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**THE
FIELD ARTILLERY
JOURNAL**

EDITED BY

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LIEUTENANT-COLONEL (FIELD ARTILLERY) UNITED STATES ARMY

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BRITISH 9.2-INCH HOWITZER
On the Western Front in France

THE FIELD ARTILLERY JOURNAL

VOL. VI

OCTOBER-DECEMBER, 1916

NO. 4

Field Artillery Schools of Fire in Other Countries

BY H. EAGER, FIRST LIEUTENANT 4TH FIELD ARTILLERY

THE purpose of this paper is to give a description of the Field Artillery Schools of Fire in other countries, their organization, purposes, methods and facilities, and to compare them briefly with our own School of Fire. Instructional ammunition allowances will be stated wherever data are available.

In some cases the information at hand concerning these schools is rather limited, and, except in a few instances, no information is more recent in date than the beginning of the present European War.

GERMANY

The School of Field Artillery Fire and the School of Heavy Field Artillery Fire are located at Juterbog. The two schools are completely separated, each having its own commanding officer, instructors, target park, etc. The range, however, is used in common by both schools, being at the disposal of each school every alternate day during the term. It is under the charge of the commanding officer of the Target Range, a retired colonel or general officer.

The area of the target range is approximately 18 square

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miles. The reservation is composed of fairly varied ground, making it possible to have considerable practice before the officers become too well acquainted with it.

For observation and for protection of the range parties sixty splinter proofs and towers have been constructed on the range. In areas where direct hits are not likely to occur wooden or brick towers and light earth splinter proofs have been constructed. In areas where direct hits are more liable to occur, are heavy earth splinter proofs, some of which are of concrete surrounded and covered with three yards of earth and provided with armored doors.

The range telephone system permits of connecting all observation and range guard stations with any or all of the firing points. Around the boundaries of the reservation overhead wires are used, the total length being 33,000 yards, while on the range itself are underground cables, connecting all observing towers and splinter proofs, the total length of this system being 42,000 yards.

Moving targets are operated from three machine houses, located on the Northern, Eastern and Western part of the reservation, and from traction engines and wagons on which are mounted drums operated by electric motors.

A laboratory is attached, where ammunition is prepared for the school. About 100,000 rounds of field gun ammunition are used by the school each year for instruction purposes.

The target park, comprising about twelve buildings, consists of work shops and depots in which the targets and target materials are manufactured and kept.

THE OBJECTS OF THE SCHOOL are:

1. To teach the artillery officers of the army how to shoot.
2. To develop and extend the methods of fire prescribed by regulations.

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3. To try out new methods of fire control and direction, with a view of increasing the effectiveness of artillery fire.

4. To test new matériel, equipment, etc., with a view to determine whether or not they should be adopted by the service at large.

5. To collect statistical data.

The school is divided into two departments, one of which, Department "S" has charge of the advanced courses to which majors, captains and first lieutenants are ordered; the other, Department "B" has charge of the courses for second lieutenants of the active army, as well as those for reserve officers.

COURSES GIVEN AT THE SCHOOL are:

1. *Senior Course*, for captains and senior first lieutenants. Two terms of 4 months each a year. Number of officers in each term, staff officers 11, captains 37, first lieutenants 46; total 83.

2. *Junior Course*, for second lieutenants, who have completed three years' service with their regiments. Two terms of 4 months each year. Number of officers in each term, not more than 100.

3. *Course for Reserve Officers*.—Five terms of 42 days each a year. Number of officers in each term, captains, not more than 9; lieutenants about 88.

4. *Course for Field Officers and Senior Captains*.—Two terms of one month each a year.

5. *Course for General Officers*.—For general officers promoted from other branches of the service. One term of 14 days a year. Number of general officers in term, 14. Three officers are attached as observers to Department "A." They do not take actual part in the instruction but are free to express their ideas at the critiques, in fact are supposed to do so.

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Two courses a year are given at the School of Heavy Field Artillery Fire. The siege and field artillery are separated in Germany, each forming a distinct branch of the service. Formerly only siege artillery officers were ordered to this school, but in recent years field artillery officers are also ordered there. Siege artillery officers are ordered to the School of Field Artillery Fire, but the exact number is not known. General officers are also required to take a fourteen days' course of instruction and observation at the Heavy Artillery School.

All artillery officers of the German Army are required to take at least three courses at the Field Artillery School of Fire as follows:

(a) *As lieutenants*, as soon as they have completed three years' service with their regiments. They are then supposed to be familiar with the Firing Regulations and Drill Regulations and to have had a certain amount of experience in handling the firing battery. During this period each lieutenant has conducted the fire of a battery in at least one problem a year during the target season.

(b) *As senior first lieutenants or as captains* when they attend the senior course. Usually every officer is ordered to this course twice, once as a first lieutenant and once as a captain.

(c) *As senior captains or as field officers*.—Excepting when radical changes in the prescribed methods of fire have been made, regimental commanders are not ordered to take this course. The last five weeks of the Senior Course are devoted entirely to battalion and regimental practice. It is for this period that the field officers are ordered to the school. The general officers appear for the last two weeks of this course, which are devoted to battalion and regimental practice.

The SUBJECTS OF INSTRUCTION in the different courses include the following:

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Senior Course:

- (a) Target practice,—battery, battalion and regimental.
- (b) Tactical use of field artillery,—principally selection and occupation of positions.
- (c) Kind of ammunition that should be used and methods of fire to be employed in order to obtain the greatest effect upon the different targets with the least expenditure of ammunition.
- (d) Results that should be obtained against different targets under varying conditions by the expenditure of a given amount of ammunition.
- (e) The ammunition supply service of the German and of foreign armies.
- (f) Description of matériel, its advantages and disadvantages.
- (g) Organization and equipment of field artillery of other armies.

Junior Course:

- (a) Target practice, including the battery only.
- (b) Battery drill.
- (c) Tactical use of field artillery, selection and occupation of position.
- (d) Reconnaissance work, including sketching and the duties of officer patrols.
- (e) Description of the matériel issued and emergency repairs.
- (f) The organization and equipment of field artillery of other armies.
- (g) Following the hounds (once a week during fall term).

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Course for Reserve Officers:

- (a) Duties as platoon commanders.
- (b) Target practice, including the battery only.
- (c) Tactical considerations, involving the selection and occupation of positions.
- (d) Description of matériel issued.
- (e) Reconnaissance work.
- (f) Tactical rides.
- (g) Riding lessons.

The groups of officers attending each course are divided into three sections, a captain having charge of each section. A major supervises the work of the group.

The STAFF OF THE SCHOOL consists of a commandant, with rank of major general, a captain and adjutant. Two field officers, assistant commandants; five majors and fifteen captains as instructors; three or four artificer officers, who have charge of the shops, laboratories, etc., and who also superintend experiments and collect statistical data.

Ten of the instructors are detailed each summer by the inspector of field artillery to take part in the annual manoeuvres and are assigned to division staffs or are used as umpires. At least one instructor a year is detailed to attend the Infantry School of Fire course.

Troops on duty at the School of Field Artillery Fire consist of one regiment of field artillery of nine batteries, organized into three battalions of three batteries each. One of these battalions is equipped with light field howitzers.

The STAFF OF THE SCHOOL OF HEAVY FIELD ARTILLERY FIRE is as follows:

Commandant. Colonel or general officer.

Instructors. One lieutenant colonel, two majors and two captains.

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Troops. One battalion of siege artillery consisting of four batteries.

The enlisted men of the instruction regiment are specially selected from the regiments of the service, and must have a good record, be in good physical condition and have perfect sight. As a special distinction, the men of instruction regiment are given the grade of lance corporal.

Noncommissioned officers transferred to the instruction regiment must be well trained and must have served as chiefs of section for at least one year prior to transfer.

METHOD OF INSTRUCTION.

The general system of instruction at the school is entirely of a practical nature, only such theoretical instruction being given as is absolutely necessary in order to train the officers in conduct of fire.

No examination or recitations in theoretical subjects are held, the authorities of the school contenting themselves by requiring the student officers to apply what little theoretical instruction given, to target practice.

In Department "A" target practice is held every other day throughout the course, the remainder of the days being used for detailed critiques and theoretical instruction by the instructor, or lectures by the student officers on selected subjects.

In Department "B" instruction is also given in the handling of the different instruments issued to Field Artillery and in practical ballistics.

All target practice, whether in Department "A" or Department "B" is divided into school practice and battle practice: In Department "A" the first month of the course is devoted entirely to School Practice. In Department "B," School Practice lasts until the instructor is convinced that the knowledge of the officer has progressed sufficiently to allow battle practice to be held with profit. The object of the "School

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"Practice" is to bring out and explain every mistake as soon as it is made. Time is no object and fire for effect is not allowed. This practice is divided into two parts, instruction in percussion ranging and instruction in time ranging. Target shell is used in the first kind of instruction. This is cast iron shell, loaded with black powder and provided with a percussion fuse. Service shrapnel is used for giving instruction in ranging with time fire. In this practice the student officer is simply directed to determine the range to any desired target. Any mistakes made by student officers are immediately brought to their attention by the instructor, the fire being temporarily interrupted for this purpose. The most difficult kind of targets are used during this period. In at least 30 per cent. of the problems the targets are not visible at all until one succeeds in placing the smoke of a bursting projectile in rear of them, and even then the closest kind of observation is required to pick them up.

The object of "Battle Practice" is to train the officers to conduct fire of a battery or larger unit under conditions similar to those which would exist on a battlefield. During this practice an officer is given a problem and allowed to solve it in his own way, the instructor not interfering with him in the least. When he has finished, a critique is held in which all his errors are pointed out to him. As one of the main objects of this practice is to develop individual judgment as to the effect produced on the target or targets, fire for effect is always required. The student officer gives the command to stop the firing when in his opinion the effect produced warrants it. If the officer conducting the fire makes too many mistakes or fails to get the range, the instructor relieves him and details one of the other officers to continue the firing. On an average about 130 rounds are expended on a problem, although occasionally as many as 300 rounds are expended on one battery problem.

As soon as the allotted ammunition for the day has been expended, the student officers assemble around the instructor who holds the "field critique." During the field critique the instructor

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confines himself, as a rule, to remarks regarding the tactical situation and the way in which it was understood by the student officers, the position selected, the way in which it was occupied, the kind of fire selected for ranging, the point of the target selected to range on, the commands used and the general way in which the fire was conducted. Sometimes the observations made by student officers are questioned, but such remarks are as a rule confined to flagrant cases.

At the critiques, the student officers concerned are not only permitted but are generally required to explain their reasons for having done anything which apparently does not meet with the approval of the instructors. One can violate every rule and regulation contained in either the Drill and Firing Regulations provided one has sufficient ground for so doing and that the result obtained justifies the action taken. Everything is done to develop the initiative of the student officers and to make them willing to assume responsibilities.

As soon as the field critique is over, the officers detailed to make up the firing reports proceed to the lecture room where all the information acquired at the firing position, and by the range parties is written on the blackboards.

After this an informal critique is held, all the student officers and instructors being present. The object of this critique is to correct any mistake which might have been made in entering the data on the blackboards and which if not corrected would cause an injustice to be done to some officer. Sometimes an instructor brings out points in connection with the day's firing, evidently for the purpose of calling one's attention to them so as to insure a more thorough critique the next day. Some enlisted man then copies what is on the board on lithographic paper. These copies are then sent to the printing press and the required number of copies struck off, one for each student officer, besides those required for the school, War Department, etc. The next day a detailed critique is held, some student officer being detailed to criticise the practice of

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one of his companions. When he finishes the instructor holds the final critique. If any officer belonging to the school and senior to the instructor is present he also has the right to criticise.

Battalion battle practice is held twelve times. *Nine* of these practices are held by the senior course, Department "A," three for each section. *Three* are held by Department "B." In all the problems the majors and lieutenant colonels who are present during the latter part of the course are detailed as battalion commanders. From about 250 to 550 rounds are expended for each practice, making an average of from about 80 to 190 rounds per battery.

The function of the battalion commander is limited entirely to fire direction. Student officers are detailed from the sections to act as battery and platoon commanders.

In the critiques following Battalion practice the remarks are confined in general to the methods employed by the battalion commander in directing the fire of his unit and to the way in which he handled it. Excepting in flagrant cases no remarks are made regarding the conduct of fire by the individual battery commanders.

One Regimental Battle Practice is held in each Department, "A" and "B." The ammunition consumed is about 1000 rounds per practice.

In all of the battle practices, Battery, Battalion and Regimental, a definite tactical situation is given out. The student officers, mounted, assemble at a designated point and are then ordered to report to the instructor who gives out the tactical situation and the orders which the Battery, Battalion or Regimental commander would supposedly receive from his superior officers are then detailed as battery commanders, executives, and chiefs of platoon.

In the battalion and regimental practices targets are put out representing our own troops and any of these targets hit

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are entered on the target reports. To fire on one's own troops is considered one of the most unpardonable offenses an artillery officer can commit.

SIMULATED TARGET PRACTICE.

Simulated target practice in Department "A" precedes each target practice for the first month of the course. In Department "B" it is held before every practice during the whole course.

Targets located similarly to those in battle practice are used, the instructor indicating whether or not the shots are over, short, hits or undetermined.

PANORAMIC SKETCHING.

Department "A." Certain officers, designated by the instructor, are sent forward to some point prior to each practice to make a panoramic sketch of all the targets they observe.

Department "B." Immediately before each practice all officers submit a panoramic sketch showing the kind and location of all targets they had observed from some position designated by the instructor.

THEORETICAL WORK.

Department "A." The theoretical part of the work in this department consists only of general information given out at odd times by the instructors during or after the critique and by lectures held by student officers to the assembled class at stated periods towards the end of the course.

Department "B." As far as possible all the theoretical work is of a practical nature and consists in giving the student officers the theory on which the practical part of their work was based.

The subjects studied are Ballistics, the Range Table, Probability Tables, and use of instruments.

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The following is the allowance of ammunition allotted each year to the school for instruction purposes:

For each student officer in Department A, 182 rounds
For each student officer in Department B, 123 rounds
For each reserve officer in Department B, 63 rounds

From $\frac{1}{4}$ to $\frac{1}{3}$ of the above are shell, the remainder shrapnel.

Additional ammunition is allowed for all experimental work.

The instruction batteries also get the regular yearly allowance of ammunition which is about as follows:

FIELD AND HORSE BATTERIES.

Shrapnel	450
Shell, H. E.	150
Cast Iron Shell	100
	<hr/>
Total	700

LIGHT FIELD HOWITZER BATTERIES.

Shrapnel	550
Shell, H. E.	250
Cast Iron Shell	100
	<hr/>
Total	900

The targets, fixed, moving, appearing and disappearing are excellent in construction and in operation.

The course at Juterbog is nothing more or less than the continuation and extension of the course given in each regiment during the yearly target practice. The main difference is that at Juterbog the primary object is to train the officers, whereas the primary object of the yearly regimental practice is to train the men and the batteries.

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AUSTRIA.

At the time in which the information concerning the Austrian School of Field Artillery Fire was obtained, it was still in an incomplete state both as to organization and construction of the necessary buildings and appliances. The school is located at Hajmarker and has an excellent range. During the first course given, which lasted three months, about 150 student officers were present.

Several of the instructors had been sent to Germany prior to being detailed, for the purpose of taking the course of instruction at the School of Fire at Juterbog.

Six batteries were detailed from different artillery regiments, which only remained at the school during the period of instruction, but at the time it was proposed to organize an instruction regiment, similar to the one the Germans have.

The methods of fire are about the same as the German ones: The artillery is fully equipped with telephones, panoramic sights and range finders and the matériel and equipment is well up to date.

FRANCE.

The "Ecoles à feu," or Field Artillery Schools of Fire in France are the periods of annual target practice.

France is divided into as many regions or territorial departments as there are army corps. In each army corps region there is established a target range. Some of these are more extensive and important than others, but almost all of them are very limited in size. At some of the target ranges rude barracks have been constructed and enclosures or sheds for the horses. This is the case at the Camp de Chalons and at Mailly.

Mailly is used by the experimental firing board and a regiment is permanently stationed there. At this place is also given a special course in target practice for lieutenants and captains

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of artillery, but it has been recommended that this course be developed into a Field Artillery course of application for higher officers of all the arms.

The schools of fire are established with the object of teaching fire control to the officers and the handling of the pieces under war conditions to the men, and to demonstrate to the entire personnel the effects produced by artillery on the field of battle. Target practice is held under the supreme authority of the army corps commanders for the troops under their command. Each year the Secretary of War designates the target ranges where the schools of fire for the different army corps will take place. The duration of the target practice is about 25 days. The various organizations proceed to the ranges by marching.

The general scheme of instruction of the schools of fire is about as follows:

Preparatory practice, which is held in order to familiarize the new men with the matériel and complete the training acquired in garrison *service practice*, which is organized in such a way as to bring the batteries, battalions and regiments into situations such as would occur in active operations.

Preparatory practice is carried out under easy conditions and with sufficient slowness to correct errors.

If the target range is in the vicinity of the garrison, preparatory practice alternates with the regular garrison exercises. If the troops are sufficiently drilled the preparatory practice is omitted.

In the service practice the greatest attention is paid to carrying out stated tactical problems. The firing is almost always by battalion or larger units.

The accepted system of practice is as follows: The colonel of the regiment draws up tactical schemes for the practice of his groups or battalions, which may either practice singly or by double groups or sometimes more. The group commander then proceeds to carry out the tactical scheme set by his colonel.

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The colonel, taking his position near the group commander watches the effect of the fire, the passage of the orders given and continues to change or modify the tactical situation as the firing progresses. Upon the completion of the problem the colonel criticizes the firing on the field.

Targets are rare. There are no range parties. Occasionally use is made of a gun target, old equipment.

The possibilities of unchecked, ineffective fire are great. Such shooting does occur at times. However, the French regard the matter much more from the standpoint of extreme rapidity in ranging, trusting to throw the enemy's fire discipline early out of gear, and then adjust the fire more accurately.

Infantry officers are usually detailed to attend the target practice courses as observers. Their advice as to tactical schemes is sought and every effort is made to simulate as closely as possible actual tactical situations and to coordinate the work of the Artillery with that of the Infantry. Each target range is under the charge of a director, and the methods of instruction and practice are kept uniform through the efforts of the Inspector-General of Field Artillery.

The annual allowance of ammunition for target practice varies, but on the average it is about 400 rounds per battery.

All battery officers are given an opportunity to fire at least once during the target season.

RUSSIA.

The officers' Artillery School has for its objects:

(a) The theoretical and practical training of artillery captains and field officers for the battle use of batteries and groups of batteries.

(b) The development and improvement in the artillery of

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skill in firing, in connection with maneuvering, and the establishment of correct views on the efficient application of artillery fire in battle.

(c) The establishment of methods for carrying out preparatory exercises for firing and maneuvering and correct systems of training.

The school is under the immediate command of the chief of the Ordnance Department.

The Chief of the School is a lieutenant general and has as an assistant a major general. The instructors are field officers.

Light and horse batteries are kept permanently at the school for instruction purposes. In addition to the battalions of light artillery, a howitzer battalion and an aviation section are ordered to the school during the summer practice.

The courses of study are theoretical and practical.

The theoretical studies consist of:

(a) *Artillery:*

- (1) Ballistic qualities of field and mountain guns and howitzers.
- (2) Shell and shrapnel action.
- (3) Firing regulations.
- (4) Instructions and regulations for artillery maneuvering.

(b) *Artillery Tactics:*

- (1) Basic qualities and battle aims.
- (2) Organization.
- (3) Battle use of Artillery.

(c) *General Tactics.*

(d) *Hippology:*

Horse-shoeing, conditioning of horses, reception of horses during war time.

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The practical studies consist of:

(a) *Artillery and Tactics:*

- (1) Indoor firing exercises.
- (2) Artillery rides and selection of positions.
- (3) Battle firing.
- (4) Matériel.

Stripping and assembling of guns and instruments.

Emergency repairs.

(b) *General Tactics.*

Tactical problems in the field.

(c) *Topography.*

(d) *Hippology.*

(e) *Practical Work:*

Communication: Visual, telephone, and telegraph.

The course lasts about six months and begins in February. To the course are sent annually 36 field officers and 108 captains.

About 1100 problems, including battery and battalion problems are fired during the course. The ammunition allowance is about 325 rounds per officer. In the battalion firing the field officers direct the fire of the batteries, the captains acting as battery commanders. However, the field officers actually conduct the fire of a battery in about twelve problems each. The firing is at all sorts of targets, fixed, disappearing, moving and flash. These are usually well placed and simulate closely service conditions.

The battery, battalion and regimental communication is poor. The observation of firing by range parties is, as a rule, not properly arranged as is also the service of transmitting to the firing points results of the firing.

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ENGLAND.

Prior to the present war England had no School of Fire in the real meaning of the word.

The English Field Artillery instruction system for target practice was conducted by a board of three officers, the senior member of which was called the Principal Instructor in Gunnery, the others, Instructors in Gunnery. During the winter season this board is located at the war office, acting in an advisory capacity on all field artillery matters. During the summer months, three central camps for field artillery target practice are established and to each of these camps one of the instructors in gunnery is sent. All the field artillery organizations in the United Kingdom went to one or the other of these camps for their yearly target practice and while there were under the instructor in gunnery in all that pertains to target practice. The instructor laid out the course, gave out the problems and held the critiques. The target practice as compared to that in the continental countries was extremely inferior.

Since the beginning of the war several officers' training schools for Field and Horse Artillery have been organized.

The purpose of these schools is to put aspirants for commissions through a short period of intensive training, which is the best that can be hoped for during the present grave national crisis. The training schools are divided into two parts, one for second lieutenants holding probationary commissions, who had previously been selected by their commanding officers for probable aptitude for commissions, and one for aspirants for commissions from the Officers' Training Corps. During the course each officer is sent to the Gunnery School for a short course in the conduct of fire.

From a field artillery point of view the instruction is excellent and the methods thorough.

Upon the successful completion of the course, the officers are assigned to the peculiar kind of artillery duty for which

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they are recommended by the commandant, duty with firing batteries, as observing officers, signal officers, with the ammunition columns, and as staff officers and aides to artillery commanders.

An adverse report from the commandant of the school, supported by reasons, is sufficient to place a student officer on probation and a second adverse report is sufficient to drop the officer from the army list.

The officers' Training School for Field and Horse Artillery at St. John's Wood, London, turns out one hundred officers every three and a half months.

The course includes the following subjects:

- Driving drill.
- Simulated firing.
- Laying.
- Testing sights.
- Battery drill.
- Sword drill.
- Signalling:
 - Buzzer.
 - Semaphore.
 - Wig-wag.
- Use of Instruments.
- Casualties to Equipment.
- Riding.
- Knotting and Lashing.
- Stables and Harnessing.
- Hippology.
- Physical training.
- Marches and march discipline.
- Interior economy.
- Disposal of stores and disabled ordnance.
- Military hygiene.
- Hints to young officers, mess etiquette.

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ITALY.

The Italian School of Field Artillery Fire is located at Viltuno on the west coast of Italy. The range is varied and suitable for field artillery target practice, but its extent, $5\frac{1}{3}$ miles long to $1\frac{1}{2}$ and $\frac{1}{2}$ miles wide, is too limited to allow proper instruction.

The instruction batteries are not permanently assigned to the school, but are detailed by roster each year from the Field Artillery at large and only remain at the school for five months. Four batteries are detailed each year and while at the school they are organized into a temporary battalion under the command of a major.

The commanding officers of the school and the school staff are detailed from the Field Artillery at large for periods varying from two to four years.

Six terms a year are held, five for field artillery officers and one for fortress artillery officers. The duration of each term is about three weeks. The number of officers sent to the school each year are: 27 field officers; 153 captains and lieutenants.

The school has a yearly allowance of 7500 rounds. This is in reality distributed among the captains, giving them each approximately 100 rounds. Most of the lieutenants sent to the school get very little if any practice except as platoon commanders.

The school is very poorly equipped with targets and has no mechanical appliances whatsoever for operating them.

The yearly allowance of ammunition for the batteries of the service at large totals 200 per battery, 25 of which are service shrapnel, 175 cast iron practice shrapnel.

Due to the small allowance of ammunition the state of affairs exists in the Italian army that theory has taken the place of actual practical experience.

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JAPAN.

In the Japanese School of Fire there are two courses.

Course "A" for captains, has one term lasting 8 months. About 30 captains attend this course.

Course "B" for 1st lieutenants and occasionally 2nd lieutenants, has two terms of 4 months. About 30 lieutenants attend each term.

In addition about thirty field officers are called out each year to attend part of the course.

The school is provided with a large range, and a training battalion is stationed there permanently for the purpose of carrying on the instruction and for experimental purposes. All enlisted men detached to the training battalion must have at least one year's service.

The object of the Field Artillery School of Gunnery is to instruct the student officers in gunnery, field artillery tactics, methods of communication, and to promote the uniform progress of training in the Artillery arm by distribution of the students to the various units.

Courses are given in tactics, communication—visual signalling and telegraphy, matériel, drill, riding and driving, and field engineering.

The ammunition allowance is not known.

HOLLAND.

The Dutch School of Fire is small but is very well organized and equipped and fulfills the need of the small Dutch army completely. It is organized on German lines which, however, have been modified so as to be better adapted to local conditions and to the needs of a small army.

The instruction battery is not permanently located at the school, but the same battery is detailed from year to year.

The yearly allowance of ammunition for the school is as follows: shrapnel, 1500; shell, 350; total, 1850.

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Three courses a year are given, each lasting fifteen days. Eight student officers and eight non-commissioned officers are ordered to the school for each course. This gives an average of about 77 rounds of ammunition per officer.

All battery officers take the course at the school every five or six years.

The target practice allowance for each regiment of Field Artillery is 1960 rounds yearly, or 326 rounds per battery.

SWEDEN.

The course at the Swedish School of Fire lasts six weeks. Two batteries are used in the firing, composed of officers, noncommissioned officers and privates from the different regiments of artillery.

To the school are ordered yearly twelve captains and a few lieutenants.

Each captain is allowed about 500 rounds of ammunition during the course.

The student lieutenants act as chiefs of section and chiefs of platoon during the course.

NORWAY.

The course lasts three weeks and is attended by ten captains and three lieutenants. An instruction battery is attached to the school.

The course includes practical and theoretical instruction.

The ammunition allowance for the course is about 2280 rounds, composed of 1275 practice shrapnel, 855 service shrapnel and 150 shell, making the average allowance for each student officer about 228 rounds.

The lieutenants act as chiefs of platoon, balloon observers, reconnaissance officers, etc.

FIELD ARTILLERY SCHOOLS OF FIRE

Our School of Fire compares very favorably with the schools of fire in other countries, but is lacking in a few respects, among which the most notable are its small instructional ammunition allowance and its lack of adequate and suitable buildings.

Officers of this arm of the service generally cannot fail to recognize what excellent results might be obtained by a course at the School of Fire of eight or ten months for second lieutenants just entering the service, not only in making them more fit to properly carry out their duties upon joining their organizations, but in grounding them in sound fundamental principles, and establishing greater uniformity of instruction throughout the service. Unfortunately, such a course is not possible at present on account of the Detached Service Law.

The value of the course for militia officers cannot be underestimated and the course should be extended.

The above and other points are covered in the annual report of the Commandant of the School of Fire, July 1, 1915, and are summed up in his recommendations which follow:

"It is recommended that:

"(1) The Commandant be informed of all changes affecting school personnel in ample time for him to nominate officers to fill the vacancies that will be caused thereby.

"(2) The student officers attending course "A" be fixed for the present at 24.

"(3) The student non-commissioned officers attending be fixed for the present at 36.

"(4) The student militia officers attending Course "D" be increased indefinitely.

"(5) Course "A" be extended one month.

"(6) Selected militia officers be permitted to take Course "A."

"(7) A course of 4 months be provided for junior militia officers.

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"(8) A course of 10 months be provided for second lieutenants of Field Artillery.

"(9) Two additional instructors be provided for Course "A" and for membership of the Field Artillery Board.

"(10) One or two, depending upon the action on Section 3, this paragraph, additional instructors be provided for Course "C."

"(11) Appropriate tactical units be placed at the disposal of the school.

"(12) Requisite ammunition be provided.

"(13) The school detachment be increased.

"(14) Mechanical traction for mobile target be provided.

"(15) Suitable permanent construction be undertaken without delay.

"(16) The Commandant be informed as to the view of the War Department on the above recommendations, because a clear understanding of a definite policy is necessary to the preparation of workable schedules and the efficient conduct of instruction."

Howitzer Fire

BY MAJOR E. D. SCOTT, FIELD ARTILLERY

(Abstracted from a series of lectures given at The Army Service Schools)

HOWITZERS are short guns.

Smokeless powder is slow burning. By varying size, form, and density of the grain, the density of loading, and the size of the combustion chamber, the rates of combustion, degree of heat, expansion of gas, and therefore the propelling power, may be varied as desired. The propelling charge of any gun is of such a character that it is completely burned and its maximum propelling power is attained, just as the projectile leaves the bore. It follows that if the same round of ammunition be fired from a shorter gun, the propelling charge will not be fully burned, the maximum propelling power will not be attained, the projectile will leave the bore with less velocity, and will not carry so far.

By giving the shorter gun a greater angle of elevation, its projectile may be made to carry as far as that of the long gun.

By reducing the propelling charge, and hence the strain on gun and carriage, and the length of bore for combustion, a lighter gun and carriage may be constructed for a given weight of projectile.

Conversely, for a given weight of gun and carriage, a gun may be constructed carrying a heavy projectile.

Thus the 3-inch gun and the 3.8-inch howitzer are of the same weight, that is, the same mobility, yet their projectiles weigh 15 and 30 pounds respectively, and they are used at the same ranges. The 4.7-inch gun and the 6.0-inch howitzer are of the same mobility, yet their projectiles weigh 60 and 120 pounds respectively.

Howitzers, generally speaking, have about half the muzzle velocity of guns, but it is sufficient so that they can be used for

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direct fire at short ranges. The gun projectile is dependent almost wholly on the velocity imparted to it by the propelling charge, while the howitzer projectile, because of its high trajectory, is greatly aided by gravity.

All howitzers have separate ammunition. Usually the powder charge is made up in three or more small packages. For example, the cartridge case of 4.7-inch howitzer ammunition contains three packages. Used just as it is, it covers "Zone 3," with one package removed it covers "Zone 2," with two packages removed it covers "Zone 1." The purpose is to secure a steep angle of fall at all ranges.

At 2000 yards the following slopes of fall are obtained:

Zone 1, 1 on 1.2

Zone 2, 1 on 3.3

Zone 3, 1 on 7.0

At that range, then, the most effective fire against a trench might very well be had by using Zone 1.

The corresponding angles of departure are:

Zone 1, 39 degrees 42 minutes.

Zone 2, 16 degrees 10 minutes.

Zone 3, 7 degrees 29 minutes.

It is evident that advantage can be taken of much higher and steeper cover, and that an enemy behind such cover can be better attacked, by using the Zone 1 charge.

The initial velocity, Zone 1, is only 454 f. s., but gravity assists greatly in the descent, and the terminal velocity at 2000 yards is 427 f. s. This is sufficient to explode shell on impact, and shell is dependent upon its own explosive force for effect. In the case of shrapnel, the bursting charge imparts an additional velocity (taken as 275 f. s. in our service) to the bullets. This brings their velocity up to about 700 f. s., little below that of pistol bullets, and as they are of about the same weight, they are about equally effective.

HOWITZER FIRE

The area covered by the bullets on the ground is relatively small. In the case above, a burst 100 yards from the target (measured on the trajectory), would give a pattern on the ground, elliptical in form, about 45 yards in depth by 30 yards in width, an area of about 900 square yards. This means a density of nearly one bullet per square yard of pattern, and a relatively high percentage of hits.

At the same range the 4.7 gun gives about one bullet per 17 square yards, and the 3.0 gun one bullet per 40 square yards.

Data are not available concerning the dispersion of the howitzer, but it seems likely that in very high angle fire (as in the case above, for instance), the whole pattern might be short of the target or beyond it, while in the case of gunfire the pattern will always contain the target, except at very long ranges.

The following table gives the heights of burst and burst intervals, for a density at target of one bullet per square yard of cross section of the cone of dispersion. Also the diameter of the cone of dispersion at target, and its diameter 20 yards beyond target.

The angle of opening is assumed to be 16 degrees. Figures for the 3.8-inch approximate. Range 3000 yards.

Piece	B.I.	H.B.	H.B.	D.	D.20 yards beyond target
	yard	yards	mils	yards	yards
2.95-inch Mtn. gun.....	60	15.6	5	17.2	22
3-inch Field gun	64	8.7	3	17.9	23
3.8-inch Field How	91	21.1	7	25.9	31
4.7-inch Field How	106	24.5	8	29.2	35
4.7-inch Field gun	108	9.1	3	29.8	35
6-inch Field How	134	29.9	10	38.7	42

It is evident that the 4.7 shrapnel can cover a 50% greater front than the 3-inch, and as the bullets are 37% heavier, they are more effective.

Similarly the 6-inch shrapnel covers more than double the width of the 3-inch, and its bullets are nearly twice as heavy.

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If the point of burst of the 4.7-inch be lowered to where the front covered is the same as that covered by the 3-inch, the density of bullets becomes 2.8 per square yard, and 2.8 times as many hits may be expected as with the 3-inch.

If the same be done with the 6-inch, the density is 4.65 bullets per square yard, and 4.65 times as many hits may be expected.

The superiority of the heavier calibres is incontestable.

If the question of weight, which is a great factor in ammunition supply, be considered, the advantage lies with the light gun. The following table illustrates:

Piece	Wt. of round	Bullets	Equivalent in 3-inch		Advantage of 3-inch
			Weight	Bullets	Bullets
3-inch	18.75	252
3.8-inch	35.00	526	1.86	468	(advantage with 3.8-inch)
4.7-inch G.....	73.50	711	3.92	988	277
4.7-inch H.....	67.00	711	3.57	900	189
6-inch H.....	132.00	1174	7.04	1774	600

The very superior mobility of the light gun, and its greater supply of bullets per weight of ammunition, render it the most suitable weapon for what might be termed skirmishing, the fighting that precedes the establishment of one side in strong works. When the hostile main position is to be attacked, the superiority of the heavy projectile demands its use.

FIRING OVER INFANTRY

This will necessarily be a normal procedure, for the batteries will be scattered over about as much front as the infantry attack covers. It ought not to be viewed with dread. The infantry will not be able to distinguish the noise of its own shrapnel from that of the enemy and an occasional short burst will pass unnoticed. But the constant appearance of smoke balls over and in front of the enemy's position will be assurance that their own artillery is supporting them. Even at 6000 yards the

HOWITZER FIRE

error of the gun will bring very few bursts as much as 200 yards short of the target and they will be to the infantryman's eye as close to the target as the others. Besides, every man should thoroughly understand that when the charge begins the artillery will advance its fire so that he will not only be safe from it when he reaches the hostile position, but will have only the enemy left in the latter to deal with. No counter attack will succeed in reaching him.

Position of the artillery with respect to the infantry in action:

A 3-inch gun (old model) has a lateral traverse of 70 mils either way. Hence at 1000 yards a battery can cover a front of 220 yards, at 2000 yards a front of 360 yards, and at 3000 yards a front of 500 yards, etc., without shifting the trails of the guns. It is not impossible to shift the trails under fire, but it might be impracticable at times, and of course in any case involves more or less exposure of the gun squads, and this objection is strongest when the guns are in the infantry line, when rifle and machine gun fire is added to that of artillery. As the hostile line approaches, the front that a battery can cover with its fire diminishes till it finally reaches its own front, about 80 yards.

In case of a counter attack by our own infantry, the fire of our guns would almost certainly be blocked at once.

Assume the battery to be 1000 yards in rear of the infantry line. The latter is stronger by the number of rifles that can be put in the space the battery would have occupied if put in the front line. Questions of fire control, maneuver, ammunition supply, are simplified for the battery, and it remains to be seen if the support of the infantry can be given as well from that position.

A battery so placed can at the infantry line cover a front of 220 yards, at 1000 yards to the front of that line it can cover a front of 360 yards. On level ground the height of trajectory above our infantry would be roughly 30 yards, perfectly safe for them. The 100-per cent. zone for longitudinal dispersion

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for the range is about 130 yards. The interval of burst is about 70 yards. A fire, then, with a range of 2000 yards, would give bursts from 1860 to 2000 yards from the gun, sweeping the ground effectively from 1875 yards to 2500 yards from the guns. But the hostile attack will begin its infantry attack within that area, hence our battery can operate effectively against it without danger to its own infantry. If the hostile attack continues its advance, our guns can keep up the fire at least until the advance is within charging distance, then if our line is to fall back, the guns can cover the movement and sweep off the advance enemy, or if it is to resist with the bayonet, the gun fire will be continued against the hostile supports.

That such covering fire is possible may be seen from a study of the action of the shrapnel. Assuming that it would not be desirable to have it burst nearer than 100 yards in front of our trench or position, it must be fired at a range of 1200 yards, at least. This places the mean point of burst at about 1100 yards from the gun or 100 yards from our line, and the ground will be swept from 150 to 500 yards from the latter. The shrapnel will pass about 5 yards above the defenders, and a premature burst would, of course, be deadly, but just at that particular time, would probably not be noticed.

The chances of firing into our own troops in such a case could be reduced somewhat, sacrificing some of the effect on the enemy, by firing with a greater elevation, but the same fuze, thereby raising the trajectory.

At 6000 yards the 100-per cent. zone for longitudinal dispersion is about 360 yards, hence such artillery support could continue until the hostile attack was about 200 yards distant. In this case the mean trajectory is 85 yards above our infantry.

Below 1000 yards the flatness of the trajectory practically forbids such close support, unless the conformation of the ground is favorable. Using the same data as above, it is evident that an advance by our infantry can be supported up to within charging distance in the first case and in the 6000 yard case, and this will be true of all cases falling between these.

HOWITZER FIRE

When the charge begins, the artillery keeps up its fire, merely increasing the range gradually, interposing a barrier to the advance of hostile supports or the development of a counter attack. This is called "advancing the fire."

It may be assumed that our charge will advance about 150 yards per minute. Assuming our guns firing 2000 yards, as the charge is seen to begin, 3 or 4 volleys are fired at 2100, followed by 3 or 4 more at 2200, after that observation must determine what to do.

It must be remembered that only in adjusting fire may serious errors on the part of artillery personnel be expected. Great changes in the setting of instruments render errors likely. Once fire for effect is begun the changes are small, sometimes none at all for many rounds, and regularity is assured. The error of the gun need only be considered.

Granting reasonably good observation then, our artillery firing over our infantry, from positions 1000 yards in rear, can defend it against hostile infantry until the latter comes within charging distance, or can support our attack until it arrives within charging distance of the enemy.

The greater angle of fall of howitzer projectiles permits of their being used until the opposing lines are much closer.

The first part of the statement is of particular importance in the taking up of defensive positions. Such a position presupposes weakness and an intent to make the terrain and artificial obstacles, as well as dispositions, help out, and in the general case a battery's place of possible maximum usefulness is somewhere at least 1000 yards in rear of the line of trenches. In offensive action the necessity of getting within suitable range of the hostile positions will usually govern.

Such a position might be termed one of final maximum usefulness,—in the earlier stages of the engagement the necessity of firing on the hostile columns at a distance, or combatting the hostile artillery, may render necessary the use of positions close to, or even in front of, the trenches of the infantry, the final position to be taken for their close defense.

English Artillery Harness

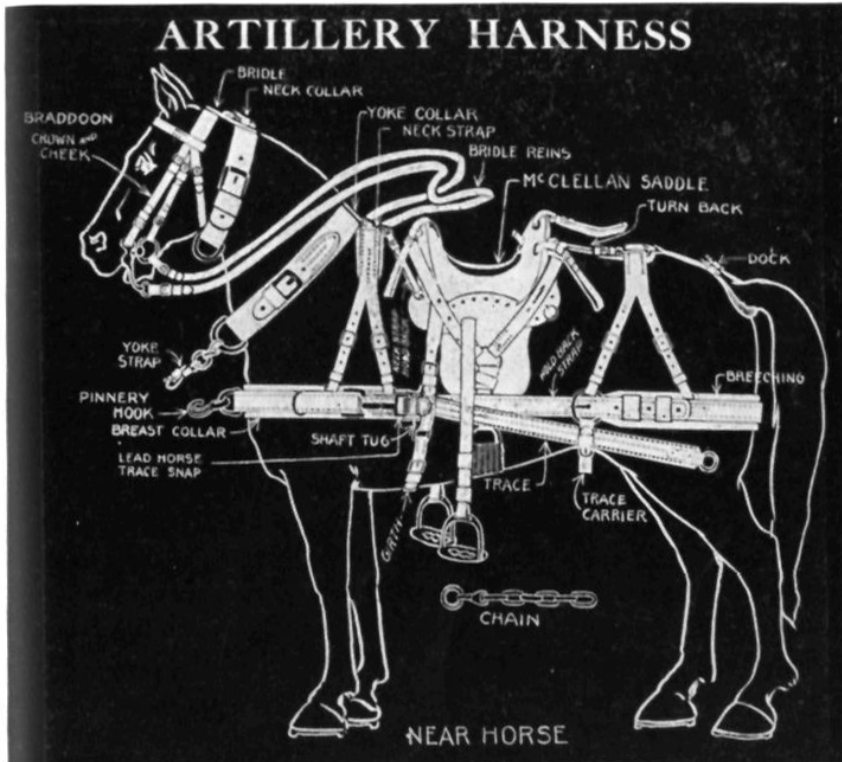
BY CAPTAIN ROGER D. SWAIM, ADJUTANT FIRST BATTALION FIELD ARTILLERY,
MASS. VOL. MILITIA.

RECENTLY opportunity was given to examine a "war order" of English artillery harness. Unfortunately no notes were made at the time and only the photographs are now available. These are particularly interesting at this time in view of the discussion as to the value of the breast collar and this article is submitted in the hope that someone who has seen the harness in use will be able to furnish further information.

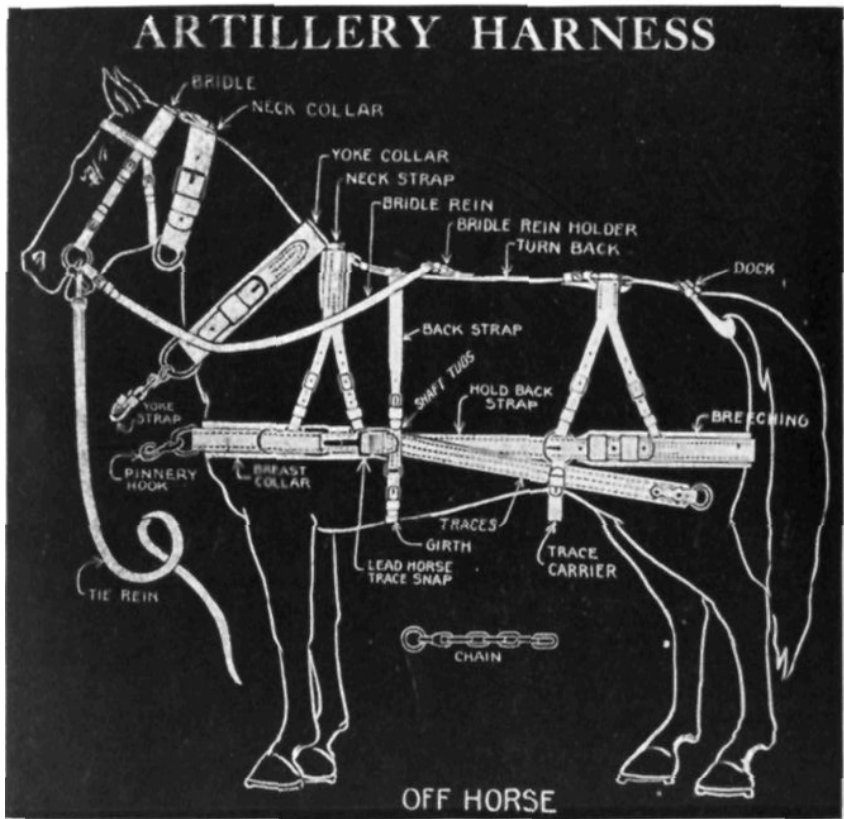
Figures 1 and 2 show the near wheel and near lead harnesses complete on wooden models. The pole yoke as shown is probably higher than in actual use. It was explained that the neck piece (*C*) passes through the large rings (*A*) on the side of the breast collar into the neck piece tug (*B*) to which it is attached by quick detachable device similar to that in use in our service.

A metal pad somewhat similar to our steel collar pad, over which the neck piece (*C*) and neck strap (*I*) pass, carries the weight of the collar and pole at the top of the neck.

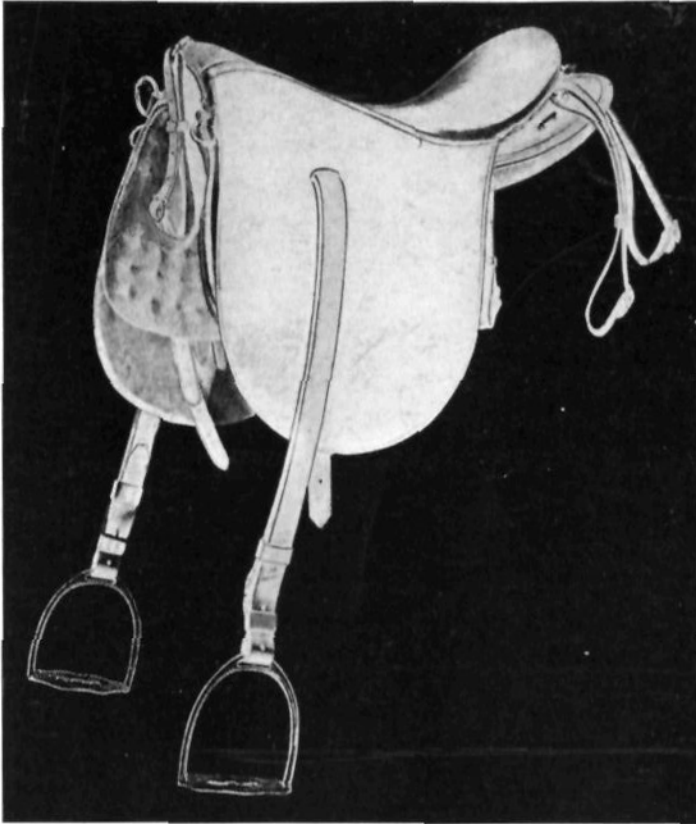
The traces (*E*), which are the same in lead and wheel pairs, are attached to the collar by quick-detachable device. A similar fastening at the rear end of the trace proper connects it in the case of the wheel trace to the single-tree and in the case of the lead or swing to the short section of trace (*D*) connecting with the chain (*K*) in the breast collar of the horse in rear. There appears to be no provision for adjusting length of traces. The short section of the trace proper acts to connect the breeching with the pole yoke through the attachment of the pole yoke to the collar at the rings above referred to, and the effect of the breeching, it seems, is aided by the crossed hip straps (*J*) which probably transfer part of the strain to the rump. The forward



Bridle, $\frac{1}{8}$ -inch crown with chafe and dee on top to hold neck strap, $\frac{3}{8}$ -inch fronts, $\frac{3}{8}$ -inch outside checks, $\frac{3}{4}$ -inch throat strap, $\frac{3}{4}$ -inch braddoon crown, $\frac{3}{4}$ -inch braddoon checks, $\frac{7}{8}$ -inch by 5 feet curb rein, $\frac{7}{8}$ -inch by $4\frac{1}{2}$ feet braddoon rein; No. 50 buckles, all leather loops hand sewed in. Neck collar, 2-inch wide, loop at buckle for dee to fasten tie rein in, $\frac{7}{8}$ -inch billet on top to fasten to crown piece. No. 50 buckles, sewed leather loops Yoke collar, $2\frac{1}{4}$ -inch wide, $\frac{1}{2}$ -inch billet, $\frac{1}{2}$ -inch chafe on ends, $\frac{3}{4}$ -inch billet on top to fasten in breast collar neck piece, 2-inch dee and $1\frac{1}{2}$ -inch dee put together with twisted lap link, 2-inch dee to slide on collar, $1\frac{1}{2}$ -inch dee to fasten yoke strap in, No. 50 buckles, sewed leather loops. Yoke strap, $1\frac{1}{2}$ -inch, No. 50 buckles, two leather loops sewed in. Neck strap for breast collar, 2-inch wide with $2\frac{1}{2}$ -inch fold in center, buckle on front to fasten yoke collar to ring on back to fasten saddle to, looped in breast collar with Conway buckles. Breast collar, 3-inch fold, $1\frac{1}{4}$ -inch end layer to form loop for shaft tugs, $\frac{3}{4}$ -inch dees for hold back straps to run through, $1\frac{1}{4}$ -inch chafe with trace square for tug to fasten in, $1\frac{3}{4}$ -inch tug with trace square for trace to fasten in. Shaft tugs, $1\frac{1}{4}$ -inch double and stitched to hold up traces and backing straps, dee in bottom for points and girths. Saddle, McClellan style, $16\frac{1}{2}$ -inch tree, leather covered seat, $12\frac{1}{2} \times 12$ -inch skirts, $1\frac{1}{8}$ -inch slings, $1\frac{1}{4}$ -inch point straps. $1\frac{1}{8}$ -inch stirrup leathers, metal stirrups; dee in back to fasten turn back in, straps in front to fasten to rings in neck piece, $1\frac{3}{8}$ -inch straps on side to hold up shaft tugs, four coat straps, footman loops on back to fasten saddle bag on. Saddle bags furnished if desired, at additional price. Turn back and hip strap, $1\frac{1}{4}$ -inch tug on rump with large safe for turn back to buckle in, snap on end of turn back to snap in dee on saddle, 2-inch hip split, 1-inch, sewed in trace carrier on top and looped back in breeching with Conway buckles. Breeching, $2\frac{1}{2}$ -inch fold, $1\frac{1}{2}$ -inch layer, $1\frac{3}{4}$ -inch ring, buckles on end to buckle backing strap in, two leather loops on each end. Docks, folded, roller buckles, leather loops. Trace carriers, 1-inch, sewed leather loops. Hold back straps, $1\frac{3}{8}$ -inch doubled and stitched, three-ply, 11 feet 6 inches long; pinnery book on front to fasten tongue chain in. Traces, $1\frac{3}{8}$ -inch wide, doubled and stitched, three ply, three rows stitching, $1\frac{3}{4}$ -inch roller snap in one end to fasten in breast collar, $1\frac{3}{4}$ -inch ring clipped on other end for trace chains to fasten in.



Bridle, 1 $\frac{1}{8}$ -inch crown with dee on top to fasten neck collar in, $\frac{3}{4}$ -inch throat strap, $\frac{7}{8}$ -inch front, $\frac{7}{8}$ -inch by 5 $\frac{1}{2}$ by 3 feet reins, 1 $\frac{1}{8}$ -inch tie rein with snap on end, No. 50 buckles, sewed leather loops. Neck collar, 2-inch wide, loop at buckle for dee to fasten the rein in, $\frac{7}{8}$ -inch billet on top to fasten to crown piece, No. 50 buckles sewed leather loops. Yoke collar, 2 $\frac{1}{4}$ -inch wide, 1 $\frac{1}{2}$ -inch chafe on ends, $\frac{3}{4}$ -inch billet on top to fasten in breast collar neck piece, 2-inch dee and 1 $\frac{1}{2}$ -inch dee put together with twisted lap link, 2-inch dee to slide on collars, 1 $\frac{1}{2}$ -inch dee to fasten yoke strap in, No. 50 buckles, sewed leather-loops. Yoke collar, 1 $\frac{1}{2}$ -inch, No. 50 buckles, leather loops sewed in. Neck strap for breast collar, 2-inch wide with 2 $\frac{1}{2}$ -inch fold in center, buckle on front to fasten yoke collar to, ring on back to fasten turn back in, looped in breast collar with Conway buckles. Breast collar, 3-inch fold, 1 $\frac{1}{4}$ -inch end layer to form loop for shaft tugs, 1 $\frac{3}{4}$ -inch dee for hold back straps to run through, 1 $\frac{3}{4}$ -inch chafe with trace square for tug to fasten in, 1 $\frac{3}{4}$ -inch tug with trace square for trace to fasten in. Shaft tugs, 1 $\frac{1}{4}$ -inch double and stitched to hold up traces and backing straps, dee in bottom for points and girths. Back strap, 1 $\frac{3}{4}$ -inch, to hold up shaft tugs. Turn back and hip straps, 1 $\frac{1}{4}$ -inch tug with large safe on rump to buckle turn back in, 1 $\frac{1}{4}$ -inch turn back with snap on end to snap in neck piece on breast collar, $\frac{3}{4}$ -inch dee sewed on twin back strap with buckle and strap to fasten bridle rein in, 2-inch hip strap slit 1 inch, sewed in trace carrier on rump and looped in breeching. Breeching, 2 $\frac{1}{2}$ -inch fold, 1 $\frac{1}{2}$ -inch layer, 1 $\frac{3}{4}$ -inch ring, buckles on end to hold buckle hold back straps in, two leather loops on each end. Docks, folded, roller buckles, leather loops. Trace carriers, 1-inch, sewed leather loops. Hold back straps, 1 $\frac{3}{8}$ -inch doubled and stitched three ply, 11 feet 6 inches long; pinnery book on front to fasten tongue chain in. Traces, 1 $\frac{3}{8}$ -inch wide, doubled and stitched, three ply, three rows stitching, 1 $\frac{3}{4}$ -inch roller snap in one end to fasten in breast collar, 1 $\frac{3}{4}$ -inch ring clipped on other end for trace chains to fasten in.



I. M. COLONIAL SADDLE

Tree, 19 inch extended bar somerset, crupper loop. Seat, kip. Skirts, $19\frac{1}{2} \times 19\frac{1}{2}$ seamed to seat. Pads, sheep skin serge lined. Stirrup leathers, $1\frac{1}{4}$ -inch riveted and sewed. Girths, hair. Stirrups, metal. Girth straps, two on each side $1\frac{1}{8} \times 15$. Two long billets, one on each, 1×19 inches, 1×15 inches. Three coat straps, $34 \times \frac{7}{8}$. One coat strap, for front $23 \times \frac{7}{8}$, $1\frac{1}{2}$ inch ring on off side for tie rein. Two 1 inch dees on front. Three footman loops for saddle bags.

ENGLISH ARTILLERY HARNESS

end of these hip straps (*H*) is held in place on the trace by passing through a small lug attached to the trace. In the lead harness there appears to be nothing to prevent the loin strap (*F*) sliding back off the horse or from side to side.

The bridle is a combination bridle and halter. In the one seen a strap attached at one end to the bit passed over the crown following the check and crown pieces of the halter through the loop in the rear ends of the brow band and buckled to a short strap attached to the other side of the bit. This made a much lighter head gear than ours with a halter that stayed up on the head.

The general impression was of an extremely simple serviceable harness quickly put on and quickly removed. With no crupper, no attachment to the saddle, no side straps under the belly and the flexible breast collar it should be easy to strip a fallen horse. It may be that the pole yoke would tend to ride up through absence of martingale. Possibly this may be counteracted by lower breeching through use of the crossed hip straps. An attachment at the rear of the saddle would prevent displacement of the loin strap.

No saddles were included in the "war order" seen.

Notes of the Present European War

*From "De Militaire Spectator," Holland
Published in the "Memorial del Ejército de Chile," April, 1916*

TRANSLATED FROM THE SPANISH BY MAJ. G. A. SKINNER, MED. CORPS, U. S.
ARMY, MAY 30TH, 1916

THE Publishers of the Memorial have recently arranged for a series of articles on the present state of the great European War from the pen of Captain P. J. van Munnekrede, of the Holland General Staff, whose observations have the advantage of proceeding from a professional studying the events at short range, and having at his disposal the accounts of combatant officials of the Belgian and English armies.

Capt. Munnekrede says:

MASS ATTACKS

Frequent press notices of the present war would lead one to conclude that the Germans executed the attacks in the form which in some ways resemble the mass attacks of the time of Napoleon. This description is not correct and depends on an error of observation. The compact mass attacks of the Germans are the result of successive lines, which follow each other at a short distance in order to ensure sufficient support to the first line. In conformity to German regulations, the last lines are kept in close formation while not exposed to the fire of the enemy.

In looking from a distance it is evident that a considerable force advancing under such a formation would appear to be in close order. On this account there are times when the attacking Germans, who are preoccupied with obtaining a prompt reinforcement of the line of fire and a rapid advance, by which precautions they diminish their losses, collect in considerable numbers.

NOTES OF THE PRESENT EUROPEAN WAR

"As usual, the Germans threw themselves to the front," says a recent account of the attack at Courland, a fact which the Russians abundantly confirmed.

It is evident that in an attack carried forward with great vehemence and energy, there will frequently occur an accumulation of troops in certain locations; it is also natural and inevitable that in the last stages of a defensive combat, the assaulting troops will accumulate at the point where it appears most easy to break through the enemy's line.

To these circumstances are due, without doubt, the rumor of the antiquated form of attack which the Germans are said to use.

THE ATTACK ON FORTIFIED POSITIONS

Concerning the attack on fortified positions, or on lines partly fortified, from facts already known the following conclusions may be drawn; if the fight for the territory in front of the position has terminated favorably for the attacking party, two distinct phases of the attack on the position may be determined as follows:

1. The fight for the superiority of fire.
2. The assault by the infantry.

The struggle for the superiority of fire may last a long time as it is almost exclusively executed by the artillery, which puts all its force into the struggle to annihilate the artillery of its opponent.

A large number of points of fire and a great quantity of artillery ammunition are provided for in advance. During the bombardment by the artillery the infantry attempts to approach the enemy's position. Generally this is only possible during the darkness of night, and a slow or rapid advance will depend entirely upon the intensity of the enemy's fire and the means at his disposal for illuminating the territory in front of his position. Once the attacking infantry has succeeded in establishing himself in trenches a short distance in front of the enemy's position,

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it awaits the dawn for the surprise assault. Hand grenades, bayonets and machetes are used in the assault. Engineer patrols lead the assaulting troops to cut the wire entanglements, which have not been destroyed by the artillery fire. During the assault the artillery cannot continue the bombardment of the first lines of the enemy's position, as to do so would interfere with their own troops. To protect the assaulting lines, the artillery changes its fire to the country back of the position of the enemy, and throws such a quantity of projectiles over the surface that there is absolutely no possibility for the defensive reserve to approach the threatened point. This fire is called "barrier fire," and continues without interruption until, if the assault were successful, the victors approach and prepare to defend the captured position, or in case of a repulse, until the danger of pursuit by the enemy has disappeared.

THE STRUGGLE FOR THE SUPERIORITY OF FIRE

Before the present war it was generally considered that the object of infantry fire consisted in obtaining a superiority of fire over the fire of the enemy's infantry. The Dutch regulations for infantry seem to uphold this opinion, when it says in Article 233: "In the fire fight while in open order, such as is usually used against the enemy's infantry, commanders of units have the permanent obligation of taking the necessary means to maintain a constant supply of reinforcements against the line of the enemy, until a superiority of fire shall have been obtained."

The most recent experiences respecting the infantry attack teach us that it is very probable that superiority of fire is never obtained in infantry attacks alone. And how could it be otherwise? How could an attacking infantry column obtain a superiority of fire over a defender entirely protected by trenches, in which not even the head is visible? Such a position as outlined is the most ideally unfavorable one for infantry attack, but let us suppose a situation more favorable, the probability

NOTES OF THE PRESENT EUROPEAN WAR

of obtaining the superiority of fire on the part of the attacking infantry alone is small.

Let us assume that in an unexpected encounter one of the contestants is obliged to select a defensive position. There would be no opportunity then to prepare a fortified position that would meet all requirements. Even in so favorable a condition for an infantry attack the outcome of the operation would be very doubtful, if an attempt were made to obtain superiority of fire by infantry alone.

The almost insuperable difficulty in obtaining this result is clearly comprehended if we compare the excellent target made by a group of soldiers during the moments in which they are forced to show themselves in order to gain distance, with the small mark which is offered by the defenders, even though they have no artificial protection. That is to say, the attacking party has to frequently expose his entire body during the greater part of the combat, whereas the defender merely exposes the head.

The enormous difficulties which present themselves when an infantry attack attempts to dominate a line by rifle fire alone, up to the point where an assault is possible, make it more necessary than ever to employ machine guns and artillery.

The constant experience of the present war demonstrates that it is not without purpose that the belligerents give capital importance to these arms over those of the enemy. Where it has not been possible to count on the satisfactory support of the artillery, the infantry has suffered enormous losses before it has been able to advance to the position from which it has been possible to use bayonets and hand grenades.

The only means that will diminish these losses are the intelligent use of the terrain and an adequate formation, united with great rapidity of movement.

Our infantry has not been able to employ enough time in this class of training.

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COMMISSIONED AND NON-COMMISSIONED OFFICERS IN OFFENSIVE COMBAT

Combat conducted according to the exigencies of to-day puts the morale of the troops, especially the infantry, to a very severe test, and consequently the moral influence of the officers is more necessary than ever in maintaining discipline and counteracting detrimental forces. For this reason it is indispensable to inculcate into the officers and men how great is the fault of unnecessary exposure to danger.

It is all the more necessary as all the belligerents have given instructions that officers and non-commissioned officers are to be disposed of first. Officers of organizations who remain on their feet or kneeling in the line of troops in order to instil valor into them, and indicate a charge, for example, by waving the arms, are using ancient tactics. The officers of small units now mix in the line of troops and make the assault with them. From an absolutely confidential source we have received word that officers of the German infantry do not advance in front of their troops, even in an assault, but always move at the same time and in line with their men, and generally carry a rifle in the hands.

It is evident that these measures would be negative if the commanders of troops used a distinctive uniform. In the German army a very energetic reaction against distinctive markings has taken place, and in the last imperial orders a very decided opinion is expressed in this matter (October, 1915).

THE CONDUCT OF FIRE

Another question of no less importance is, how may organization commanders obtain an accurate and energetic control of fire. Judging from recent experiences it is evident that in our army in peace these activities are exaggerated, at least in the offensive.

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The running about from side to side back of the line of troops to rectify the line and aim, which is customary by commanders of minor parts of organizations, is a thing which in reality is impossible, at least in open country.

The custom of transmitting orders in a low voice on the firing line is a form of communication which fails in modern combat. Orders transmitted in that manner will not carry more than three or four men from the source, if indeed the order has not failed of comprehension by the first, which often happens.

As a consequence of these facts, it is necessary in training our marksmen to bear in mind that in modern combat the man is almost entirely thrown on his own initiative.

THE ASSAULT

The assault as now understood, even in field battles, is launched from a distance much shorter than we have been accustomed to use in our exercises in double time, in times of peace. An assault which begins at 200 meters or even 100 meters from a position in which the defenders maintain themselves firmly, has in it the germ of failure. Fifty meters is the greatest distance from which such an action, always perilous, should be undertaken. If it is impossible to penetrate the enemy's lines, it is necessary to use all the influence possible to compel the troops to remain and continue the combat at short range. A retreat from within 100 meters or less of the enemy would probably result in annihilation.

THE WAR IN THE TRENCHES

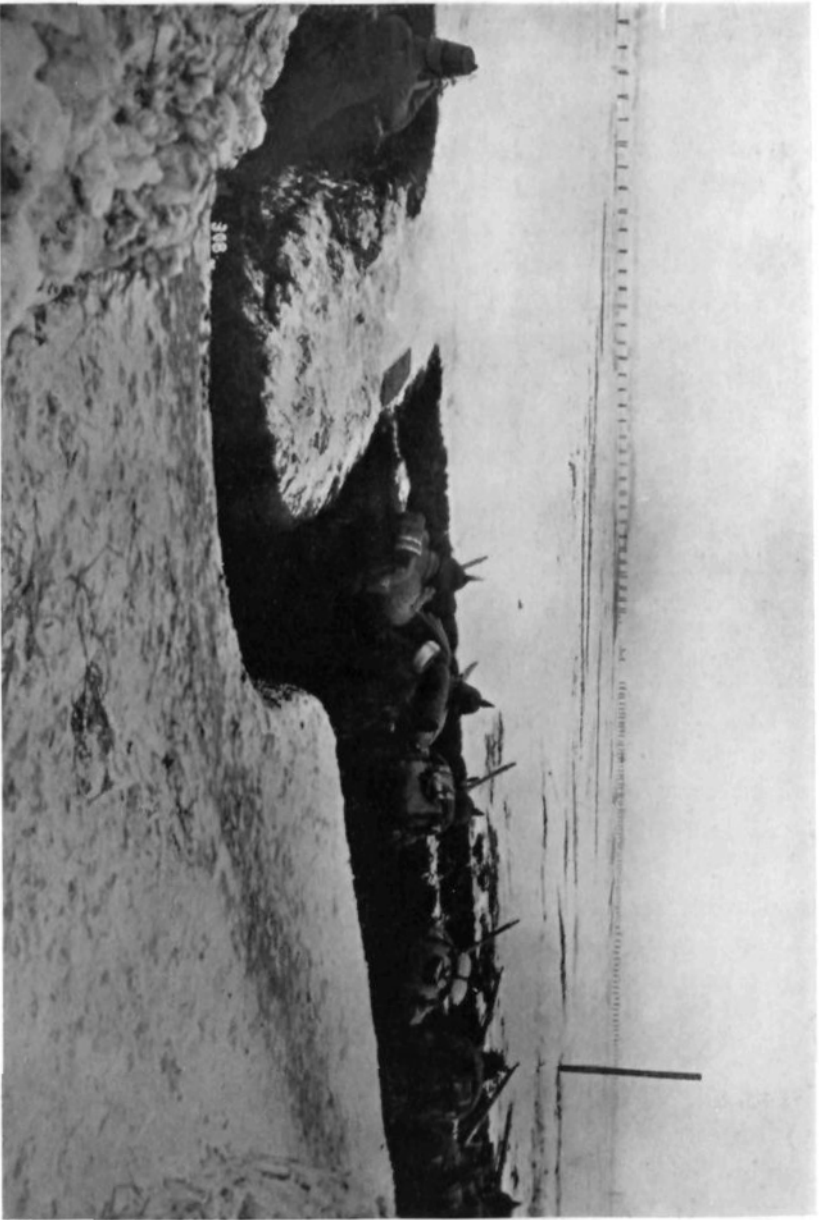
Former communications respecting the war in the trenches are more and more confirmed by recent experiences. (See appendix to Memorial for October, 1915.) The only new thing observed is the present construction of shelters and blinds in many cases on slopes posterior to the trenches instead of under the anterior slope, in order to be below the line of fire.

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This is done in order to give the parapet the greatest resistance against the fire of demolition from the machine guns and artillery. The shelters are covered with at least a meter of earth. Moreover they are hiding the greater part of their shelters back of the trenches and occupying the trenches only during fire. It



is clear that this method of hiding their shelters can only be used when it is possible to arrange communicating trenches well protected. The fortified trenches that are now constructed by German recruits in the great drill grounds of the army garrisons are of this form, and it is reasonable to suppose that they have adopted the model which recent experience has proved to be the most satisfactory. The accompanying



TYPICAL GERMAN FIRING TRENCH, SHOWING TRAVERSE

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photograph gives a clear idea of the trench as at present used. It shows a long line of straight trenches. The passage ways are longer and wider than previously and are frequently so arranged that flank fire is possible.

Attention is called to the unusual number of machine guns which are placed in position; in some places there is a machine gun every thirty or forty paces. An abundance of machine guns facilitate the occupation of the line of fire by very few troops, especially during the period of bombardment. In this way they try not to expose the men unnecessarily to fire. Observation stations are very frequent in order to guard against surprise. To give an alarm the telephone is used; the German trenches always have a very elaborate network of telephones.

The obstacles used are tree trunks and wire. These are built in an unobstructed line; at regular intervals apertures are left which serve for counter attacks and sallies, and which they close when necessary by a sort of "portcullis." In front of the obstacles caltrops are scattered, and these are connected up with wire in such a manner that anyone approaching would be likely to stumble and fall in the trap. This is not used so much with the object of impeding an assault as to detain the patrol of the enemy charged with cutting the wires, which are the real obstacles.

About a kilometer back of the last line of trenches, field batteries are placed, perfectly hidden and invisible to the enemy. Back of these batteries are placed the howitzers, which are used not only to destroy the fortifications of the enemy, but also to keep under fire all targets in a territory for a distance of five to eight kilometers back of the trenches, and especially the reserve columns of ammunition and provisions, which are located by air scouts. The artillery knows perfectly the exact distance of every point in the field, and a constant and careful observation of the first line of trenches makes it possible to concentrate the fire on any target that appears. The observer is always connected to the battery by telephone.

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HAND GRENADES

The use of hand grenades is constantly increasing. In some places, where the opposing trenches are very close, the combat is almost exclusively with this class of arms. Grenades made from tin cans are much preferred. These are filled with pieces of the enemy's shells and dynamite, and are provided with a short wick with a cap of fulminate and closed with solder.

Each soldier carries six grenades to the attack. To fire them, a cord is pulled which explodes the cap and sets fire to the wick. Then the grenade is thrown with the hand and the explosion follows in seven seconds.

In all the belligerent countries the troops are taught to throw grenades. The method which they use is as follows: The recruits are arranged on the ground, provided with practice grenades at first, and later with loaded ones. At a sign from the instructor they arise, run forty meters and throw the grenade, attempting to hit targets three meters wide, whose boundaries are marked by string, some thirty paces from the point of throwing.

Another form of practice is to put the troops in trenches, in front of which an opposing trench has been constructed which simulates that of the enemy. Grenades are thrown and should fall in the latter trench.

In a large number of places in France, back of the lines, they are teaching the method of throwing grenades in this manner. These courses last four days. When the practice is with loaded grenades, it is necessary to take some precautions to prevent accidents which might occur from flying pieces in a premature explosion. To avoid this danger small armored places are erected near the point of throwing, behind which the instructor and pupils may take refuge.

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DIRECT ARTILLERY FIRE

For some time before the beginning of the present war the attention of the inspectors of artillery was so much engaged with the indirect fire of the artillery that a decided preference to it, in place of direct fire, for field artillery had taken place and had caused a certain amount of carelessness in the practice of direct fire.

The events of the present war have proved that these observations were right. With the perfected instruments that are to-day available for range finding, there are very few targets that cannot be hit by indirect fire. But there are times in combat when the latter cannot be employed.

During the early stages of combat there is little necessity for any other method of aiming, but during the latter part of an encounter, with its moments of alternating, advancing and retreating, it is evident that there will be occasions in which the control of fire will escape from the hands of the battery commanders. If then the battery cannot command direct fire with the same precision that it can the indirect, the result will be that which happened to the Russians in many battles. On many brilliant occasions where great loss to the enemy could have been inflicted, the opportunities were lost to the Russian artillery because they had not been sufficiently trained in the use of direct fire.

THE COMBINED ATTACK OF INFANTRY AND FIELD ARTILLERY

Those who have seen an attack executed at manoeuvres in which one or several batteries of field artillery have accompanied the infantry in the open field, have no doubt thought that this proceeding could not be used in real combat. Such conclusions would at first appearance seem to be justified. It cannot be denied that the employment of batteries in the formation indicated is more difficult than it was in the war of 1870–1871. Undoubtedly the act of accompanying the firing line up

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to a short distance from the enemy will always be at the risk of suffering great losses for the artillery, but this circumstance is not sufficient to refuse permission for this method of attack in a modern battle.

In order to supplant the actual accompaniment of the infantry firing line by field artillery, a system of advancing observers alone has been tried, leaving the pieces in their detached positions behind; but this proceeding does not furnish the infantry with the energetic assistance which to-day is more than ever necessary.

Recent experience has demonstrated that it is impossible to withhold the artillery accompaniment to the infantry in the last stages of an attack, in spite of the losses which the latter arm is likely to suffer.

In such supreme moments it would be absolutely out of the question to expect the necessary help from batteries hidden away at the rear, and depending for their employment on long telephone lines. The better method appears to be to execute an advance of the artillery from different points simultaneously and with isolated pieces. It is very probable that the enemy would not be able to bring under an efficient fire all the small targets which would be represented.

AN ILLUSTRATION OF THE ARTILLERY IN ACTION

The combat of Zandvoorde is notable in many ways, but especially, because it gives us an example of the tasks which fall to the artillery in modern combat and the forms in which these were executed. The following account of this action comes to us from well authenticated sources. In the last half of October, 1914, the commander of the German army in Flanders decided to take up a position in Ypres. The village of Zandvoorde formed a salient of great importance to the English defensive line, because the height on which it was situated gave command of the country for a considerable distance.

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The English had very well comprehended the importance of this point and had powerfully reinforced it with fortifications in the village itself, while in the neighboring woods and fields were constructed earthworks and walls. In front of the principal part of the position at Zandvoorde a wire entanglement from ten to fifteen meters in width was placed. When the German cavalry, reinforced by the light infantry, arrived in front of the village of Zandvoorde at the end of October, the leader quickly discovered that there was little chance of capturing this point from the English with the force at his disposal.

The commander resolved not to attack until the arrival of the main body of the army. Upon its arrival the English were attacked in the country in front of the village and very violent actions followed. The German infantry was able to advance slowly until it was within about 400 meters of the principal position.

The English defended themselves with their accustomed bravery and tenacity, receiving powerful assistance from their artillery, which on various occasions took position in the first line of the combat.

The resistance which the Germans experienced was so tenacious and the losses so great, that they comprehended that it would not be possible to approach the position without a previous bombardment by the heavy artillery. On October 31, at 8 A.M., 150 pieces of heavy and light artillery opened a very violent fire on Zandvoorde and the infantry availed itself of the powerful help to approach close to the position of the enemy. At exactly 9 A.M. all the bands played the piece, "Heil dir im Siegerkranz," which was a signal for the assault.

The wire entanglements, the greater part of which had been destroyed by the artillery fire, were cut by wire cutters, an operation which cost the lives of many German soldiers.

The English survivors of the bombardment would not surrender. Those who had power left to handle a rifle decimated

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the assaulting troops to the last moment with a rapid fire, and then engaged in bayonet combat with the Germans, who after the severe fighting had reached the trenches, and encountered hosts of English dead, which clearly proved the destructive effects of the German artillery fire.

But the attackers were not content with the triumph gained; they continued the assault through the village of Zandvoorde, which had been reduced to ruins, and arrived at the opposing lines, where they turned on the retreating English a very destructive fire. A field battery also took part in the pursuit. It crossed the burning village at a gallop and took a second position 150 meters in front of the German line, and opened a deadly fire on the retreating enemy. A battery of heavy howitzers also advanced and took a position within the limits of Zandvoorde to add its powerful help up to the last moment. These episodes recall in many ways, incidents of the battles of 1866 and 1870.

THE CAVALRY

The cavalry on the west front appears to have been completely forgotten and at present has few opportunities to contribute to the rapid termination of the war.

At the beginning its position was very different. Then the cavalry took a very considerable part in the operations of the war, as may be deduced from the following account: At the beginning of the war the supreme commander of the German army concentrated great numbers of cavalymen, who were employed at the extreme of the right wing during the invasion of Belgium, and whose part was to keep the front clear by means of reconnoissance of the enemy, and to cover the march of the advance German column.

After the fall of Liege, they attached to this body of cavalry two battalions of light infantry, which had taken part in the fall of this fortress and which, after its fall, was no longer necessary.

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Each one of these battalions was composed of six companies, four companies of infantry, one company of cyclists and one machine gun company. The cyclists companies were almost always attached to the reconnaissance squadron, which moved at a great distance from the main body. The northern group of these mounted troops, which were composed of the second and fourth divisions of cavalry, marched in the direction of Haelen, where, on August 1, they attempted to force a passage of the Grette River, defended by the Belgians. The two battalions of light infantry, united with a dismounted force of cavalry, took the village of Haelen after a violent combat, in which the artillery and machine guns took a large part.

It was not possible for the Germans to advance further than Haelen on account of the Belgian resistance on the west.

From Haelen the German cavalry marched in the direction of Antwerp, to Diest, with the object of retarding the concentration of the Belgian forces, which eventually went to reinforce the troops west of the river Grette.

At the same time they watched Ostend, where the air scouts had signalled that the English were disembarking. Then the cavalry doubled to the left and marched toward Cambrai, in the neighborhood of which the cyclists and advanced squadron came in contact with the English troops that arrived from the west. The march continued very rapidly and in two days they covered 130 kilometers, accompanied by the battalion of foot troops.

Approaching Catrinères they undertook a very unusual combat, to add to the burden of the already wearied troops. A detachment from the army, which arrived at a very opportune time, attacked the entrenched English line in front, while the mass of the cavalry and light infantry attacked them on the flank, a movement which decided the combat in favor of the Germans. One of the machine gun companies especially distinguished itself in this encounter, when, thanks to an act of the highest judgment, it was able to cause enormous losses to

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an English battalion, which carelessly showed itself on a height.

Constantly fighting, the German cavalry continued its triumphal march to Crepy and La Ferte up to Coulommiers, not very far from Paris. Here they received orders to retreat and protect the exposed flank of the German column on its backward march.

Now began a very hard time for this intrepid cavalry. The enemy did not allow it a moment's rest; fighting all the time, they undertook to return over the same road used in the advance. The foot troops, artillery and machine guns were permanently in the rear guard. One especially hard day for the infantry was in Gendelu, when they received orders to retard the advance of a great British force. This arduous task was very well done. Occupying an excellent position, they obliged the enemy to deploy, by means of a violent and well-directed fire. Only when they were in danger of being surrounded from both flanks and the English cavalry appeared in their rear was the order given to retire.

This retreat was very difficult for they were under the fire of the artillery and were carrying their machine guns on their shoulders. The infantry retired in small groups and the movement was so well executed that none of the war supplies fell into the enemy's hands, with the exception of one machine gun which had been put out of action by a hand grenade. They had retarded the enemy two hours and a half.

The retreat continued to Vic, where they passed the river Aisne. Then cavalry helped to repel an attack of the French near Soissons; from here they went rapidly to Noyon to oppose an advance of new French troops, and at which point the infantry was sent forward in automobiles to gain time.

It being necessary to prolong the wing of the army in Belgium, the cavalry now received orders to move more to the north, which could not be realized without serious combat at Roze, Chaulmes, Dompierre and Somme.

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After the arrival of great reinforcements of seasoned and brave troops, there was no necessity for the cavalry in this theatre of war, and at last they received orders to return to the rear guard at Zandvoorde, attached to the infantry.

When the details of the adventurous raids are known they will, without doubt, result in many valuable lessons in the most complicated art of the management of large masses of cavalry. For the present, we may consider it well proven that the cavalry of a mobile army, always being followed by a powerful force, will, under those conditions, be able to surprise and paralyze the enemy's army through long and rapid marches. In this work nothing could have been superior to the German cavalry during the present war. At the same time it has been made evident that infantry may oppose a cavalry raid by resistance, in front of which the mounted troops are helpless.

By means of intelligent use of automobiles they have been able to give infantry the necessary rapidity to accompany cavalry. Another event of no less importance is the arming of the cavalry with machine guns.

The cavalry joined to light infantry will always give the same advantage that the Germans held in the above mentioned combats.

DOGS IN WAR

The dogs in the present war have rendered greater service than ever. In the west front the allies had about 600 well-trained dogs which have been utilized in many and varied services. Their value in seeking the wounded has been proved in previous wars, but the employment of dogs as draft animals for machine guns is newer, and in this field they have gained a great reputation. They have been also frequently utilized for carrying communications, munitions and provision to the line of fire.

The training of dogs to carry communications is a task that requires much tact and patience. At the outset the dogs are

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taught to go and come a short distance between two points about twenty meters apart, and the distance is slowly increased until it is several kilometers.

In France the following method of teaching has given good results: In the instruction field are constructed trenches in order to accustom the dogs to the objects they will encounter on the field of battle. They are taught to run on the bottom of these trenches up to the first line and exactly to a predetermined point, where a disk has been placed which is visible at some three hundred meters. Little by little this distance is increased until the dogs are able to reach the first line, although the direction is only pointed and the distance considerable. Messages and orders are attached to the collar.

If the dogs are required for transporting ammunition or provisions they are attached to light carts and serve very well for draft animals in the trenches. The period of instruction for dogs varies from 20 to 30 days.

Without doubt, where the dogs render the greatest service is at the front where they accompany the sentries and patrols. Nothing escapes their vigilance, and they bark at the slightest noise.

The service of the advance is very hard and it is not always possible to relieve men with the frequency desired; so the aid lent by the dogs is not to be despised. They have saved many lives and have made possible the repulse of an assaulting enemy, whose attack, except for the vigilance of the dogs, would have been a painful surprise.

AUTOMOBILES IN WAR

Armored automobiles have attracted much attention in all the operations of the present war in all its theatres. The cars used in France weigh 5.9 tons more or less. Above the chassis a casemate of steel is constructed 2 meters long, 1.9 high and 1.6 wide. This is capable of containing six riflemen, who are able to fire through loop holes, which are then closed. Behind the casemate is an armored box for munitions.

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The chauffeur's seat is also protected by armor. The speed is approximately 20 kilometers per hour.

Other types of war automobiles are provided with a revolving turret armed with rapid-fire cannon or machine guns.

The English are using for this service light trucks which have been provided with armor on the sides. Up to the present the Russians have employed very few of these vehicles, but it is rumored that they have bought a thousand war automobiles in the United States.

It is the general opinion in all armies that armored cars are of great utility and will be employed permanently.

There are two special classes of cars that have proved of great practical utility. One of these is a very heavy armored car, whose armament is rapid-fire cannon. Naturally, such a moving fortress cannot be used except where there are good roads, on account of its great weight.

For the above reasons attempts to invent a much lighter type of armor and armament have been many, and there is every reason to believe that important improvements will soon be made in this class of machines.

It is said that there are now armored cars that have a speed of 50 to 60 kilometers an hour, and which can run over the open country away from roads. These new cars are able to run forward or backward with equal facility, which is a great advantage in solving the problem of these machines in retreat. This has heretofore been difficult on account of the maneuvering necessary to turn on the roads. If the new inventions are practical, it will be necessary to consider seriously the means of defense against these formidable adversaries, especially for troops on the march and at rest. The experiences of the present war have demonstrated that a surprise attack by an armored automobile may cause serious losses and occasionally cause actual panic among the troops. For this reason troops at rest should not omit the precaution of closing the roads which lead to the bivouac with barricades of trees, cars and the like.

The Massing of Artillery

From Les Conditions de la Guerre Moderne

TRANSLATED BY FIRST LIEUTENANT S. S. WINSLOW, C. A. C. SEPT. 29, 1916

IN the many battles which he directed, Napoleon, at the decisive moment usually made use of a mass of artillery, which he had assembled, at the proper time and place to produce what he called the "evenement" or crisis.

"In battle as in siege," he wrote, "the art consists in converging the fire of a great number of guns on a given point: the conflict once established there, he who contrives to have a large mass of concealed artillery open suddenly on one of these points is sure to be successful."

The Napoleonic principles are immortal, but they must be adapted to the times and place and to the progress of the human mind.

The mass of artillery of which Napoleon speaks, meant every piece that he could concentrate at a given moment, on a point of the battlefield, to produce the desired effect.

This principle was applied by the Prussians in 1870 without notable change, except that it had been enlarged upon. In the battle of August 18, the Germans had about 300 guns firing on the village of Saint Privat, which formed a supporting point for the right of the French Army.

In the present war, the Germans have given the principle a slightly different interpretation, in that they have made the mass of artillery consist of heavy guns, capable of gaining superiority as much by their own power as by their number. The Prussians at first, had not come to this new conception of the mass of the artillery, and the proof is their 42-centimeter howitzers, which they employed very effectively in the attack on Liege, Namur and Antwerp.

By means of the railroads, they were able to transport their

THE MASSING OF ARTILLERY

heavy artillery from one front to another, hoping to attain partial successes here and there, which they could later combine into a decisive victory.

But the transportation over long distances of this heavy artillery is a delicate and tedious operation. It includes work of all kinds, including the supply of ammunition and the siting of the batteries as well as the hauling of the guns over iron tracks.

Thus, last December, the Germans unloaded the heavy artillery which had driven back the Russian and Serbian fronts, at a point fifteen kilometers north of Verdun.

During the next month, they added to this formidable siege park, five new army corps. These, with the two corps regularly covering the Verdun sector, made an army of seven army corps, charged with the capture of Verdun.

The work preparatory to the sudden attack on this place lasted two months. On February 20 the bombardment of the exterior works on the north side of Verdun began, while at the same time the duel between the opposing artilleries was kept up on the front extending from Vauquois (on the left bank of the Meuse) to Etain on the right bank, a distance of forty kilometers.

The real attack began on February 21, developing during succeeding days, until February 28, when an attempt was made to throw a Prussian regiment, the 24th Brandenburgers, into Fort Douaumont. This fort had been totally destroyed by the German heavy artillery, most of which was located on the right of the Meuse, half way between the river and the village of Etain, and about fifteen kilometers north of the town of Verdun.

From February 21 to 27, inclusive, the French commander slowly gave ground, defending the ground foot by foot, trying always to save his men from the heavy German artillery, which included the 42-centimeter howitzers.

On the 27th a party of our reserves made a counter attack on

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the ruins of Fort Douaumont, in which the 3rd Prussian Corps had secured a foothold. The fort was surrounded. This attack reflected great credit upon the officer that ordered it as well as the troops that executed it.

A French report, dated 11 P.M. on February 27, said: "To the East and West of Fort Douaumont our troops surround remnants of enemy forces which have gained a foothold there and are holding on with difficulty.

"This encirclement, which is still in effect, will result in the capture of the Prussians confined in the ruins of the fort."

The attack slowed up a little on February 28, and there was a brief pause. The enemy had gained an area eight to ten kilometers long and four to five deep. The Prussian armies made this gain at a cost in losses, the equal of which has not been known in any previous engagement.

The struggles which took place north of Verdun from February 21 to 28 showed a universal method of procedure, which differentiates them from former wars.

The heavy artillery of both sides has played an essential part, without, however, lessening the value of the heroic work accomplished by the opposing infantries. The French infantry, which Marshal Canrobert, in 1854, qualified as the best in the world, did remarkable work. *The Daily Mail*, in speaking of the battle of Verdun, said: "If the German infantry had been as good as their guns, they would have succeeded. But the French infantry is without equal."

All honor to the French soldier, who has the highest warlike virtues the world has ever seen.

Four years ago, our director, Leon Baily, wrote: "Soldiers of France, as good as you are now, you are the last reason for war. You are the hope on which we base the certainty of Victory."

Long live France.

Notes From the Artillery Line in France

BY CHARLES NORDHAMM

(*Revue des Deux Mondes*, March 15, 1915)

SINCE the beginning of this war there has been much talk of the advantages of our artillery, of its tremendous effects, of the causes of its superiority. Our 75, in particular, has become a kind of popular and marvelous idol, which perhaps works an injustice to its big brothers, the 105, 155, 120, and to its nearer, 90 and 95. I ask permission, before going farther, to define, as far as I have myself seen, the probable causes of our superiority in artillery and why it works considerably greater havoc than the artillery of the enemy. I will do so, abstaining as far as possible from all technical discussion. There is nothing in artillery, more than any other science—artillery is indeed a science—which cannot be clearly explained even to the least educated, if it is lucidly described.

There is no prettier sight than a battery of 75's in action, in the manner that we are doing it here. The four pieces are arranged in parallel, a dozen meters apart, the trail and the wheel-brakes solidly imbedded by the recoil in the cultivated ground of a beet field. Poor beet! . . . It is in the deepest hollow of a beet field that our four pieces are grouped; for to-day one delivers his fire no longer from crests, but from the deepest hollows of the terrain, where one cannot see the object at which one fires; for if *one* can see it, *one* can also be seen, one would not be screened (*défilé*). That is the great phrase for efficiency! To screen (*défiler*) one's self, to be screened, that is nearly the *alpha* and *omega* of modern artillery. In this strange art of hurling to a great distance masses of iron, ornamented with copper, upon one's adversary, the whole point, or nearly so, is that he should not know where to send his response. But, however, the battery needs an eye; that eye is the captain, who,

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placed on a neighboring eminence in a thicket or behind a bush, sees with his field-glass the target and regulates his fire by giving telephonic orders to his chiefs of piece. The gunner then does not as a rule see the object fired at; he has not the satisfaction of the cavalry or infantry, who see the men that they kill; masked as to the horizon, firing upon the invisible, receiving projectiles which fall from he knows not where, more than any one else he must have confidence in his chief, who alone sees and knows.

It is then by telephone that the captain gives his orders to the battery. In this respect, as in many others, war has modified the customary regulations, and one hardly ever sees, if indeed any one sees, battery signalling outfits, like the Chappe telegraphs which would be leather arms, and transmitting 100 meters or more, by its enormous and somewhat amusing movements of its arms—the directive thought of the chief. From the German school, we quickly learned to make use of the telephone, which certain short-sighted (*misoneistes*) technicians lately looked on with contempt. It must be admitted that, among the battery telephones, those which we have taken from the enemy are among the best. To-day there is no longer a battery which is not united telephonically with its outpost of observation, with its group, with its colonel, and when everything is at its best with the infantry support. All this makes an immense network, which runs along the entire front, bearing everywhere orders and information, synchronizing actions and, like long spider-webs which in the abandoned houses—alas, there are many such at this present moment—skirting (bordering) broken panes of glass.

Beside each piece is a caisson, clothed like itself with grey iron, lowered towards the ground and opening wide the sheltering blinds of its armory where, like bottles of old wine in a cellar, the glittering shells are arranged in their circular and deep chambers. The six special men (*servans*) are at their

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posts; upon the exact coördination of their movements depend the accuracy and rapidity of the fire: the two shell-bearers (*pourvoyeurs*) kneeling on the ground, each behind one of the armories of the caisson, the *déboucheur* between the two; they place continually the shells that they take in the *ogives* of the *débouchoir*. But I must here deviate a little, for it is to be feared that those of my readers who have not been artillerymen do not understand this jargon. This then is the *débouchoir* (explosion-regulator) and the use to which it is put. No one is ignorant that artillery projectiles are to-day of nearly a cylindrical shape terminating in an *ogival* point. Formerly they were round in form, and it is to be noted that in this respect they followed in their evolution the same road as the architectural style of churches whose arches, at first round in the Roman style, were elongated into an ogive in the Gothic. The projectiles of to-day then are Gothic, and the ogive which terminates them carries at its extremity the *fuse*. This latter is a little marvel of mechanism, which causes at the wished-for moment the explosion of the shell.

* * * * *

The exploding mechanism of the fuse is set in action by springs which act automatically at the instant of the starting of the shell and by a little powder-cord which burns from the movement of the shell and sets fire some seconds later to the powder-chamber placed at the base of the shell and causes it to explode. The number of seconds which elapse between the departure of the shell and its bursting depends entirely on the length of action of this little powder-cord. This is regulated at will by means of a channel that is cut in the fuse and which *debouches* it, that is to say places it at this point in direct communication with *amorçe* (flashing-powder) which inflames the powder-cord, without the need of burning the rest of it. The *debouchage* (time-cutting) of the fuse was formerly done by hand with cutting-pliers (*emporte-pièce*), and in accord with

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the captain's instructions. The *débouchoir* (fuse-setter) is a marvelous apparatus which the *déboucheur* (the fuse-setting operator) manipulates and which performs its work automatically with much greater accuracy and rapidity. In the German artillery they still cut their fuses (*déboucher*) by hand: they have no *débouchoirs* (mechanical fuse-cutters), which is one of the reasons of our superiority.

* * * * *

There are then two *pourvoyeurs* (shell-handlers) and a *déboucheur* (fuse-cutter) behind their caisson, all with unmoving bodies with hands only active; before them they have as a horizon only their caisson emptying little by little, near them German shells burst; intent on their mechanical work they do not stir save to fall when struck. . . . Beside them three serve the piece, the loader, the firer, the aimer. The first rapidly takes from the *déboucheur* the shell handed to him, and, solidly squatting on his widely separated legs, with a quick and energetic movement, which sows death, projects it into the breech which the firer has opened. Quickly this man shuts it with a click, seizes the firing-pin and lets it fall, then reopens the breech-block from which the cylinder of the shell is instantly ejected. At the beginning of the war we abandoned the cylinders on the field of battle; now, we gather them up carefully, not that we are like the Germans on the point of lacking copper, but because these cylinders are all ready to facilitate tomorrow more quickly the shells. During this time the aimer, who is the eye itself of the piece, bends over it to the left, his eye on the aiming glass, his hand on a screw or *manivelle* modifying according to the captain's instructions, or bringing back instantly the piece after the discharge to its previous position.

* * * * *

When well served we have fired thirty shots per minute from each piece.

Military Aviation

A STUDY PREPARED IN THE WAR COLLEGE DIVISION, GENERAL STAFF

I. INTRODUCTION

1. RELATION OF AVIATION TO THE MILITARY SERVICE

IN THIS paper it is proposed to consider various aeronautical appliances in regard to their practical value in campaign, as shown by such data as are now available from the theatre of war in Europe.

In its relation to the military service, aviation to-day may be regarded as embracing all aerial appliances, such as heavier-than-air craft, dirigibles lighter-than-air craft, and non-dirigibles or captive lighter-than-air balloons, together with the personnel necessary for their operation and management.

2. USE OF AIRCRAFT ON OUR COAST AND WITH OUR MOBILE LAND FORCES

In considering this subject account should be taken, first, of the use of aircraft of various types along and beyond the coasts and frontiers of the United States upon the outbreak of war; second, the use of aircraft in the Army by the mobile forces; third, the use of aircraft by our over-sea garrisons.

In addition to the battle fleet and units of the Navy designed to take the offensive on the high seas, the waters contiguous to the coast line of the United States are organized into naval defense districts. These cover certain sections of the coast line and contain patrol vessels, both surface and subsurface, and aircraft for reconnaissance purposes. These are essentially for the purpose of finding out and locating hostile vessels which are approaching the coast and of determining their strength, dispositions, and probable intentions.

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Added to the strictly naval formations included in the naval defense districts, in time of war the United States Coast Guard (in peace under the Treasury Department) passes to the control of the Navy.

The Coast Guard, in addition to its boats and revenue cutters which will be utilized as patrol vessels, embraces the Life-Saving Service. The latter has stations more or less regularly distributed along the coasts which are connected by telephone lines. They are also equipped with visual signaling appliances to communicate from shore to ships. The Navy maintains a chain of radio stations along our coasts and over-sea possessions.

The naval defense districts become of great importance in case that the main battle fleets are defeated or in case they are operating at a great distance. Therefore, when an enemy expedition breaks through the naval defense and approaches the coast with a view to forcing a landing the resistance to such an expedition becomes primarily a function of the Army.

The defensive formations of the Army consist of the harbor defenses and accessories and the mobile units. The harbor defenses consist of fixed and mobile gun defenses and mine defenses; also obstacles both on land and in the waters. The aircraft required in connection with the harbor defenses should consist of machines used for one or more of the following purposes:

(a) For reconnaissance—that is, to determine the strength, dispositions, and probable intentions of the enemy.

(b) For preventing hostile aerial reconnaissance.

(c) For destroying hostile aircraft and for offensive work against enemy submarines and other vessels, including the interruption of enemy mining or countermining operations.

(d) For aiding in spotting the fire of Coast Artillery, both against ships and against any invading force that may invest the seacoast fortifications.

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The number and character of the aircraft required depends on the locality, number of harbor defenses, their organization, strength, and positions. Each harbor-defense area, therefore, needs to be studied with this specific end in view, and should have radio apparatus not only for communicating with the Navy but also for communicating with its aircraft and with the units of our mobile forces.

In addition to the aircraft required with the harbor defenses themselves, aircraft are required with modern movable coast-defense armament employed as an auxiliary element of the mobile forces in defending the intervals between our fortified harbors and with units of the mobile forces.

The use of aircraft with the mobile units is a definite matter; each division requires one squadron of twelve aeroplanes. These are divided into three companies of four aeroplanes each, two companies having reconnaissance and artillery observation machines and one company having two high-speed machines especially constructed for long-distance reconnaissance and for combating the enemy's aerial craft; two battle machines for the purpose of bomb dropping and offensive work against enemy material of all sorts. This is in keeping with the best practice that has been developed in the European War.

3. USE OF AIRCRAFT AT OVER-SEA STATIONS

The use of aircraft with the Army in the over-sea possessions is analogous to that mentioned above with the harbor defenses; and in addition, wherever mobile units of the Army happen to be, they must be provided with suitable aircraft. The defense of over-sea possessions constitutes a problem in itself, and these garrisons must be equipped not only with machines capable of reconnaissance over land, but also with those capable of operations over water, with the power to alight in water—that is, hydroaeroplanes.

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The type of machine to be used necessarily depends on the locality; for instance, in Hawaii practically all of the military machines would need to be hydroaeroplanes; in the Philippines and Panama a great proportion of them. To the Coast Artillery troops in the United States proper and in the districts around the Great Lakes the same considerations apply. It is believed that the main principles enunciated above should be followed, and that an estimate of actual machines and material, both heavier and lighter than air, should be made for all places.

II. GENERAL TYPES OF AIRCRAFT

4. CAPTIVE BALLOONS

For over a century captive balloons have been used by the armies of all the leading military nations. Their function has been one of observation, that is, to see what those on the ground were unable to see. They have therefore proved a useful means of observing and reporting the effects of artillery fire. Electrical means of communication greatly enhanced the utility of captive balloons, as it made communication instantaneous from car to ground instead of by the older way of raising and lowering written messages by ropes. In clear weather and on favorable terrain captive balloons are able to distinguish different branches of the service at a distance of 16,000 yards or about nine miles. With the best glasses at the present time the field of observation is said to extend to 20,000 yards. In general, captive balloons of the "Sausage" or "Drachen" type are used by all the armies of the great nations. Along the French-German front in northern France these balloons are used in great numbers all along the lines. Their function is to observe the fire of artillery and keep watch of all movements of hostile parties within their field of view. They are connected by telephone directly with the batteries whose fire they are observing and with the headquarters to which they are attached.

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In many cases the captive balloons work in conjunction with aeroplanes. The aeroplanes by flying over the terrain where the hostile targets are located find out the exact position of those which the captive balloons have been unable to locate by themselves. When by means of signals the locations of the targets have been indicated to the observer in the captive balloon, the aeroplanes proceed to other duty. Aside from the use of the captive balloons in conjunction with aeroplanes, their duties are practically the same as they have been for many years or were in our own Civil War. Free balloons such as were used from Paris, for instance, in 1870, are now a thing of the past, their place having been taken by the aeroplane or the dirigible airship. All military captive balloons are now so constructed that their undersurface acts like a kite, thereby making them steady in a strong wind. To keep the envelope distended properly in the face of the wind, a wind sail is provided so as to transmit pressure to the rear part of the envelope by means of the wind itself. Captive balloons are used not only with the field forces, but also are especially useful in fortress warfare. The organizations which handle these balloons consist ordinarily of some 4 officers, 72 men for each balloon section.

5. DIRIGIBLES

The term dirigible, as applied to aeronautical appliances, signifies a lighter-than-air craft, which is equipped with engines and propellers capable of moving it from place to place. Dirigibles may be roughly divided into three classes: Non-rigid, or those whose envelope can be entirely packed into a small space when deflated, and that have no rigid framework of any kind; semi-rigid, or those that have a stiffening for a part of their length in order to enable the envelopes to maintain their shape to better advantage than the non-rigid; the rigid, which have a framework for the whole envelope that maintains itself continuously. All have been tried for the last fifteen years.

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The non-rigid types have not given very good results, as they are too much dependent on the weather, due to distortion of the envelopes; the semi-rigid have given some satisfaction and have been largely employed. The advantage of the semi-rigid types is that they may be packed for shipment and reassembled much more easily than the rigid types; they can be deflated quickly and, consequently, are not so subject to complete destruction as the rigid types when anchored to the earth. On the other hand, they are not able to develop the speed that the rigid types, such as the "Zeppelin," are capable of.

Dirigibles and aeroplanes are frequently compared with each other as to their utility in general. As a matter of fact, they are two entirely different military accessories and are as different in many ways as is a captive balloon from an aeroplane. Dirigibles are able to stay in the air at any height for long periods of time. They are capable of running at reduced speed, can hover over localities for minute observation and to take photographs. They are able to carry several tons' weight in addition to their passengers and crew. From the fact that they are able to remain stationary over a given place they are able to launch their projectiles with greater accuracy. Dirigibles in the present war have been used both over land and sea. At sea they have carried out reconnaissance, have acted offensively against hostile submarines, have accompanied transports in order to observe the approach of hostile craft, have been used in mine laying, stopping and examining hostile merchant vessels at sea, and for bombarding hostile localities. The airships which have made the longest trips and developed the greatest efficiency thus far are the German "Zeppelin" rigid-frame type. These have repeatedly flown over England at a distance of at least 300 miles from their base, and have nearly always returned in safety. Some have been lost, however. Aeroplanes appear to be unable to cope with them at night. While dirigibles have not proved themselves to be a determining factor in combat, either on land or sea, they are being developed to the

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greatest extent possible, especially by the Germans, who have dirigibles of very great size. The principal features of this type are a rigid framework of aluminum, a number of drum-shaped gas bags, and a thin outer cover. Although the details of construction are not definitely known up to date, their length is about 485 feet, their volume about 900,000 cubic feet, their total lift over 20 tons, and their useful lift about 5 tons. They are driven by four motors of a total horsepower of about 800, which is applied to four propellers. Their speed is from 50 to 60 or more miles per hour and a full-speed endurance of over 100 hours, or more than 4 days. It is therefore evident that in good weather these airships have a radius of action of from 5000 to 6000 miles. Moreover, they are being constantly improved, and are probably capable of crossing the Atlantic Ocean. Crews of from 10 to 20 men are required for their operation; they are armed with bombs of various sorts, light guns, and are equipped with searchlights. They carry very efficient radio apparatus, which have equipments for determining the directions from which radio impulses are being sent. In this way they are able to locate themselves at night or in foggy weather when the ground is invisible. They require very large and expensive hangars, gas plants, and equipments for their operation. When forced to make landings outside of their hangars, on account of their bulk, they are very difficult to handle in hard winds, and are liable to destruction thereby.

The best of the non-rigid and semi-rigid airships have a capacity of more than 800,000 cubic feet, a maximum speed of 50 miles per hour or less, and a full speed endurance of about 24 hours. As mentioned above, their great asset is extreme portability and cheapness as compared with the rigid type.

6. AEROPLANES

Heavier-than-air craft made their appearance as military agencies in 1908, when the Wright brothers demonstrated thoroughly their possibilities in this respect. While many of the

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salient features of heavier-than-air machines had been worked out years before, it remained for the internal-combustion engine to really make mechanical flight possible. The military possibilities of aircraft of this description were appreciated immediately by the great nations. Large appropriations were made at once, notably by France and Germany, for their development. At first England was slow to take up the matter, but in 1912 had gone at it thoroughly and was spending large amounts of money for their development. Italy, Russia, Japan, and the smaller nations of Europe and South America made liberal appropriations for obtaining the material and developing the personnel. Aeroplanes were used in a small way during the Italian campaign in Africa during the Balkan-Turkish War, and during the Balkan War. These nations had very little equipment and very few trained flyers. Wherever the aeroplanes were given the opportunity, under average conditions they rendered efficient service in reconnaissance.

7. TYPES OF AEROPLANES

We now find aeroplanes consisting of three principal classes: (a) Scout or speed machines; (b) reconnaissance aeroplanes; (c) battle machines. The first are used for distant reconnaissance and combating the enemy's aircraft, the second for ordinary reconnaissance and the observation of fire of artillery, and the third for the destruction of enemy's material, personnel, or equipment.

8. REQUIREMENTS OF VARIOUS TYPES OF MACHINES

Great advances have been made since the war began in all these machines, all the details of which are not yet available. The following table, which appeared in the London Times of February 19, 1914, gives the approximate requirements of each type of machine at the beginning of the war. These general characteristics are still desired, but the radius of action and the speed have been considerably increased:

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PERFORMANCES REQUIRED FROM VARIOUS MILITARY TYPES

	Light scout.	Reconnaissance aeroplane (a)	Reconnaissance aeroplane (b)	Fighting aeroplane (a)	Fighting aeroplane (b)
Tankage to give an endurance of	300 miles	300 miles	200 miles	200 miles	300 miles
To carry	Pilot only	Pilot and observer plus 80 pounds for wireless equipment.	Pilot and observer plus 80 pounds for wireless equipment.	Pilot and gunner plus 300 pounds for gun and ammunition.	Pilot and gunner plus 100 pounds.
Range of speed	50 to 85 miles per hour	45 to 75 miles per hour	55 to 85 miles per hour	45 to 85 miles per hour	45 to 75 miles per hour.
To climb 3500 feet in	5 minutes	7 minutes	10 minutes	10 minutes.	8 minutes.
Miscellaneous qualities	Capable of being started by the pilot single-handed.		To land over a 30-foot vertical obstacle and pull up within a distance of 100 yards from that obstacle, the wind not being more than 15 miles per hour. A very good view essential.	A clear field of fire in every direction up to 30° from the line of flight.	A clear field of fire in every direction up to 30° from the line of flight.

Instructional aeroplanes with an endurance of 150 miles will also be tested under special conditions; safety and ease of handling will be of first importance in this type.

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9. AEROPLANE ENGINES

As to material, the most important consideration in aeroplane construction has been the engine. Without excellent engines the best aeroplanes otherwise are of no service; in fact, may be a source of danger. In the countries where aeroplane development has made the most progress large prizes have been given for the development of suitable engines. At the same time, research and experimentation have gone on along this line at Government plants. Engines require frequent replacement. In fact, it is reported that after 100 hours in the air engines are "scrapped" and new ones installed. The plan found to give excellent results for the development of material is for the Government to have stations where experimentation along all lines is carried on. On the data furnished by these establishments specifications are made up for the construction of aircraft by private individuals and civil manufactories. If any parts, such as the engines mentioned above, need additional development, prizes are offered to stimulate construction and progress.

III. FUNCTIONS OF AIRCRAFT

10. HEIGHT AT WHICH AEROPLANES MUST FLY

It was soon found out that to escape the fire of small arms a height of about 4000 feet above the ground had to be maintained. As soon as balloon guns were created this height had to be increased to 6000 feet, at which height it is now necessary to fly in order to be reasonably safe from being hit by hostile projectiles sufficient to bring the machine down. At this height, 6000 feet, small details of the terrain and small detachments of troops or material are very difficult to distinguish. On the other hand, large columns of troops, trains, railways, bridges, artillery firing, and sometimes in position, defensive positions of large extent, and things of that nature can be

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readily distinguished. Whenever it becomes necessary for the aircraft to fly at a lower altitude than 6000 feet the chance of destruction by gunfire must be considered.

11. STRATEGICAL RECONNAISSANCE

Reconnaissance of this kind is strategical in its nature, the tactical reconnaissance of particular localities is still carried out by troops or captive balloons. In fact, it may be said that all strategical reconnaissance is now carried on by aircraft. The reconnaissance is carried out by an officer who requires considerable experience in order to be able to distinguish objects on the earth and assign to them their true military value. The pilot is either an officer or noncommissioned officer. The observer is always a trained tactical officer, because in reconnaissance of this nature an untrained person can not interpret the military significance of what he sees.

12. PHOTOGRAPHY FROM AEROPLANES

Photography is utilized to the greatest extent possible in aerial reconnaissance. The devices are so arranged that they are capable of taking one or a series of views of a particular locality. The plates or films thus made are rapidly developed and are thrown on a screen by means of a stereopticon, when all details are magnified to any extent desired and details invisible to the naked eye are brought out plainly. These details are then entered on the maps of the officers concerned. As the height at which an aeroplane is flying can be taken from the barograph, and as the focal angle of the lens of the camera is known, a scale can easily be worked out and the views form good maps of the terrain photographed.

13. AEROPLANES AND ARTILLERY

In addition to reconnaissance in general, aeroplanes have taken their place as a fixture for observing the fire of artillery. Due to the degree of concealment which artillery is now given,

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it is impossible to determine its location from the ground. The aeroplanes first pick up the targets, report their location to the field artillery, and then observe the fire of the batteries. By means of prearranged visual signals or radiotelegraphy the aeroplanes are able to indicate to the artillery where their fire is making itself felt. If artillery is insufficiently provided with aeroplanes, it is well established that an enemy so provided has an overwhelming advantage.

14. CONTROL OF THE AIR

For this reason, among others, attempts to gain "control of the air" are made by belligerents at the inception of hostilities. This takes the form of offensive action by aeroplane against aeroplane. For this purpose machines known as "speed scouts" and "battle aeroplanes" have been developed. All the great European nations are now equipped with them. The only way in which enemy aeroplanes can be effectively dealt with is by aeroplanes, because they are difficult targets for gunfire from the ground. To gain control of the air a great preponderance in number and efficiency of aircraft is necessary. So far in the European War, unless one side had a greatly preponderating number and quality of aeroplanes, they have been unable to obtain and keep control of the air. An excellent instance of obtaining control of the air seems to be furnished by the Austro-Germans when they initiated the campaign against the Russians in May, 1915. In this instance complete control of the air appears to have been obtained. The results to the Russians were disastrous because the Austro-Germans were able to fly at will wherever they wanted to, could pick up the location of the Russian masses, and make their movements accordingly, entirely unobserved by the Russians. In the fire of their artillery they had the advantage of being able to locate the Russian guns and observe their own fire, while the Russians were powerless to do so.

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In an article on "Recent Progress on Military Aeronautics," published in the *Journal of The Franklin Institute* for October, 1915, Lieut. Col. Samuel Reber, Signal Corps, United States Army, sums up the question of machines for control of the air as follows:

Experience has developed three types of aeroplanes for military purposes: The first, the speed scout, for strategical reconnaissance, a one seater, with a speed up to 85 miles per hour and radius of action of 300 miles and a fast climber, about 700 feet per minute; the second for general reconnaissance purposes with the same radius of action, carrying both pilot and observer and equipped with radiotelegraphy, slower in speed, about 70 miles per hour, and climbing about 500 feet per minute, and in some cases protected by armor; the third or fighting craft, armored, and carries in addition to the pilot a rapid-fire gun and ammunition and so arranged as to have a clear field of view and fire in either direction up to 30 degrees from the line of flight, the speed to run from 45 to 65 miles per hour, and the machine to climb about 350 feet per minute.

15. SURPRISE MOVEMENTS

It is often said that due to the use of aeroplanes surprises are no longer possible. Generally speaking, this is so, providing both sides are equally well equipped with machines and weather conditions are favorable. If, however, complete "command of the air" is obtained by one side, the chances of surprising the enemy are greater than they have ever been before.

16. BOMB DROPPING

In addition to their functions of reconnaissance, the observation of the fire of artillery, and the combat of hostile machines, both heavier and lighter than air, much time, thought, and ingenuity have been given to the subject of dropping projectiles. Bombs of various sorts weighing from a couple of pounds to 50 pounds have been tried. The most common ones weigh from 15 to 35 pounds. At the height at which aeroplanes are required to fly it is extremely difficult to hit an object with any certainty. Various devices have been used and tried for

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this purpose. The factors of height, speed, and wind, are almost impossible to compensate for entirely, up to the present time, so that consequently bomb-dropping in general or the launching of projectiles of all kinds from aeroplanes has not attained great results insofar as the actual destruction of material or personnel is concerned. Advances along this line are constantly being made, however, but progress is slow. A special type of aeroplane has been developed for dropping bombs and battle purposes. For bomb attacks on any locality these machines are sent in flotillas of from 30 to 60 machines, each of which is provided with from 5 to 10 bombs. They go to the locality and circle over it, dropping their projectiles. Against railways, roads, bridges, and hostile parks of various kinds, this method of attack has given considerable success.

IV. ORGANIZATION OF AEROPLANE UNITS

17. TACTICS OF AEROPLANES

As to tactical use aeroplanes seem to be approaching methods similar to those used by a navy. That is, first the speed machines reconnoitre to the front; they are followed by the battle machines, which in their turn clear the way for the reconnaissance aeroplanes; those assigned to the artillery stay right with their guns. Fortresses, harbor-defense works, and naval formations require special organizations of aeroplanes, some or all of which may be operated from the water. The organization, kind, and number of the machines and personnel required for this particular service depend on the special locality and mission of whatever formation the aircraft are to be attached to.

18. DEVELOPMENT DURING EUROPEAN WAR

The use of aeroplanes is gradually being developed from experience in the European War. Organization has been found to be one of the most important considerations; in general the organization has been into squadrons. The squadron is

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a tactical and administrative unit. It has a personnel consisting of pilots, observers, bomb droppers, mechanics, chauffeurs, and drivers. Flying personnel has to be developed in the military service. Unlike chauffeurs, for instance, there are few in the civil population who can be drawn on. The few who fly are demonstrators, exhibition flyers, or sportsmen. They are very few in number and scarcely a military asset. In France the squadrons usually have six machines and two spares. They have the same organization of depots of resupply that other units of the armies possess. The squadrons usually consist of complete units of one kind of machine; that is, speed, reconnaissance, or fighting. These squadrons are usually assigned to an army, or more if the machines and personnel are available.

In general an aeroplane requires for its operation a personnel of 1 pilot, 1 observer, and 2 enlisted men, mechanics, chauffeurs, etc.

In England 12 machines of different classes are assigned to a squadron.

19. ASSIGNMENT OF AEROPLANES TO ARTILLERY

Many are of the opinion that machines with the personnel to operate them should be assigned permanently to artillery regiments, so that they would be immediately available whenever action is required by the artillery. If they have to be obtained from a higher headquarters valuable time is often lost. It is believed that before long aeroplanes will be assigned permanently to regiments of artillery.

V. DEVELOPMENT OF AERONAUTIC PERSONNEL

20. GENERAL LINE OF DEVELOPMENT IN EUROPE

In the development of their aeronautical personnel all nations have worked more or less along similar lines. At first these detachments were attached to the engineers. All the

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pilots and observers were officers, while the mechanics and others were enlisted men. As the science developed and more and more machines became necessary the importance of this branch constantly increased until eventually it formed a separate arm of the service.

Instead of officers only being employed in the flying of the machines noncommissioned officers began to be used as the pilots.

21. OFFICER-OBSERVERS AND NONCOMMISSIONED OFFICER-PILOTS

The observers were either trained staff officers or officers of particular branches when the reconnaissance being made especially concerned a certain branch. For instance, in the observation of artillery fire an artillery officer, for the inspection of a demolished bridge over a great river an engineer officer, or for the observation of the tactical or strategical dispositions of an enemy's troops a staff officer. Noncommissioned officers are now very generally used as pilots. All countries now at war have found that they have places for all the trained pilots they can possibly obtain. In general the units are commanded by officers and a certain number of the pilots are officers, but the bulk of the piloting is done by enlisted men, while the officers are carried as observers.

22. LOSSES TO AERO PERSONNEL IN WAR

The losses to the flying personnel in war, when equipped with proper machines, seems to be less than that of infantry, cavalry, and artillery in the order named.

Motor Transport in Campaign

STUDY PREPARED IN THE WAR COLLEGE DIVISION, GENERAL STAFF

I. INTRODUCTION

THE past fifteen months of war have resulted in verifying in every respect the predictions of military writers of late years. All pointed out that nature and science would be called upon to serve mankind in many practical ways, and that achievements then (at the time of writing) in their infancy would, under the stress of war, develop into aids which would be found to be of far-reaching importance.

Such of these predictions as relate to the use and application of motor transport have been found to be correct, and this is shown primarily through its improvement and development, but lastly by the fact that it has become absolutely essential to the efficient prosecution of a campaign.

1. GENERAL CONDITIONS OF EMPLOYMENT

Modern weapons of offense and defense, such as large-calibre mobile artillery, the machine gun, and the aeroplane, have exercised a marked and direct influence on combat in general. Strategy has been affected by the altered conditions affecting the battle, and even the conduct of an action has been influenced. Along with the use of motor transport, which altered the aspect of warfare, both in countries with good highways and in those which lack them, comes a speeding up of the rate at which military operations can be conducted. The strategic mobility of troops has been increased, and this fact will bring about greater ease in the grouping of forces for the battle.

Indirectly they promote "the independence of the troops of their lines of communication, by facilitating the bringing

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up of supplies and by creating possibilities for concentration and movements which did not formerly exist. Commanders acquire thereby greater freedom of action."

It must not be assumed, however, that the methods of warfare have been revolutionized through the use of motor transport. When the war is over and the newspapers have ceased to announce in big headlines the wonderful achievements of this type of transport, we shall undoubtedly find there are many limitations to be placed on its use. However, there is no doubt that it has aided in a remarkable way the supply and transport of troops.

What may have been found feasible on the western front might not have been found possible in the plains of Galicia and Poland. Difficulties connected with the repair and supply of fuel have limited the use of this transport in a number of cases, but no definite rule can as yet be deduced from the special cases which are set forth in the press and in the popular magazines.

2. VARIOUS TYPES EMPLOYED

The history of the present war indicates conclusively that all attempts to employ a special type of car or truck for service have ceased. The type of truck or car ordinarily in use in the particular theatre of operations before hostilities offers the most adaptable and suitable transport for war in that theatre.

In France no attempt has been made to use any particular type of either automobiles or motor trucks, but the Government has taken what it could get from the principal manufacturers. As far as possible, endeavor is made to have all the motor trucks of each army the same make.

Various American trucks have been found excellent in every way, and a light chassis for ambulances is rendering the best service. These can go where heavier vehicles in many cases could not pass, and where they would only encumber the road.

It seems to be generally conceded abroad that the trains

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corresponding to our field and combat trains should be horse-drawn, while the division, corps, and army trains are best constituted of motor transport. There are to be found some exceptions to this rule, but, generally speaking, the official reports are a unit in this respect.

3. MOTOR TRUCKS—USES, CAPACITY, PERSONNEL

The corps trains, for instance, in the French organization correspond to our divisional trains (supply, ammunition, sanitary, and engineers' trains), have in part been replaced by motor vehicles. The supply train still remains animal-drawn, with the exception of that part of it engaged in taking forward beef from the slaughtering points to the regimental train (their meat wagons). The ammunition train remains equipped with animal-drawn caissons. As previously explained, these caissons must often pass off of the metalled roads and travel through fields so as to supply combatant units. Ammunition is pushed up much closer to troops by auto trucks than was the case in previous wars. The *étape* or link therefore to be covered by the caisson is not as great as it used to be. However, the expenditure of artillery ammunition is much greater than was ever contemplated, and the saving of the road space in the length of the *étape* or link has been more than compensated for in the additional number of trips these vehicles must make. The very large calibre guns are not assigned to the corps, but are part of the army artillery. The size and weight of the ammunition of some of these guns make it practically necessary to replace their ammunition by motor trucks. These guns themselves are so heavy as to make it necessary to carefully pick out the ground over which they are taken into position. They are not mobile in the sense of the guns with the corps and some of the lighter type of heavy guns with the army. Their position is also such as to make their re-supply in ammunition much simpler than the smaller guns.

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The sanitary trains have been greatly supplemented by the attaching of automobile ambulances directly to these trains, in addition to the animal-drawn units. Although not known definitely, it is believed that some of the animal-drawn elements of this train have been suppressed. The more rapid evacuation of the wounded by automobiles and the distance the automobile can cover has cut down considerably the number of "ambulance immobilizé" (field hospitals) with the corps.

It has been ascertained that to-day the number of automobiles of different classes with the different armies varied somewhere between 2500 and 4000 with each army. Aside from the touring cars assigned permanently to different headquarters and the auto trucks and ambulances assigned to the corps and those assigned to special service, such as the aviation service, etc., the balance are attached to the army. They form what might be called the automobile convoy of the army, and they are either temporarily assigned for certain specific work to corps and divisions or are used in pushing supplies and material forward to troops from railheads. The formations of the different "parks" attached directly to the army correspond generally to the formation laid down in our Field Service Regulations for Columns. It is believed that after the war is over and as the auto truck develops in efficiency that the effort will be made to reduce the size of trains with the divisions and corps, and by means of what we call "columns" to push supply and evacuating points closer up to the troops. The English have perhaps gone further in this particular to-day than the French, but it is thought that, with a well-trained personnel and efficient direction, the results that would obtain under this system would be better than the old.

Any intelligent person can foresee that at some future time animal-drawn vehicles with an army will disappear. However,

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to-day, when roads are not good and when from one reason or another certain vehicles supplying troops must pass off these roads into the field, the animal-drawn vehicle still has its advantage and must of necessity be retained.

In France the roads are excellent and are well kept up. In the Vosges a number of new roads are being constructed. These latter roads are all permanent and beautifully installed.

Notwithstanding these fine roads in France, the combat and field train of combatant units in their entirety, as well as a large portion of their corps train (our division trains), remain animal-drawn.

There seems to be no doubt that when we consider the road conditions in our possible theatre of operations we will not be able to change to the motor truck until a much later date than the European army. This will undoubtedly be the case, unless a great advance is made in automobile construction. While the authorities always have been great believers in auto trucks and are satisfied that in time of war we will have need for them in the thousands, it is believed that the development of an efficient auto truck for combat and field train purposes goes hand in hand with the development of an efficient farming auto truck. When an auto truck has been developed that will bring in the average farmer's crop from his fields we will have an efficient auto truck for combat and field train purposes.

One of a great number of uses of auto trucks to-day is to move troops promptly into a threatened sector of the line of trenches. In one operation each division had temporarily under its orders fifty auto trucks for moving troops. These trucks were kept with the reserves. Each truck could carry twenty equipped infantrymen. By the use of these trucks and within a very few minutes 1000 men could be loaded and moved to the threatened point. With this load and moving at the rate of about twelve kilometers an hour, it would not take long to commence throwing in reserves. These were only a few of the

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auto trucks that the army had. If the situation became more serious, then additional trucks could also be used for the same purpose.

There is no question but that in other theatres of war, when a war of manoeuvre has been carried on, these trucks have been used to carry troops on raids accompanying cavalry. The supply trains with cavalry have also been made up of the transport.

The animal-drawn army trains or grand parks, except certain vehicles of the artillery and engineers, have been entirely done away with and their work done by the army automobile convoy.

On the line of communication and in the zone of the interior practically all the transportation in general use is motor-drawn.

The escort wagon has somewhat the same drawbacks as an auto truck when it comes to moving off the roads and in the fields. During this war certain troops could not have held positions had they not a vehicle of re-supply that was capable of getting off a road covered by hostile artillery fire and passing through fields under cover to near the troops. It is believed that we should give some serious study to the working out practically of this question of a suitable type of combat train wagon.

The heavy auto-truck companies are often supplied with trailers, the trailer having the same carrying capacity as the truck. This type usually carries three tons, but for all-round service a one and one-half-ton truck has been found most acceptable. The use of trailers, however, must depend upon road conditions, and where good road conditions do not exist the strain on the truck is so great as to render the use of the trailers with the truck not advisable.

The number of auto trucks is usually fixed by the number of vehicles required to transport either one day's rations for a corps (125 tons) or two "lots" of ammunition, infantry and

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artillery (160 tons). The trucks are expected to make 12 miles an hour and to be able to travel about 100 miles a day.

The personnel with an auto-truck company varies, but it is not far from the organization prescribed for our motor-truck companies.

The use of motor transport has reduced, by many men, the personnel of the service of supply, thus releasing a greater number of men for the firing line. In the past, during some wars, the number of men required behind the lines was equal, if it did not exceed, the number of fighting men.

4. AUTOMOBILE PARKS

The extended use of automobiles of every type in the present war has created some new problems, one of the most important being the maintenance of the various motor wagons in a condition for service. Although the reliability of motor cars has been enormously improved in recent years, they, more than most machines, are subject to many ills and troubles.

Motor-car troubles may be conveniently grouped under three heads: Ordinary road troubles, such as can be repaired by chauffeurs or mechanics with the simple tools and repair parts carried for this purpose; second, more serious troubles, which call for shopwork; third, very serious troubles, which call for factory work.

In order to meet satisfactorily the second class of troubles, those calling for shopwork, recourse is had to the organization of so-called automobile parks, one for each field army. Like many other features of the present war, the automobile park is a new creation called for by the emergency of the situation. The number of automobiles of all kinds assigned to the field armies varies according to the conditions, such as size and extent of front of the army, character of country as regards available roads and railroads, etc. The automobiles assigned to each

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army are numbered serially, and by observing the numbers noted at different times and places a fair idea of the number of machines belonging to a field army may be obtained. This number averages not less than 2500 per field army, including both passenger and freight autos. It is evident that with so large a number of machines constantly doing hard service there will be need for some organized and controlled scheme for repairs. This is the task of the automobile park.

In a populous region where position warfare has obtained for some time the problem is easy. Existing garages or machine shops in conveniently located towns afford all necessary requisites for an automobile park and permit of undertaking repairs on a large scale. On the other hand, where field warfare has been the rule and where large industrial towns and villages are lacking, the problem is more difficult, requiring, in the first place, that the repair park have a certain amount of mobility and also that it carry along its equipment and appliances. Under these conditions the repairs that can be undertaken in the field are more limited.

Supposing a field army to be established in some garrison camp, its personnel would be housed in the barracks of the peace garrison. If no suitable buildings were available for shops and garages, suitable light-frame structures are erected, arranging the buildings by centering the repair departments around the sides of a rectangle, with open sheds in the centre for housing machines repaired and awaiting repairs.

The various shops are a carpenter shop, painting and glazing shop, machine shop equipped with power lathe, shaper, emery wheel, drill press, etc., a vulcanizing shop, a blacksmith shop, and an oxy-acetylene welding outfit. The latter is a most useful affair, enabling broken parts of steel, brass, and even aluminum to be welded together. There is also a small printing shop for printing various blank forms used by chauffeurs in recording car performances. A large stock room containing

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spare parts of all usual makes of automobiles forms part of the park and enables repairs to be made very quickly.

About 200 cars are usually on hand at the park, some pretty bad cases among them, including several which had suffered from shell fire. With appliances available quite serious repairs can be undertaken without returning cars to factory. A supply of repaired cars in running order is maintained from which issues can be made in exchange for cars turned in for repairs.

The personnel of the park consists of one captain, taken from the railway regiments; two lieutenants, one from the cavalry and one from the artillery; and about 400 men drawn from recruit depots, and most of them skilled workmen.

5. THE ARMORED CAR

The weak point in the comparatively heavy armored car lies in its dependence on the condition of the road and its helplessness before ordinary obstacles, such as ruts and ditches. It has its uses, however, under the conditions noted in the following remarks:

In the German invasion of Belgium * * * motor vehicles apparently played an enormously important part in enabling the enemy to push forward more rapidly than he could have done had he had to depend entirely on his cavalry. The armored car early proved its value for this sort of patrol work. It exercised another influence on the cavalry arm, in that, by expediting the rate at which it was possible for the invader to push forward, it placed correspondingly a greater strain on the mobility of cavalry, and to that extent used up the horses of the enemy at an additional rate, as instance the extremely ill condition into which they got last autumn.

Thus in this connection the advent of the motor vehicle to modern warfare made possible operations beyond the scope of cavalry unaided, and at the same time put a greater strain on that arm. It has also speeded up the movement of the main armies, because, unlike horses, motor vehicles do not tire during the spells in which it is possible for men to work them.

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6. MOTORCYCLES

These have generally proved unsatisfactory, and for messenger and orderly service they have been replaced by the light motor car. Light 4- or 5-horsepower, two-passenger cars, like the Bébé Peugeot and the Zebre, can go almost anywhere.

In some newspaper reports and in letters from the front rumors of the use of a large number of motorcycles to move troops occur, but no verification of this has ever been received through official channels.

Based on these reports an organization of a large number of motorcyclists has been proposed, with a view to their use in place of cavalry. Notwithstanding the comparative invisibility of the motorcycle and its individual adaptability to a varied terrain such a plan appears unfeasible. In the first place the men would have to be trained as soldiers before they can become military cyclists, and, in the second place, no teamwork of the mass could be assured without some training of the whole as a body.

Companies for duty at army corps or division headquarters are feasible, but it is not believed that large bodies can operate with the same ease as cavalry. It is safe to assert that during operations in Courland a motorcycle corps of 60,000 could not have replaced that amount of cavalry or have done the work expected of them.

7. USE IN COUNTRIES HAVING FEW ROADS

Perhaps the phase which has most vividly brought home the change wrought by the advent of the motor in the conduct of military operations has been its employment during the campaign against De Wet.

The average mind can here appreciate the advance made by the present-day methods of warfare, as the scene was identical in nature with that of fifteen years ago, when something in the neighborhood of a quarter of a million British soldiers were

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engaged in rounding up De Wet and his Boers. There is, however, this difference, that, while the numbers concerned were much smaller than in the campaign referred to above, the uprising led by De Wet was in the nature of a surprise, which made the mobilization of the necessary troops and the accumulation of supplies impossible in advance of the emergency. The hostile Boers in this instance had precisely the same mobility which enabled them to elude the British troops so easily fifteen years ago.

The difference in the later campaign is shown by the fact that motors were employed instead of horses and horse-drawn transport.

But these cars were not built for military use, being merely machines owned by members of the Johannesburg Automobile Club, many designed for use only on roads as we understand them in Europe. The work in hand, however, required that the cars should be driven across country in all manner of directions, over the veldt where there chanced to be neither road nor track, and across the beds of rivers.

Moreover, the vehicles usually carried something more than the normal load. Scarcely two cars were of a kind or model. Thus, from the point of view of military service, it would have been impossible to select anything in the way of motor vehicles less suitable for the task. Of course, many of the cars broke down, as they are breaking down every day in the war area in Europe. But the thing that counted was that more cars got through than fell out of the running, while of those that failed it must be observed that up to the point at which it broke down each assisted to keep the enemy on the run. To that extent it did its work toward rounding him up.

8. AMBULANCES

Motor traction has worked wonders in this war with the food and ammunition supply, yet in each one of these services the final stage is still made by horse-drawn vehicles. However,

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under the existing conditions of trench warfare the sanitary service has gone even further and has supplanted all slow-moving horse-drawn vehicles by light and efficient motor ambulances.

The motor ambulance is the machine for which the ordinary pleasure car chassis, unaltered, has proved most suitable. The provision of these ambulances has undoubtedly contributed enormously to the saving of life and suffering. But the best of them scarcely begins to realize the possibilities of a motor vehicle for this service in regions in which roads are either lacking or are torn up as a result of warfare. They are no longer using ambulances having the excessive overhang so common among those presented at the beginning of the war. But that is only a slight improvement, for even to-day the driver of the average motor ambulance sits in the best swung position. At least part of the patient's body as he lies flat—usually the feet and the lower part of the legs—projects behind the back axle.

Nor should motor ambulances have too long wheel bases, because it is often necessary to turn them in brief compass. Obviously the driver should not be placed where he sits in an ordinary touring car or town carriage. If the motor must be accommodated in the same part of the chassis, then the ambulance driver and the attendant seated beside him should be placed above the engine, as they are in certain types of French and German motor buses.

This arrangement would enable the best part of the chassis ordinarily occupied by the driver to be used by the patient, the whole of whose body could accordingly be brought well between the two axles. There is nothing to the speed at which these ambulances have to be driven that would render it undesirable to accommodate driver and attendant above the motor. Nor is this all, for the present system of springing is at best a mere

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combination of makeshifts, in that all springs are the results of building up laminations of steel plates.

Each spring so built up can give the smoothest riding only at certain vibrations and certain loads, whereas the whole point of having a motor vehicle for any sort of service is that you can use it either with full load, with part load, or without any load; also that you can drive it over any sort of surface at any speed of which it is capable, from the slowest to the fastest. No form of laminated steel spring can therefore be quite suitable for the purpose. Possibly pneumatic suspension will prove a successful solution of the problem.

These motor ambulances, under cover of darkness, come right up to the dressing stations and evacuate direct to the clearing stations, which are back at corps headquarters in some suitable building. It is due altogether to these swiftly moving ambulances that wounded can be forwarded to the base and finally to England. A man, if wounded in the forenoon is out of luck, but the man wounded in the afternoon may reach a hospital in England before his name reaches his corps headquarters as among the wounded.

9. FUEL

Sufficient data do not yet exist from which we can state definitely the various kinds of fuel employed. Among those mentioned are alcohol, benzol, kerosene, and gasoline. Shortage in gasoline and increase in the price will undoubtedly cause a search for a new fuel. Its arrival is certain, as there has never been a crying demand for any improvement without an answer from the engineers and inventors. Improved carbureters and lighter cars show, in a way, the line of advance of improvements.

With the export demand, the war, and the domestic demand, there does not seem to be much thought of lower prices for gasoline. While kerosene could be used and would be cheap, it has, up to this time, exhibited a tendency to give off an

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odor when burned and it also leaves an excess of carbon in the cylinders. The low grade of gasoline is a little more difficult to start on, but it supplies more heat and is a better fuel for general work after the motor is under way.

Some moderately successful attempts have been made in this respect, but, although the cost has been reduced to seven cents per mile, a great deal of trouble exists because of the sediment left in the carbureter. This may, however, be remedied by study, and we may have a new, less expensive fuel before long.

Thus the war has speeded up the development of the motor car, permanent improvements will result and, perhaps, a new fuel.

10. DEFECTS IN CONSTRUCTION BROUGHT OUT UNDER THE STRAIN OF ACTIVE-SERVICE CONDITIONS

Lack of standardization of parts and the continual breaking of radiators are mentioned as being the main troubles encountered in handling this kind of transport. The last trouble undoubtedly comes from the shock due to bad roads and to continued use without an opportunity for repairs or rest.

For the student who has studied carefully the development of this transport the most gratifying thing about remodelling the proposition of modern warfare, made possible by the arrival of the motor vehicle, is the fact that every accomplishment and every success, up to date, stands to the credit of machines neither specially designed nor produced for war purposes.

WHEELS

The wheels giving the most satisfaction are those in which a steel plate replaces the spokes, and where the dual tire is of solid rubber. This has been tried out in several trucks and found serviceable.

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LIGHTING SYSTEM

The "Prestolite" system was not serviceable nor satisfactory, and electric lighting found much better in every way. The feature reported on as being successful in every way was the movable headlight. It is of great use when loading and unloading at night and while off the main road and parking the machines. A good electric headlight arranged on a universal joint and within reach of the driver has been spoken of as an ideal arrangement.

BRIDGES

Closely connected with the use of motor transport comes the importance of good roads, and next the question of bridges and a study of the means to be taken to strengthen the highway bridge ordinarily encountered in this country. Heavy ordnance, together with a continual stream of motor transport, will without doubt test the average highway bridge in many probable areas of operations. The development of heavy ordnance has called for the use of the motor in its transportation. There is plenty of information on hand to show that the transport of heavy ordnance, away from the railroad lines, has been accomplished by special motor vehicles.

11. RESULTS OF THE WAR

The export of motor vehicles in the past two years has moved forward with a great bound. In 1915 it amounted to \$100,000,000, while in 1914 it was \$28,507,464, an increase of 250 per cent. The estimated value of commercial vehicles exported was \$63,000,000 of the total. England has been the best buyer of automobiles from the United States. Her purchases amounted, for the fiscal year ending June 30, 1915, to 5306 trucks. France and Russia also were heavy purchasers. When the war ends there must needs be an immediate readjustment of the great industries of the belligerent countries. Hence

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it is believed that there will be left in the hands of many of our manufacturers trucks of the latest pattern. Why should we not use them to form the cadres for our divisional and army transport, and accustom not only the troops but a number of officers and men with the use, handling, and repair of motor vehicles?

The following quotation, taken from a foreign motor publication, shows that this question has already been agitated in France:

Among the problems that are apt to come up at the close of the war in Europe is the means to be taken by the belligerent nations in disposing of the motor trucks now in use by the armies. France apparently has formed an answer to the question already. At an auction held recently, 740 of the Paris internal-gear drive omnibuses mobilized at the beginning of the war were sold, to be replaced by an equal number of similar chasses for work at the front. By selling these chasses at this time to private owners it was possible to forestall the purchase of that many chasses from neutral nations.

Another benefit to France is that this method of selling French trucks that have seen service prevents the beginning of an installation of foreign chasses by large owners who might after the war, in the interest of standardization, continue their purchases of trucks made outside of France.

The foreign trucks now used by the French Army are run until they are useless and can not be overhauled advantageously, and are then replaced by French-made chasses, the latest advices from France being that the factories there are now in a position to care for the army's needs.

12. CONCLUSIONS

The question is at once asked whether or not we have taken steps to use this transport and to avail ourselves of the large amount of suitable matériel existing to-day in the United States.

The answer is made that this has been done as far as existing appropriations will allow. However, most of these vehicles are operating singly or in pairs, and at no one place are there sufficient for one company.

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13. ORGANIZATION

The organization proposed for a motor-truck company conforms to the experience of officers abroad, but as yet no attempt has been made to collect the material of automobile parks or for repair shops and these are shown by the experience of all to be badly needed in field operations.

The assignment of this transport to the divisional trains is correct and conforms with the practice abroad.

There should be organized in each division a motor-truck company, and attached thereto a repair shop. This organization will form a cadre as well as a place where chauffeurs and mechanics can be trained. It is true we can recruit plenty of men from this class when war is imminent, but it is one thing to be a chauffeur and another to be a military chauffeur.

Abroad this defect does not exist, but with us something should be done to remedy the lack of disciplined material. The experience of certain of the belligerents in this respect will be ours if we become involved in war.

14. COLLECTION OF THIS TRANSPORT

Based on the type of vehicle *in use* in the cadre in each division, attempt ought to be made to arrange for a large number of vehicles *of a similar type*. The same type of vehicle, as far as possible, should be used within a division or even a field army if such can be accomplished.

The Federal Trade Commission could, under the law, obtain the data, in each divisional district, necessary for listing suitable transport. The Quartermaster General's Office has prepared a provision plan for utilizing motor transport, under existing laws, and this plan includes a contract system which will take the place of the prizes and subsidies that have been found so efficacious abroad.

All these steps are in the right direction, and we have conserved

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the underlying principle for the use of mechanical-driven transport, and this is that it is a transportation unit pure and simple. It picks up a load at one place and discharges this load upon arrival at destination. It is not employed in transporting mobile reserves. The animal-drawn vehicle transports the rolling reserve. Animal-drawn vehicles are still being purchased in great numbers by the French. A recent order has been placed for over 4000 of these wagons. The French have not as yet replaced the animal-drawn transport of combat and field trains with auto trucks, nor do they apparently intend to do so. The corps supply, ammunition, and sanitary trains remain animal-drawn, except that automobile ambulance sections form part of the sanitary train, and fresh-meat automobile sections form part of the supply train.

The foregoing facts are striking when we consider the excellent roads being maintained in the theatre of operations. The animal-drawn vehicle will undoubtedly be eventually replaced by mechanical-driven transport. However, before this can be done, even in Europe, many mechanical imperfections at present existing in the auto truck must be overcome. Our problem in this particular is more difficult than the European, when we consider the roads and bridges in our probable theatre of military operations, and it is very possible that we will not be able to make the change until some time after it has been effected in Europe. Notwithstanding the fact that it may be some years before we can use auto trucks in our first and second lines of transportation, the fact remains that, in the event of a war, we will have need for this kind of transportation in great quantities behind our second-line transportation.

Duties of the Army General Staff

LECTURE DELIVERED AT THE NAVAL WAR COLLEGE

BY F. J. DIAZ, LIEUTENANT COLONEL, CHIEF OF SECTION OF THE GENERAL STAFF

[*Official Publication of the Chilean General Staff*]

SUMMARY

1. Conception of the General Staff.
2. Role of the General Staff in time of war.
3. Role of the General Staff in time of peace.
4. Organization of the Chilean General Staff in time of peace.
5. Organization of the Chilean General Staff in time of war.
6. General idea of the work of the General Staff.
7. General idea of the work of the troop General Staffs.
8. General idea of the functioning of the War College.
9. General idea of the work falling to the officers of the General Staff who serve in the War Ministry.

1. CONCEPTION OF THE GENERAL STAFF

The modern exercise of military command, that is to say, the conduct of the army and of its large units, has been the origin of the creation of the General Staff. The impossibility of a single man, be he even a Frederick II, or a Napoleon, attending to all the requirements which strategy to-day imposes on the conductor of an army, or on those of the operation units into which it is divided, has made it indispensable that both should surround themselves with a headquarters, or better

EDITOR'S NOTE.—This article, although in no sense bearing upon the subject of Field Artillery, is of interest in showing what is being done in the matter of military preparation by our South American neighbors, in addition to being an excellent lecture on General Staff organization.

The Chilean Army of the present day has been organized along German lines, by a commission of German officers, which was on duty with it for fully a decade prior to the European War.

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said, a following, suite, or retinue, composed of a certain number of officers and military employes, charged with advising him in the several functions into which the command is divided. Of this suite or retinue, the part specially occupied with the operations of war is denominated the General Staff; and, the activity of this organ of command being the most essential part thereof, the chief who presides over it is therefore the one who must direct the entire work of the Headquarters. This title, however, like that of General Staff, does not correspond in its meaning to the ideas which it represents, and it is to be expected that modern military language will have to replace them by others which more nearly correspond to their true conception.

By the name of General Staff Corps is also designated the body of officers who, through having shown in practice certain gifts of aptitude and preparation, are charged in an army with the discharge of the various staff duties, supplementing the functions of command.

The Prussian General von Clausewitz, the father of the doctrine of modern war, has said: "The General Staff is charged with transforming into orders the thoughts of the Commanding General, communicating these orders to the troops, and relieving the commander of the unfruitful labor of details." This definition would be complete, adds Bronsart von Schellendorff, in his classic work on the Duties of the General Staff, if in these duties were included that of caring for the maintenance of the fitness for war and the well-being of the troops in every particular; since, although in all large commands the auxiliary services are represented by special agencies, as a general thing these agencies lack the knowledge of the purely military circumstances or appreciate incorrectly the military situation, so that the General Staff is obliged to operate permanently in stimulating their work and clarifying their ideas. For this reason, it is indispensable that the Chief of Staff of any command should be the visible head of the entire headquarters.

DUTIES OF ARMY GENERAL STAFF

The officers of the General Staff Corps, in whatever situation they may exercise their functions, have no authority to command; because this authority in fact and by right belongs to the commander, whom they aid and assist with their counsels and proposals, an authority which passes to the legal successor, that is, to the officer next in grade or rank, within the respective sphere of action. This condition of the General Staff, like that of all adjutants, is modified only in so far as refers to the despatch or transmittal of current matters or to the communication of dispositions which have emanated from the commanding authority.

2. ROLE OF THE GENERAL STAFF IN TIME OF WAR

According to Bronsart von Schellendorff, previously cited, the activity of the General Staff, considered in time of war, is extended to the following matters:

(1) Preparation of all the dispositions relative to the quartering, service of security, march and combat of the troops;

(2) The communication of the orders which are dictated to this end, whether verbal or written, at the time and in the extension which may be necessary;

(3) The collection, compilation, and adequate disposition of all the data which refer to the conditions and military progress in the theatre of operations, comprising therein the acquisition of charts or maps relating thereto;

(4) The collection and interpretation of news referring to the hostile army;

(5) The maintenance of the military fitness of our own troops, and the exact and permanent knowledge of their condition in every respect;

(6) Keep the daily books, prepare reports of combat, compile and prepare all those data which are to serve subsequently for the military history;

(7) The discharge of special commissions, especially reconnaissances.

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The enunciation alone of these matters suffices to show the many requirements which are imposed upon the knowledge, intelligence, judgment, and activity of an officer of the General Staff in the field; the attention and care required in his special intellectual preparation and in the formation of his character, considering that, besides the general qualities inherent to all officers, he needs a larger dose of self-denial, discretion, reserve, and modesty; because his employment, close to the high command, places him in general in a sphere of action very superior to that which corresponds to his age and years of service.

3. ROLE OF THE GENERAL STAFF IN TIME OF PEACE

According to the same German author, whom I have preferred to follow in this discourse, on account of his authority and prestige, the labor of the General Staff in time of peace, must centre principally in its preparation for war; with the understanding, however, that this labor is varied in character, depending upon whether the officer is serving in the Great General Staff, in the General Staffs of troops, in certain departments of the War Ministry, or in the administration or faculty of the War College.

The group of officers denominated the Great General Staff have under their charge, under the direction of their chief, the preparation of the possible war operations of the army, preparing for its concentration and transportation, acquiring a comparative knowledge of foreign armies, studying the theatres of war and preparing good maps thereof. They are charged, moreover, with the fostering of the military sciences, principally by means of military history; likewise with the instruction of General Staff officers and the preparation of grand manœuvres.

To the General Staffs of troops, assigned to the higher commands, falls the preparation for war of the great units; marches, quartering, service on railroads and news; the preparation and execution of divisional manœuvres, and the instruction of the troops, so intimately connected therewith.

DUTIES OF ARMY GENERAL STAFF

The officers who constitute the directive personnel (not as students) of the War College are occupied in the teaching of the principal branches of military science, as well as with the proper conduct of the establishment.

Since it is not possible in the small armies, such as ours, to constitute a special corps of officers for the War Ministry, whose service requires a capacity to some extent superior to that exacted by the General Staff itself, the latter has been required to provide the Ministry with a part of its officers.

4. ORGANIZATION OF THE CHILEAN GENERAL STAFF

The study of the transformation through which the organization of the General Staff of any well-constituted army has passed, demonstrates that the factors which have had the greatest importance in obtaining the most favorable development of that organization have been the following:

(1) The independence and autonomy of the institution with respect to the other higher authorities of the army, to such an extent that not only is it almost everywhere under the direct orders of the government, but that there are countries in which it depends directly from the head of the State;

(2) The standard of not submitting to dispositions which involve exclusiveness in the recruiting of the officers, permitting entrance under proof to any officer of the army who may have shown intelligence, knowledge, and character which entitle him to such a distinction;

(3) The instruction of the officers, in the War College as well as in the General Staff itself, on the basis of a military instruction derived from the experience of war and the application of the doctrines of the concrete case;

(4) The fact that the officers of the General Staff have not been formed into a closed lineal list (*escalafon cerrado*), like that of one of the arms, but, on the contrary, the establishment

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in each grade of the obligation to serve during a certain time with troops;

(5) The fact that, to fill places in the General Staff, no order of rigorous succession is exclusively followed with the institution; so that, to fill a vacancy which has occurred, there are considered all candidates in the army who are entitled to it, and who at the time are in a position to occupy it; providing, in this way, that the best prepared elements shall be attracted to the institution.

These five fundamental principles for the organization of a good General Staff have been duly considered in the organic regulation of our army, so that they are found included in its provisions.

According to this statute, our General Staff comprises four different parts, to wit:

(A) The Great General Staff, which is the central point of the entire service;

(B) The General Staffs of the troops, assigned to each one of the four division commands;

(C) The War College, which should properly be considered as a department of the General Staff;

(D) The General Staff officers who, as Chiefs of Section or assistants, serve in some of the departments of the War Ministry.

The Inspector General's Department of the army has also an officer who fulfills the functions of a Chief of the General Staff.

I will take up in succession these four divisions.

(A) THE GREAT GENERAL STAFF

The Central Department, whose chief is at the same time a separate section, to wit:

The Great General Staff comprises four departments and the sub-chief of the whole institution. It centralizes the strategic

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preparation for war, interpreted practically by means of plans of operations for all possible cases of war, likewise the instruction of officers, through war games, staff rides, special exercises, etc.

The Information Department, charged with the knowledge of foreign armies, and the study of the probable theatres of war.

The Transportation Department, which prepares the concentration of the army, in accordance with the plans of operations.

The Topographical Department, which is occupied in obtaining an exact and detailed topographical knowledge of the country, serving at the same time as a school for officers from the point of view of the appreciation of terrain; also in constructing all the maps needed for war.

The separate Historical Section, charged with the editing of the history of the national wars and of those foreign wars which may have special importance for our own country.

The departments are divided into sections and are organized with a personnel which is classified as follows:

(a) Officers, in which are comprised:

Chiefs of department, with the grade of lieutenant colonel or colonel.

Chiefs of section, majors or lieutenant colonels.

Attached or officers of the General Staff, captains or majors.

This hierarchy of office is in accord with that of the War Ministry and with that of the General Staffs of troops, as will be seen later.

(b) Civil employes and operatives, for the work of the topographical survey and for the shops of the General Staff.

(c) Clerks, to make clean copies of the work.

(c) Office orderlies, for the care and cleaning of the offices.

(e) Orderlies, one for each officer.

The entire institution is placed under the orders of the Chief of the Great General Staff, with the grade of General.

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To obtain the position of an officer of the General Staff, it is required that the candidate perform a proof exercise of one or two years. It is not necessary to have been a student at the War College, since, as has already been said, the entrance to the General Staff obeys no absolute formula, and every distinguished officer must have the door open; but, in general, the institution utilizes annually all the graduates of the college who obtain the corresponding rating.

(B) THE GENERAL STAFFS OF TROOPS

As I have already stated, the four division commands which exist at the present time, have each a Chief of Staff, lieutenant colonel or major, and two General Staff officers, majors or captains. They are all selected by the division commander from the various candidates presented to him by the Chief of the Great General Staff. The divisional Chiefs of Staff are considered by the organic regulation as chiefs of section; but propositions have not been lacking that they should be considered as chiefs of department, in order that their offices may be occupied by lieutenant colonels or colonels.

The divisional General Staff is only a part of the headquarters or division command; therefore, to comprehend its object, it is convenient to consider the latter in its entirety.

All the business which is transacted in one of these commands is divided into four sections as follows:

- I. General Staff.
- II. Adjutant's Office.
- III. Military Justice.
- IV. Administration, comprising the intendency, sanitary, veterinary and religious services.

Section I is formed by two officers, Ia and Ib, and is occupied in the despatch of the following affairs: Marches, quartering, troop exercises and manœuvres; staff and tactical rides, mobilization, communications, government affairs; strength and condition of foreign armies; regulations of the different

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arms and matters relating to military organization; questions of public right, state of the fortifications; reconnaissances, maps, winter work of officers.

Section II is composed of one or two officers, who in the second case are denominated a and b, and whose activity is extended to the following affairs: Orders of the day, garrison service, reports and returns, matters relative to the courts of honor, personal affairs of officers and men; decorations, interior service of the troops, recruiting and discharge, disability, remount, armament and munitions.

In Section III work one or several employes of military justice—judges—matters referring to pardons, orders on the findings of courts of honor, disciplinary punishments and appeals, deaths, matters of the press and others which have some relation to the exercise of military justice. It is necessary to bear in mind that within the organization described, the judges who form part of a divisional command or of whatever other authority, are not mere advisory functionaries, as is ordinarily believed; since, outside of the work indicated, they are obliged to transact and despatch all the judgments arrived at in the exercise of the judicial faculties corresponding to the command or authority to whom they are assigned, as well as to act as judge advocates or members of courts martial.

In Section IV are despatched the corresponding affairs, by the functionaries below indicated:

The division Intendent, as Section IVa, is in charge of all matters relative to rationing, money, construction, clothing, provisions for journeys (*viáticos*), and personal affairs of the intence corps.

The division Surgeon, as Section IVb, despatches the medical decisions connected with the matters of discharge and disability; matters referring to the hygiene of the troops and personal affairs of the sanitary department.

The division Chaplain, as Section IVc, matters relating to

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religious service, including personal affairs of his department.

The Veterinary of the division, as Section IVd, matters relating to his profession and to the veterinary corps.

The distribution of work which has been indicated may be changed by the division commander in certain cases; he also determines the division of duties between the officers of Sections I and II.

The Chief of Staff is responsible for all the office service of the command, and to him is subordinated all the remaining personnel of the headquarters, who must report to him and consult with him in everything before attending the conference which takes place before the division commander. In these conferences Sections III and IV first report and retire; Sections I and II are present during the entire conference, withdrawing at the end, in order that the Chief of Staff may confer with the General concerning confidential and secret matters. As a general rule, no work must be presented for the signature of the Commander without having been first viséed by the Chief of Staff. The latter should be empowered to replace the Commander, in case of temporary absences, in urgent and routine affairs, signing "by order of the Commanding General," it being understood that in this despatch of urgent and routine affairs there shall not be included anything connected with tribunals of honor, the exercise of judicial and disciplinary faculties, decisions on appeals, permits, or any personal affair, in which the said Commander should necessarily be substituted by his legal successor, who is the senior brigade commander. This method of substitution, which is the same that governs in the cases of short absences of other commanders, is indispensable because in any other way it would make difficult the instruction reviews (*revistas de instruction*) at which must be present simultaneously two or more commanders. In these cases, the Chief of Staff must be able to proceed with the daily despatch of affairs, delaying those matters which require the action of the commander or his successor, in cases of absence of

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greater or less duration or in which the commander really leaves his post on account of sickness or leave.

(C) THE WAR COLLEGE

According to the Organic Regulation of the Army, this establishment, which has not the same character as the other establishments of the Army because of its rôle or significance, has for its object the preparation of a certain number of officers of the army in the higher branches of military art, in order that they may be later employed as officers of the General Staff or the War Ministry, in the superior staff offices or as professors.

It is composed at the present time of an administration and three annual courses. The former is composed of a director (colonel), a sub-director (lieutenant colonel), and an adjutant (major or captain), all belonging to the General Staff, with the character of Chief of Section and General Staff officer respectively. They take charge of a large part of the classes and direct the practical exercises. The classes are composed of fifteen students; the third class is composed of only those officers who have received in the second course the necessary rating for the General Staff, and who in consequence must join that staff as officers under trial. The rest of the students go to the Army with a rating for the higher staff positions and as professors.

The College has also a civilian librarian, and the necessary enlisted personnel for its service.

(D) THE GENERAL STAFF OFFICERS IN THE WAR MINISTRY

I have stated previously that some departments of the War Ministry need a certain number of specially prepared officers, and that, since they cannot be organized into a separate corps, as is done in the great armies, they are included in the General Staff. To this I now add that there is a real advantage in that there should go to the Ministry those officers who, in the service of the Great General Staff, have given proof of true capacity and professional preparation, since their work is of transcendental importance to the Army.

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The departments which need such officers are:

1. The General War Department, because, as we shall see later, from it emanate the regulations and other dispositions relative to the organization, armament, and instruction of the army; and because therein is systematized the activity of all arms and services, and because it is therein that the doctrines that experience and science teach receive the form of regulations and prescriptions. On this department, therefore, principally depends the progress of the Army.

2. The Department of Personnel, because therein are prepared the promotion and assignment of officers, in virtue of their attainments and fitness; and the simple announcement of this matter suffices to make understood the enormous importance of the places therein occupied as Chiefs of Section by some officers of the General Staff; through the reflex action which they exercise over the spirit and the formation of character of the entire body of officers of the Army, facilitating and fostering the just appreciation of the personality of each member thereof.

Doubtless other departments of the Ministry, such as that of Military Administration, for example, need the collaboration of some officers of the General Staff; and it is not improbable that in the future they will be assigned thereto, when the existing number will permit it.

To facilitate the assignment of General Staff officers to the Ministry, and of officers of both these institutions to troops, establishing also a certain ascending movement in their service, the hierarchy of offices in the Ministry must be a little higher than that of the General Staff, in the following form:

Chiefs of Department: Colonels and generals.

Chiefs of Section: Lieutenant colonels or colonels.

Aids: Captains or majors.

At the present time only the Chiefs of Department comply with these conditions.

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5. THE GENERAL STAFF IN TIME OF WAR

The organization of the General Staff is not materially modified due to the mobilization of the army. The Great General Staff, which is located close to the government up to the outbreak of war, is placed under the orders of the general-in-chief of the army designated by the latter, provided the President of the Republic does not personally take command in conformity with the provisions of the constitution.

Aside from the General Staff officers which the Organization Regulations consider for the commands and units which are organized only in case of war, the work of the General Staff taken as a whole is performed principally at the headquarters of the Commander-in-Chief and in the general division commands; and, as in these headquarters the institution appears as one of the component organs, I deem it useful to explain the organization of both entities so as to give an exact account of their activities.

The headquarters of the Commander-in-Chief comprises, as I have said, the Commander-in-Chief and the Chief of Staff, the latter being, according to the doctrine of Marshal von Moltke, the only consulting organ of the former and the director of the entire service within the headquarters itself, as has been seen in treating of the divisional commands. Said headquarters consists besides of the following divisions:

- I. General Staff.
- II. Adjutant's Office.
- III. Office of the Judge Advocate.
- IV. Intendence General of the Army.
- V. General Inspection of Lines of Communications and Railroads, in which are comprised as sections the service of railroads, sanitary service, telegraphs, and mails.
- VI. Consulting authorities of artillery, engineers, and navy, who are a general of artillery, a general or colonel of engineers, and an admiral or captain (*capitan de navio*) of the navy, with their respective aids.

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VII. The vicariate of the army.

The General Staff properly speaking comprises four sections, composed of a certain number of chiefs of section and officers, all of them under the charge of the Sub-chief of Staff, to wit: Operations, Information, Communications, and Cartography. To constitute these sections the Great General Staff assigns a part of its officers, leaving a goodly number of them for the service which depends on the Inspection General of Lines of Communications and Railroads, likewise to form an acting Great General Staff, which remains in charge of the building and of some of the work which cannot be suspended even in time of war.

The division commands do not suffer any essential modifications on mobilization; on the contrary they receive an increase of personnel in some of the sections, especially that of intence, which assumes a wider scope than in time of peace.

To meet all the needs that arise in war, it is undoubted that the number of officers in service in time of peace will not suffice; but even in this case, sending them periodically to serve with troops presents a new advantage, since some of them who are so serving will help to fulfill the demand occasioned by the state of war.

It is true that the War College suspends its functions, and that some officers therefrom will be available, but on the contrary there will be very few who can be taken from the War Ministry, since this establishment must continue functioning in time of war with a greater intensity of work.

6. GENERAL IDEA OF THE WORK OF THE GREAT GENERAL STAFF

To form an idea of the activities of any military institution and to thoroughly comprehend its organization, it is necessary to compare it with a factory which must supply certain definite products. That is what I am going to do with the General Staff.

It has been seen that this institution pursues as a primary object the preparation of the army for war from a strategic

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point of view. This preparation is manifested practically through two labors or products, which are:

1. The plan of mobilization, comprising also all the complementary dispositions intended to assure its fulfillment;
2. The plans of operations, which are nothing else than studies which explain the probable employment of the army for each of the several cases of war which may occur. For this it is not necessary that these cases be probable, it suffices that they may be possible for the General Staff to study them and set them forth in memorial.

As these two classes of work or products of the General Staff centralize to a certain extent the activity of the entire institution, since in them are employed the efforts of all, they have been assigned to the Central Department, which is in charge of the sub-chief, as has been stated.

Now, in order that the said plans may be founded on concrete data and that they may not be a mere fantasy, certain bases are needed as follows:

1. The knowledge of the army itself, including the auxiliary elements which the country can furnish it.
2. The knowledge of the probable enemies.
3. The study and knowledge of the theatres of war.

These bases are made known practically through an account of each of the armies studied, which account contains the collected and compiled data; and by means of a map of each theatre of war accompanied by an explanatory and supplementary memoir which includes all the data which the map itself does not show. These two classes of work belong to the Department of Information; but with the single exception of the compilation of the data referring to our own army, which has been confided to the Central Department for two reasons: First, because this work has an intimate relation with the plan of mobilization; and second, because from the comparison of the latter with the state of organization of the army and with the plans of operations, many suggestions are derived which the

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Chief of the General Staff must present to the government in the form memoranda.

The preparation of the army for each case of war, interpreted, as I have said, through the plan of mobilization and plans of operations, comprises also the concentration, so to speak, the grouping before the enemy in each particular case. This concentration is effected practically by means of the so-called plans of transportation by sea or by land, or by both means at the same time, according to circumstances. This work belongs to the Department of Transportation.

However, said plans of transportation likewise need in their turn proper bases, as follows:

1. The knowledge and detailed study of the means of transportation, which are principally railroads and ships.

2. The establishment of military itineraries (time tables) for the various lines, in view of the maximum capacity which can be attributed to them.

It has been seen elsewhere that the knowledge of a theatre of war is obtained, above all things, through a good map; and as the war maps to be utilizable must be founded as much as possible in a topographical survey, whose execution is, moreover, a real school for the officers of the General Staff in so far as it relates to the knowledge of terrain; and as the national territory is necessarily part of some theatre of war, every well-organized General Staff has under its charge the topographical survey of the country, without preventing some of the installations which the latter requires being used in the execution of the other work of the institution.

From which is deduced the activity of the Survey Department, to which I referred in the organization of the General Staff.

The fundamental work of the General Staff is derived from military science, whose principal source is the history of war. For its own interest and for that of its teaching organ, the War College, by means of which the General Staff promotes the

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progress and the evolution of the army, there are considered also as a part of the activity of the institution the editing and study of the national campaigns, as well as the advantage of the foreign campaigns which may be of importance to our own country, work which is assigned to the Historical Section.

Finally, in order to take care in due form of the instruction of officers, and above all things, as a means of determining the efficiency of their work, it is indispensable to require the execution of certain special tasks, in which the entire personnel of the General Staff as a whole takes part, tasks in the form of the following exercises:

- (a) Strategic war games.
- (b) Staff rides.
- (c) Conferences and special exercises.

On account of the nature and form in which these exercises are conducted, they have been included in the sphere of action of the Central Department, provided the Chief of Staff himself does not take them directly under his charge.

What has been set forth will have demonstrated, without doubt, that it is the greater or smaller quantity of work that decides the division of the departments and sections, as well as the multiplication of the latter; but at times it decides also the nature of the work therein, as happens in the Survey Department.

At the present time the Central Department has two sections, the Information Department three, the Transportation Department two, and the Survey Department three; to History is dedicated a single section.

The three sections of the Survey Department are as follows: The Trigonometric Section, charged with the primary, secondary, and tertiary triangulation; the Topographical Section, which is employed in the plane table survey; and the Cartographic Section, which reproduces maps and performs other General Staff work. The two first are divided in their turn into committees, which are under the orders of General

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Staff officers; the last is divided into sub-sections or workshops.

It is not possible to develop in a lecture the detailed comprehension of each of the duties of the Great General Staff which I have just enunciated along general lines, duties which give rise, in their turn, to numerous secondary occupations; since these duties form a branch of instruction at the War College, and even this branch occupies itself only with the most important of them.

7. GENERAL IDEA OF THE WORK OF THE GENERAL STAFFS WITH TROOPS

The activity of the troop General Staffs is deduced in great part from that of the Great General Staff, since, as has been seen, the latter extends its action to the whole army, while the former are circumscribed, each one to the corresponding part of the armed forces. The nature of the activity is, however, the same.

The only work which can be considered as characteristic and special, is that relating to the annual course of instruction of the troops, which, commencing in the recruit school, terminates in the manoeuvres; but even in this matter the Great General Staff must intervene when the grand manoeuvres take place, that is, when at least two divisions operate, one against the other, or several divisions against a simulated enemy, in which case it is the duty of the Great General Staff to prepare for them, aiding in every way the Inspector General of the Army, who directs them as the representative of the government.

The annual course of instruction of the troops must be followed in a rational and systematic form, since it is one of the most important functions of the armed forces in time of peace.

8. GENERAL IDEA OF THE FUNCTIONING OF THE WAR COLLEGE

What has been previously stated with respect to the object and organization of the War College demonstrates the importance of this establishment, so closely united in its end and

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action with the General Staff. So that, both these things being known, it is very easy to show the activity which it is called upon to develop.

This activity is not essentially academic, as might be easily supposed, because the theoretical work of the school halls, done by preference according to the applied method, is finished with staff rides, special exercises, and practical work of every kind, and more especially through the execution of the war game in all its forms.

The plan of study of the College comprises military branches and branches of general instruction. The former are military history, tactics, and General Staff service, which are the most important; followed by topography, applied principally to the survey, fortification, and the knowledge of arms; and, as an amplification of the first of these latter, siege warfare and the knowledge of the means of communication. Moreover, as a complement of tactics, naval warfare, and as a complement of General Staff service, military law.

The branches of general science, which every officer already knows, since it is a requisite to enter the military course and obtain the grade of second lieutenant, must be continued in the College, not only with the object of obtaining greater education, but also on account of the relation which many of them bear to the purely military studies. Public law, in its double aspect of constitutional and administrative; mathematics, history, and scientific geography, are intellectual discipline which must be encouraged in the best possible form, so that on finishing the course of three years, not only will there have been formed good General Staff officers, good aids for higher authority and good military professors, but there will have gone forth from the halls of the establishment a nucleus of military men who, with their knowledge and intellectual culture, will carry progress to the furthest garrisons of the country.

Such is the intense teaching labor which falls to the War College.

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9. GENERAL IDEA OF THE LABORS WHICH FALL TO GENERAL STAFF OFFICERS IN THE WAR MINISTRY

To give a succinct account of the work which falls to the officers of the General Staff, who, in the character of chiefs of section or auxiliaries, are serving in the War Ministry, as I explained previously, it is necessary to keep in mind the object and organization of this high institution, comparing it with a factory, as I have done in the case of the General Staff.

The War Ministry is not a mere office of transmission, a great mail box where are gathered the official letters, despatches, memorials, proposals, and petitions of the military authorities and of the members of the army; it must be the most active and efficient organ of the entire military organism, if it be desired that the latter be, through its organization, armament, equipment, and instruction, an efficient instrument of the national defense; because to the Ministry, which with great propriety has been called the heart of the army, as the General Staff has been called its brain, belongs an action so characteristic and definite that it cannot be substituted, even under the pretext of defects of organization, by any other high authority which is not close to the government.

In fact, the most important part of this action, consists in preparing that which corresponds to the Executive Power insofar as it refers to the war branch, elaborating projects of law and the instruction regulations for the service of the army which are indispensable in order that every part of the military machine may produce its corresponding effect within the whole.

It may be said that it is in this function of the Ministry that the colossal importance of the institution is manifested and that the knowledge and competence of the personnel that composes it is shown; since, when the Ministry is weak in this respect, when the resolutions of the government are not founded in the latest advances of military science, no regimen can be

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established and no service can be systematized, the highest organic and administrative authority coming into open conflict with other, perhaps subordinate, authorities, who are, however, better oriented concerning the several military affairs.

Consequently, if the acts of the government must be inspired with the true knowledge of the institutional needs and tendencies; if these acts must have for their object the greater efficiency of the armed forces, then in the War Ministry, which is the working centre in which they must be elaborated and given definite form, must be found employed the best elements of our officers who have been properly prepared.

This explains sufficiently the presence of General Staff officers in the said institution, and since the Ministry is a great factory of regulations and orders destined to assure the functioning of all the services, the variety of the latter imposes a subdivision of the Ministry into departments and sections, a subdivision which maintains a relation with the character of the orders and regulations and with the specialization of the personnel.

The transmittal of isolated matters which reach the Ministry is a secondary labor, for whose despatch are needed mechanical forces which are sufficiently familiar with the laws and regulations in force, but which are not in a position to cause changes in what is already prescribed.

Summing up, for the elaboration of the immense amount of material gathered in the Ministry, and in order that advantage may be taken of this material, it is necessary that it should be confided to a personnel of capable officers, who know to the bottom the entire organization of the army, from a scientific military point of view.

The said elaboration requires, above all, a technico-military department in which are prepared the regulations and instructions relative to the organization of the arms and services, of the isolated corps of troops and establishments, to the instruction

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of the personnel in its multiple manifestations, keeping in mind its best preparation for war. This is the object of the so-called General War Department, in which serve exclusively selected officers of the General Staff.

The same may be said of the Military Administration branch, under which name are included the services of accounts, rationing, clothing, quartering, and military construction, which have so great importance both in time of peace and war; of the Military Justice branch, the base of esprit and discipline, those moral factors which have so often decided the victory, and from which emanate the military codes, disciplinary regulations, and the prescriptions concerning pensions and retirement; of the Remount and Sanitary services, branches of military administration which, on account of their importance, have been separated from the common trunk. Finally, the movement of the official personnel, a name which should not evoke the thought that in it is comprised all that refers to persons, but that from it are derived not only the decrees for promotion and assignment, but also the several lineal lists of the army, the need of compiling the record of each officer and preparing selection lists which permit of systematizing the promotion and assignment, in accordance with the needs of the service and the aptitude of each officer.

All these branches must be attended to by departments which in their turn are subdivided into sections; the most important of which, I repeat, are in charge of officers of the General Staff.

It would be a great task in this lecture to follow, in their inception and birth, each one of these labors of legislation and regulation, examining their antecedents and explaining the experiences of peace and war which they assume, and the difficulties of their practical application. These labors are performed in an immense laboratory, in which the history of war—the

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practical application of the doctrines—serves as a point of departure, but in which are gathered exercises of every kind and scientific experiments in convenient installations, a laboratory which small armies possess only in a restricted and incomplete form, seeing themselves obliged to be tributary to larger armies which supply them with teaching personnel and permit them to perfect in their ranks the instruction of a certain number of officers who are sent to them as commissions to study.

Report on the Goodyear Kite Balloon

BY CAPTAIN F. B. HENNESSEY, 2D FIELD ARTILLERY.

PURSUANT to Paragraph No. 16, Special Orders, No. 116, War Department, May 17, 1916, the undersigned proceeded to Akron, Ohio, at 8 A.M., May 18, 1916, and was there met by the representative of the Goodyear Rubber Company, and taken to East Cleveland, Ohio, where the Goodyear Company had placed one of their latest type kite balloons for purpose of inflation and test.

Owing to the fact that several commercial concerns utilize the same supply of hydrogen during the day time, the Goodyear Company was unable to complete the inflation of the balloon during daylight hours of May 18, therefore inflation was continued during the night of May 18, completing same by noon of May 19. The rest of the afternoon was spent in making various tests. These tests were witnessed by Lieut. S. H. Maxfield, of the Aeronautical Division, U. S. Navy, and officers of the Spanish and Portuguese Armies, delegated by their respective governments to purchase war supplies, etc. Lieutenant Maxfield, who is a balloon expert, had tested the original Goodyear Kite Balloon in February, 1916, which was accepted by the U. S. Navy Department, and has since been in commission at the U. S. Navy Aeronautical Station, Pensacola, Fla. The complete details of the test of May 19, 1916, are herewith attached, including photographs.

This Goodyear Kite Balloon is a great improvement upon the German Drachen or "Sausage" type of observation balloon, so extensively used by all the principal armies on both the Eastern and Western fronts in the present European War. During the present campaign around Verdun, both sides have been using a great many of these kite balloons for general observation purposes, but more especially for conduct of fire

REPORT ON THE GOODYEAR KITE BALLOON

of Field Artillery, they being peculiarly fitted for this purpose, possessing a very stable observation platform on account of their unique construction and as they are connected directly by telephone with their respective artillery organizations, the rapidity, accuracy and intensity of artillery fire is thus greatly increased.

In clear weather and on favorable terrain, the observers are able to distinguish the different arms of the service at a distance of 16,000 yards and with the best of glasses, at 20,000 yards, or over eleven miles, while stationed at an altitude of 2000 feet.

Following the best European practices, it is considered that the minimum equipment required for modern Field Artillery is one kite balloon per battalion of Field Artillery, and the pilots and observers should be experienced officers of the Field Artillery.

DETAILED REPORT ON GOODYEAR KITE BALLOON

I. Construction: Figs. 1 and 2 show the conventional European type of kite balloon. Its steadiness depends on the combined action of the "steering bag" (*a*) and the "tail-cups" (*bb*). Its resistance may be considered as made up of several parts:

1. The resistance of the gas-bag itself, a function of its size and shape.
2. The resistance of the steering bag, greatly augmented by the large opening at its front.
3. The pull of the tail-cups, determined by the number of them necessary to maintain a reasonable steadiness.
4. The resistance of the cordage and basket.
5. The resistance of the cable.

Figs. 3 and 4 show the original Goodyear model, in which a modest attempt was made to increase the steadiness by increasing the effective lateral surface of the steering bag. It was also found possible by proper design to cut down considerably

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the amount of cordage previously used, thus effecting a slight decrease in resistance.

Experience with this type of balloon, however, showed that a radical departure in design was necessary if any marked improvements over the existing forms were to be achieved.

A basic study was made of each different part. Numerous experiments, failures and successes, pointed the way, and finally the results were combined and reduced to practical form in the present type of "Goodyear Kite Balloon."

The principal outstanding features of the Goodyear Kite Balloon are as follows:

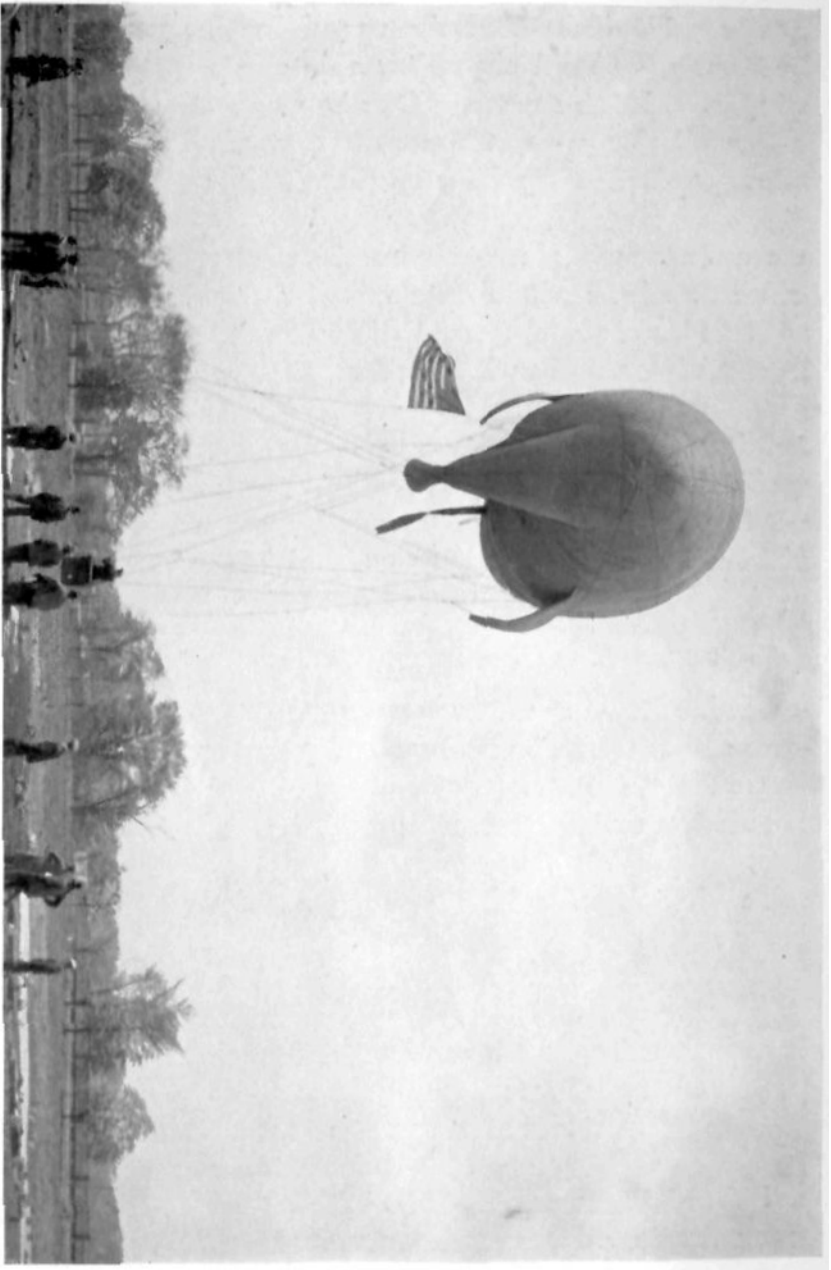
1. The shape of the gas-bag is so modified as to have a minimum resistance consistent with other requirements.

2. The steering bag is replaced by an air funnel which is the only inflated protuberance on the balloon. This carries the keel and the tail-cups and has a valve at its lower end through which air enters to supply the balloonet (*f*). With this construction a comparatively small hole will supply all the air necessary to keep the balloon well inflated under all conditions.

3. The keel, like the funnel, is non-rigid, being supported entirely by a proper balance of forces. Its great advantage over the old steering bag is the fact that it presents a double concave surface to the wind so that it is held in the wind by a positive pressure on both sides at once. In this way any tendency to yaw is stopped almost before it starts. On the other hand, the old type of steering bag will allow a considerable deflection or swing of the balloon before its corrective influence is felt. In addition to this the keel has only a small fraction of the resistance of the "steering bag," is lighter in weight and is simpler in practical use. It will keep practically the same form in any wind from a calm to 20 M. per second, or 45 miles per hour.

4. The side fins are so shaped and disposed that they help in the stability as well as in the kite effect of the balloon.

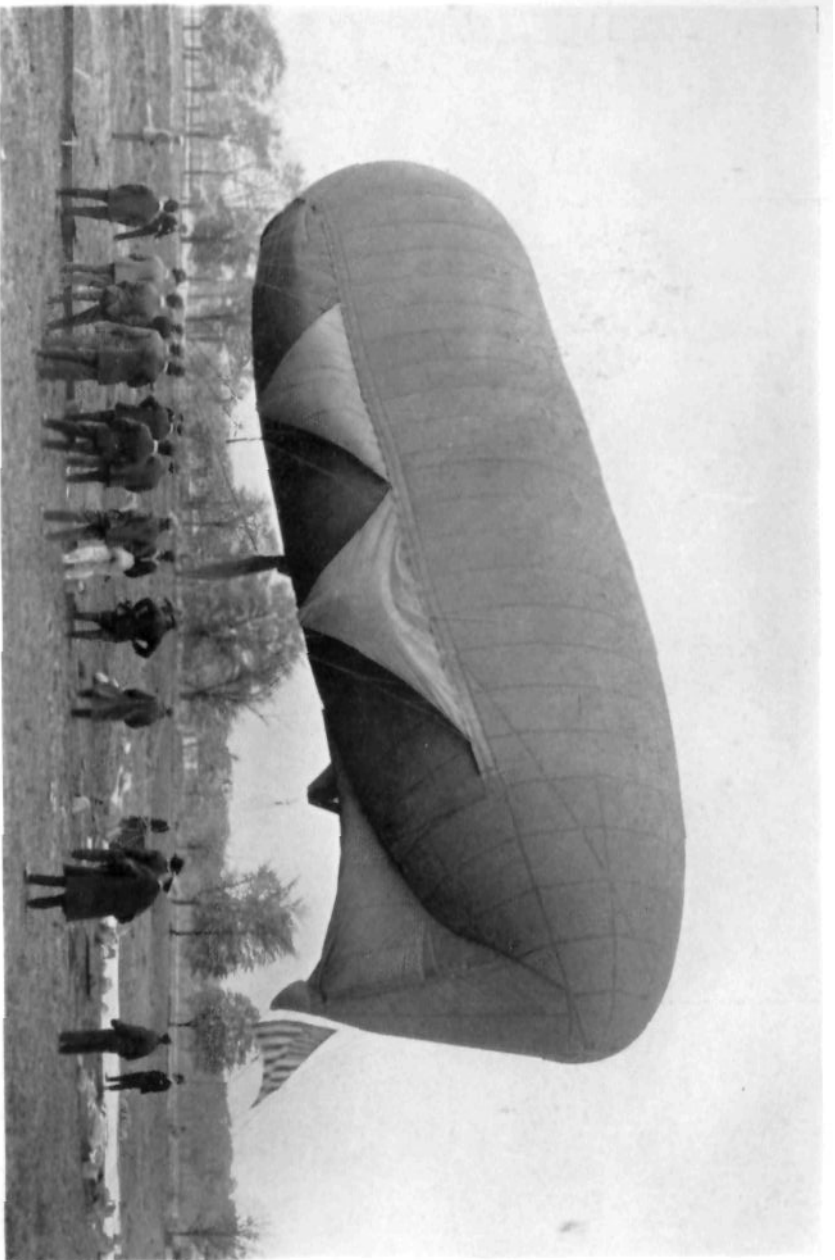
5. The function of the tail-cups has been reduced almost



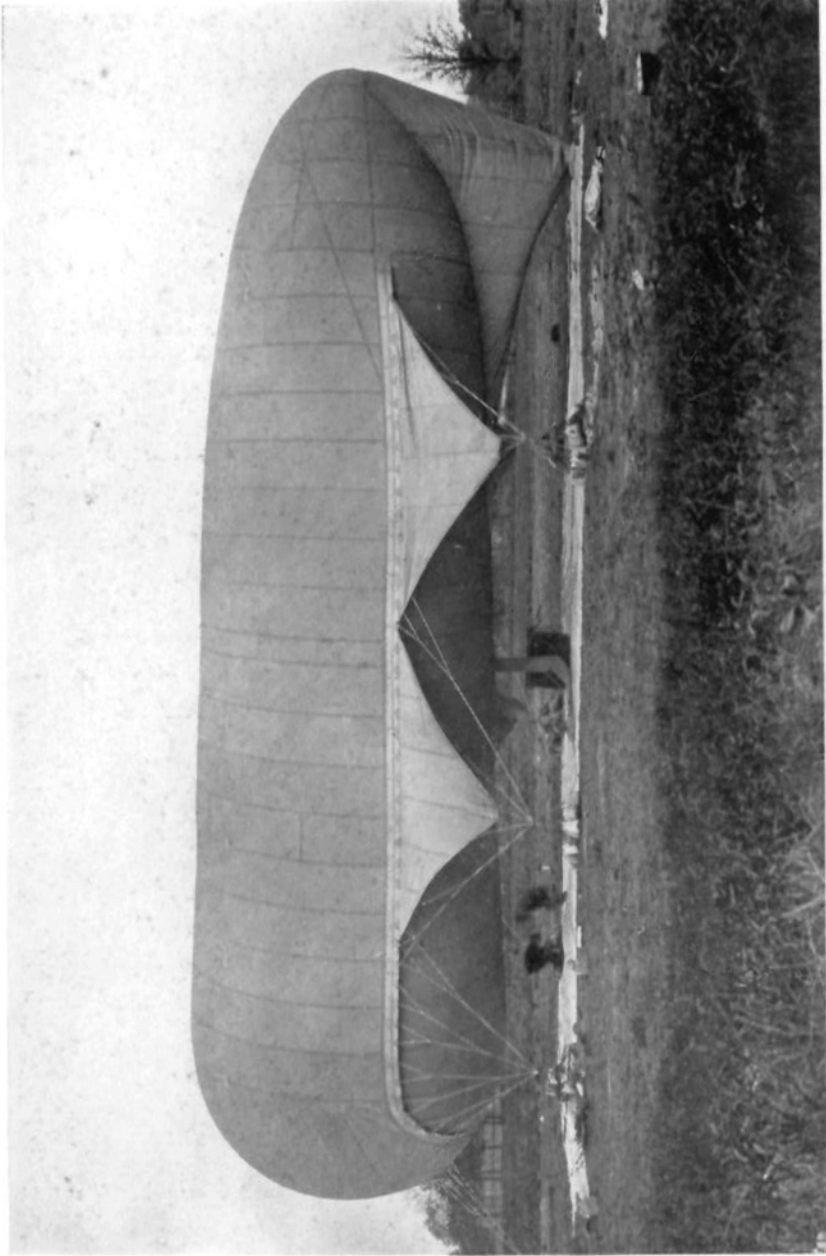
GOODYEAR KITE BALLOON
REAR VIEW OF STEERING BAG



GOODYEAR KITE BALLOON
SHOWING ARRANGEMENT OF TAIL CUPS



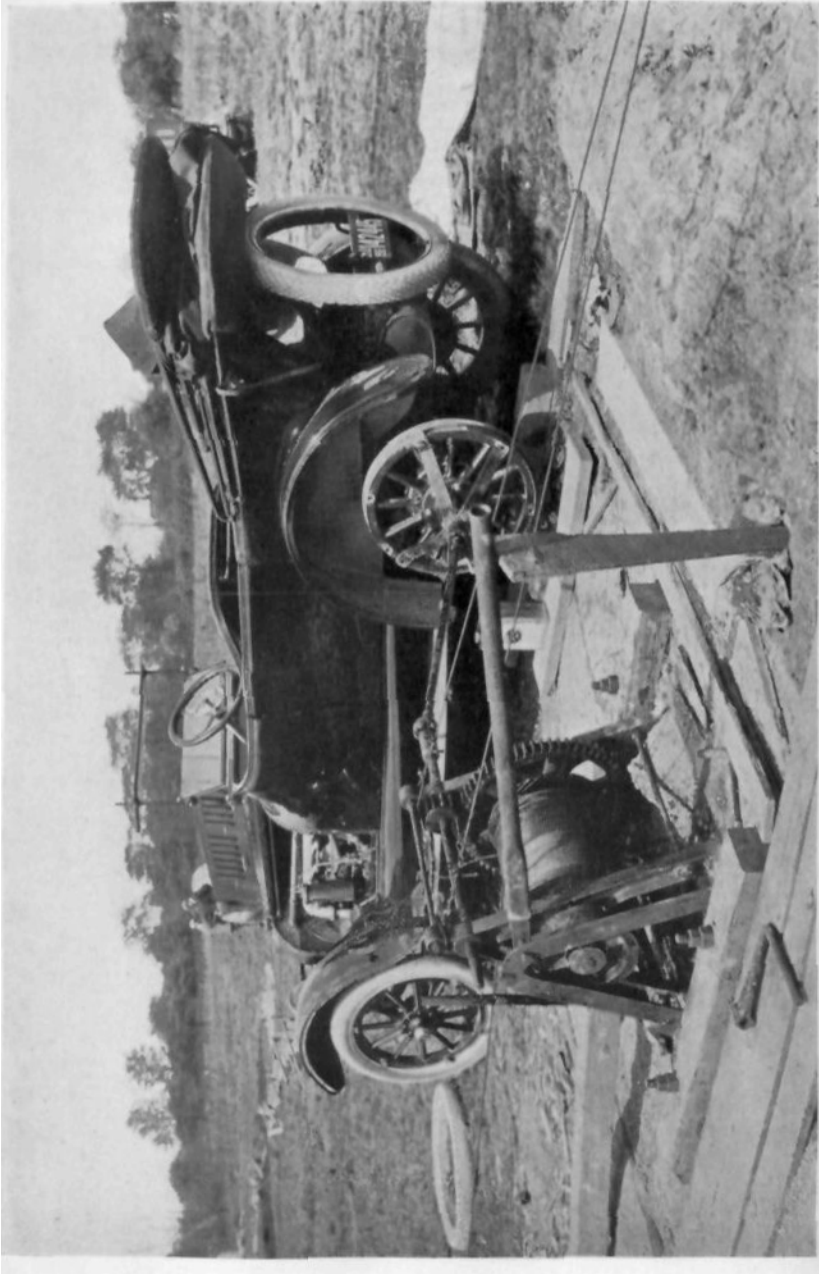
GOODYEAR KITE BALLOON
SHOWING SIDE FINNS AND STEERING BAG



GOODYEAR KITE BALLOON
SHOWING METHOD OF INFLATION



ADAPTATION OF AUTOMOBILE DRIVING WHEEL
FOR LOWERING KITE BALLOON



WINDLASS FOR LOWERING KITE BALLOON
CONNECTED WITH DRIVING WHEEL OF AUTOMOBILE

REPORT ON THE GOODYEAR KITE BALLOON

wholly to one of dampening the motion of the balloon in a gusty wind. Contrary to expectations it was found that the form of construction of the tail-cup was a considerable factor in its stability. Its present form was adopted as a result of practical and wind tunnel experiments on numerous different designs.

6. The resistance was farther cut down by making the balloon more nearly self-contained and eliminating superfluous cordage and protuberances.

7. In other balloons it was found that the gas leakage through the valve was commonly many times greater than all other sources of leakage combined. The valve was therefore designed especially to prevent leakage. Its size is more than ample for all requirements of captive or free balloon use. The air valves have also been made tighter and more efficient, thereby cutting down the quantity of air required.

8. A very simple and efficient damping device for the basket has been devised.

II. General Dimensions:

1. Length 82 feet.
2. Diameter 22 feet.
3. Capacity: Main bag, 25,000 cubic feet; balloonet, 5000 cubic feet.

4. Lifting power 800 pounds.
5. Basket to hold two passengers and five bags of sand, weighing fifty pounds each.

6. Method of attachment: By windlass through block, as shown in photographs.

7. Communication: By field telephone or buzzer and by empty sand bags used as signal flags.

8. Method of inflation: By large balloon cloth tubing, as shown in photographs. (May be filled from small portable cylinders, by means of individual tubing to cylinders.)

9. Several flights were made at various altitudes, with wind varying from 12 to 45 miles per hour.

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The following notes of a typical flight with 1000 feet of cable fully extended, is enumerated to give example of data collected:

Date—May 19, 1916.

Time—4.15 P.M.

Temperature—62° F. Cloudy.

Wind—Gusty; 12 to 35 miles per hour.

Altitude	Wind Velocity	Angle of balloon from ground, measured by transit
100 feet	12 M.P.H.	41°–54°
200 feet	12 M.P.H.	51°–63°
300 feet	22 M.P.H.	45°–55°
400 feet	30 M.P.H.	45°–51°
500 feet	30 M.P.H.	48°–54°
600 feet	35 M.P.H.	40°–63°
700 feet	28 M.P.H.	39°–57°

Time to run out balloon with 1000 feet of cable, 4½ minutes.

Time to descend, 3 minutes.

A tour of the Goodyear Rubber Company's Balloon Department was made. They have every facility for balloon manufacture and can guarantee delivery of kite observation balloons at rate of one per week.

THE UNITED STATES FIELD ARTILLERY ASSOCIATION

Annual Meeting

THE annual meeting of the Association was held at the Army and Navy Club in Washington, December 22, 1916, with the President, General Macomb, in the chair. A quorum for the transaction of business was present in person or by written proxy. The minutes of the last meeting were approved. The Secretary presented the resignation of Colonel Peyton C. March as a member of the Executive Council, submitted because, in the opinion of Colonel March, as many as possible of the members of the Council should be stationed in Washington. Upon motion the resignation was accepted. The Secretary-Editor submitted his annual report "on general affairs and progress of the Association and the conduct of the JOURNAL since the last regular meeting," as required by the constitution. The following-named officers were elected to membership on the Executive Council:

Lieutenant-Colonel William M. Cruikshank (Field Artillery), Adjutant General's Department, U. S. Army, vice General Macomb.

Major Fox Conner (Field Artillery), Inspector General's Department, U. S. Army, vice Colonel March.

Major Thorndike D. Howe, 1st Massachusetts Field Artillery, vice Colonel Sherburne.

Major Robert H. Tyndall, Indiana Field Artillery, vice Major Vandercook.

A committee of officers was appointed to audit the Treasurer's accounts, and after informal discussion of the affairs of the Association the meeting adjourned.

REPORT OF THE SECRETARY-EDITOR.

The business of the Association during the fiscal year ended November 30, 1916, amounted to \$4215.41, of which the cash receipts were \$3807.91, and bills which had not been paid when the books were closed for the fiscal year amounted to \$407.50. These amounts, added to the \$240.77 on hand at the beginning of the year, made the total income of the Association \$4456.18. The total of the expenditures during the year was \$3336.12, leaving a cash balance in the Treasury at the close

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of the fiscal year of \$712.56, which with the bills payable made the total assets of the Association at the end of the year \$1120.06. A detailed statement of receipts and expenditures is given below:

RECEIPTS	
Balance on hand, December 1, 1915	\$240.77
Subscriptions, copies sold, books, etc	2574.12
Advertisements	1184.71
Refunds of expenditures for members.....	22.00
Interest on deposits	27.08
	\$4048.68
EXPENDITURES	
Printing, engraving, postage, stationery, etc.....	\$2872.50
Office equipment	1.05
Telegrams, express, freight	10.15
Clerk hire	230.00
Solicitation of advertisements	75.53
Books, subscriptions, etc., for members	131.34
Refunds and miscellaneous expenses	15.55
	3336.12
Balance on hand, November 30, 1916.....	\$712.56
Bills due and payable	407.50
	\$1120.06
Total assets	\$1120.06

The prediction of the Secretary in his annual report last year that the increased circulation and advertising patronage of THE FIELD ARTILLERY JOURNAL would continue as permanent sources of income, has been verified. In addition, THE JOURNAL continued its healthy growth during the year. The value of the advertising patronage increased about 46 per cent. There was a gain of 7 per cent. in the number of Regular Army Field Artillery active members of the Association; a gain of 22 per cent. in the National Guard active membership; a gain of 55 per cent. in other subscriptions; and an increase of 29 per cent. in the total number of paying subscribers to THE JOURNAL. The Association has passed through some lean years, and at all times the burden of maintaining the magazine has been heavy; but to-day the Association is solvent and THE FIELD ARTILLERY JOURNAL may be said to be an established institution. It has become still more widely known, and thus the scope of its influence and its opportunities for carrying on the work for which it was established have been considerably extended. This has, of course, resulted in a corresponding increase in its correspondence with business firms and persons in civil life, thus adding to the burden of work placed upon the management. During the year the number of Field Artillery officers of the Regular Army not members of the Association was reduced from 39 to 28. Were those remaining to join the Association, so that it might be stated that all Field Artillery

THE UNITED STATES FIELD ARTILLERY ASSOCIATION

officers of the Regular Army were members and subscribers to THE JOURNAL, it would be of very material assistance to the management in its dealings with business men and others. While it may be too much to expect the entire commissioned personnel of the National Guard Field Artillery to join the Association, the loyal support given by many National Guard officers is encouraging and helpful and without it the Association could not carry on the work it is doing. Meanwhile, it might be well to repeat that there are still twenty-five Field Artillery officers of the Regular Army who are not assisting in the work, three having joined since the close of the fiscal year and prior to the date of this report.

During the year we have continued our pleasant and profitable relations with our publishers, the J. B. Lippincott Company, of Philadelphia, to whom we are indebted for coöperation and material assistance.

EDITORIAL DEPARTMENT

WE are in receipt of a little pamphlet, "First Days in Manila," which has been prepared by the Philippine Branch of the Army Relief Society for distribution to those who are going to Manila.

In its foreword is the statement that "It is not complete, it is not a literary production, nor is it an advertising scheme. It has been compiled by a few Army People now on foreign service desiring to do their best to help out those now at home or those who have recently arrived in the Philippines."

The motive is praiseworthy. Examination of the pamphlet reveals the fact that it contains much information of value to those going to the Philippines, information that will save them time and trouble.

We are informed that copies of this pamphlet will be found on all transports sailing from San Francisco, and that they are for free distribution to officers and their families. We doubt not that those who go as strangers to the Islands will be grateful for the help that it will give them.

Our New Year's Greeting.

THE Field Artillery Association has just completed a very successful year, both financially and otherwise. Financially the Association is on a firmer foundation than it has ever been before. The income has been materially greater than the expenses, though the latter have been heavier than ever before, and the balance remaining is a satisfying one with excellent prospects for the coming year. Subscriptions have increased and the advertising has been placed upon a sound business basis with correspondingly increased returns.

We are gratified with the increase in the membership of the Association, and desire to thank our members for the interest that has been shown in the work of our institution.

EDITORIAL DEPARTMENT

We also note with pleasure the extension of the influence of the Association through THE JOURNAL. An effort has been made to widen the sphere covered by the organ of the Association, and it is beginning to bear fruit. The general interest of the nation in military matters has been awakened, and our people are seeking for enlightenment. We shall be fortunate if we can assist in this enlightenment by placing before them the best in Field Artillery literature.

The policy of THE JOURNAL has always been to avoid discussions of policy and to limit itself to matters connected principally with the technique of the arm, its organization, matériel, and methods. This policy is still believed to be the proper one. At the same time, in order that we may appeal to a larger circle of readers, many of whom are not professional, it is believed to be proper at this time to extend it, and to publish from time to time articles more or less popular in character, if such can be obtained.

If we can thus excite the interest of our people, it is believed that not only shall we be able to extend our circulation and influence, but we can also, without transgressing the bounds of official propriety, assist materially in the campaign of education that is now under way as to military preparedness.

Many of our people now know that Field Artillery has played a most important part in the battles abroad, but they have been taught by the newspapers, through articles that, while they are accurate in many respects, are written to accentuate the "human interest" phases of battle. Few of them have taken up the popular feature of artillery technique, simple explanations of "how they do it." We feel that now is the time to take up such articles in our pages.

The Editor therefore desires to invite articles of this character, in addition to the standard technical essays that have usually filled the pages of THE JOURNAL, and calls upon our membership to assist him in extending the interest of the whole people of the United States in the Field Artillery arm.

BOOK REVIEWS

THE SUBMARINE TORPEDO BOAT. Its characteristics and modern development. By Allen Hoar, Junior Member American Soc. of Civil Engineers. D. Van Nostrand Company, New York, 1916. Illustrated. Price, \$2.00.

The author traces the history of the submarine boat from the earliest effort by a Hollander, Dr. Cornelius Van Drebbel, in 1624, up through the attempt of Bushnell, during our American Revolution, and the later experiments by inventors in the United States and France, the only two nations that seemed interested in the problem, to the inventions of Holland and Lake, whose development has resulted in the submarine of the present day.

His technical treatment of the principles of construction of the submarine is clear and excellent. The mathematics are simple and should be easily understood by even a high school student.

Means of defense against submarines are well treated, as are the principles of tactical evolution both for offense and defense.

The author closes the work with a short chapter on submarine mines, which is quite interesting.

The book is excellently printed, with good paper, clear type, well reproduced photos and plates, and has a comprehensive index of its subject matter.

MILITARY AND NAVAL AMERICA. By Captain Harrison S. Kerrick, C.A.C., U. S. Army. Doubleday, Page & Company, New York, 1916. Illustrated.

A compendium of military and naval information for the student, teacher, and the general public. The author has drawn freely upon official sources for his information, which is consequently accurate. The book itself is very comprehensive, including practically every branch of the military and naval service. Illustrations are freely used, which adds materially to the attractiveness of the book.

Like many of the "preparedness" works of the present day, however, it shows that it has been prepared in haste, under pressure. The arrangement could be improved; condensation of certain parts would have been beneficial, while the expansion of others would have added to the value of the work.

BOOK REVIEWS

It is also to be regretted that the author, in describing the several corps and departments, has included in his text the names of the officers who were at the time of writing at the heads of them. This renders the work ephemeral, as, even since the work was written, changes have taken place in the Army War College and in the Quartermaster Corps.

The work is well printed, and the illustrations are excellent. It is well worth the reading.

RADIODYNAMICS. The Wireless Control of Torpedoes and Other Mechanisms. By B. F. Meissner, Associate Member Institute of Radio Engineers, Expert Radio Aide, U. S. Navy. D. Van Nostrand Company, New York, 1916. Illustrated. Price, \$2.00.

The author presents in an orderly and instructive work the history, methods, and apparatus of Radiodynamics, the art of controlling distant mechanisms without artificial connecting means.

The modern development of wireless telegraphy has led to experimentation along the lines of the transmission of power by radio; the end is not yet, but up to the present time discovery along this line has been in the nature of controlling rather than impelling distant mechanisms. The methods and apparatus used for this purpose are described in an interesting and instructive manner.

It is interesting to note that the chief development of Radiodynamics has been along military and naval lines. It may be that the art is more applicable to war than to peace, but in view of the corresponding development of many other arts and sciences in the same direction, it would almost seem that war calls forth much more than peace the highest inventive genius of man.

The work is replete with diagrams and excellent illustrations, adding materially to the clearness of the text.

The paper, type, illustrations, and binding are of the usual excellent quality produced by the publisher. An excellent work for the engineer, student, or military man, and an ornament to a library.

LESSONS IN VISUAL SIGNALLING. By M. A. Palen, 2d Lieut., 12th Infantry. George Banta Publishing Company, Menasha, Wisconsin. Price, 60 cents.

A short course in visual signaling, designed to aid in the instruction of enlisted men. The lessons are well divided, and the exercises are such that they contain only the letters in the lesson of the day and previous

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lessons. The system should be easy of application and should assist materially in the instruction of signal detachments.

The book contains a series of lessons for both flag and two-arm semaphore signaling, with instructions as to location of signal stations, etc.

PROBLEMS IN TROOP LANDING. An Infantry Division. Prepared by the Department of Military Art, Army Service Schools. Press of the Army Service Schools, Fort Leavenworth, Kansas, 1916.

A series of studies in the troop leading of an infantry division, first, on the offensive, and second, on the defensive. From the introduction, it appears that the various situations have been the subjects of troop leading problems that have been solved in 1913 and 1915 by the Line Class, and that they have been rewritten, in minor particulars, to conform to subsequent changes in organization and regulations.

A comprehensive review of the entire work is a matter of extended study, involving considerable time and labor.

It is to be regretted that the publication of the work was not delayed until organization tables based upon the National Defense Act were available. The organization of the typical division is now statutory, and there is no longer any necessity for the makeshift provisional organizations of the Tables of Organization of 1914. The division and brigades are provided with a headquarters, train and military police force is provided without the necessity of detaching a troop of cavalry and a company of infantry, a regiment of engineers has been added instead of a battalion, and other material changes have been made.

It is also to be regretted that the map of Gettysburg was selected for the scene of the problems. Tactics and military geography should be combined as far as practicable in our studies, and it seems contradictory to place a concrete problem upon terrain that can never be more than abstract. It seems proper to suggest that the scene of the problems solved at our service schools should be one or another of the several well-marked strategic areas involved in our national defense plans.

On the whole, the book is a series of excellent studies and should be carefully read by all officers and utilized in the working of similar problems. It is highly recommended to the service.

Index to Current Field Artillery Literature

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

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

Aerial guns—Germany—European war.—The armament of German aircraft in the war. (Clipping from *La France Militaire*, August 13, 1916. Filed envelope case—Aeroplanes—Germany—European war.)

Aerial guns.—Development of non-recoil guns for aeroplanes. (Machinery, August, 1916, p. 1103.)

Aerial warfare—European war.—Aero-photographs taken by French aircraft on the Macedonian front. (L'illustration, August 26, 1916, p. 192.)

Aerial warfare—European war.—French methods of aircraft co-operation with infantry. (Clipping from *Japan Times*, August 27, 1916. Filed envelope case—Battle tactics—France—European war.)

Aerial warfare—European war.—Account of destruction of Zeppelin near London. (From *London Daily Telegraph*, September 4, 1916. Filed envelope case—aerial warfare—European war.)

Aerial warfare—European war.—Aeronautics in the great war. The captive balloon, and the important work it performs. Illustrated. (*Scientific American Supplement*, September 30, 1916, p. 216.)

Ammunition—artillery—high explosive shells.—Ammunition used in modern rapid fire guns. (*Army and Navy Gazette*, August 26, 1916, p. 549.)

Ammunition—artillery—France.—The manufacture of heavy projectiles in France. Illustrated. (*La Science Et La Vie*, August-September, 1916, pp. 373-378.)

Ammunition expended in battle—artillery—European war.—The question of ammunition consumption and manufacture. (P. 123. *La Guerre Moderne et ses Nouveaux Procédés*. By Bellet & Darville, Paris, 1916. U104 B44 (1916).)

Ammunition—expenditure in battle—artillery—European war.—A total of 500,000 rounds a day was supplied in the battles in Picardy since June, 1916. (*Broad Arrow*, July 26, 1916, p. 77.)

Armored automobiles.—Various traction mechanisms that might be employed for armored battle cars in view of the use in European war by British on the French front, September, 1916. (*Scientific American*, September 30, 1916, p. 305. With illustrations.)

Armored cars—European war.—The automatic land cruiser. Part played by American company in developing the "Tanks" of French battlefields. Illustrated. (*Iron Age*, September 28, 1916, p. 695.)

Artillery—European war.—Comparison of the artillery of the belligerents. German inferior. Statement of classes of 2000 pieces of artillery said to be employed by Germans at Verdun. (clipping from *Gazette de Lausanne*, August 5, 1916. Filed envelope case—artillery—European war.)

Artillery—European war.—Views of devices for protection against observation by aircraft. (L'illustration, August 19, 1916, p. 184.)

Artillery—European war.—Discussion of the sound of guns and zones of silence as experienced in the war. (*Revue Des Deux Mondes*, September 1, 1916, pp. 217-228.)

Artillery—European war—French front.—Plans before the war. How they have been modified. (From *La France Militaire*, September 14, 1916. Filed envelope case—artillery—European war—French front.)

Artillery—France—European war.—The changing opinions in regard to shrapnel and shells. Effect of French fire. (From *La France Militaire*. August and September, 1916. Filed envelope case—artillery—France—European war.)

Artillery—France—European war.—Condition of the artillery in 1914. Work of Colonel de Bange. (From *La France Militaire*, September 5, 1916. Filed envelope case—artillery—France—European war.)

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- Artillery—Roumania.*—Data on the artillery matériel of the Roumanian army. (From La France Militaire, August 30, 1916. Filed envelope case—artillery—Roumania.)
- Artillery drill and tactics—France.*—Plans before the war. How they have been modified. (From La France Militaire, September 14, 1916. Filed envelope case—artillery—European war—French front.)
- Artillery drill and tactics—European war.*—The Italian artillery attack on the Isonzo, July, 1916. (Clipping from Gazette de Lausanne, August 14, 1916. Filed envelope case—European war—Italian front.)
- Artillery fire—Electricity.*—Electricity in operation and the firing of guns. With cuts. (La Science Et La Vie, August-September, 1916, pp. 241-251.)
- Artillery fire—zone of silence.*—Discussion on the distance gun fire can be heard and zones of silence. Illustrated. (La Science Et La Vie, August-September, 1916, pp. 215-220.)
- Armored cars—European war.*—Notes on the present European war: Brief description of types at the front. General opinion that armored cars are of great utility and will be employed permanently. (P. 11. From De Mil. Spectator. Published in Memorial del Ejercito de Chile, April, 1916. Transl. by Maj. G. A. Skinner, Med. Corps, U. S. A. Tr. No. 2957.)
- Artillery.*—Portable lights for use in fuze setting during night firing, etc. Plan proposed in Chile. With cuts. (Memorial Del Ejercito De Chile, July, 1916, pp. 452-462.)
- Artillery—Europe.*—Tabular statement of number of pieces per operative unit; in an inf. battl., and model; caliber; weight of projectile; m. vel.; range, etc., in the artillery of Russia, France, Italy, Great Britain, and Sweden. (Militar-Wochenblatt, June 14, 1916, p. 2463. No. 104.)
- Artillery—European war.*—Advance obtained in the mobility of the artillery. (Clipping from La France Militaire, July 8, 1916. Filed envelope case—artillery—European war.)
- Artillery—European war.*—French preparation with artillery for advance on the Somme. (Clipping from N. Y. Times, August 6, 1916. Filed envelope case—European war—France.)
- Artillery—France.*—French classification of types. (Clipping from La France Militaire, July 14, 1916, Filed envelope case—artillery—France.)
- Artillery—France—European war.*—Gun models in the army at beginning of the war. (Memorial De Artilleria, July, 1916, p. 98.)
- Artillery matériel—Germany—European war.*—Pictures of machine gun, automatic rifle, and trench mortars. (Illustrated London News, July 22, 1916, p. 96.)
- Balloons—European war.*—The captive balloon, and the important work it performs. (Scientific American Supplement, September 30, 1916, p. 216.)
- Battle tactics—European war.*—Notes on the present European war: Mass attacks. Attack on fortified positions. The struggle for superiority of fire. Conduct of fire. Assault. War in the trenches, etc., etc. (From De Mil. Spectator. Published in Memorial del Ejercito de Chile, April, 1916. Translated by Maj. G. A. Skinner, Med. Corps, U. S. A. Tr. No. 2957.)
- Battle tactics—Germany—European war.*—Specimen of German regimental order for attack in an action in the Argonne forest. (P. 64. Der Krieg im Argonnerwald. By B. Kellermann, Berlin, 1916. D534.1 A6 K29.)
- Bibliography—Field Artillery.*—List of books for study and reference relating to school of fire for field artillery, and recommended for junior officers of field artillery. June, 1916. (Filed envelope case—bibliography—field artillery.)
- Discipline.*—Treatise on discipline and how it is obtained in organization of business. (The Executive and His Control of Men. By E. B. Gowin, New York, 1916. BF431 G72.)
- Discipline—discipline and freedom.*—How discipline is obtained. Effects of the European war on crime in England. (Nineteenth Century and After, July, 1916, p. 88.)
- Discipline—Germany—European war.*—Unity of doctrine in German army permitted rapid organization of divisions from battalions taken from different commands. (Clipping from La France Militaire, July 17, 1916. Filed envelope case—training—Germany—European war.)
- Electricity.*—Electricity in operation and the firing of guns. With cuts. (La Science Et La Vie, August-September, 1916, pp. 241-251.)

INDEX TO CURRENT FIELD ARTILLERY LITERATURE

- Engineer Training.*—Field artillery service for civilian engineers. Problems and solutions in gun pointing for indirect fire. (Engineering News, September 21, 1916, p. 564.)
- Explosives.*—The nature of explosive. General principles on which their composition and action depend. (Scientific American Supplement, October 7, 1916, p. 230.)
- Field Artillery—Canada—European war.*—War establishment of a field artillery brigade. (P. 18. Canadian Expeditionary Force Units. Instructions governing organization and administration. Ottawa, 1916. UA600 A5.)
- Field Artillery—United States.*—The field artillery of the United States Army. Illustrated. (Scientific American, August 5, 1916, p. 120.)
- Field artillery fire.*—List of books for study and reference relating to school of fire for field artillery and recommended for junior officers of field artillery. June, 1916. (Filed envelope case—bibliography—field artillery.)
- Field artillery—United States.*—Field artillery service should attract engineers. Reasons stated with outline of the problems. (Engineering News, August 24, 1916, p. 353.)
- Field artillery—Japan.*—Data on the Japanese field artillery with illustrations. (La Science Et La Vie, August-September, 1916, pp. 343-351.)
- Field artillery drill and tactics.*—Field artillery service for civilian engineers. Problems and solutions in gun pointing for indirect fire. (Engineering News, September 21, 1916, p. 564.)
- Field artillery fire.*—Electricity in operation and the firing of guns. With cuts. (La Science Et La Vie, August-September, 1916, pp. 241-251.)
- Field engineering.*—Field fortifications and entrenched camps. History of, different methods, p. 117. (Operations of the Division of Military Engineering. Washington, 1894. UG7 16 1893.)
- Field fortifications—European war.*—Organization and types of defense works, mines, etc. Illustrated report of Spanish military observers. (La Guerra y Su Preparacion, August, 1916, pp. 461-486.)
- Field glasses.*—Optical glass. Various qualities required, and the history and methods of its manufacture. (Scientific American Supplement, August 19, 1916, p. 118.)
- Field guns—Germany—European war.*—Views of field guns with shields. (La Guerre, No. 11, pp. 23-24.)
- Guns.*—The evolution of big guns. From the cast-iron smooth bore to the modern breech-loader. Illustrations. (Scientific American Supplement, October 14, 1916, p. 252.)
- Guns.*—Modern gun construction and breech mechanism. Illustrated. (Pp. 241-641-773. Operations of the Division of Military Engineering, Washington, 1894. UG7 16, 1893.)
- Guns.*—Evolution and construction of breech mechanism for guns. With diagrams. (From The Times—National Review, China, June 17, 1916, p. 497.)
- Guns—Great Britain—European war.*—Photographs of howitzers and railroad guns, and the means of protecting from view. (Filed envelope case—guns—Great Britain—European war.)
- Guns—Great Britain—European war.*—Pictures of 75 and 210 mm. howitzers. (Illustrated War News, August 2, 1916, p. 39.)
- Guns—European war.*—View of a heavy gun position on the Salonica front. (Filed envelope case—guns—European war.)
- Guns—Germany—European war.*—Characteristics of the 13 cm. gun of the German artillery. (From La France Militaire, August 24, 1916. (Filed envelope case—guns—Germany—European war.)
- Guns—Great Britain—European war.*—Photographs of heavy guns on rails. (Illustrated London News, August 19, 1916, p. 224.)
- Heavy Field Artillery—Great Britain—European war.*—Pictures of British types of heavy guns. (Clipping from Daily Mail, July, 1916. Filed envelope case—heavy field artillery—Great Britain—European war.)
- Heavy field artillery—Great Britain—European war.*—Pictures of heavy guns and howitzers on western front. (Illustrated War News, July 19, 1916, pp. 18-19.)
- Heavy artillery—European war.*—The big guns in the war. The new artillery being used by the allies. (Scientific American Supplement, September 16, 1916, p. 184.)
- Heavy artillery—France—European war.*—Picture of a mortar battery at its firing point. (Illustrated London News, September 2, 1916, p. 277.)

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- Heavy artillery—Germany—European war.*—Organization of the heavy artillery. (Clipping from La France Militaire, August 12, 1916. Filed envelope case—heavy artillery—Germany—European war.)
- Heavy artillery—Russia—European war.*—Observation and communication in the heavy artillery. Russian methods in the war. (Journal United Service Institution of India, July, 1916, p. 294.)
- Helmets—European war.*—Description and illustration of a trench helmet. (Land and Water, July 27, 1916, p. XIII.)
- Helmets—European war.*—Pictures of German type which covers the face. (Times History of the War, August 15, 1916, pp. 474-483.)
- Helmets—France.*—The constituent parts of a steel helmet, and number that have been made. (Engineering, August 4, 1916, p. 104.)
- Helmets—Germany.*—Photo of German type of helmet for the trenches. (Illustrated War News, August 23, 1916, p. 5.)
- Helmets—Germany—European war.*—Illustration of helmets, showing also gas masks. (Clipping filed envelope case—helmets—Germany—European war.)
- Howitzers—Great Britain—European war.*—View of a heavy field howitzer in action. (Illustrated War News, September 20, 1916, p. 21.)
- Landing operations.*—Historical instances and methods of landing operations. (See Index of Military Operations and Maritime Preponderance, their relations and interdependence. By Col. C. E. Callwell, London, 1905. U200 C14.)
- Mechanical transportation.*—Use of White trucks in the armies of United States and France. Illustrated. (Clipping from The Albatross, July, 1916. Filed envelope case—mechanical transportation.)
- Mechanical transportation.*—Auto repair trucks for field service. Importance of portable machine shops in modern warfare. Illustrated. (Scientific American, September 9, 1916, p. 242.)
- Mechanical transportation—European war.*—Data on capacity, organization and methods of railroad and motor transportation. (Journal Military Service Institution, September-October, 1916, p. 251.)
- Mechanical transportation—European war.*—Number of motors in France in 1914, and their utilization. (P. 245. La Guerre Moderne et ses Nouveaux Procédés. By Belet & Darville, Paris, 1916. U104 B44 (1916).)
- Mechanical transportation—European war.*—Photo of a British heavy howitzer drawn by a truck. (Filed envelope case—mechanical transportation—European war.)
- Mechanical transportation—France—European war.*—Description and illustration of French methods, types and training in motor traction for heavy guns. (Clipping from The Automobile, August 24, 1916. Filed envelope case—mechanical transportation—France—European war.)
- Mechanical transportation—France—European war.*—How France trains military chauffeurs. Experience with various types of automobiles; good and bad qualities. (Clipping from Motor Age, New York, August 17, 1916. Filed envelope case—mechanical transportation—France—European war.)
- Mechanical transportation—United States.*—Details about 125 automobiles carrying 800 soldiers from San Francisco to Monterey, July, 1916. (Clipping filed envelope case—mechanical transportation—United States.)
- Mechanical transportation—United States.*—Needs of transportation. Present methods mediæval. By Capt. Gordon Johnston, U. S. A. (From The Motorists' Magazine, 1916. Filed envelope case—mechanical transportation—United States.)
- Mechanical transportation—Great Britain—European war.*—Picture of motor-tractors for heavy artillery. (Illustrated London News, August 5, 1916, pp. 151, 168.)
- Mechanical transportation.*—A comparison of weight in its relation to horse-power in motor vehicles. (Scientific American Supplement, September 23, 1916, p. 199.)
- Mechanical transportation.*—Various traction mechanisms that might be employed for armored battlecars in view of the use in European war by British on the French front, September, 1916. (Scientific American, September 30, 1916, p. 305. With illustrations.)
- Mechanical transportation.*—Number of motor trucks employed in the European war and by the United States Army on the Mexican border. (American Review of Reviews, October, 1916, p. 413.)
- Mechanical transportation—European war.*—Motor types and methods of transportation in the armies of France, Germany, Great Britain and Russia. Illustrated. (Der Krieg, Nos. 51 and 52, pp. 67-85. D501.4 K93.)

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- Mortars—France—European war.*—Constructive and ballistic data concerning 29.3 cm. Danish mortars reported to be employed by the French at Verdun. (Clipping from Fremdenblatt, Vienna, August 4, 1916. Filed envelope case—mortars—France—European war.)
- Mortars—European war.*—Picture of a mortar battery at its firing point. (Illustrated London News, September 2, 1916, p. 277.)
- Mountain artillery—Mexico.*—A short comparative study of matériel of the regulation mountain artillery and that proposed by Maj. M. Mondragon. Illustrated. (P. 897. Operations of the Division of Military Engineering, Washington, 1894. UG7 16, 1893.)
- Night operations.*—Portable lights for use by artillery. Plan proposed in Chile. With cuts. (Memorial Del Ejercito De Chile, July, 1916, pp. 452–462.)
- Observation—European war.*—Means of observation from trenches. French experience in the use of periscopes. (Clipping from La France Militaire, July 1, 1916. Filed envelope case—observation—European war.)
- Periscope—Germany—European war.*—Picture and details of a giant German field-periscope with telescopic tube on its wheeled travelling-carriage elevated to a height of fifty feet. (Illustrated London News, August 12, 1916, p. 183; also in L'Illustration, July 22, 1916, p. 73.)
- Periscope—Great Britain—European war.*—Notes on periscope types adopted for field use. (List of Changes in War Matériel, July 1, 1916, p. 613.)
- Periscopes—France—European war.*—Means of observation from trenches. French experience in the use of periscopes. (Clipping from La France Militaire, July 1, 1916. Filed envelope case—observation—European war.)
- Projectiles—France.*—The manufacture of heavy projectiles in France. Illustrated. (La Science Et La Vie, August-September, 1916, pp. 373–378.)
- Searchlights—United States.*—Photo print of a field generator and searchlight for the United States Marine Corps. Title page. (Army and Navy News, September, 1916.)
- Shells.*—High explosive shells. Ammunition used in modern rapid-fire guns. (Army and Navy Gazette, August 26, 1916, p. 549.)
- Sights—artillery—European war.*—Illustrated account of new types developed in the war. (La Science Et La Vie, July, 1916, pp. 145–152.)
- Signalling—European war.*—The need and growing use of optical signalling. (From La France Militaire, September 1, 1916. Filed envelope case—signalling—European war.)
- Signalling—France—European war.*—Methods and apparatus for optical signalling in the armies. Illustrated. (La Science Et La Vie, August-September, 1916, pp. 337–342.)
- Sketching.*—An outline of the elements for panoramic sketching. With diagrams and plate. (Journal R. Artillery, August, 1916, p. 145.)
- Telescopes—European war.*—Photo of a German field telescope of very high power mounted on wheels. (Filed envelope case—telescopes—European war.)
- Trench warfare—European war.*—The problem of enfilade. Notes on the value of enfilade fire as opposed to frontal fire, especially with regard to trench warfare. British experience in the war. With cuts. (Journal R. Artillery, August, 1916, p. 152.)
- Trenches—European war.*—Plans of German trench works on the western front. (Clipping filed envelope case—trenches—European war.)
- Trenches—European war.*—Plans of German trenches, and trenches compared. (From London Morning Post, September 4, 1916. Filed envelope case—trenches—European war.)
- Trenches.*—Digging of trenches by machine. Suggestive measures used for draining ditches. Illustrated. (Scientific American Supplement, October 7, 1916, p. 228.)
- Verdun.*—Illustrations of French fortifications; German trenches. Results of bombardment. (Clipping field envelope case—Verdun.)
- Verdun—European war.*—German methods in attack upon Verdun. (Clipping from Japan Weekly Mail, June 10, 1916. Filed envelope case—Verdun—European war.)
- Verdun—European war.*—Photographs of Fort Douaumont, etc., taken from the air. French attack on May 22, 1916. With maps. (L'Illustration, June 10, 1916, p. 532.)
- Watering troughs.*—Notes on a portable linen watering trough for horses. Illustrated. (Boletin Del Ejercito, Cuba, September, 1916, pp. 7–13.)

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- Army and Navy Journal, New York City.
- Army and Navy Register, Washington, D. C.
- Artilleritidskrift, Stockholm, Sweden.
- Artilleristische Monatshefte, Berlin, Germany.
- Cavalry Journal, Fort Leavenworth, Kansas.
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- Forest and Stream, New York City.
- Infantry Journal, Washington, D. C.
- Informacion Militar del Extranjero, Madrid, Spain.
- * Journal des Sciences Militaires, Paris, France.
- Journal of the Military Service Institution, Governor's Island.
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- Journal of the U. S. Artillery, Fort Monroe, Virginia.
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- Memorial del Estado Mayor de Ejército de Colombia, Bogota, Colombia.
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- Revista de Artilharia, Lisbon, Portugal.
- Revista del Circulo Militar, Buenos Aires, Argentine Republic.
- Revista di Artigleria e Genio, Rome, Italy.
- Revista Militar, Buenos Aires, Argentine Republic.
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- Scabbard and Blade, Fond du Lac, Wisconsin.
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* Publication suspended during the war.

Field Artillery Directory

REGULAR ARMY

FIRST FIELD ARTILLERY (Light.)

Schofield Barracks, Hawaii

Colonel.

Snow, William J.

Lieutenant Colonel.

Horn, Tiemann N.

Major.

Austin, Fred T.

Chaplain.

Fealy, Ignatius (1 lieut.)

Captains.

McIntyre, Augustine

Currie, Dennis H.

Hoyle, René E. De R

Lyerly, Ballard

First Lieutenants.

McCleave, William

Martin, Truby C

Daly, Charles D

Stewart, Frederick, W.

Ahern, Leo J.

Frankenberger, Bertram

Second Lieutenants.

.....
Veterinarians.

Stokes, Wilfred J.

Haynes, James R.

SECOND FIELD ARTILLERY (Mountain.)

Philippine Islands.

Colonel.

Van Deusen, George W.

Lieutenant Colonel.

.....
Major.

Spaulding, Oliver L., Jr.

Chaplain.

Houlihan, James F. (1 lieut.)

Captains.

Stuart, Edward A

Hennessy, Frederick B.

Barnes, Joseph F

Fuger, Albert S.

Baker, Scott

Pennell, Ralph McT. (att.)

Hall, Albert L.

Thorp, Frank, Jr., (att.)

SECOND FIELD ARTILLERY (Mountain)—Continued.

Captains

Randol, Marshall G.

Mort, John E.

Higley, Harvey D.

King, Edward P., Jr.

First Lieutenants.

Hopkins, Samuel R.

Hayden, Herbert B.

Oliphant, Thomas G. M.

Jones, Lloyd E.

Polk, Newton N.

Anderson, Jonathan W.

Bailey, Wesley M.

Second Lieutenants.

.....
Veterinarians.

Gage, Fred B.

Gould, John H.

THIRD FIELD ARTILLERY (Light.)

Permanent Stations:

Hdqrs. and 1 Battn., Ft. Sam

Houston, Tex.

2 Battn., Ft. Myer, Va.

Present Station:

Hdqrs., 1 Battn., and Batty, D

Eagle Pass, Tex.

Battys, E and F, Laredo, Tex.

Colonel.

Millar, Edward A.

Lieutenant Colonel.

McCloskey, Manus

Major.

Farrar, Henry B.

Chaplain.

Perry, Barton W. (maj.)

Captains.

Gallup, Fred H.

Bunker, Charles M.

Jones, Clarence N.

Michel, William N.

Mortimer, Charles G.

Margetts, Nelson E.

Smith, Edwin De L.

Miles, Sherman

Lewis, Robert H.

First Lieutenants.

Kirkwood, Robert G.

Brabson, Joe R.

Thurber, Philip L.

Harris, Arthur R.

THIRD FIELD ARTILLERY

(Light)—Continued.

First Lieutenants.

Beukema, Herman

Waldron, Albert W.

Wallace, John H.

Hudnutt, Dean

Hibbs, Louis E.

Second Lieutenants.

.....
Veterinarians.

Griffin, Gerald E.

Mitchell, Aquilla

FOURTH FIELD ARTILLERY (Mountain.)

Permanent stations:

Hdqrs. and 1 Battn., Ft. D. A.

Russell, Wyo.

2 Battn., Corozal, Canal Zone.

Present Stations:

Hdqrs. 1 Battn., Columbus, N.

Mex.

Batty D. Brownsville, Tex.

Colonel.

Irwin, George Le R.

Lieutenant Colonel.

Lyon, LeRoy S.

Major.

Merrill, Thomas E.

Chaplain.

.....
Captains.

Faulkner, Albert U.

Apple, George M.

Lawson, Laurin L.

Mason, Roger O.

Brewster, Alden F.

Wheeler, Ernest S.

McNair, Lesley J.

Cubbison, Donald C.

Maul, John C.

Collins, Leroy P.

First Lieutenants.

Rumbough, Joseph W.

Bateman, Harold H.

Eager, John M.

Scott, Richard C.

Eager, Howard

Craig, Louis A.

Dunigan, Francis J.

Wesbee, Charles M.

Maguire, Hamilton E.

Jones, H. Crampton

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FIELD ARTILLERY DIRECTORY—Continued.

<p>FOURTH FIELD ARTILLERY MOUNTAIN—CONTINUED.</p> <p><i>Second Lieutenants.</i></p> <p>.....</p> <p><i>Veterinarians.</i></p> <p>Le May, Daniel Sproule, William A.</p> <p>FIFTH FIELD ARTILLERY (Heavy.)</p> <p>Permanent station: Ft. Sill, Okla.</p> <p>Present stations: Hdqrs. 1 Btn. and Batty, E, Camp Ft. Bliss, Tex. Batty, D, Ft. Ringgold, Tex. Batty, F, Brownsville, Tex.</p> <p><i>Colonel.</i></p> <p>Menoher, Charles T</p> <p><i>Lieutenant Colonel.</i></p> <p>Bowley, Albert J.</p> <p><i>Majors.</i></p> <p>Smith, Wright Starbird, Alfred A</p> <p><i>Chaplain.</i></p> <p>Clemens, Joseph (capt.)</p> <p><i>Captains.</i></p> <p>Donnelly, Edward T Briggs, Raymond W. Wood, Norton E Davis, Robert Glassford, Pelham D. Davis, Joseph R. Booker, Phillip W. Capron, Webster A. Perkins, Kenneth S.</p> <p><i>First Lieutenants.</i></p> <p>Crane, John A. Prince, Frederick A. Meyer, Vincent Barnes, Julian F. Wyeth, John C. Burr, John G. Lester, James A. (att.) Reinhart, Stanley E. Woodward, William R.</p> <p><i>Second Lieutenants.</i></p> <p>.....</p> <p><i>Veterinarians.</i></p> <p>Williams, Herbert S. Power, Richard H.</p>	<p>SIXTH FIELD ARTILLERY HORSE—CONTINUED</p> <p><i>Chaplain.</i></p> <p>Dickson, Thomas J. (maj.)</p> <p><i>Captains.</i></p> <p>Yule, Edgar H. Birnle, Upton, Jr. Griffin, Francis W. Myers, Joseph E. Wood, William S. Dodds, William H., Jr. Bishop, Albert T. Starkey, John R. Marley, James P.</p> <p><i>First Lieutenants</i></p> <p>Beere, Donald M. Miner, Harold E. Clarkson, Herbert S. Helmick, Charles G. Houghton, William C. Anderson, John B. Zundel, Edwin A. Marsh, Raymond Rutherford, Ray C. King, Alfred K.</p> <p><i>Second Lieutenant</i></p> <p>.....</p> <p><i>Veterinarians.</i></p> <p>Hill, William P. Mason, Alfred L. (att.)</p> <p>SEVENTH FIELD ARTILLERY (Light)</p> <p>Permanent station: Ft. Sam Houston, Tex.</p> <p><i>Colonel.</i></p> <p>Sturgis, Samuel D.</p> <p><i>Lieutenant Colonel.</i></p> <p>Farr, Otho W. B.</p> <p><i>Major.</i></p> <p>.....</p> <p><i>Chaplain.</i></p> <p>Joyce, Francis P. (capt.)</p> <p><i>Captains.</i></p> <p>McKinlay, Louis H. Merrill, Walter W. Bailey, Benjamin M. Sands, Alfred L. P. Harlow, Charles W. Greely, John N. Barrows, Frederick M. Dunn, William E. Parrott, Roger S.</p> <p><i>First Lieutenants.</i></p> <p>Turner, Frank A. Lewis, Burton O. Dawley, Ernest J. Peyton, Bernard R. Magruder, John Nance, Curtis H. Tarpley, Jesse F.</p> <p><i>Second Lieutenant.</i></p> <p>.....</p> <p><i>Veterinarian.</i></p> <p>Foster, Frederick</p>	<p>EIGHTH FIELD ARTILLERY (Light.)</p> <p>Permanent Station: Ft. Bliss, Tex.</p> <p><i>Colonel.</i></p> <p>March, Peyton C.</p> <p><i>Lieutenant Colonel.</i></p> <p>Bishop, Harry G.</p> <p><i>Majors.</i></p> <p>Hopkins, Frank E. Lambdin, William McK.</p> <p><i>Chaplain.</i></p> <p>Smith, Samuel J. (maj.)</p> <p><i>Captains.</i></p> <p>Quinn, Leo P. Neal, Carroll W. Osborne, Thomas D. Sturgill, Walter S. George, Charles P. Shepard, William H. Gottschalk, Telesphor G.</p> <p><i>First Lieutenants.</i></p> <p>Seaman, George G. Hobbs, Harvey M. Morrow, Norman Parker, Edwin P., Jr. Swing, Joseph M. McBride, Horace L. Bradburn, Clarence E.</p> <p><i>Second Lieutenant.</i></p> <p>.....</p> <p><i>Veterinarian.</i></p> <p>.....</p> <p>NINTH FIELD ARTILLERY (Heavy.)</p> <p>Permanent Station: Schofield Barracks, Hawaii.</p> <p><i>Colonel.</i></p> <p>McMahon, John E.</p> <p><i>Lieutenant General</i></p> <p>Guignard, William S.</p> <p><i>Major.</i></p> <p>Butner, Henry W.</p> <p><i>Chaplain.</i></p> <p>.....</p> <p><i>Captains.</i></p> <p>Kilbreth, John W., Jr. Browning, William S. Pratt, Raymond S. Corey, John B. W. Frankenberger, Samuel Kilbourne, Henry S., Jr. Paine, George H. Pfeil, Henry H.</p> <p><i>First Lieutenants.</i></p> <p>Erienkotter, Herman Devers, Jacob L. Gay, George S. Vanderveer, Harold C. Hauser, John N. Daly, Joseph O.</p> <p><i>Second Lieutenants.</i></p> <p>.....</p> <p><i>Veterinarians.</i></p> <p>.....</p>
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FIELD ARTILLERY DIRECTORY

FIELD ARTILLERY DIRECTORY—Continued.

LINEAL RANK*

No. Name, rank, and date of rank.	No. Name, rank, and date of rank.	No. Name, rank, and date of rank.
<i>Colonels.</i>		
1 Van Deusen, G. W. 7 sept. 11	9 <i>Westervelt, W. I.</i> 25 jan. 07	75 Bishop, A. T. 1 July, 16
2 Millar, E. A. 1 dec.	10 Birnie, U., Jr. 25 jan.	76 Prosser, W. E. 1 July.
3 Sturgis, S. D. 27 dec. 12	11 <i>Deems, C., Jr.</i> 25 jan.	77 Huntley, H. W. 1 July.
4 <i>Berry, L. G.</i> 16 mar. 13	12 <i>Doyle, F. C.</i> 25 jan.	78 Smith, E. De L. 1 July.
5 McMahon, J. E. 3 June, 16	13 McIntyre, A. 25 jan.	79 <i>Pennell, R. McT.</i> 1 July.
6 Menoher, C. T. 1 July.	14 <i>Greene, G. R.</i> 25 jan.	80 Sturgill, W. S. 1 July.
7 <i>Hinds, E.</i> 1 July.	15 Briggs, R. W. 25 jan.	81 Miles, S. 1 July.
8 March P. C. 1 July.	16 Bunker, C. M. 25 jan.	82 <i>Parker, C.</i> 1 July.
9 <i>Kenly, W. L.</i> 1 July.	17 Griffin, F. W. 25 jan.	83 <i>Burleson, R. C.</i> 1 July.
10 <i>McGlachlin E. F., Jr.</i> 1 July.	18 <i>Welsh, R. S.</i> 25 jan.	84 Davis, J. R. 1 July.
11 Lassiter, W. 1 July.	19 <i>Campbell, T.</i> 25 jan.	85 Starkey, J. R. 1 July.
12 Irwin, G. Le R. 1 July.	20 Craig, D. F. 25 jan.	86 Hoyle, R. E. DeR. 1 July.
13 McNair, W. S. 1 July.	21 <i>Warfield, A. B.</i> 25 jan.	87 <i>Olmstead, D.</i> 1 July.
14 Snow, W. J. 1 July.	22 <i>Burt, W. H.</i> 12 June.	88 Maul, J. C. 1 July.
<i>Captains—Continued.</i>		
<i>Lieutenant Colonels.</i>		
1 Gatley, G. G. 12 June, 16	24 <i>Hennessy, F. B.</i> 26 July, 07	90 Paine, G. H. 1 July.
2 Lyon, Le R. S. 1 July.	25 Lawson, L. L. 12 Aug.	91 Collins, L. P. 1 July.
3 Horn, T. N. 1 July.	26 <i>Locke, M. E.</i> 25 Aug. 08	92 Lyster, B. 1 July.
4 <i>Summerall, C. P.</i> 1 July.	27 <i>Kilbreth, J. W., Jr.</i> 1 Apr. 04	93 Lewis, R. H. 1 July.
5 <i>Cruikshank, W. M.</i> 1 July.	28 <i>Bryson, J. H.</i> 10 Sept. 09	94 Booker, P. W. 1 July.
6 Farr, O. W. B. 1 July.	29 Mason, R. O. 30 Sept.	95 <i>Cruse, F. T.</i> 1 July.
7 <i>Aultman, D. E.</i> 1 July.	30 <i>Browning, W. S.</i> 15 Nov. 10	96 Marley, J. P. 1 July.
8 <i>Fleming, A. S.</i> 1 July.	31 <i>Barnes, J. F.</i> 3 Mar. 11	97 Potter, W. C. 1 July.
9 Payne, B. 1 July.	32 <i>Ennis, W. P.</i> 11 Mar.	98 Pfeil, H. H. 1 July.
10 Guignard, W. S. 1 July.	33 <i>Currie, D. H.</i> 11 Mar.	99 Merrill, W. W. 1 July.
11 Bowley, A. J. 1 July.	34 <i>Browne, B. F.</i> 11 Mar. 11	100 Downer, J. W. 1 July.
12 Bishop, H. G. 1 July.	35 <i>Pratt, R. S.</i> 11 Mar.	101 Bailey, B. M. 1 July.
13 <i>Newbill, W. D.</i> 26 July.	36 <i>Brewster, A. F.</i> 11 Mar.	102 <i>Sharp, W. F.</i> 1 July.
14 <i>McCloskey, M.</i> 26 July.	37 <i>De Armond, E. H.</i> 11 Mar.	103 Thorp, F. Jr. 1 July.
<i>Majors.</i>		
1 <i>McMaster, R. H.</i> 18 Nov. 14	38 Wood, N. E. 11 Mar.	104 <i>Tyndall, J. G.</i> 1 July.
2 <i>Stephens, J. E.</i> 3 June, 16	39 <i>Fuger, A. S.</i> 11 Mar.	105 Sands, A. L. P. 1 July.
3 Merrill, T. E. 12 June.	40 <i>Michel, W. N.</i> 11 Mar.	106 George, C. P. 1 July.
4 <i>Conner, F.</i> 1 July.	41 <i>Wheeler, E. S.</i> 11 Mar.	107 Harlow, C. W. 1 July.
5 <i>Butner, H. W.</i> 1 July.	42 <i>Hollyday, T. W.</i> 11 Mar.	108 <i>Rucker, W. H.</i> 1 July.
6 <i>Newbold, H. L.</i> 1 July.	43 <i>Corey, J. B. W.</i> 13 Apr.	109 Shepherd, W. H. 1 July.
7 <i>Scott, E. D.</i> 1 July.	44 <i>Churchill, M.</i> 13 Apr.	110 <i>Randol, M. G.</i> 1 July.
8 <i>Smith, W.</i> 1 July.	45 <i>Jones, W. F.</i> 13 Apr.	111 <i>Greely, J. N.</i> 1 July.
9 <i>Starbird, A. A.</i> 1 July.	46 <i>Mortimer, C. G.</i> 26 May.	112 <i>Capron, W. A.</i> 1 July.
10 <i>Lloyd, C. R.</i> 1 July.	47 <i>Margetts, N. E.</i> 26 May.	113 <i>Mort, J. E.</i> 1 July.
11 <i>Spaulding, O. L., Jr.</i> 1 July.	48 <i>Davis, R.</i> 7 June.	114 <i>Barrows, F. M.</i> 1 July.
12 <i>Lansa, C. H.</i> 1 July.	49 <i>Myers, J. E.</i> 7 Sept.	115 <i>Dunn, W. E.</i> 1 July.
13 <i>Farrar, H. B.</i> 1 July.	50 <i>Wood, W. S.</i> 8 Sept.	116 <i>Burns, J. H.</i> 1 July.
14 <i>Granger, R. S.</i> 1 July.	51 <i>Frankenberger, S.</i> 18 Oct.	117 <i>Hughes, E. S.</i> 1 July.
15 <i>Moore, D. T.</i> 1 July.	52 <i>Morrison, W. F.</i> 9 Feb. 12	118 <i>Smith, T. J.</i> 1 July.
16 <i>Hopkins, F. E.</i> 1 July.	53 <i>Ferris, C. J.</i> 26 Aug.	119 <i>Parrott, R. S.</i> 1 July.
17 <i>Austin, F. T.</i> 1 July.	54 <i>Rehkopf, N. B.</i> 11 July, 13	120 <i>Gottschalk, T. G.</i> 1 July.
18 <i>Pulis, C. C.</i> 1 July.	55 <i>Baker, S.</i> 9 Oct.	121 <i>Higley, H. D.</i> 1 July.
19 <i>Boiseau, L. T.</i> 1 July.	56 <i>Howze, M. W.</i> 24 Oct.	122 <i>King, E. P., Jr.</i> 1 July.
20 <i>Lambdin, W. McK.</i> 1 July.	57 <i>Kilbourne, H. S., Jr.</i> 22 Nov.	123 <i>Perkins, K. S.</i> 1 July.
<i>Captains.</i>		
1 Gallup, F. H. 7 July, 04	58 <i>McNair, L. J.</i> 19 Apr. 14	<i>First Lieutenants.</i>
2 <i>Stuart, E. A.</i> 25 Jan. 07	59 <i>Allin, G. R.</i> 13 June.	1 Kirkwood, R. G. 13 Apr. 11
3 <i>Donnelly, E. T.</i> 25 Jan.	60 <i>Glassford, P. D.</i> 18 Nov.	2 <i>Marr, H. E.</i> 26 May.
4 <i>Brooke, G. M.</i> 25 Jan.	61 <i>Bryden, W.</i> 10 Jan. 15	3 <i>Rumbough, J. W.</i> 7 June.
5 <i>Williams, H. C.</i> 25 Jan.	62 <i>Honeycutt, F. W.</i> 27 June.	4 <i>McCleave, W.</i> 13 June.
6 <i>Faulkner, A. U.</i> 25 Jan.	63 <i>Hand, D. W.</i> 25 Jan. 07	5 <i>McBride, A. C.</i> 20 June.
7 <i>Apple, G. M.</i> 25 Jan.	64 <i>Blakely, C. S.</i> 4 Nov. 15	6 <i>Brabson, J. R.</i> 20 June.
8 <i>Yule, E. H.</i> 25 Jan.	65 <i>Smith, E. T.</i> 3 June, 16	7 <i>Sparks, L. C.</i> 1 July.
	66 <i>Danford, R. M.</i> 12 June.	8 <i>Crane, J. A.</i> 1 July.
	67 <i>Quinn, L. P.</i> 12 June.	9 <i>Prince, F. A.</i> 1 Apr. 12
	68 <i>Gruber, E. L.</i> 1 July.	10 <i>Magruder, M.</i> 28 May.
	69 <i>Neal, C. W.</i> 1 July.	11 <i>Martin, T. C.</i> 31 May.
	70 <i>Cubbinson, D. C.</i> 1 July.	12 <i>Rogers, W.</i> 31 July.
	71 <i>McKinlay, L. H.</i> 1 July.	13 <i>Dougherty, L. R.</i> 22 Aug.
	72 <i>Osborne, T. D.</i> 1 July.	14 <i>Hopkins, S. R.</i> 26 Aug.
	73 <i>Dodds, W. H., Jr.</i> 1 July.	
	74 <i>Hammond, J. S.</i> 1 July.	

*NOTE:—Names of officers detailed from the line for service in the staff departments under section 26, act of February 2, 1901, acts of March 2, 1903, June 25, 1906, March 2, 1907, March 23, 1910, or July 18, 1914 and officers detached from their proper commands under act of March 3, 1911, or July 18, 1914, are printed in italics.

THE FIELD ARTILLERY JOURNAL

FIELD ARTILLERY DIRECTORY—Continued

No. Name, rank, and date of rank.	No. Name, rank, and date of rank.	No. Name, rank, and date of rank.
<i>First Lieutenants—Continued</i>		
15 Hollingsworth, C. P. 6 sept. 12	51 Andrews, J. 1 July, 16	87 Cain, D. E. 1 July, 16
16 Daly, C. D. 5 mar. 13	52 Oliphant, T. G. M. 1 July.	88 McMahon, J. E. Jr. 1 July.
17 Palmer, A. K. C. 22 nov.	53 Proctor, M. 1 July.	89 Clarkson, H. S. 1 July.
18 Stewart, F. W. 13 June, 14	54 Wrona, W. J. 1 July.	90 Craig, L. A. 1 July.
19 Hayden, H. B. 18 nov.	55 Erwin, V. P. 1 July.	91 Helmick, C. G. 1 July.
20 Ahern, L. J. 10 Jan. 15	56 Bloom, F. 1 July.	92 Sedlacek, E. 1 July.
21 Beere, D. M. 10 Jan.	57 Meyer, V. 1 July.	93 Thurber, P. L. 1 July.
22 Erlenkotter, H. 12 May.	58 Hicks, E. H. 1 July.	94 Houghton, W. C. 1 July.
23 Thummel, C. B. 15 May.	59 Morrow, N. P. 1 July.	95 Wyeth, J. G. 1 July.
24 Miner, H. E. 4 Nov.	60 Jones, L. E. 1 July.	96 Harris, A. R. 1 July.
25 Devers, J. L. 1 Apr. 16	61 Polk, N. N. 1 July.	97 Burr, J. G. 1 July.
26 Taliaferro, L. H. 8 May.	62 Bradley, F. 1 July.	98 Anderson, J. B. 1 July.
27 Bateman, H. H. 8 May.	63 Andreson, R. E. 1 July.	99 Burr, W. E. 1 July.
28 Turner, F. A. 3 June.	64 Deshon, P. 1 July.	100 Lester, J. A. 1 July.
29 Seaman, G. G. 12 June.	65 Barnes, J. F. 1 July.	101 Beukema, H. 1 July.
30 Reynolds, C. C. 12 June.	66 Vanderveer, H. C. 1 July.	102 Strubble, H. S. 1 July.
31 Gay, G. S. 20 June.	67 Andrus, C. 1 July.	103 Dunigan, F. J. 1 July.
32 Wallace, F. C. 20 June.	68 Maxwell, R. L. 1 July.	104 Zendel, E. A. 1 July.
33 Lewis, B. O. 1 July.	69 Browne, C. J. 1 July.	105 Howard, C. W. 1 July.
34 Odell, H. R. 1 July.	70 Hauser, J. N. 1 July.	106 Busbee, C. M. 1 July.
35 Selleck, C. A. 1 July.	71 Greenwald, K. C. 1 July.	107 Waldron, A. W. 1 July.
36 Dawley, E. J. 1 July.	72 Anderson, R. E. 1 July.	108 Wallace, J. H. 1 July.
37 Beard, L. A. 1 July.	73 Gillespie, J. A. 1 July.	109 Marsh, R. 1 July.
38 Jones, I. 1 July.	74 Bailey, W. M. 1 July.	110 Swing, J. M. 1 July.
39 Goetz, R. C. F. 1 July.	75 vonHoltendorff, J. D. 1 July.	111 Reinhart, S. E. 1 July.
40 Peyton, B. R. 1 July.	76 Winton, W. F. 1 July.	112 Hudnutt, D. 1 July.
41 Magruder, J. 1 July.	77 Frankenberger, B. 1 July.	113 Hibbs, L. E. 1 July.
42 Riggs, E. F. 1 July.	78 Austin, R. B. 1 July.	114 Tarpley, J. F., Jr. 1 July.
43 Nance, C. H. 1 July.	79 Daly, J. O. 1 July.	115 McBride, H. L. 1 July.
44 Bowley, F. W. 1 July.	80 Parker, E. P., Jr. 1 July.	116 Maguire, H. E. 1 July.
45 Beatty, J. C. 1 July.	81 Eager, J. M. 1 July.	117 Rutherford, R. C. 1 July.
46 Hatch, J. E. 1 July.	82 Scott, R. C. 1 July.	118 Woodward, W. R. 1 July.
47 Walker, C. A., Jr. 1 July.	83 Eager, H. 1 July.	119 King, A. K. 1 July.
48 Simpson, B. W. 1 July.	84 Young, W. C. 1 July.	120 Jones, H. C. 1 July.
49 Finch, N. B. 1 July.	85 Crane, W. C., Jr. 1 July.	121 Bradburn, C. E. 17 Aug.
50 Hobbs, H. M. 1 July.	86 Brewer, C. 1 July.	

FIELD ARTILLERY DIRECTORY

FIELD ARTILLERY DIRECTORY—Continued

NATIONAL GUARD

FIRST INSPECTION DISTRICT

Capt. Ned B. Rehkopf and Lieut. Harold E. Marr, Inspectors,
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1st Lieut. Lucius E. Hill.
2nd Lieut. Walter B. Smith.
2nd Lieut. Harry G. Hall.

Massachusetts

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Lieut.-Col.
Capt. Robert E. Goodwin, Adjutant.
Chaplain Murray W. Dewart.

FIRST BATTALION Headquarters, Boston

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Capt. Norton Wigglesworth, Battalion Adjutant.

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1st Lieut.

HEADQUARTERS COMPANY

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1st Lieut. Stuart McLeod.

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1st Lieut. Geo. A. Parker.
2nd Lieut. James F. Clarke.
2nd Lieut. Erland F. Fish.

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1st Lieut. Arthur P. Trombly.
1st Lieut. John B. Haliburton.
2nd Lieut. Milton J. Haynes.
2nd Lieut. Edward J. Gully.

BATTERY C, LAWRENCE

Capt. Watkins W. Roberts.
1st Lieut. R. A. Daniels.
1st Lieut.
2nd Lieut. Sumner H. Needham.
2nd Lieut. Wesley L. Whelpley.

SECOND BATTALION Headquarters, Salem

Maj. Thorndike D. Howe.
Capt. John A. O'Keefe, Jr., Battalion Adjutant.

BATTERY D

Capt. Frank S. Perkins.
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1st Lieut. Carroll M. Wheeler.
2nd Lieut. Roland H. Choate.
2nd Lieut. Nathaniel S. Simpkins, Jr.

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1st Lieut. Harry E. Mitton.
1st Lieut. George E. Burke.

2nd Lieut. Harry E. Cahoon.
2nd Lieut. Edward H. Calhoun.

BATTERY F

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1st Lieut. Clyde W. Johnson.
1st Lieut. Willis G. Dockum.
2nd Lieut. Herman A. MacDonald.
2nd Lieut.

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1st Lieut. Gerald T. Hanley.
1st Lieut.
2nd Lieut. Donald S. Babcock.
2nd Lieut. Harold R. Barker.

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1st Lieut. Ernest L. Averill.
2nd Lieut. John W. Newton.
2nd Lieut. Clive C. Day.

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1st Lieut. Marcus Morton, Jr.
1st Lieut. Stuart L. Bullivant.
2nd Lieut. Philip J. Clark.
2nd Lieut. John McArthur.

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Dawson Olmstead, Inspectors, New York City

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1st Lieut. Charles W. Fritz.
2nd Lieut. Louis C. Ceils.
2nd Lieut. Tegwell L. Powell.

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1st Lieut. Samuel R. English.
1st Lieut. John H. Dittess, Jr.
2nd Lieut. Charles V. Dickinson.
2nd Lieut. John W. Hicks.

BATTERY C, EAST ORANGE

Capt. Edward C. James.
1st Lieut. Clarence A. Nordine.
1st Lieut.
2nd Lieut. Frank C. Nagel.
2nd Lieut. Robert L. Eaton.

New York

FIELD ARTILLERY BRIGADE

Brig.-Gen. William S. McNair.
Maj. Leonard Bacon Smith, Adjutant.

It is requested that changes be reported to the Secretary, United States Field Artillery Association, Army War College,
Washington, D. C.

THE FIELD ARTILLERY JOURNAL

FIELD ARTILLERY DIRECTORY—Continued

FIRST FIELD ARTILLERY Headquarters, New York City

Col. Henry H. Rogers.
Lieut.-Col. Merritt H. Smith.
Maj. Charles R. Seymour.
Maj. James E. Austin.
Capt. Francis D. Bowne, Supply Company.
Capt. Alvan W. Perry, Headquarters Company.
Capt. Benjamin Van Raden, Headquarters Company.
1st Lieut. Clarence G. Michalis, Supply Company.
Chaplain Herbert Shipman.

HEADQUARTERS COMPANY

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1st Lieut. Archibald P. Britt.

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1st Lieut. Thomas E. Hitchcock.
1st Lieut. William H. Thomas.
2nd Lieut. Edward R. Granger.
2nd Lieut. Charles E. Dunlap.

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1st Lieut. Channing R. Toy.
1st Lieut. James H. Giles.
2nd Lieut. William P. Welsh.
2nd Lieut. Charles E. Dunlap.

BATTERY C, BINGHAMTON

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1st Lieut. Albert J. Sinnock.
2nd Lieut. Steele Wotkyns.
2nd Lieut. Philip B. Weld.

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1st Lieut. George S. Gibbons.
2nd Lieut. Clinton M. Lucas.
2nd Lieut. Fred. A. Petersen.

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1st Lieut. Robert L. Russell.
1st Lieut. Matthew S. Weir.
2nd Lieut. Harold LeR. Whitney.
2nd Lieut. Aidan C. Kelly.

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1st Lieut. James S. Larkin.
1st Lieut.
2nd Lieut. Edwin S. Bettleheim.
2nd Lieut.

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Maj. James B. Richardson.
Maj. DeWitt C. Weld.
Capt. Louis F. Kuntz, Supply Company.
Capt. Albert D. Washington, Supply Company.
1st Lieut. George A. Sheddon, Supply Company.

HEADQUARTERS COMPANY

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Capt. Robt. W. Marshall.
Capt. John D. Butt.

1st Lieut. Edward L. Brennan.

BATTERY A, BROOKLYN

Capt. Walter P. Fox.
1st Lieut. John D. Butt.
1st Lieut. Roger P. Clark.
2nd Lieut. Henry P. Bristol.
2nd Lieut. Thomas H. S. Andrews.

BATTERY B, BROOKLYN

Capt. Lester C. Fox.
1st Lieut. Horst A. C. Albrecht.
1st Lieut. Harry C. Miller.
2nd Lieut. Edward L. Brennan.
2nd Lieut. Walter H. Hereth.

BATTERY C, BROOKLYN

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1st Lieut. Edward O. Gilmore.
2nd Lieut. James H. McSweeney.
2nd Lieut. Arthur M. Floor.

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1st Lieut. Henry G. W. Cox.
2nd Lieut. Charles C. Warren.
2nd Lieut. Theron R. Strong.

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1st Lieut. Dean Nelson.
1st Lieut. Frank A. Spencer, Jr.
2nd Lieut. Herman A. van Brakel.
2nd Lieut. Weyman D. Herbert.

BATTERY F, NEW YORK CITY

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1st Lieut. Charles H. King.
1st Lieut.
2nd Lieut. Raymond L. Hoffman.
2nd Lieut. Francis V. Hayes.

THIRD FIELD ARTILLERY Headquarters, Buffalo

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Lieut.-Col. John D. Howland.
Maj. Louis H. Eller.
Maj. James P. Fowler.
Capt. Charles H. Williams, Supply Company.

HEADQUARTERS COMPANY

Capt. Bradley Goodyear.
Capt. Thomas Marks.
Capt. Wm. H. Kennedy.
1st Lieut. John D. Webber.
Chaplain Walter Fornes.

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Capt. Chauncey J. Hamlin.
1st Lieut.
1st Lieut.
2nd Lieut. Eben C. Sprague.
2nd Lieut. Henry Schen.

BATTERY B, BUFFALO

Capt. Patrick J. Keeler.
1st Lieut. Howard K. Parker.
1st Lieut.
2nd Lieut. John B. Howland.
2nd Lieut. William J. Gaskin.

It is requested that changes be reported to the Secretary, United States Field Artillery Association, Army War College, Washington, D. C.

FIELD ARTILLERY DIRECTORY

FIELD ARTILLERY DIRECTORY—Continued

BATTERY C, BUFFALO

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1st Lieut.
1st Lieut.
2nd Lieut. Carleton B. Briggs.
2nd Lieut. Leonard S. Allen.

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1st Lieut. Edward L. Williams.
2nd Lieut. D. Rumsey Wheeler.
2nd Lieut.

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1st Lieut. Harry L. Gilchriese.
1st Lieut.
2nd Lieut. Edwin C. Gutelins.
2nd Lieut. Louis Wojkoroski.

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1st Lieut. Horace H. Burkhardt.
2nd Lieut. Marvin M. Marcus, Jr.
2nd Lieut.

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District of Columbia

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1st Lieut. Harry E. Shilling.
2nd Lieut. Homer M. Mohr.
2nd Lieut. Milton T. Noyes.

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1st Lieut. Ellwood S. Moorhead, Jr.
1st Lieut.
2nd Lieut. Charles L. Ladson.
2nd Lieut. Gerald G. McGrath.

Pennsylvania

FIRST FIELD ARTILLERY Headquarters, Pittsburgh

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Lieut. Col. Albert V. Crookston.
Maj. Theodore R. McLain.
Maj. William T. Rees.
Capt. Josiah L. Reese, Adjutant.
Capt. Edwin L. Brown, Quartermaster.
Capt. Robert W. Cooper, Commissary.
Capt. James B. McCalley, Battalion Adjutant.
Capt. James F. Kratzer, Battalion Adjutant.
1st Lieut. Edward A. Ohotnicky, Battalion Quartermaster and
Commissary.
1st Lieut. Carl H. Conner, Battalion Quartermaster and
Commissary.
Capt. Charles M. Miller, Chaplain.

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1st Lieut. George W. Edwards.
1st Lieut. Benjamin E. Cole.
2nd Lieut. Thomas P. Harris.
2nd Lieut.

BATTERY B, PITTSBURGH

Capt. Clinton T. Bundy.
1st Lieut. Blaine Aiken.
1st Lieut. Samuel D. Hollis.
2nd Lieut. Chas. C. Williams.
2nd Lieut. Anthony J. Leffler.

BATTERY C, PHOENIXVILLE

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1st Lieut. Frederick S. Swier.
1st Lieut. Augustine S. Janeway.
2nd Lieut. John G. Failor.
2nd Lieut. John Nuckel.

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1st Lieut. Garret Cochran.
2nd Lieut. John H. Ball.
2nd Lieut. Clyde R. Shelly.

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1st Lieut. William G. Fullman.
1st Lieut. Harry Howe.
2nd Lieut. Harry F. Plank.
2nd Lieut. William J. Miller.

BATTERY F, PITTSBURGH

Capt. John S. Purucker.
1st Lieut. Harry L. Probst.
1st Lieut. William K. Weaver, Jr.
2nd Lieut. Peter J. McGurk.
2nd Lieut. John M. Browning.

SECOND FIELD ARTILLERY Headquarters, Philadelphia

Col. Hamilton D. Turner.
Lieut. Col. Thomas J. Ross.
Maj. John H. Hall.
Maj.
Capt. Jacob H. Geissel, Adjutant.
Capt. Stanley W. Root, Quartermaster.
Capt. Frank P. Ruddat, Commissary.
Capt. Andrew R. Lockhart, Battalion Adjutant.
Capt. Edwin J. Nowlen, Battalion Adjutant.
1st Lieut. Joseph Moorhead, Battalion Quartermaster and
Commissary.
1st Lieut. Romanus Fellman, Battalion Quartermaster and
Commissary.
1st Lieut. Robert J. McFetridge, Chaplain.

BATTERY A, PHILADELPHIA

Capt. J. Gobin Cranage.
1st Lieut. William A. Davis.
1st Lieut. James W. Duffy.
2nd Lieut. Edward M. Horter.
2nd Lieut. Hubert R. Southall.

BATTERY B, PHILADELPHIA

Capt. William M. Rowland.
1st Lieut. Harry H. Ennis.
1st Lieut. Frederick J. Widman.
2nd Lieut. George E. Roth.
2nd Lieut. Robert Adams, Jr.

BATTERY C, PHILADELPHIA

Capt. George A. Morrison.
1st Lieut. Alexander J. Maile.
1st Lieut. Robert W. King.
2nd Lieut. William E. Boeger.
2nd Lieut. Edward Hubbs.

It is requested that changes be reported to the Secretary, United States Field Artillery Association, Army War College, Washington, D. C.

THE FIELD ARTILLERY JOURNAL

FIELD ARTILLERY DIRECTORY—Continued

BATTERY D, PHILADELPHIA

Capt. Robert G. MacKendrick.
1st Lieut. William A. March.
1st Lieut. Joseph K. Fornace.
2nd Lieut. George S. Stewart.
2nd Lieut. Erroll B. Hay.

BATTERY E, PHILADELPHIA

Capt. Harold Hellyer.
1st Lieut. Charles C. Hicks 3rd.
1st Lieut. Clement Tingley.
2nd Lieut. Frank P. Reed, Jr.
2nd Lieut. William F. Brown, Jr.

BATTERY F, PHILADELPHIA

Capt. Walton Clark, Jr.
1st Lieut. Harry L. Gormley.
1st Lieut. Charles D. Shaw, Jr.
2nd Lieut. Wharton G. Ingram.
2nd Lieut. William F. Brothers.

THIRD FIELD ARTILLERY

Headquarters, Wilkes-Barre

Col. Asher Miner.
Lieut.-Col. Fred T. Cruse.
Maj. James A. Dewey.
Maj. Olin F. Harvey, Jr.
Capt. Benjamin F. Evans, Adjutant.
Capt. George W. Cox, Battalion Adjutant.
Capt. Stephen Elliott, Battalion Adjutant.
1st Lieut. James M. Farr, Chaplain.

HEADQUARTERS COMPANY, WILKES-BARRE

Capt. Alexander A. DeCelles.
1st Lieut. Neil Chrisman.

SUPPLY COMPANY, WILKES-BARRE

Capt. William S. McLean, Jr.
1st Lieut. George H. Rhinehart.

BATTERY A, HAZLETON

Capt. William L. Ravert.
1st Lieut. George N. Deitrich.
1st Lieut. Christopher A. Dunningan.
2nd Lieut. William W. Lazarus.
2nd Lieut. William S. James.

BATTERY B, PITSTON

Capt. Jacob A. Fleischer.
1st Lieut. Samuel J. Traher.
1st Lieut. Ernest R. Winters.
2nd Lieut. Leo A. Tierney.
2nd Lieut. O. Raymond Snyder.

BATTERY C, NANTICOKE AND PLYMOUTH

Capt. Robert F. Waters.
1st Lieut. Thomas J. Kniff.
1st Lieut. Adnah G. Kostenbauder.
2nd Lieut. William J. Spry.
2nd Lieut. Martin P. Hart.

BATTERY D, WILKES-BARRE.

Capt. William H. Zierdt.
1st Lieut. Thomas H. Atherton, Jr.
1st Lieut. Robert C. Miner.
2nd Lieut. Edward Brown.
2nd Lieut. David R. Palmer.

BATTERY E, WILKES-BARRE

Capt. Alexander A. Mitchell.
1st Lieut. George N. Klein.
1st Lieut. William H. Smith.

2nd Lieut. Charles H. Zierdt.
2nd Lieut. Thomas N. Troxell.

BATTERY F, WILKES-BARRE

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1st Lieut. John W. Coover.
1st Lieut. William K. Russell, Jr.
2nd Lieut. Henry H. Dean.
2nd Lieut. Harold R. Mahoney.

Maryland

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1st Lieut. James C. McLanahan.
1st Lieut. Gustavus Ober, Jr.
2nd Lieut. John Ridgely, Jr.
2nd Lieut. A. Hunter Boyd, Jr.

Virginia

FIRST BATTALION

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1st Lieut. Edward J. Keegan.

BATTERY A, RICHMOND

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1st Lieut. Edward C. Rees.
1st Lieut. James C. Pollard.
2nd Lieut. John T. Wood.
2nd Lieut. George H. Myers.

BATTERY B, NORFOLK

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1st Lieut. McChesney H. Jeffries.
1st Lieut. W. Carleton Jones.
2nd Lieut. John D. Thomas.
2nd Lieut. Cary A. Willcox.

BATTERY C, PORTSMOUTH

Capt. Ira Branch Johnson.
1st Lieut. Walter J. Tennent.
1st Lieut. Lester T. Gayle, Jr.
2nd Lieut. Irving L. Leaf.
2nd Lieut. Thomas S. Moseley.

BATTERY D, HAMPTON

Capt. Frank H. Couch.
1st Lieut. Thornton F. Jones.
1st Lieut. Robert G. Suggen.
2nd Lieut. Charles B. Powell.
2nd Lieut. Robert F. Taylor.

FOURTH INSPECTION DISTRICT

Lieut. Charles S. Blakely, Inspector, New Orleans, La.

Alabama

BATTERY A, BIRMINGHAM

Capt. Leon S. Dorrance.
1st Lieut. Alpha Brumage.
1st Lieut. Robert L. Pittman.
2nd Lieut. Laurence S. Morgan.
2nd Lieut. George C. Davis.

BATTERY C, BIRMINGHAM

Capt. C. P. Noland.
1st Lieut. Schuyler H. Richardson.
1st Lieut. William M. Rogers.
2nd Lieut. E. S. Jemison.
2nd Lieut. A. A. Adams.

It is requested that changes be reported to the Secretary, United States Field Artillery Association, Army War College, Washington, D. C.

FIELD ARTILLERY DIRECTORY

FIELD ARTILLERY DIRECTORY—Continued

Georgia

FIRST BATTALION
Headquarters, Savannah

Maj. Edward D. Wells.
Capt. Joseph H. Thompson, Adjutant.
1st Lieut. Alan M. McDonnell, Quartermaster and
Commissary.

BATTERY A, SAVANNAH

Capt. Edward G. Thomson.
1st Lieut. Alexander R. MacDonnell.
1st Lieut. Mathias M. Ray.
2nd Lieut. Joseph B. Buckner.
2nd Lieut. Joseph H. Comer.

BATTERY B, ATLANTA

Capt. Andrew J. McBride, Jr.
1st Lieut. Robert G. Mangum.
1st Lieut. Frank Boynton Tidwell.
2nd Lieut. John W. LeCraw.
2nd Lieut. Sidney F. Dunn.

BATTERY C, SAVANNAH

Capt. Edward G. Butler.
1st Lieut. Joseph E. Inglesby, Jr.
1st Lieut. R. F. Rumph.
2nd Lieut. Lewis H. Harper.
2nd Lieut. Alexander W. Lackey.

Louisiana

FIRST BATTALION
Headquarters, New Orleans

Maj. Allison Owen.
Capt. Stanley M. Lamarie, Adjutant.
1st Lieut. Edward L. Posey, Quartermaster and Commissary.

BATTERY A, NEW ORLEANS

Capt. Schaumburg McGehee.
1st Lieut. Willis W. Hobson.
1st Lieut. Arthur C. Ball.
2nd Lieut. Cyril W. Bassich.
2nd Lieut. James S. Mason.

BATTERY B, NEW ORLEANS

Capt. James E. Edmonds.
1st Lieut. Harold P. Nathan.
1st Lieut. Peter Hamilton.
2nd Lieut. Frederick G. Gassaway.
2nd Lieut. Meigs Oliver Frost.

BATTERY C, NEW ORLEANS

Capt. Bryan Black.
1st Lieut. Guy R. Molony.
1st Lieut. Walter J. Stauffer.
2nd Lieut. Louis S. Goldstein.
2nd Lieut. George S. Clarke.

FIFTH INSPECTION DISTRICT

Capt. Clarence Deems, Jr., Inspector, Indianapolis, Indiana

Indiana

FIRST BATTALION
Headquarters, Indianapolis

Major Robert H. Tyndall.
Capt. Thomas S. Wilson, Adjutant.
1st Lieut. Frank W. Baschmana, Quartermaster.

BATTERY A, INDIANAPOLIS

Capt. Gavin L. Payne.
1st Lieut. Marlin A. Prather.
1st Lieut. Sidney S. Miller.
2nd Lieut. Daniel I. Glossrenner.
2nd Lieut. Mark A. Dawson.

BATTERY B, PURDUE UNIVERSITY, LAFAYETTE

Capt. Harry E. McIvor.
1st Lieut. Harris C. Mahon.
1st Lieut. Frank D. Dexter.
2nd Lieut. Wm. H. E. Holmes.
2nd Lieut. Frank W. Bryant.

BATTERY C, LAFAYETTE

Capt. Arthur O. Brockenbrough.
1st Lieut. Rosier W. Levering.
1st Lieut. John C. Doyle.
2nd Lieut. Frank Nisley.
2nd Lieut. Wilmer C. Kashner.

BATTERY D, FORT WAYNE

Capt. John C. Scheffler.
1st Lieut. Henry C. Moriarty.
1st Lieut. Luther H. Mertz.
2nd Lieut. Bertram Lewis.
2nd Lieut. Lee Hensley.

Michigan

BATTERY A, LANSING

Capt. Chester B. McCormick.
1st Lieut. Fred G. Fuller.
1st Lieut. F. G. Chaddock.
2nd Lieut. Earl H. Spencer.
2nd Lieut. Harold H. Beltz.

BATTERY B, LANSING

Capt. Frank P. Dunnebacke.
1st Lieut. Chester E. Boelio.
1st Lieut. Joseph H. Lewis.
2nd Lieut. Edgar J. Learned.
2nd Lieut.

Ohio

FIRST BATTALION
Headquarters, Columbus

Maj. H. M. Bush.
Capt. Quida A. Kulish, Adjutant.
1st Lieut. John B. Morton, Battalion Quartermaster and
Commissary.

BATTERY A, CLEVELAND

Capt. Everette C. Williams.
1st Lieut. Robert K. Norton.
1st Lieut. John L. Sullivan.
2nd Lieut. Harold Matthys.
2nd Lieut. Charles S. Bailey.

BATTERY B, AKRON

Capt. Hurl J. Albrecht.
1st Lieut. Joseph J. Johnson.
1st Lieut. John F. Babbitt.
2nd Lieut. John R. Taylor.
2nd Lieut. Welton A. Snow.

BATTERY C, BRIGGSDALE (COLUMBUS)

Capt. Rodney E. Pierce.
1st Lieut. George H. Bartholomew.
1st Lieut. Lawrence S. Schlegel.
2nd Lieut. Vincent Welker.
2nd Lieut. William D. Kinsell.

It is requested that changes be reported to the Secretary, United States Field Artillery Association, Army War College, Washington, D. C.

THE FIELD ARTILLERY JOURNAL

FIELD ARTILLERY DIRECTORY—Continued

SIXTH INSPECTION DISTRICT

Lieut. Louis R. Dougherty, Inspector, Chicago

Illinois

FIRST REGIMENT
Headquarters, Chicago

Col.

Lieut.-Col.

Capt. R. W. Thompson, Quartermaster.

1st Lieut. F. C. Armstrong, Chaplain.

FIRST BATTALION
Headquarters, Waukegan

Major A. V. Smith.

Capt. Jacob McG. Dickinson, Adjutant.

1st Lieut. Benedict L. Maloney, Quartermaster and
Commissary.

BATTERY A, DANVILLE

Capt. Curtis G. Redden.

1st Lieut. Lawrence D. Smith.

1st Lieut. Thomas S. Hammond

2nd Lieut. Fred C. Anderson.

2nd Lieut. R. A. N. Baltz.

BATTERY B, CHICAGO

Capt. Frank M. Course.

1st Lieut. Max E. Payne.

1st Lieut. George H. Gould.

2nd Lieut. Roy F. Riggs.

2nd Lieut. Perry D. Smith.

BATTERY C, FORT SHERIDAN

Capt. Noble B. Judah.

1st Lieut. Bruce D. Smith.

1st Lieut. George Richardson.

2nd Lieut. Joseph Medill Patterson.

2nd Lieut. George Fisher.

SECOND BATTALION
Headquarters, Chicago

Maj. Charles R. Vincent.

Capt. Hugh R. Montgomery, Adjutant.

2nd Lieut. Martin H. Foss, Quartermaster and Commissary.

BATTERY D, CHICAGO

Capt. Edgar A. Ewing.

1st Lieut. R. A. Bokum.

1st Lieut.

2nd Lieut.

2nd Lieut.

BATTERY E, CHICAGO

Capt. Henry J. Reilly.

1st Lieut. Horace R. Denton.

1st Lieut. Irving Odell.

2nd Lieut. D. L. Smith.

2nd Lieut. W. F. Rike.

BATTERY F, UNIVERSITY OF ILLINOIS, URBANA

Capt. Bruce W. Benedict.

1st Lieut. G. H. Doshier.

1st Lieut. W. H. Kasten.

2nd Lieut. Arthur W. Reebie.

2nd Lieut. Edmund Fleming.

Wisconsin

BATTERY A, MILWAUKER

Capt. Philip C. Westfahl.

1st Lieut. Alonzo J. Comstock.

1st Lieut. John G. Reed.

2nd Lieut. William F. Fracdrich.

2nd Lieut. Alvin A. Kuechenmeister.

BATTERY B, GREEN BAY

Capt.

1st Lieut. Leland Wells.

1st Lieut.

2nd Lieut. Leroy Hoberg.

2nd Lieut.

BATTERY C, RACINE

Capt. George W. Rickeman.

1st Lieut. James W. Gilson.

1st Lieut. Richard Drake.

2nd Lieut. Richard C. Bryant.

2nd Lieut. Harry J. Sanders.

Iowa

FIRST BATTALION
Headquarters, Clinton

Maj. Roy S. Whitley.

Capt. James L. Oakes, Adjutant.

1st Lieut. Frank H. Hinricks, Quartermaster and Commissary.

BATTERY A, CLINTON

Capt. Jacob E. Brandt.

1st Lieut. Martin W. Purcell.

1st Lieut. Loren R. Brooks.

2nd Lieut. Frank G. Luth.

2nd Lieut. Clyde Dickerson.

BATTERY B, DAVENPORT

Capt. Arthur M. Compton.

1st Lieut. Harry H. Ward.

1st Lieut. Roland S. Truitt.

2nd Lieut. Edward McCoy.

2nd Lieut. Walter H. Peterson.

BATTERY C, MUSCATINE

Capt. Otto W. Mull.

1st Lieut. Clark M. Barnard.

1st Lieut. Edward A. Roach.

2nd Lieut. Charies Robinson.

2nd Lieut. Edward J. Cox.

SEVENTH INSPECTION DISTRICT

Capt. Waldo C. Potter, Inspector, Kansas City Mo.

Kansas

BATTERY A, TOPEKA

Capt. John M. Hite.

1st Lieut. William P. MacLean.

1st Lieut. James C. Hughes.

2nd Lieut. Alfred C. Bartel.

2nd Lieut. Richard B. Porter.

Missouri

FIRST BATTALION
Headquarters, Independence

Maj. Edward M. Stayton.

Capt. John H. Thacher, Adjutant.

1st Lieut. Charles C. Bundschu, Quartermaster and
Commissary.

BATTERY A, ST. LOUIS

Capt. Frank M. Rumbold.

1st Lieut. Walter J. Warner.

1st Lieut. Robert C. Rutledge.

2nd Lieut. Daniel F. Jones.

2nd Lieut. Leon R. Sanford.

BATTERY B, KANSAS CITY

Capt. Arthur J. Elliott.

1st Lieut. Roy T. Olney.

1st Lieut. Fielding L. D. Carr.

2nd Lieut. Thomas S. McGee.

2nd Lieut. Marvin H. Gates.

BATTERY C, INDEPENDENCE

Capt. John L. Miles.

1st Lieut. Spencer Salisbury.

1st Lieut. Roger T. Sermon.

2nd Lieut. Keneth V. Bostian.

2nd Lieut. Edgar G. Hinde.

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FIELD ARTILLERY DIRECTORY

FIELD ARTILLERY DIRECTORY—Continued

Texas

BATTERY A, DALLAS

Capt. F. A. Logan.
1st Lieut. Fred M. Logan.
1st Lieut. Ward C. Goessling.
2nd Lieut. Arthur H. J. Dumke.
2nd Lieut. Willard J. Stanton.

BATTERY B, SAN ANTONIO

Capt. Claude V. Birkhead.
1st Lieut. Douglas Mackenzic.
1st Lieut. Raymond Phelps.
2nd Lieut. Michael H. Erskine.
2nd Lieut. George D. Dewees.

EIGHTH INSPECTION DISTRICT

Capt. W. F. Sharp, Inspector, Denver, Colorado

Colorado

FIRST BATTALION Headquarters, Denver

Maj. Wm. F. Sharp.
Capt. Henry C. Nickerson, Adjutant.
1st Lieut. Lewis G. Carpenter, Quartermaster and
Commissary.

BATTERY B, DENVER

Capt. Guylan A. Blanchard.
1st Lieut. Canton O'Donnell.
1st Lieut. W. H. H. Cranmer.
2nd Lieut. Richard S. Filius.
2nd Lieut. Edward F. Hart.

BATTERY C, DENVER

Capt. Victor W. Hungerford.
1st Lieut. Daniel W. Knowlton.
1st Lieut. William H. Shade.
2nd Lieut. James H. Gowdy.
2nd Lieut. Horace Lunt.

New Mexico

BATTERY A, ROSWELL

Capt. Charles M. de Bremond.
1st Lieut. James C. Hamilton.
1st Lieut. Willard F. Hird.
2nd Lieut. George M. Williams.
2nd Lieut. W. E. Buchly.

Utah

1ST BATTERY, SALT LAKE CITY

Capt. William C. Webb.
1st Lieut. Curtis Y. Clawson.
1st Lieut. Fred T. Gundry.
2nd Lieut. Harold C. Mandell.
2nd Lieut. A. R. Thomas.

NINTH INSPECTION DISTRICT

Capt. Emery T. Smith, Inspector, San Francisco, Cal.

California

Headquarters, Oakland

Maj. Ralph J. Fancuf.
Capt. Frederick W. H. Peterson, Adjutant.
1st Lieut. James Gleason, Quartermaster.

BATTERY A, LOS ANGELES

Capt. Jesse McComas.
1st Lieut. Harold G. Ferguson.
1st Lieut. Walter Lucer.
2nd Lieut. Robert W. Yates.
2nd Lieut. Frederick H. Hover.

BATTERY B, OAKLAND

Capt. Harry F. Huber.
1st Lieut. Edward E. Vicary.
1st Lieut. John W. White.
2nd Lieut. Howard W. Enefer.
2nd Lieut. Clyde Alexander.

BATTERY C, STOCKTON

Capt. Edward Van Vranken.
1st Lieut. Otto E. Sandman.
1st Lieut. Charles H. Young.
2nd Lieut. Hunt A. Davidson.
2nd Lieut. Charles A. Reyner.

Oregon

BATTERY A, PORTLAND

Capt. Charles W. Helme.
1st Lieut. Bert V. Clayton.
1st Lieut. Charles L. Johnson.
2nd Lieut. Gilbert W. Stevens.
2nd Lieut. J. Benjamin Hayes.

STATE OF MINNESOTA

Capt. Geo. R. Greene, Inspector, Fort Snelling, Minn.

FIRST FIELD ARTILLERY Headquarters, St. Paul

Col. George E. Leach.
Lieut. Col. William J. Murphy.
Maj. William H. Donahue.
Maj. George T. Gorham.
Capt. Charles A. Green, Adjutant.
Capt. Fred L. Baker, Quartermaster.
Capt. Joseph L. McKinney, Commissary.
Capt. Erwin H. Sherman, Battalion Adjutant.
Capt. Frederick A. Tiffany, Battalion Adjutant.
1st Lieut. Holland C. Headley, Battalion Quartermaster and
Commissary.
1st Lieut. William J. Harrington, Chaplain.
1st Lieut. William Hoag, Supply Company.

BATTERY A, ST. PAUL

Capt. Wallace Cole.
1st Lieut. Fletcher Rockwood.
1st Lieut. John S. Nichols.
2nd Lieut. Charles F. Baird.
2nd Lieut. George N. Bright.

BATTERY B, ST. PAUL

Capt. Charles L. Ames.
1st Lieut. William S. Jenkins.
1st Lieut. James K. Edsall.
2nd Lieut. Cavour L. Truesdale.
2nd Lieut. Henry R. Freeman, Jr.

BATTERY C, ST. PAUL

Capt. John H. McDonald.
1st Lieut. Philip J. McCauley.
1st Lieut. Henry A. Stempel.
2nd Lieut. Levens D. Williams.
2nd Lieut. Otto Seidel.

BATTERY D, MINNEAPOLIS

Capt. Theodore A. Kaldunski.
1st Lieut. Hugh H. Barber.
1st Lieut. Robert W. Grow.
2nd Lieut. Douglas G. Burrill.
2nd Lieut. Dana C. Schmahl.

BATTERY E, MINNEAPOLIS

Capt. Jerome Jackman.
1st Lieut. William R. Cross.
1st Lieut. Claude H. Helgesen.
2nd Lieut. James G. Cadwell.
2nd Lieut. Kenneth P. Gregg.

BATTERY F, MINNEAPOLIS

Capt. Walter F. Rhinow.
1st Lieut. Edwin Rollmann.
1st Lieut. Harold L. Goss.
2nd Lieut. Jay E. Gillfillan.
2nd Lieut. Oliver M. Michaels.

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