study of practical firing problems. In recognition of this, many scientific men, teachers in civil institutions were called into service by the Experiment Commission. They calculated our range tables for fire upon aircraft; devised methods for determining the error of the moment, and for facilitating adjustment; worked out the process for sound ranging, and for high-burst ranging. Incidentally, it may be noted that this last-named procedure was known to the French twenty years ago (*Revue d'Artillerie*, July, 1899, p. 303). The war numbers of the *Artilleristische Monatshefte* are full of articles from these men. And their work is not yet ended; but I may confidently assert that many important ballistic problems have been solved by German scientific men, and that many more advances will be accomplished through them.

The German foot artillery, whose officers had all attended the army technical schools, was better instructed technically than the field artillery. Since at the beginning of the war it also possessed a great superiority over the enemy in both men and matériel, its success was immediate and conspicuous.

Germany's future army will certainly be much smaller and the

term of service shorter; it is, then, all the more necessary that the officers' training be of the highest. Our private industry will provide us the best of weapons, in the future as in the past. The officers must be prepared to decide upon the requirements which the weapons are to satisfy, determine whether these have been satisfied, suggest improvements, devise regulations for their use, and train the troops accordingly. This means an officers' corps with a high grade of education. To secure this, I believe the following things are necessary:

1. No one should be accepted as a candidate for an artillery commission without a thorough grounding in mathematics. The officer on duty with troops may not have to deal with abstruse mathematical computations, or even with extended numerical calculations. But he must be able to think mathematically, and to read an elementary discussion of ballistic questions. Without this knowledge, one may slavishly follow the rules of fire, but can not use them freely and intelligently, because they will not be understood thoroughly. If anything goes wrong, one is entirely at sea. Until recently, a candidate was required to make an examination mark in mathematics of at least "fair"; this requirement has been dropped, although the use of modern weapons demands more and not less. Properly, the requirement should have been raised, making the minimum "good." Without this, one can not properly train his noncommissioned officers and gunners. With the shorter service, these men can not depend upon memory alone, but must solve their problems by reason.

2. Every artillery officer must have a solid technical training. To this end, the best means would be a one-year course at a special artillery school, where theory and practice should go hand in hand. The teachers would have to be very carefully selected; this point will be further considered below.

3. Specially qualified officers should be given the opportunity for higher technical training. With the reduced strength of the army, it is doubtful whether it would be possible to maintain a separate institution; if not, it should be made a part of the technical school at Charlottenburg, special courses being instituted; as, for example, at the Zurich Polytechnic, where there are officers among the instructors. The courses should cover several years, and include exterior and interior ballistics, gun construction, mathematics (differential and integral calculus, mechanics, probabilities, etc.), physics, chemistry (especially in military applications), practical laboratory work, and foreign languages if desired. Passage to a higher course should be made dependent upon satisfactory completion of a lower; but the course should be so planned that any part of the course would

be useful alone. There should be an entrance examination, as for the War Academy.

4. Formerly, the best of our officers sought assignment to the General Staff, because the prospects for advancement were better. But the work of an especially qualified officer may be of more value to the country as an artilleryman than as a general staff officer or an adjutant; men who are conspicuous in their own specialties should have the same opportunities for advancement as the general staff. More officers would then volunteer for technical schools. For instructors at the higher military schools, for members of the Experiment Commission, for the School of Fire, and for posts in the Ministry of War dealing with artillery matters, officers with technical training should be sought. This has not always been the case.

5. The Experiment Commission should always have a "scientific section," as it had during the war. Not only will this help in the proper planning and conduct of experiments, but the association of officers and scientists will tend to breadth of view.

6. Officers should be given opportunities for private study, and the necessary books must be made accessible to them. At one time each army corps area had its "artillery library," which contained a few of the most important books and periodicals, and which made them available in the officers' clubs. Later, a very few regiments possessed their own libraries. The higher authorities, if not actually hostile to the technical press, were at least indifferent and discouraging, perhaps because it sometimes contained criticism of existing institutions. It was natural, therefore, that even the best qualified officers hesitated to publish anything. Even the requirement that the articles should be submitted for approval tended to discourage them. This will partly explain why it was that Germany, alone among military powers, had no artillery magazine from 1897 to 1906. Up to that time the place had been filled by the *Artillery and Engineer Archives*, which died in that year for lack of support, at the respectable age of sixty-two. I was myself editor of this paper in the '80's, and tried, but without success, to persuade regiments to subscribe for it at the very moderate rate of six marks a year!

For an officer who wishes to improve himself in his profession, there is no better method than to write for the magazines; since he thus invites criticism, he is compelled to work his questions out thoroughly.* I believe it is highly desirable that all hindrances be removed from the way of the military press in future, and efforts made to stimulate it, by doing away with all exaggerated ideas of secrecy.

* We sincerely hope that many of our readers will bear this suggestion in mind.—Editor.

The German and French Field Artillery at the Beginning of the War

"M.," ARTILLERISTISCHE MONATSHEFTE, SEPTEMBER, 1919*

THE article in the May-June number on the training of artillery officers brings up the question of the relative efficiency of the French and German artillery at the opening of the war, and represents a point of view which was not uncommon during the war, especially in the infantry, and which I can not leave undisputed.

I may claim a certain special right to enter the discussion, from the fact that I was formerly one of the strongest advocates of the French methods, and often urged more attention to them, in my articles in the *Monatshefte*. I was looked upon as a "fanatical Gallomaniac"; at least I may claim to have carefully studied the French methods and to have looked upon them without prejudice.

After the first few battles I seldom met an old acquaintance that he did not ask me, more or less maliciously, what I now thought of "my" French artillery. And I was forced to admit that I was pleasantly surprised; that while I still had the utmost admiration for their theoretical knowledge, I could not say so much for their practical skill. And I still stand by this assertion. It is based, of course, upon my own experience chiefly, but this is unavoidable; all war experience is made up of many individual experiences. A few of the more instructive of these personal experiences are given below.

On August 22, 1915, we fired almost continuously upon French infantry, from 2.45 to 7.05 P.M., out of a fairly well covered position. We fired with good effect upon skirmish lines both moving and stationary; troops lying down in the open were so badly punished that they disappeared long before our infantry came near them; counterattacks, especially one strong one made in several waves, were broken up by our fire; we made many changes of target, up to 800 mils, in country that was almost entirely open to view, and fired about a thousand rounds. All this time there was a French artillery regiment only 2800 metres from us, which did not disturb our fire in the least. His bursts were enormously high, and he used only shrapnel—a habit which he soon changed; spent bullets in our shields and one broken canteen constituted the entire effect. We did not do much to the French batteries, either, but we were too busy with infantry to pay much attention to them. I fired a few rounds at an observation station, but had to pass on to other targets. Now it

* Translated by Colonel O. L. Spaulding, General Staff, U. S. Army.

stands to reason, and in fact prisoners confirmed the fact, that the French infantry must have cursed their artillery heartily that evening, for not preventing the hostile guns from shooting every skirmish line to pieces as soon as it was seen.

The infantry here seemed to think that it is possible to eliminate the effect of hostile artillery fire entirely, even in manœuvre warfare. But the French artillery often failed to accomplish it, even in cases where peace experience seemed to indicate its possibility. On August 24, 1914, our battalion was in position in the front edge of a wood on a forward slope, using direct laying, from 3.20 P.M. until dusk, first holding off a hostile attack, and then supporting our own counter-stroke. Nothing came our way but ineffective high bursts and occasional chance shots. The howitzer battalion of the regiment, which was at first behind the wood, moved up when the French attack came so close that it could no longer clear the mask, and put two batteries in a perfectly open position north of the wood. They fired from here with excellent effect, and except for one direct hit had no losses to speak of. The third battery, which remained in the old position, caught a French battery just going into position in the open, and prevented it from ever getting into action; its guns were abandoned and afterward captured.

The incident of the 2d of September was still more remarkable. The French had let us come across the Meuse, to attack us on the other side. Twenty-three batteries of the army corps had to pass along a single road, running between a steep ridge and the railway embankment in the river bottom. This road was soon so congested that our regiment marched along the embankment itself. The end of this defile was visible from several places, as were also the positions thereabouts. Nevertheless, we succeeded in deploying without loss, although we should never have been allowed to do it in manœuvres. And then, from 3.45 P.M. till dark, I fired from a perfectly open position, under constant shell fire. The bursts were short, over, and in the battery; the moral effect was decidedly annoying, and the smoke hampered us sometimes, but we had no losses, although one gunner had his coat torn by the blast from a shell that burst close to him. This sounds "fishy," but it is a fact. In the first place, the "target" shots were all in the gun intervals; the fragments of the shell fire were too small to do much harm; and, above all, the enemy lost most of his shots over into the deep valley close behind us, so that for hours he was firing at about 50 metres too long range. We fired some 800 rounds at hostile infantry, and even replenished our ammunition from caissons of the light ammunition column, without loss.

On September 6th I fired from 2.15 P.M. until dark, in a position

so slightly covered that the blast of every shot showed dust, and under constant fire. The enemy's adjustment was excellent; he used both shell and shrapnel, and apparently had two or three batteries. This time we had eight men wounded, all by shrapnel bullets that got through openings in the shields or intervals between gun and caisson. But our fire was never disturbed, and the enemy's infantry got no relief.

In all this, I am not claiming that we could have done any better in the enemy's place, but only pointing out that the French infantry had at least as good ground to complain of their artillery as ours had. And they did it, too; *"l'infanterie crie toujours"* was the first thing that captured artillery observers said, in the summer of 1915, when we asked them as to the relations between the two arms. This *"cri"* is natural enough, and is even necessary as a stimulant for the artillery, but it is not always technically justified.

In position warfare, I regained something of my higher opinion of the French artillery, but can not agree that they "led" in the development of methods of reconnaissance. In the summer of 1915 we often captured maps of our artillery positions, in which hardly a battery was correctly placed, while we, as early as April, 1915, got accurate locations of hostile batteries from our flash and sound ranging stations. I am speaking now of a wooded country—the Argonne—where the French air observation, elsewhere so good, could not accomplish much. His difficulty in locating us may have been due to the fact that his guns gave big flashes, while we had succeeded in almost entirely eliminating ours by the flash-reducing compounds. This comparison leads us to the question of matériel.

Before the war I knew the French gun as well as a German officer could, and since August 25, 1914, when we captured some of them, I have had personal acquaintance with it. I can still say to-day, what I said on August 25th, and what all my cannoneers said when they had worked with the French gun for a while—that as between the French gun and ours I prefer ours. We had better shield protection, we needed no "abatage," and, above all, we had our excellent panorama sight, while the enemy had their antiquated and highly complicated arrangement of "plateau" and "tambour," compelling the use of mental calculations. True, their range scales were graduated to 6800 and ours only to 6000; but one can always use the gunner's quadrant. On September 1, 1914, I fired at 7200 metres upon retiring skirmish lines, and had no difficulty. So much for the field gun; but we must not forget that we are talking of the field artillery as a whole. And we had the light field howitzer. Besides this, the enemy had nothing to compare with our aiming

circles and scissors telescopes. As for ammunition, shrapnel failed generally on both sides; the French shell had greater moral effect, but ours had a combination fuze, which was often very useful.

Now for the question of organization. Before the war I was the strongest advocate of the four-gun battery, and wrote countless articles on this text for the *Monatshefte;* but in November, 1914, when I was first called upon to report on my war experience, I came out equally strong for the six guns. For I had seen how the effect of field artillery fire always comes from short, decisive bursts. I had seen that even a seven-hour fight in which we expended a thousand rounds consisted of short bursts, connected by periods of slow fire. I had never disputed that in such a short burst a six-gun battery was 50 per cent. better than a four-gun, because it could throw 50 per cent. more ammunition; but what I had not recognized before was the importance of this utilization of favorable moments. Besides, I always had "the battery mounted" in the back of my head, and thought in terms of double section columns and marches of approach. In the war I began to see that there is nothing to be done but to unlimber to the flank and bring each caisson in any way one can—if it is brought in at all, which it usually was not later on. Under those conditions, it makes no difference whether one is working with eight carriages or twelve. In peace, one waits impatiently for the battery and looks at his watch; in war, one looks through the telescope and leaves the executive officer to bring the guns into the marked position.

Later on, in position warfare, we had only four guns, and were always trying to get six. In the autumn of 1916 my battalion had 17 guns in position, five of them of course not horsed, so great was the demand for flanking platoons, wandering guns, etc.

The answer to this will doubtless be that no one ever disputed that a larger number of guns means an increase in strength; the question is simply whether the available guns shall be grouped by fours or by sixes. For example, in a regiment of 36 guns, shall we have nine four-gun or six six-gun batteries? Before the war I should have answered without hesitation, nine four-gun batteries; during the war I should have said neither nine four-gun or six six-gun, but nine six-gun. If in peace time I am authorized to keep up nine batteries, I should certainly give each one six guns. I will not dispute that with four guns I can have two more caissons full of ammunition; but it has been my experience that ordinarily, ammunition supply is a matter of manufacture at home. There is always enough on the battlefield; in every one of the larger engagements in manœuvre warfare I fired a thousand rounds or so, and in the evening always had more ammunition in the position than I could

carry. Where it came from I generally did not know, but it was there. Later, it is true, this was not the case. But on the defensive the reason was generally the hostile fire which prevented replenishment; on the offensive it was congestion of roads and the difficulty of crossing the trench system, together with the bad condition of the horses.

One thing is certain; if we had not had the six-gun batteries it would have been impossible to organize new units so quickly, and this was a decisive factor in the fighting on the eastern front in 1915. We must not forget that with each gun turned over to a new battery there can go a trained gun detachment.

All in all, I believe that our organization before the war—six-gun batteries, light howitzer battalions, plenty of heavy artillery—was better than that of the French.

It is true that for twenty years before the war the French artillery had been leader technically. The reason for this is to be found in the course of development of the German field artillery since 1877. The sharp separation from the foot artillery, the selection of a cavalryman as inspector of the new special arm, and the introduction of a cavalry type of drill regulations, whose influence remained even until 1907, brought it about that while the foot artillery became too much of a fortress arm, the field artillery neglected gunnery for mounted work. The reaction came in the foot artillery about 1893, when the Schlieffen-Planitz reforms introduced driver detachments and the heavy field artillery. For us it came about the end of the century, with the disappearance of the Podbielski system and the renewal of closer relations between troop units and technical study, which had been treated as a separate matter coming within the province of special schools only.

But let us not forget that this system had much good in it, although it may have been badly overdone. Even our enemies admitted that our mobility was greater than theirs, even up to the final manœuvres in the 1918 offensives. Mobility of staffs, combined with the habit of rapid decision, and mobility of batteries, combined with willingness to accept losses, often enabled us, even from the very first, to help out the infantry in emergencies. It is hard to strike the proper mean between the two requirements, but 1918 indicates that it is possible. To keep in this proper mean is the task of the future.

COMMENT BY GENERAL ROHNE

The interesting war experiences described above may appear to contradict my views as expressed in the May-June number and on earlier occasions. This is not the case; in fact, they confirm my opinion. This sounds paradoxical; the explanation follows.

I do not dispute the correctness of the descriptions of these experiences; but I do doubt the safety of generalizing from them. They prove only the value of high technical training. As he himself says, the writer had studied the French artillery carefully, and followed closely all its progress. He was for years an instructor at the Field Artillery School of Fire, and, as his articles in the *Monatshefte* show, was in the habit of meditating deeply on his observations and taking his profession very seriously. Finally, he went to war with a battery that had had a very high peace strength, which greatly favored training. That such a battery was up to all requirements, and did not fear to meet the French artillery, is not surprising. But how, on the basis of this experience, one can say that the six-gun battery is better than the four-gun as the foundation of an organization, is incomprehensible to me.

In Germany less than half (42.5 per cent.) of our light batteries were kept at the high peace strength—six guns and three caissons. In France all batteries approached much more closely to their war strength, having four guns and the same number of caissons; 78 batteries, or one-eighth of all, had four guns and six caissons. The assignments of men to guns and caissons were so planned that there was no change on mobilization. One can hardly imagine an organization better adapted to training for war. The possibility of bringing peace and war strengths close together was one of the important reasons why I favored reducing the number of guns and increasing that of batteries.

The suggestion of the writer, that a regiment should be neither nine four-gun nor six six-gun batteries, but nine six-gun, reminds me of the saying of King Frederick William IV: "If you ask me whether I prefer Potsdam or Hanover as a residence, I should say Cassel." With the same right I might say: "No; two regiments, of six four-gun batteries." We must accept the existing conditions. That the rapid organization of new batteries would not have been possible if the old ones had not had six guns, I must doubt. That a change from six guns to four was made during the war indicates to me that the directing authority was so impressed with the merits of the smaller battery as to be willing, even under war conditions, to accept the evident disadvantages to the greater requirement for officers and extra vehicles. I can only regret that this decision was reached so late.

That the French did not have the fine optical equipment that we had, is well known; French industry could not supply it.

General Ludendorff, in his memoirs, supports my assertion that the artillery did not favor the application of scientific methods to its practice; for he says that calculation of the correction of the moment was strongly opposed by old artillerymen.

CURRENT FIELD ARTILLERY NOTES

Role and Missions of the Artillery

"LA FRANCE MILITAIRE" publishes in its issue of April 5, 1921, the second instalment of the comments of "Commandant G" on the provisional French Artillery Field Service Regulations of 1919.* In this case the commentator discusses the question of the rôle and missions of artillery, and as he looks on the question from the point of view of comparing artillery principles of the past with the regulations developed by war experience, the new regulations are set forth in a most interesting light and are quickly grasped. The translation of this article follows:

"Whether a strength or a weakness, it is a consequence of the properties of artillery that its rôle in combat must not be considered separately, but rather as a part of a manœuvre, where its action is combined with that of the other arms, principally the Infantry. Artillery fire is only an indispensable assistance which makes it possible for the Infantry to fulfill its mission, which is to conquer or hold ground.

The regulations consequently put the question in its real light from the first lines: (a) By reason of its infirmities and its incapacities, the Artillery cannot do without the other Arms, and it has no other reason for existence but for them. *It is an auxiliary arm.* (b) By reason of its power and of the possibility of the use of this power, the Artillery is alone capable of combating and breaking down most of the resistance which is an obstacle to the success of the Infantry. *It is the auxiliary which it is impossible to do without.*

Undoubtedly the happy phraseology of the regulations avoids this term of "auxiliary" which has a disagreeable sound to the ears of the artilleryman, but they say what they mean, although in polite words. No matter what the words, the rôle of the artillery is always to assist. This is essential, and there must be full agreement on this point.

It is not less necessary that everyone should recognize that this assistance is indispensable. In 1914 we used to think that the Infantry would not have any such need of assistance. In 1917 we had come to admit that without a mass of guns it was not possible for the Infantry to accomplish anything. Both the instructions of April 4, 1919, on combat, and the new artillery regulations, reach

* For the first instalment of "Commandant G's" discussion see "Current Field Artillery Notes" March-April 1921, F. A. JOURNAL, Editor.

an agreement in locating the truth between these extremes, and give the right note; it might be said there is no case where the Infantry could do completely without the aid of the guns, but even in the circumstances where its support is the most necessary, the artillery can only give what it has. Its intervention, no matter how useful it may be, is nevertheless incapable of solving the whole series of problems which present themselves to the Infantry, and for which the Infantry alone must find a solution. Such problems are not beyond the powers and the resources of the Infantry. As one of the orders of Marshall Petain stated: "The Artillery hammers the hostile armor; the Infantry seeks the weak points in order to insinuate itself there and dress down the burrs which hinder the advance." Consequently, each arm has its part. In order to defeat the enemy the Artillery works "in union with the other arms." Each one works according to its means like a well-organized orchestra where harmony results from a conscientious execution on the part of all the players, each one playing his part in tune and in time, but where the light flute cannot delegate its rôle to the bass horn.

In the distribution composed by the command, the part that the artillery plays admits of an almost indefinite number of variations, more especially because the orchestra itself has been materially changed. In 1914, it was reduced to a single instrument, *i.e.*, the 75, the properties of which were but incompletely made use of; from now on the artillery, however, has a great variety of weapons to employ, whose power, whose scope and whose perfection permit of a large variety of combinations in its employment.

The introduction rightfully brings out the possible flexibility which is necessary in the use of artillery, and which adapts it to the realization of the leader's wishes. It marks, at the same time, the harmony of the whole, much as the leader of an orchestra indicates the piece to be played, beats the proper time and supports the executants, moderating at this point, increasing the activity at that, or leading the whole in an irresistible movement, each instrument playing its part to the best of the musician's ability, in accord and in time with the movement indicated.

The general mission of the artillery—that of directly or indirectly aiding the infantry—implies for its element a series of particular missions, the relative importance of which varies in accordance with the circumstances of the combat. Artillery fire, like all other fire, has for its object the facility of movement of the troops it supports, or to render the movement of the enemy impossible. On this fundamental theory, all variations in its operations are made possible; and many formulas are necessary to cope with the

complexity which is continually increasing the methods and means in attack and defense.

The instruction rapidly enumerates the principles of these particular missions and the general methods of action in the employment of artillery. Well known at the present time to all the combatants of yesterday, the enumeration of these would have greatly astonished us in 1914.

Even though the table of values be greatly changed, in quantity as in quality, the fundamental method of employment of artillery at first glance seems to be unchanged. Its role will always be to destroy or to neutralize. As a matter of fact, there has been an important change in this also.

Let us compare the texts of 1910 and 1919.

The first laid the greatest stress on the idea of "destruction," it being understood that the rôle of the artillery was above all that of attacking "living targets not sheltered"—at least we believed so of the 75 which composed almost the total of our field artillery. The theory of "neutralization" was engendered by the impossibility to "destroy"; it was not sought for itself, but was accepted for lack of something better.

In that of 1919, "destruction" is naturally presented as the best result, as being that against which there is no recourse, and more especially because from now on the artillery has the means of destroying things other than living targets without shelter, and because it can perform a very much wider range of work. But, as the war went on, we learned to believe that the power of "neutralization" was not something which resulted from an inability to destroy; that it has its own virtues, one of which is most important, that of permitting the leader to carry out a surprise attack. To such an extent has this idea been accepted that a neutralizing operation of artillery is one which the artillery accepts as worthy of its power; it is not the least curious result in the progress of methods of protection, which has developed parallel to the progress made in means of destruction.

Still better, it now appears that destruction follows the neutralization as a natural consequence, when this neutralizing operation is sufficiently prolonged and sufficiently intense. Destruction can be realized, but it requires times and resources to procure it, losing therefore, all the advantage of surprise and as a consequence all the advantages of important successes.

The destructive power of the artillery is far from becoming a secondary quality. It will always be necessary, in certain cases to destroy, cost what it may; and these cases are numerous because

matériel obstacles are continually making their appearance on the battlefield, obstacles which are not affected by neutralizing fire.

Then, too, it is on the matériel effect that moral effect is based. In 1914, we more or less scorned the German 77; but the Germans cursed our 75. This is one example of the difference in matériel effect. When it comes to a question of moral efficacy, it is the destructive power of a gun which measures its power of neutralization."

Ordnance Notes

"SEVENTY-FIVE" *vs.* "SOIXANTE-QUINZE"*

A COMPARATIVE STUDY OF AMERICAN AND FRENCH DIVISIONAL ARTILLERY

BY D. A. GURNEY.
Member A. O. A.

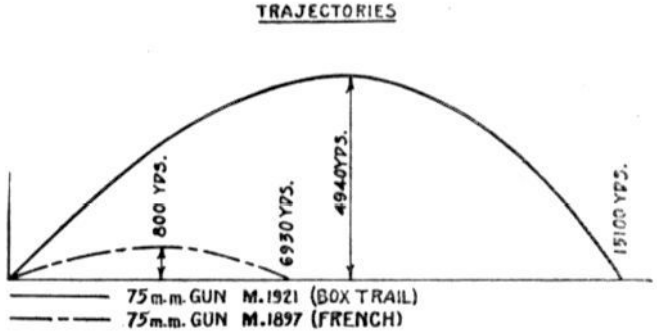
THE 75-mm. Gun Carriage, Model of 1897 (French), used by the French and American armies during the war, and familiarity known as the Soixante-Quinze, is quite generally reputed to have been the best type of field artillery weapon then in use. This favorable reputation is believed to be due principally to the fact that the hydro-pneumatic recoil mechanism used on this carriage was more reliable than the hydro-spring mechanism used on the British and German field carriages, and the single-trail axle traverse carriage is simpler to operate and repair, and cheaper to construct than the split-trail type, as used on the Italian Deport and on our 75-mm. Gun Carriage, Model of 1916.

Aside from the manufacturing difficulties experienced with the recoil mechanism of this carriage, which are quite generally understood and have been discussed in detail elsewhere, the carriage proper is not an easy manufacturing proposition. This carriage was manufactured in this country in quantity during the war, and great difficulties were found and overcome in the manufacture of the trail, which is not of simple form, and in the manufacture of the rockers and operating mechanisms.

At the close of the war an attempt was made by the Westervelt Board to obtain a consensus of opinion of the artillery officers of the various countries as to what should constitute an up-to-date carriage for the light field gun. Opinion was not at that time definitely crystallized, but all the nations had experimented to a varying degree in trying to develop a carriage having greater elevation and increased range and a wider field of traverse. As a result of its

* Reprint From *Army Ordnance*, May-June, 1921.

investigations the Westervelt Board † drew up specifications for an ideal gun which should be about 3 inches in calibre with a maximum range of 15,000 yards, a vertical arc of fire from minus 5 to plus 80 degrees, and a horizontal arc of fire of 360 degrees, and stipulated that if practicable the carriage should be designed to mount either the light field gun or the light field howitzer interchangeably. These specifications were accepted as the basis of the design of the 75-mm. Gun and 105-mm. Howitzer Carriage, Model of 1920, which fulfills all the requirements of the Calibre Board specifications, except for traverse, the total traverse obtained on this carriage being 30 degrees. The 360-degree traverse can only be obtained on a pivot mount, and seems impracticable for any conventional type of carriage to be drawn by horses. Four of these carriages, two mounting the 75-mm. field gun and two mounting the 105-mm. howitzer, have already been completed,



The New American "Seventy-Five" has twice the range of the French "Soixante Quinze"

and will soon be tested at Aberdeen. The total weight of the gun, carriage and limber is about 4800 pounds, which is considered too great for this type of artillery.

As an alternate to the split-trail carriage above referred to, design of a single trail carriage, Model of 1921, for a 75-mm. gun of the same ballistics as the 75-mm. gun, Model of 1920, has been completed and one carriage is now under manufacture, which will be available for test this coming summer. This carriage has been designed with the idea of making it as light and as simple to manufacture as possible and it is expected that the total weight of the gun, carriage and limber behind the team will not be more than 4000 pounds.

The gun is known as the 75-mm. Gun, M. 1920 MII, is 42 calibres in length, fires a shell weighing 15 pounds to a range of 15,100 yards

† *I.e.*, Calibre Board, for report of which see "Study of the Armament and Types of Artillery Matériel to be Assigned to a Field Army," FIELD ARTILLERY JOURNAL, July-August, 1919.—Editor.

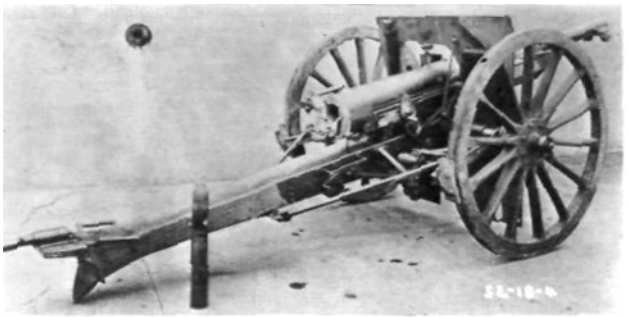
with a muzzle velocity of 2175 foot seconds, this velocity being obtained with a supercharge. The normal charge for this gun will give a velocity of 1500 foot seconds. The weight of the shrapnel is 17 pounds; the shrapnel velocity has not yet been definitely decided upon. The gun, of chrome steel, is provided with a breech mechanism of the horizontal sliding type, and weighs 945 pounds.

The recoil mechanism is hydropneumatic of the St. Chamond type, the length of recoil being constant—42 inches. Due to the fact that the elevation has been limited to 45 degrees, and due to the location of the trunnions, which are situated at the rear end of the cradle just in front of the breech, it has been found practicable to use constant recoil, thus reducing the size of the cradle materially as compared with the 1920 model, with consequent reduction in weight and greater simplicity. A spring equilibrator is provided underneath the cradle, which is designed to overcome the unbalanced moment of the tipping parts, thus providing comparatively light handwheel loads. The carriage is provided with the independent line of sight, which is accomplished by means of rockers, one on either side of the cradle pivoted at the trunnions. These rockers carry large spur arcs at their forward ends. Pinions carried by the cradle mesh with these arcs, and are rotated by means of an elevating handwheel situated on the right side of the carriage near the range drum. By rotating this handwheel the carriage is brought to the proper elevation for range. A second pair of spur pinions mounted on a shaft located in the trail very nearly underneath the trunnions mesh with these same arcs. This shaft and pinions are rotated by an angle-of-site handwheel situated on the left side of the carriage. By rotating this handwheel the rockers are leveled when indirect aiming is employed or they are used to lay the sight on the target under the condition of direct fire. The standard panoramic sight is mounted on a bracket located on the left trunnion, and is provided with a cross level for correcting the azimuth error due to difference in level of the wheels.

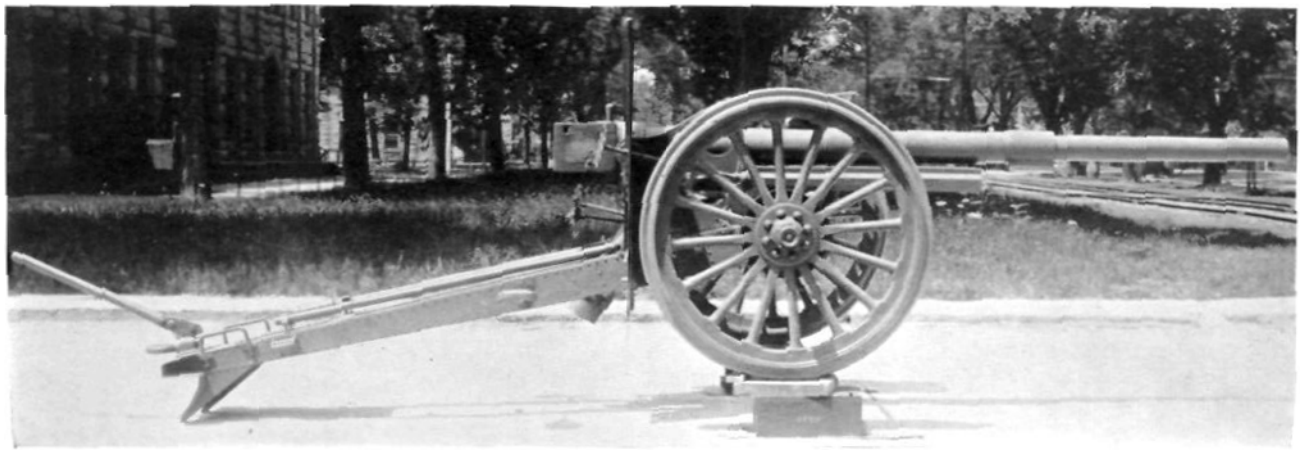
The carriage is provided with axle traverse, which is obtained by shifting the front end of the trail transversely along the axle by means of a screw and nut operated by means of a traversing handwheel situated on the left side.

The axle is of simple I-beam section, except for the axle arms, which are of standard design. The wheels are 48 inches in diameter, having 3½-inch solid rubber tires. Standard 56-inch wheel hubs and standard spoke shoes are provided. The estimated weight of each wheel is about 230 pounds.

The trail is constructed of two flasks which are of box section, the flanges being formed in such a way that no inside riveting is



THE FRENCH "SOIXANTE-QUINZE."



THE NEW AMERICAN SEVENTY-FIVE."

required. The flasks are perfectly straight from axle to spade, and are tied together near their front ends by the bracket which supports the angle of site pinions, and at their rear ends by the spade and tool box. Near the front end of the trail, triangular-shaped brackets for supporting the trunnion bearings are riveted, and the trail is provided with the customary seats for the cannoneers who operate the elevating and traversing mechanisms. No axle seats are provided. Band brakes, operated on brake drums carried by the wheels, are controlled by means of a brake line, which extends to a point near the rear end of the trail and is operated through small cables by a cannoneer seated on the carriage limber.

The main shield is secured to the trail and to the brackets supporting the trunnions. A folding apron is situated underneath the trail, and a top shield, whose position is controlled by means of hinges operating on the automobile windshield principle, is provided. This top shield is so arranged that it may be folded down over the panoramic sight hood, thus permitting the use of aiming points throughout 360 degrees of azimuth.

It should be understood that although the 75-mm. Gun Carriage, M. 1920, as designed, weighs about 800 pounds more than the expected weight of the M. 1921 carriage, a great deal of this excess weight can be eliminated by a proper redesign. The split-trail carriage is really a carriage for the 105-mm. Howitzer, and it is estimated that by using the same gun and cradle as is used on the box-trail type and limiting the elevation to 45 degrees, a split-trail carriage can be designed having 30 degrees or more traverse whose weight will not be more than 300 pounds over that of the box-trail type.

A tabulation showing the various characteristics of the 75-mm. Gun matériel, Models of 1897, 1920, and 1921, follows:

	75-mm. Gun M. 1897 (French)	75-mm. Gun M. 1920 (Split Trail)	75-mm. Gun M. 1921 (Box Trail)
Length in calibres	34.5	42	42
Muzzle velocity, shell, normal ... f.-s	1,805	1,500	1,500
Muzzle velocity, shell, super ... f.-s	.....	2,175	2,175
Muzzle velocity, shrapnel ... f.-s	1,755	not determined	
Maximum range at elevations obtainable on carriage ... yds	6,930	15,100	15,100
Maximum elevation possible	19º	80º	45º
Maximum traverse (total) on carriage	8º	30º	10º
Weight of shell ... lbs	12.2	15	15
Weight of shrapnel ... lbs	16	17	17
Normal length of recoil ... inches	47	40-18	42
Weight of gun and breech mech ... lbs	1,015	1,242	945
Weight in firing position ... lbs	2,887	3,600	2,800
Weight of gun, carriage and limber ... lbs	4,411	4,800	4,000

Equilibration*

In the earlier types of gun carriages the tipping parts were trunnioned at their centre of gravity, thereby permitting elevation or depression with a minimum of work. The recoiling parts of these earlier carriages did not strike the ground at maximum elevation, owing to their short cannon, short recoil and moderate elevation. As elevation and length of cannon were increased to meet demands for greater range, designers were confronted with the problem of providing space to receive the recoiling parts.

The obvious means of preventing the recoiling parts from striking the ground was to dig a hole to receive them, and this was done and is being done at present. But as artillery has developed, this method no longer answers all demands, and additional means were devised as follows:

1. Weighting the breech and thereby shortening the distance from the trunnions to the breech face.
2. Using a variable recoil mechanism and so shortening recoil at high elevations.
3. Using equilibrators.

The Germans and French used equilibrators on some of their carriages employed in the World War, but not very extensively. However, the demands of modern artillery have become so drastic in this regard that they can only be met by use of equilibrators on practically all field carriages.

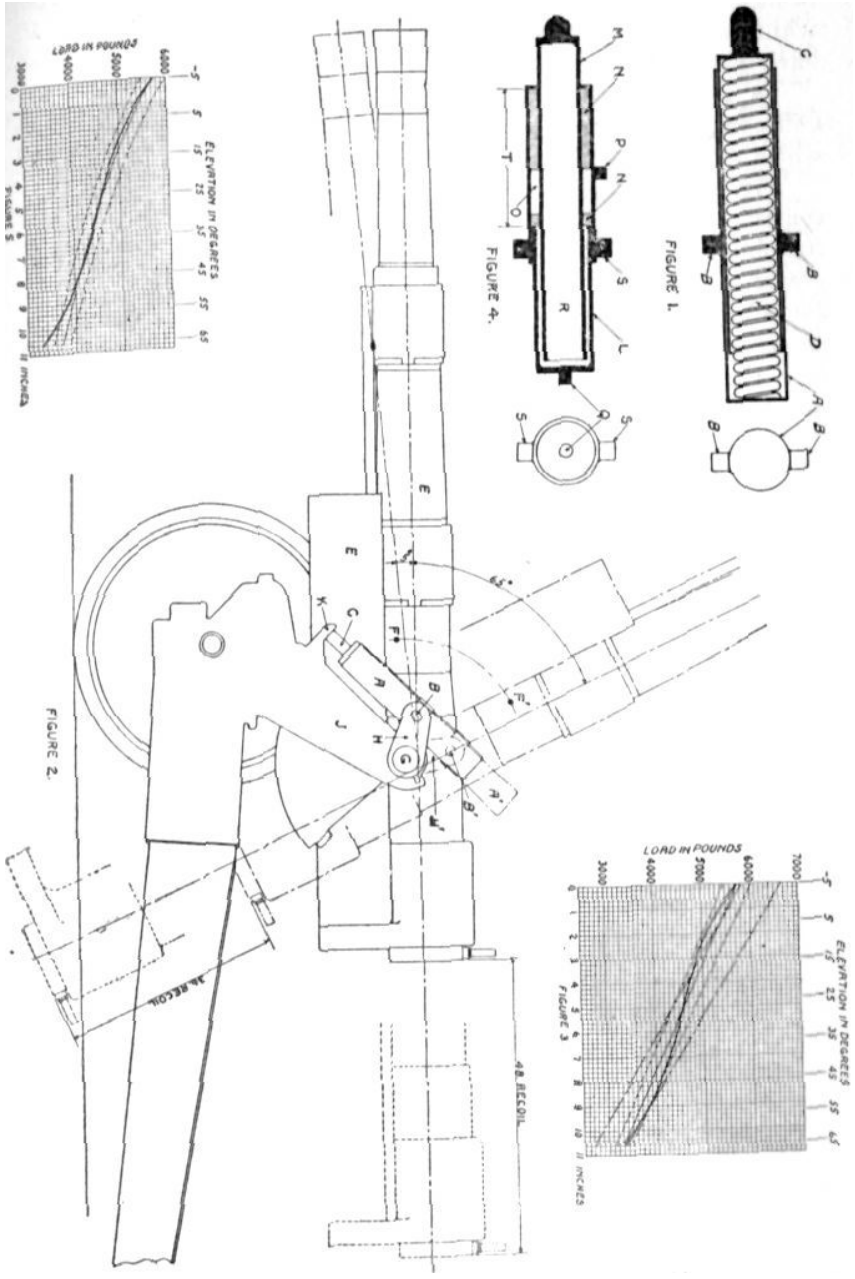
Fig. 1 shows the cross-section of a spring equilibrator. A is the shell having the trunnion B. C is the plunger. D is a spring column under compression which tends to force A and C apart.

Fig. 2 shows the application of the equilibrator to the 155-mm. Howitzer Carriage, Model 1920. The tipping parts E, with centre of gravity at F, are trunnioned at G upon the top carriage J. A pair of arms H fixed to the trunnion G receive the equilibrator trunnions at B. The plunger C sockets in the bracket K from the top carriage J. Gravity tends to pull the point F downward about G, which tendency is resisted by the equilibrator through the arms H.

Fig. 3. The heavy full curved line shows the spring load desired if the moment of the tipping parts is to be balanced in all positions. The light full line represents very nearly the actual spring load if a perfect spring were obtainable. The dotted lines show maximum and minimum spring loads, allowing a tolerance of plus or minus 5 per cent. The dot and dash lines show test loads on two springs which have been received.

Difficulties have been encountered by the Ordnance Office in obtaining equilibrator springs, owing, to the severe specifications

* Reprint From *Army Ordnance*, May-June, 1921.


LOAD IN POUNDS
ELEVATION IN DEGREES
INCHES
FIGURE 3
FIGURE 4.
FIGURE 1.
FIGURE 2.
4B RECOIL

necessary. A high fibre stress is required to limit size and weight, and uniformity of section and material is essential in the bar in order to meet the specifications. It is necessary that the springs operate within narrow limits in order to secure the delicate balance absolutely essential.

In view of the irregularities found in springs, the Ordnance Office has designed a pneumatic equilibrator which is being built and which will be tested in comparison with the spring type.

Fig. 4 shows a cross section of the pneumatic equilibrator, which consists of a shell L with trunnion S, and a plunger M. The space R contains compressed air, which is held by the packing N with a grease seal in O. P is a valve to admit grease, and O is a valve to admit air. The shoulder in L limits the packing length T so that proper volume of air is assured. The air pressure in R tends to force the plunger M out of L. This equilibrator is interchangeable with the spring equilibrator on the carriage.

Fig. 5. The heavy full curved line shows the desired pneumatic equilibrator load. The light full line shows the load obtained. The dotted lines show the load obtained plus or minus the packing friction. It should be noted that this packing friction is the most objectionable factor of the air equilibrator. This friction works in both directions of movement and can not be compensated for. It is therefore necessary that it remain within narrow limits, and it is hoped these limits will be less than the tolerances required in spring manufacture. It is believed this can be done.

BOOK REVIEW

ALLENBY'S FINAL TRIUMPH. By W. T. Massey. E. P. Dutton & Co., New York. $8.00 net.

Although as a newspaper correspondent Mr. Massey naturally inclines to write in a popular vein, his book is yet of value to the purely military student. For the American officer the campaign of late summer and early fall, 1918, in the Holy Land, has a special interest. First of all, the topography and climatic conditions of the Holy Land were in many respects very similar to those on our southwestern frontier. Other conditions were also somewhat similar to those which we may possibly have to meet—for example, the character of the enemy, the semi-civilized condition of the country, etc.

The Author appears to find the most characteristic feature of the campaign in the opportunity afforded cavalry to show that its use in masses is not only still possible but is essential under certain circumstances. Without altogether disagreeing with this view, it may well be pointed out that an equally important feature of the campaign was the skilful combinations of action between cavalry and infantry masses.

In the beginning of the campaign the Turk was, in spite of his losses, hardships and other difficulties, a first-class fighting man. Allenby accordingly took no chances, but prepared everything in the greatest detail; very much after the fashion familiar to those who served on the Western Front. Later on as the Turkish morale decreased, chances were taken and dashing cavalry actions became the usual thing. It is said that an entire cavalry division covered no less than eighty miles within twenty-four hours.

The operations of Allenby's Supply Services had to overcome the greatest difficulties. Not only did virtually everything have to come from England, but the absence of good roads and the scarcity of water seemed at times almost insuperable obstacles to the rapid movements which finally resulted in the complete destruction of the Turkish Armies. Mr. Massey pays many well deserved tributes to the men of the Supply Service whose grit and determination rendered possible the brilliant exploits of the fighting men.

Although the insufficiency of detailed maps makes it difficult to follow some of the detailed accounts, "Allenby's Final Triumph" is a valuable contribution to the history of a most instructive campaign.

FOX CONNER,
Brigadier General, U. S. A.

THE ARMY OF 1918. By Colonel Robert R. McCormick. Harcourt-Brace and Howe, New York.

The author served as a National Guard officer prior to the Great War, and visited the Allied Armies prior to the entrance of the United

States into the conflict. He, therefore, had some military knowledge and training.

As a newspaper man (one of the owners of the *Chicago Tribune*) he possessed the instinct of that calling for getting at facts and knowledge. In addition, he served for a time with the 1st American Division in France.

Finally, he was for some time attached to General Pershing's Headquarters, where information was available. The qualities which he thus possessed, and the opportunities afforded him enabled him to write a very readable book.

The "Army of 1918" means, of course, the American Army of the last year of the War—the crowning result of our military efforts.

Some idea of the subjects covered in the book appears in the Table of Contents:

It is a book that could be read with profit by the average American. It shows up our lack of preparedness due to the slight interest taken in this subject by the American people and by their representatives in Congress. After the conflict began in Europe, and prior to our entrance into the War, the American people suddenly awoke to our defenselessness only to discover that the President, who should have been the leader, was the reverse—he and a small but important part of his party in Congress held back the preparedness efforts.

The author discusses not only our miserable military policy of the past, but points the way to safety in the future through universal military training.

The newspaper man's instinct for news—but not necessarily facts—leads the author into some misstatements, that fuller investigation would have eliminated. And again, his book covers only the European part of our Army and ignores the equally large work that was going on in the United States. For our troops could not have fought in France but for the work going on here. A better knowledge of this work, and of the magnitude of the task of transforming the immense industrial organization of this country into a war machine, would have saved many of the unjust criticisms of the War Department.

The author's attitude toward the regulars is that of the amateur soldier—have we not all seen a grandstand full of baseball fans, criticizing the best professionals the game ever produced? In the same way the author allows minor defects and small circumstances to obscure the immensity of the task performed by the small body of regulars in organizing, training, fighting, and leavening the great army of 4,000,000 men we raised.

But on the whole the book is interesting, and contains much excellent matter. W. J. S.

Book Notices

OUT OF MY LIFE. By Marshal von Hindenburg. Harper & Brothers, New York. Two vols. Price, $7.50 net. Review later.

AT THE SUPREME WAR COUNCIL. By Captain Peter E. Wright. G. P. Putnam's Sons, New York. Review later.

THE PLATTSBURGH MOVEMENT. By Ralph Barton Perry. E. P. Dutton & Co., New York. $2.50. Review later.

THE ARTILLERYMAN. By First Lieutenant Jay M. Lee, 129th Field Artillery. Spencer Printing Company, Kansas City, Missouri. Review later.

PRACTICAL MINOR TACTICS. By Colonel Jens Bugge. D. Appleton & Co., New York. $2.00 net. Review later.

CANONS ÉLECTRIQUES, SYSTÈME FAUCHON-VILLEPLÉE. Berger-Levrault Editeurs, Nancy-Paris-Strasbourg, 1920. 18 Francs.

THE MANAGEMENT OF MEN. By Colonel Edward L. Munson. Henry Holt & Co., New York. Review later.

COURTS-MARTIAL PROCEDURE. United States Infantry Association, Washington, D. C. Review later.

THE RED, WHITE AND BLUE MANUAL. A Text-book for the Citizens' Military Training Camp. Vol. One. Red Course, Johns Hopkins Press, Baltimore, Md. $2.50. Review later.

Index to Current Field Artillery Literature

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

ARDANT DU PICQ, CHARLES.—Battle studies; ancient and modern battle. New York. The Macmilan Co., 1921, p. 273.

AMMUNITION, ARTILLERY.—The artillery ammunition problem, by Arthur Adelman. (*Army Ordnance*, April, 1921, p. 262.)

AMMUNITION SUPPLY.—Ammunition supply. Ammunition supply in time of war; zone of the interior; combat zone; salvage of ammunition; supply in time of peace; storage; maintenance; distribution, etc., by Alexander J. Stuart. (*Army Ordnance*, January-March, 1921, p. 180.)

ARGENTINE.—Machine guns in open warfare. Drill and tactics. Its use in the war of 1914-1918, by General Fortmuller, late of the German Army. (*Revista Militar*, January, 1921, p. 47.)

ARMIES.—Argentine. Argentine army. Its composition and distribution. Newly created regiments and their stations, by Comdt. D. Julian Chacel, military attaché of Spain in Argentine, (*La Guerre y su Preparacion*, January, 1921, p. 60.)

ARMIES.—France. Journal of the operations of the VIIIth French Army on the Flanders front between October 20, 1914, and April 5, 1915. Short sketches of the Battle of the Yser, and the first and second Battles of the Ypres, by General d'Urbal. (*Revue Militaire Generale*, January, 1921, p. 1.)

ARMIES.—France. The IXth French Corps in the marshes of St. Gond. The defense of the marshes. Sketch of operations between September 7 and September 9, 1915, by General H. Poudret. (*Revue Militaire Suisse*, February, 1921, p. 79.)

ARTILLERY.—Belgium. Development of the Belgian artillery during the late war. Experience gained in the World War which caused the present reorganization. Comparison of the Belgian artillery to-day to that of the Argentine Army. (*Revista Militar*, January, 1921, p. 77.)

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MEMBERSHIP

Statement of the Percentage of Officers of Organizations of the Regular Army who are members of the U. S. Field Artillery Association.

12th Field Artillery	89.66	per cent.
4th Field Artillery	88.89	" "
81st Field Artillery	86.96	" "
3rd Field Artillery	86.36	" "
5th Field Artillery	85.00	" "
1st Field Artillery	80.76	" "
10th Field Artillery	80.00	" "
2nd Field Artillery	69.56	" "
16th Field Artillery	61.90	" "
9th Field Artillery	60.87	" "
Field Artillery School, Fort Sill	60.00	" "
Panama Battalion	60.00	" "
14th Field Artillery	59.09	" "
8th Field Artillery	57.90	" "
21st Field Artillery	52.63	" "
80th Field Artillery	50.00	" "
83rd Field Artillery	48.65	" "
19th Field Artillery	46.43	" "
13th Field Artillery	45.95	" "
17th Field Artillery	45.00	" "
20th Field Artillery	43.48	" "
11th Field Artillery	42.86	" "
79th Field Artillery	40.00	" "
77th Field Artillery	39.13	" "
7th Field Artillery	36.84	" "
82nd Field Artillery	35.48	" "
18th Field Artillery	35.00	" "
6th Field Artillery (less 2nd battalion)	33.34	" "
78th Field Artillery	31.58	" "
15th Field Artillery	31.03	" "
Philippine Field Artillery	30.00	" "
Field Artillery School, Camp Knox	25.93	" "
76th Field Artillery	25.00	" "