

THE FIELD ARTILLERY JOURNAL

MARCH-APRIL, 1935

PUBLISHED BI-MONTHLY BY
THE UNITED STATES FIELD ARTILLERY
ASSOCIATION

March-April, 1935

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THE FIELD ARTILLERY JOURNAL

EDITED BY
DEAN HUDNUTT

MAJOR, FIELD ARTILLERY, UNITED STATES ARMY



Patron Saint of Artillery

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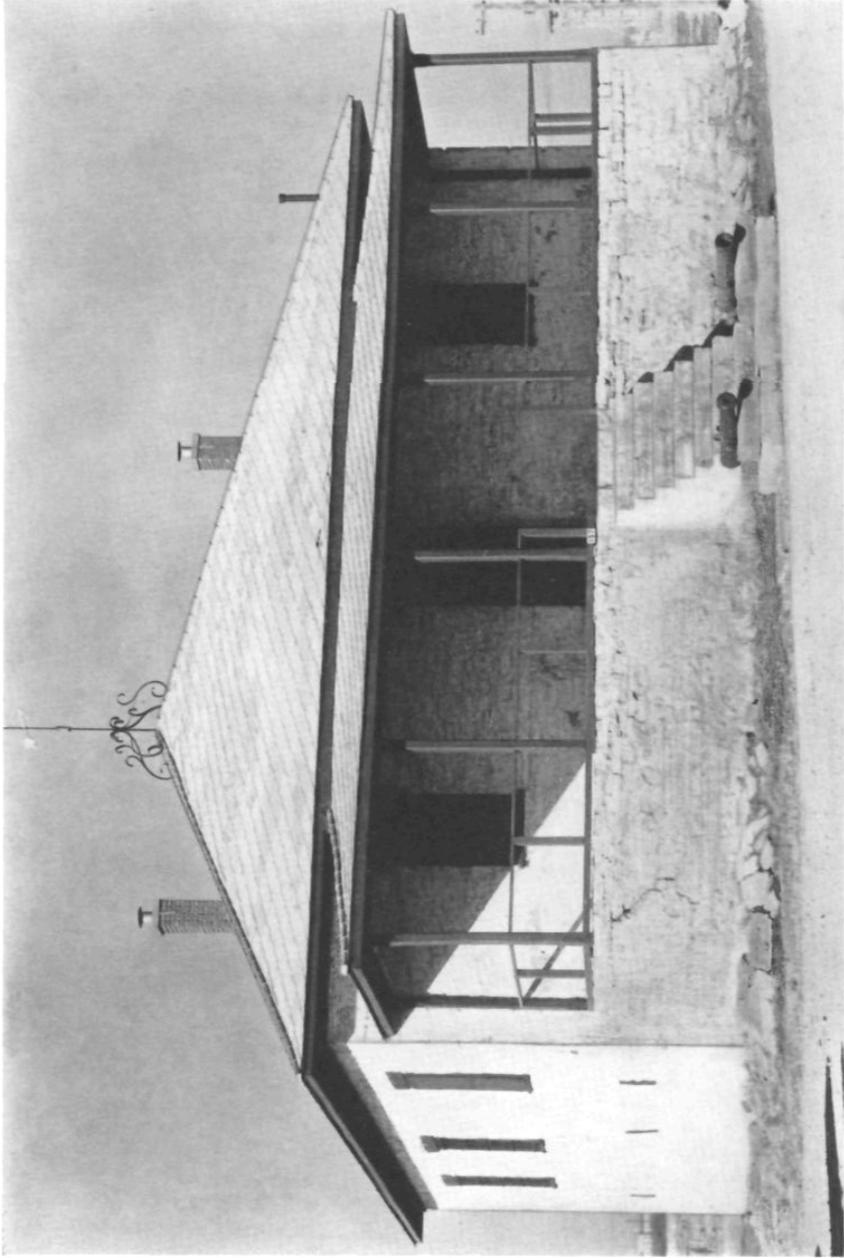
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THE FIELD ARTILLERY MUSEUM

This building erected in 1870-71 was formerly the Guard House of "Old Post" Fort Sill, Oklahoma

THE FIELD ARTILLERY JOURNAL

VOLUME XXV

MARCH-APRIL

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THE FIELD ARTILLERY MUSEUM

FORT SILL, OKLAHOMA

FOREWORD: On the occasion of a recent visit to Fort Sill I was pleased to be present at the formal opening on December 10, 1934, of the Field Artillery Museum. It is located in the old stone Guard House which itself possesses much historic interest through its association with the incidents of Fort Sill's Frontier days. Not so long after the close of that period I myself had here seen Geronimo working it out on the wood pile close by when he was temporarily domiciled within its, if none too hospitable, at least enduring, walls and bars. It was at this period that the interest of the Field Artillery in Fort Sill began and from every point of view the old Guard House affords a particularly appropriate setting for this museum.

The development of the Museum goes back to 1919 during the tenure of office of the first Chief of Field Artillery, Major General William J. Snow, who has always been so keenly alive not only to the material needs but as well to the spiritual interests of the arm. This development has been brought to its present splendid stage by the ability, industry and genius of Lieutenant Larter in his selection and arrangement of the museum, and through the active support of the officers and friends of the Field Artillery who have contributed museum pieces or otherwise encouraged the project.

Located at the school of the arm, this museum should be looked upon as the museum of the entire personnel of the Field Artillery, and I most earnestly solicit its further and continued support. Contributions of suitable museum pieces of which officers, enlisted men, and their friends must be in possession, will not only thus be safely preserved but will here perpetuate the historic value they possess.

UPTON BIRNIE, JR.

Major General, U. S. Army

Chief of Field Artillery.

THE Field Artillery Museum was officially opened on December 10, 1934. However, plans were made and steps taken to establish the Museum in the year 1919. The true history of the Museum begins during the early days of that year. The following pertinent quotations from the letters of Colonel Wm. Bryden, F. A., and Colonel J. W. Keller, O. R. C., give a first hand picture of the conditions under which the work was started:

From Colonel Bryden's letter, Schofield Barracks. T. H., May 27, 1932: "In the spring of 1919 . . . I was ordered to Fort Sill as a member of the Field Artillery Board which was to be reorganized there. In the Matériel Section of the school there was an energetic and enthusiastic instructor. Major (now Colonel) J. W. Keller, O. R. C., who was noted in those days as the only living dissector of duds, and who was responsible for most of the sectionalized fuzes and projectiles then (and probably now) in use at the school. In furtherance of our work we felt that a trip to the various Ordnance arsenals would be very valuable, and General Snow, the Chief of Field Artillery, had the necessary orders

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issued at our request. As stated by him in a memorandum for the Chief of Ordnance, 'The object of their visits is the procurement of latest data and a collection of Ordnance matériel to be used as a nucleus of a teaching collection at the school I believe such a collection extremely desirable, and would request that you issue them credentials as will give them admittance to arsenals and other places under control of your department, and authority to pursue the course outlined above.'

"Our idea was to get not only modern articles of armament and equipment, but obsolete types as well, in order that by suitable arrangement thereof the student would be easily able to study their development We were shown every courtesy at the places we visited. These were: Bureau of Standards, Washington, D. C.; Aberdeen Proving Ground, Md.; Frankford Arsenal, Pa.; Sandy Hook, N. J.; West Point, N. Y.; Springfield Arsenal, Mass.; Watertown Arsenal, Mass.; Watervliet Arsenal, N. Y.; Rock Island Arsenal, Ill."

From Colonel Keller's letter, Headquarters 310th F. A., Philadelphia, Pennsylvania, October 23, 1933: "Just one word which I omitted from my previous letter, in connection with the idea of a historical and teaching collection at Sill—never neglect to give full credit for its institution to our war time Chief of Field Artillery, General Snow, and his Commandant of the School of Fire, General Lawson. All the actual work that I or my able assistants, including Colonel Bryden, did could have amounted to nothing except for their firm belief in the value of such a collection and their unswerving support."

The large collection resulting from the trip made by these two officers included field pieces, small arms, projectiles, fuzes, bombs, saddles, and many items of equipment. When it all finally reached Fort Sill it was assembled in one of the large frame buildings later known as the "Matériel Building."

The collection remained in that building for a number of years. However, due to the lack of suitable caretaking facilities, many of the smaller items were lost. That fact, together with the loss of a number of buildings by fire and the resulting crowded condition of the school, made it advisable to store the collection for safe-keeping. With the exception of those items which had disappeared

THE FIELD ARTILLERY MUSEUM

and two small bronze guns placed in the Library, the entire collection was stored in the basement of Warehouse No. 22, Old Post. All of the smaller items were boxed, and then the entire collection boarded up in the west end of the basement, where it remained until the fall of 1933.

In the spring of 1932 permission was obtained to examine and partially catalogue the collection. It was found that time and the activities of rodents had almost entirely destroyed the identification tags. Many hundreds of partially eaten tags were found in the bottom of the boxes and on the floor of the basement. It was next to impossible to carry out the cataloguing work in the cramped space afforded by shifting the boxes. Little progress was made other than attaching new cloth tags by wire. These were inscribed with serial numbers following the system used at the Ordnance Museum in the Springfield Armory. However, in the fall of 1933 one large cell in the basement of the old "Geronimo Guardhouse" was made available for this work. In these cramped quarters the cataloguing continued until the summer of 1934.

Orders were issued during the summer of 1934 for the establishment of the Field Artillery Museum under the supervision of the Assistant Commandant of the Field Artillery School. In the early part of September of that year the entire "Geronimo Guardhouse" was made available and the work of rehabilitation started.

Because of the historical interest centering in the "Geronimo Guardhouse," no alterations of its original structure were permitted. It stands today as it was when completed by the troops who erected it in 1870 and 1871. The first step in reconditioning the building was to remove all of the shelving in each room. The next was to scrub the ceiling, walls, and floors of the main floor. The entire floor was then ready for painting with the exception of the windows. These, because of the iron bars, had to be removed from the inside to clean. The plaster walls were then whitewashed. The interior trim was scraped down to the wood and it was found that the original coat of paint had been white. However, there was no white paint available. Therefore, the next color, brown, was used.

The iron doors and bars were painted black (most of these were

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THE ENTRANCE TO "GERONIMO'S CELL."

This is typical of the other cell doors—made of three thicknesses of planking reinforced with heavy iron strapping. Three heavy iron sliding bolts were used for locking the door.

found to be made of old wagon tires, and then varnished. The cell doors were scraped to the wood and metal and treated with a double coat of spar varnish. The exterior trim was painted green to conform to the present trim in the Old Post Area. The lighting and heating plants were installed, utilizing salvaged materials to the utmost.

The next step was to build a work shop in the basement. This shop was equipped with vats for nitric acid and soda, a sink, a work bench, and tool cabinets. Electric motors and drills were secured as well as a complete set of tools and a good supply of cleaning and polishing materials.

The work took about one month to complete. It would have been next to impossible to have made any progress without the whole-hearted support of the various post and school departments. The Property Division and the Utilities Division of the Quartermaster, the Academic Division Supply Branch, the Dental Branch of the Station Hospital, the Matériel Department of the School, and the Range Detail all contributed materials and help in rehabilitating "Geronimo Guardhouse."

When the main floor was ready for occupancy it was necessary to build stands and cases for the exhibits. Lack of funds was the controlling factor to a greater extent than in any of the other projects. The stands were made out of the lumber salvaged from the shelving taken out of the rooms. They were then covered with roofing paper and burlap. While not pretentious, they are well suited to the interior of the building and to the type of articles displayed. They are made in sections six feet long and two and a half feet wide, with additional sloping stands to fit on top.

THE FIELD ARTILLERY MUSEUM

This arrangement makes it possible to use them in a number of different ways, depending on the sizes of the objects to be displayed. They are particularly well suited for the display of projectiles and fuzes.

The wall cases were made out of new lumber with double strength glass. They are five inches deep and backed with burlap over second grade pine boards. This type was adopted so as to permit a variety of uses. They are suitable for the display of documents, text books, pictures, maps, insignia, and colors. The cases for models were constructed of double strength glass sides, tops, and fronts. The backings are Prestwood panels which can be replaced with glass when it becomes necessary.

The arms racks are two-by-four uprights with dowel pins set in as pegs. While not elaborate, they are well suited to the rough stone walls and barred windows of the interior of the small-arms room. In every instance where it was necessary to attach cases or racks to the walls, uprights were installed from floor to ceiling. This made it unnecessary to drill the walls, and possible to make changes in the placing of cases.

Two raised platforms were made, one for the smaller gun tubes and one for the automatic weapons. These platforms were made of heavy planking and cross-members, covered with burlap. They were designed to distribute the weight of the displays and to permit easy cleaning of the floors. Most of the work on fixtures was done by Sgt. F. Treffinger, assistant curator, and the Museum staff. The Academic Division Carpenter Shop constructed the model cases and assisted materially in framing the glass fronts for the wall cases. The Post Exchange and the Officers' Club each contributed one showcase to the Museum. The work on preparation of the numerous items for display was carried on in conjunction with the work on fixtures so that exhibits would be ready as the facilities for displaying them were completed.

Each item had to be cleaned, treated, and catalogued before it was ready. This work required a different type of treatment for each of the various classes of items. The small arms were disassembled, cleaned, burnished, oiled, and reassembled. The metal parts were then coated with clear lacquer and the wooden parts with linseed oil. The bronze gun tubes were immersed in a 20

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2.85-INCH BRONZE HOWITZER, M1793

Laid down in 1793 by Daniel King of Germantown, Pennsylvania. The picture in rear shows the uniform of the period.



KIOWA WAR BONNET

Presented to General Wm. M. Cruikshank by the Kiowa Indians on Armistice Day, 1932.

per cent nitric acid bath for from three to four hours. They were then immersed in a saturated soda solution to prevent further action of the acid. Then the tubes were buffed and lacquered. The iron and steel gun tubes were cleaned with wire brushes and painted. The leather equipment was soaped and given a light coat of neat's-foot oil. The projectiles and fuzes were first inspected and unarmed when necessary. They were then disassembled for cleaning. All copper and brass parts were buffed and all iron and steel parts cleaned with a wire brush and emery, then repainted in the proper color. Each item was then reassembled and lacquered. The cataloguing of this comprehensive collection of ammunition was commenced at the time of preparation for display. However, due to the great number of items, this work is still far from completion.

Little work was required for the preparation of the other items. This was particularly true of the Indian exhibits. Because of the great age of many of the pieces of beadwork and pottery the safest procedure was found to be cleaning them with a soft brush. (One of the older Indian women who has contributed

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a number of pieces to the Museum informed us that the old dried buckskin articles can be softened and cleaned with wet sand and gasoline. This method will be tried out under her supervision in the near future.)

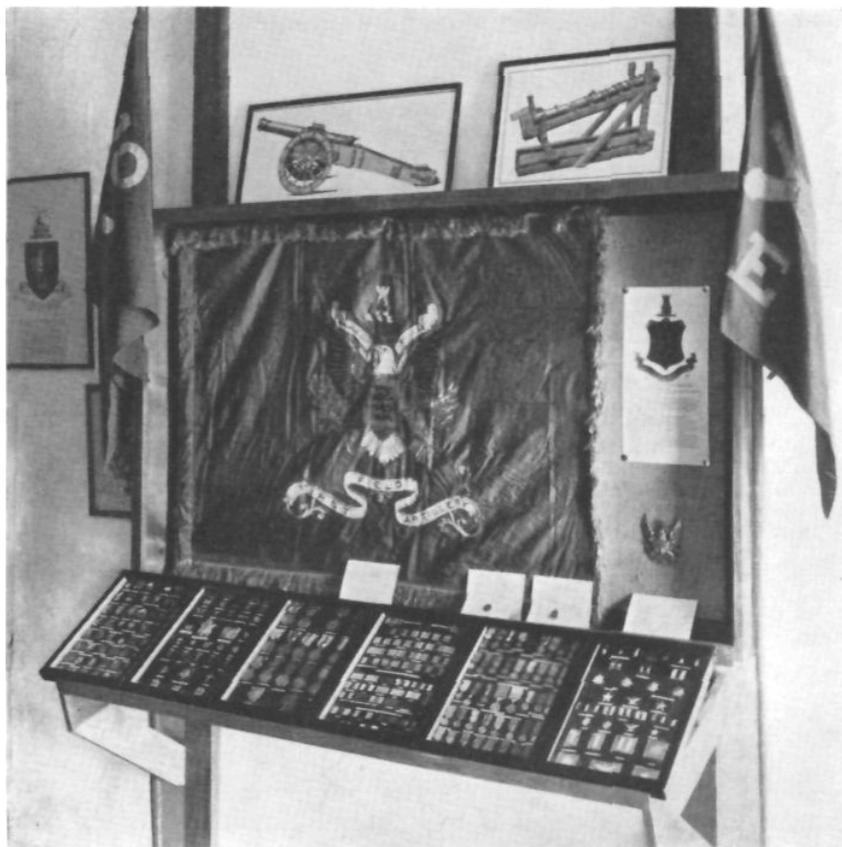
The actual displaying of exhibits was largely controlled by the size of the rooms. At present only one room is allotted to Indian and Oklahoman exhibits. However, due to the rapid growth of that collection, other rooms will soon be needed.

The enthusiastic support of the people of the garrison and the surrounding communities has been such that the entire building is filling rapidly. The greatest development has occurred in the Indian section and the small-arms section. In the former the number of items has increased to a total of 158, in the latter to a total of 167.

In assembling the material to complete this work, requests are being sent to organizations, manufacturers, individuals and various departments of the government for particular items needed. While these requests have met with general success, it has been realized that many organizations and individuals have in their possession objects of historical interest which have not come to the attention of the Museum authorities. The following list of exhibits will give an idea of some of the more important objects that have been acquired and the sources from which the Museum is continually receiving donations and deposits:

a. A silk standard of "C" Battery, 3d Artillery. This battery was the famous "Bragg Battery." credited with saving the day on February 23, 1847, during the terrific fighting of the battle of Buena Vista. The banner is embroidered with the inscription "Saved the Day Feb. 23, 1847," and the names of the following engagements in which the organization took part: Palo Alto, Resaca de la Palma, Monterey and Buena Vista for the Mexican War: Blackford's Ford. Rappahannock Station. Upperville, Ashland, Aldie, Antietam, Williamsburg, Sheperdstown, Middleburg, Culpepper, Smithfield, Chancellorsville, Fredericksburg, Hanover Court House, Kelly's Ford, Winchester, Wolperts Crossroads, Robertsons River, Raccoon Ford, Front Royal, White House Landing, South Mountain, and Gettysburg for the Civil War. This banner, a silk guidon, and a portrait of Lieutenant General

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PART OF THE PERMANENT MEYER EXHIBIT OF MEDALS AND INSIGNIA BENEATH AN OLD SILK STANDARD OF THE 1ST FIELD ARTILLERY.

Braxton Bragg were loaned to the Museum by Battery "E", 1st Field Artillery, the direct lineal descendant of the "Bragg Battery." These three deposits were the first important organizational trophies to be placed in the Museum. Coming from one of the oldest Field Artillery organizations in the United States Army, they are at once treasured for their historical significance and valued for the manifest interest and cooperation of that veteran organization.

b. An artilleryman's shell jacket. Mexican War. Loaned by Battery D. 1st Field Artillery. This organization traces its lineage back to the artillery that accompanied the St. Clair Expedition in 1792. It is to be regretted that in the past no safe repository

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was available for the many trophies that this organization must have accumulated throughout more than a century of active service.

c. A Filipino Lantaka made of bamboo wound with rope. This is a fine example of Moro bamboo gun construction, brought back from the Philippine Islands by General Kilbreth, who was the Assistant Commandant of the Field Artillery School during the early months of the World War.

d. A complete display of medals and insignia of the United States armed forces. This display was arranged, indexed and loaned to the Field Artillery Museum by N. S. Meyer, Inc., New York City. The arrangement and mounting was carried on under the supervision of Mr. A. A. Ruben, whose experience in such work has made the exhibit one of the finest of its kind in existence.

e. Silk National and Regimental Standards of the First Field Artillery. Deposited in the Museum by the 1st Field Artillery. These standards, having been found too old and fragile for use in active service, have been carefully mounted and placed under glass.

f. A collection of 202 plates of uniforms and equipment of the United States Army from 1775 to 1908 inclusive. This collection consists of the complete two-volume set of paintings by H. A. Ogden and the color reproductions of the Quartermaster General's Office, 1908. They belonged to the late Colonel George L. Byram, U. S. Army, and have been loaned to the Museum by his son-in-law and daughter, Major and Mrs. J. E. Lewis, F. A.

g. A National Standard formerly carried by the 9th Cavalry presented to the late Colonel John F. Guilfoyle, 9th Cavalry. This standard was deposited in the Museum by Colonel Guilfoyle's daughter, Mrs. R. E. DeR. Hoyle.

h. A large collection of rare autographs and Confederate paper money, loaned by Colonel and Mrs. C. S. Blakely. The autographs include those of Jefferson Davis, Lee's Corps Commanders. U. S. Grant, W. T. Sherman, G. H. Thomas, N. B. Forrest, E. M. Stanton, W. H. Seward, Santa Anna, Gideon Welles, Oliver Wendell Holmes, Horace Greeley and many other prominent soldiers, statesmen, and authors.

i. Documents pertaining to the original tavern of Benny

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TWO BRONZE 24-POUNDERS ON SHIP'S CARRIAGES IN FRONT OF A WING OF THE NEW CLUB

These guns were loaned by the Museum to the Field Artillery School Officers' Club. The carriages were constructed after Muller's specifications under the direction of the Museum staff.

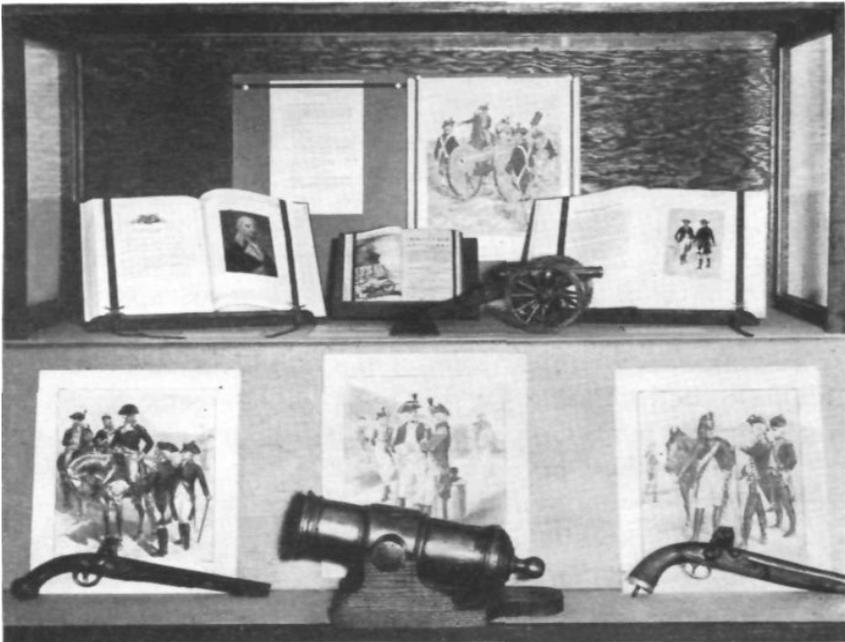
Havens. These old mortgages, etc., were loaned by Captain Clark H. Mitchell. (These documents have belonged to the Mitchell family since the time of the original owner, Peter Anspach.)

j. A large collection of Indian beadwork, loaned by Colonel and Mrs. R. E. DeR. Hoyle. Among the more important items of this collection are the beaded moccasins which belonged to Colonel J. F. Guilfoyle when he served as a lieutenant of Indian Scouts, and a doll papoose and carrier which belonged to Mrs. Lydia B. Lane, the wife of Lieutenant W. M. Lane, 3rd Mounted Rifles (1854).

k. A large collection of old Artillery Drill Regulations, etc., loaned by the Library. The Field Artillery School. These texts are used to supplement various artillery exhibits and include the following:

- (1) Plates to accompany "A New System of Artillery," M. de Scheel (the plates for the Jonathan Williams translation, 1800).
- (2) American Artillerists' Companion. Tousard, 1809, Vol. I.
- (3) A Treatise on Artillery, L'Allemand. 1820, Vol. I.

THE FIELD ARTILLERY MUSEUM



MODEL CASES IN THE MUSEUM OFFICE. EACH MODEL IS DISPLAYED WITH APPROPRIATE TEXTS AND ILLUSTRATIONS

(4) Regulations for the Artillery of the United States, 1826, 1834, 1839, 1848, 1864, 1888, 1902, 1914, 1916.

l. A small collection of rare military books donated to the Museum, including:

(1) Muller's Treatise on Artillery, second edition, 1768. The gift of General Wm. S. McNair.

(2) Baron von Steuben's Regulations for the Order and Discipline of the Troops of the United States, 1794. The gift of Colonel C. S. Blakely.

(3) The Gentlemen's Complete Military Dictionary, Boston, 1759. The gift of Lieutenant H. C. Larter, Jr.

m. Indian headdresses, beadwork, garments, and weapons from the following citizens of the State of Oklahoma.

Mr. and Mrs. D. R. Shepherd, Carnegie, Oklahoma.

Mr. and Mrs. J. M. Stephens, Lawton, Oklahoma.

Mrs. Winifred Lawrence, Lawton, Oklahoma.

Mr. Arthur Lawrence, Lawton, Oklahoma.

Mrs. Morris S. Simpson, Lawton, Oklahoma.

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George Hunt, Mt. Scott, Oklahoma.

Homer Buffalo, Anadarko, Oklahoma.

Dorothy Kawkayla, Apache, Oklahoma.

Mrs. E. Gilbert, Cyril, Oklahoma.

Notable in this collection are the following: Apache skin painting, the work of Naitche (son of Naitche, Medicine Man of the Chricahua Apaches) from the Simpson collection; Kiowa skin painting, the work of Silver Horn, from the Lawrence collection; Kiowa war bonnet of 72 eagle feather coups and two very rare stone pipes from the Shepherd collection; the war spear and shield of To-Hau-Son, great war chief of the Kiowas, from the Homer Buffalo collection; stone war axe of Hunting Horse and silver treaty medal, 1850, from the Stephens collection; an old brass bucket used at the Osage Massacre, 1834, for gathering up the heads of the Kiowas, from the George Hunt collection.

n. Gifts and deposits have been received from many other organizations and individuals in addition to those mentioned above. These will all be listed, together with the history of the articles, in the Museum catalogue.

o. During the year immediately preceding the definite establishment of the Field Artillery Museum autographed letters were received from many prominent persons endorsing the project. These letters have been suitably mounted and bound in a loose-leaf seal skin binder. It is the hope of the authorities that through the visitors' register the Museum will eventually obtain the signatures of all the Field Artillery officers as they pass through Fort Sill as visitors, students, instructors, or members of the School Troop organizations.

The growth of the Field Artillery Section has been particularly gratifying in that those items which have been acquired are of great historical interest and value. However, the development of this section of the Museum is almost entirely dependent on space and its purpose is to exhibit an historical background showing the development of the arm. The evolution of modern matériel may be traced through the improvement, or the abandonment, of many of the implements, devices, or methods which have been adopted experimentally, examples of which are included in these exhibits. As soon as the completion of new construction releases

THE FIELD ARTILLERY MUSEUM



"MULE GUN"

The history of this unusual gun and mount has not yet been prepared.

other old stone buildings the expansion of that section of the Museum will be carried out under the following general plan:

a. Field Artillery Groups arranged in chronological order to show the changes and development of the arm. These groups will consist in general of: (1) The field piece of the period with all its implements, (2) models of other vehicles, (3) the uniform and equipment to include side arms, (4) standard texts, (5) models of gun emplacements and communication nets, (6) ammunition, (7) portraits of prominent field artillery officers, (8) fire control instruments, and (9) prime movers.

b. Standards and guidons of the various field artillery organizations (past and present) to be supplemented by paintings of the coats of arms of all regiments of the Regular Army, National Guard and Organized Reserves.

c. Sectionalized pieces of matériel and ammunition for instructional purposes. This includes recoil mechanisms, breechblocks, fuzes, projectiles, sights, etc., so displayed that they may be examined and handled.

d. Trophies and documents of historical value to the field artillery.

It is through this article and other subsequent articles on the subject of the Field Artillery Museum that we hope to enlist the support of the entire arm in building up the museum.

A BOY'S APPEAL

Volin S. Dak.
Mar 1st 1935

U. S. War Dept (Artillery)

Dear Sirs, I am writing to you to see if you might have an old team of artillery horses, that are to old to be of any use, that you could give away, - You see My Dad has a farm here of 300 acres, with a big mortgage on, and we are farming this with a farm all, and have only one team of old mares, one grey and one black

I am 13 yrs this coming June and my brother Roger will be 11 this spring and us boys would like to help our Dad do some farm work this year, We have about 40 head of cattle and some pigs and sheep,

My Dad says he can not afford to buy any horses so I thought I would try and see if I could not help him some way,

Now we live 13 miles north east of Jankton S. D. and if we could get any horse in eastern S. D. or western Iowa maybe we could get some one to bring them here in a truck.

We will have about 150 acres to plow this spring and will have about 90 acres in small grain

Hoping to hear from you

I remain yours truly
Feroy Johnson

My Dads name

REC'D MAR 4 1935 O. C. E.

Charley J. Johnson

R.F.D. no 1

Volin S. D.

A BOY'S APPEAL

**WAR DEPARTMENT
OFFICE CHIEF OF FIELD ARTILLERY
MUNITIONS BUILDING
WASHINGTON, D. C.**

March 6, 1935

Master Leroy Johnson
R.F.D. No. 1
Volin, South Dakota

Dear Leroy:

If I had it in my power I would be mighty happy to give you a pair of artillery horses from those that are too old for further service in the Army.

I believe also if artillery horses could read letters and could talk, all those that have grown too old for further duty in their country's service would be asking me for the privilege of working for you and Roger. They would be happy to serve you as faithfully as their age and strength permitted in return for the good home and the kindness I know you two would give them.

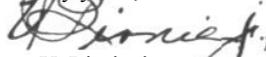
Unfortunately, however, the Government requires that these devoted and loyal old veterans of the Artillery be sold, and for that reason none can be given to you.

I believe that if I were your dad, and had a couple of youngsters like you and Roger to help me, I would feel that somehow and in some way, the three of us working together would eventually lift that mortgage.

May you, and may many, many others like you, throughout the length and breadth of our country today, continue to bring help, and hope and encouragement to our American dads.

With very best wishes, believe me

Sincerely yours,



U. Birnie, jr.,
Major General, U.S. Army,
Chief of Field Artillery.

The Field Artillery Association is undertaking to collect from officers and men of the Field Artillery an average of 3c each to the end that a pair of aged, condemned Field Artillery horses may be bid in at the next auction and may, without expense to the Government, be delivered, with the compliments of the Field Artillery, to this courageous boy.

Any surplus of funds above cost of horses and cost of delivering them will be used toward the purchase of a set of harness.

THE DIVISION HOWITZERS AND THE CORPS ARTILLERY IN SUPPORT OF AN ATTACK

BY MAJOR GEORGE D. WAHL, *Field Artillery*

FOREWORD

The subject matter contained in this article is given at the Field Artillery School in form of conferences and problems. The assistance of several officers on duty at that station in reviewing it is most gratefully acknowledged.

DUE to the relative dispersion of our small army, we seldom have medium howitzers and light artillery serving together in time of peace. As for corps artillery—it exists in such embryonic form as to require a discerning eye to locate it. Consequently, our officers learn little about the inter-relation of the various echelons of artillery during their troop service. It is only during their relatively short school careers that the question arises at all and then it often is passed over with a few generalities. The purpose of this article is to bring out the missions of these lesser known echelons and to show how their fire power is coordinated with that of the direct support artillery¹ in order to produce efficiently a mass of fire in support of the infantry.

Before taking up a discussion of the employment of the 155mm howitzer, which is common to the division and corps artillery, it might be well to compare a few of its characteristics with the 75mm gun as these have a direct influence on its use. To start with, the howitzers have a substantially greater range: for destruction—9,000 yards as compared with 7,000 for the 75mm; for neutralization—11,000 as compared with 8,000 for the 75mm; an extreme range of 12,400 as compared with 8,800 for the 75mm.* In addition, the howitzer is much more powerful, its shell weighing about 95 pounds as compared to about 12 pounds for the 75mm. However, the 75mm has a much greater rate of fire than the howitzer; for example—6 rpm maximum and 3 rpm sustained as compared to 2 or 3 rpm maximum and 1 rpm sustained for the howitzer. The howitzer shell has a much greater moral effect on personnel due to its larger bursting charge but the 75mm covers an

¹The subject "The Direct Support of Infantry in an Attack" was covered in the September-October, 1934, issue of the FIELD ARTILLERY JOURNAL.

*Shell Mark I, Fuse Short.

THE DIVISION HOWITZERS

area much more uniformly and its higher rate of fire tends to compensate for the difference in weight of projectile. The howitzer's large bursting charge is not always a blessing. It throws its fragments to such a distance that its bursts must be kept not less than 500 yards from friendly troops to avoid regrettable casualties. As far as tactical mobility is concerned, the 75mm has the advantage due to its weight. In occupying positions, the 75mm is also much faster, requiring approximately half the time necessary for the howitzer. With these rough comparisons in mind let us proceed with the consideration of the employment of these weapons.

In discussing the tactical use of the howitzer, it is logical to begin with the division weapon rather than the corps. This permits consideration of the division acting alone with no assistance from corps. The use of howitzers will then be considered when the division is operating as part of a corps. In this case, the corps artillery reinforces and supplements the fire of the division artillery.

It is a generally accepted matter of technique that the division howitzer regiment usually is employed in general support of the division. By reference to standard artillery texts, it may be found that artillery in general support supports the entire unit. The detailed missions to be executed, however, are not indicated but, by a careful analysis of the missions which must be executed, the following obviously fall to the general support artillery:

- (1) Distant interdiction and harassing fires.
- (2) Counterbattery.
- (3) Protective concentrations and fires on enemy reserves.
- (4) Concentrations reinforcing fire of direct support artillery.

Distant interdiction and harassing fires are used during the early stages of a meeting engagement to cause an early deployment of the enemy forces and delay their arrival on the battlefield. Later, they are employed to interfere with his supply system, reduce his morale and prevent timely arrival of reserves. During the closing phases of a successful engagement they are utilized to interfere with the enemy withdrawal. Thus, we can visualize this distant interdiction and harassing mission as being important largely

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prior to the launching of an attack or during its closing phases. During the attack itself, the only occasion which would call for their employment would be the inopportune appearance of enemy reserves whose arrival in the decisive area must be prevented. The number of batteries required for these missions will vary, of course, with the situation. However, in most cases it will be found that one battery usually will be able to keep one route quite well covered; sometimes it may be able to handle two or more if the terrain is favorable; often the platoons will be employed on different targets at the same moment. Obviously, airplane or balloon observation is essential for the effective execution of these missions.

Counterbattery is a most necessary mission at all times. War experience confirms the teaching that infantry cannot attack successfully in the face of effective modern artillery fire except at the cost of prohibitive losses. The enemy artillery thus must be rendered more or less ineffective prior to the hour of attack. During the progress of the attack itself, counterbattery is necessary on batteries which are located after the attack commences and neutralization must be maintained on those targets which have been attacked previously.

The initial neutralization of the enemy artillery should be effected in a relatively short period of time just prior to the attack when this is possible. In a situation where the artillery is not occupying well protected emplacements, a battery which has been neutralized will try to move such matériel as is still serviceable to a new location and resume firing. If the neutralization is made a considerable time before H hour, this battery may be able to reopen fire on our troops early in the attack. If, on the other hand, many batteries are neutralized almost simultaneously just prior to the attack, the enemy artillery should not be able to intervene effectively as our troops advance to the assault.

To accomplish this mass neutralization effectively, a short counterbattery period just prior to the attack is necessary. During this period, counterbattery assignments should be so arranged that artillery fire is massed on targets successively. Thus, for example, a light artillery battalion and a medium howitzer battalion may be detailed to fire simultaneously on the same enemy battery. Each of the five batteries designated attacks the target by concentrating

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on an area two hundred yards in diameter covering the target. The result is that approximately² 150 light and 50 medium shells land on this battery in less than three minutes. Two or three targets can be assigned to each of these counterbattery "groups." Targets can be attacked at a rate of one every six minutes or eight minutes, depending on the shift. To maintain neutralization, some³ 50 rounds or more of medium shells, depending on the cover available to the target, should be placed on each objective per hour distributed in at least two bursts. Thus, the initial neutralization will require a mass of artillery for a short period just prior to the attack. The maintenance of neutralization may be effected by a relatively small number of units—say a platoon of howitzers per two or three targets.

When the enemy's artillery observation is concentrated in a relatively small area, the effectiveness of the counterbattery may be increased considerably by blinding the OPs with smoke provided weather conditions are favorable.

Protective concentrations are designed to protect the attacking troops against counterattacks. The purely local counterattacks launched by enemy troops in the forward areas of the position must be guarded against by the direct support units. These attacks are launched from an area too close to our troops to be attacked with medium howitzers. In general, the howitzers should be employed against the enemy's more important reserves. These concentrations are placed generally upon the ground from which the counterattack should be launched and on which the infantry weapons supporting it would be placed. They should be scheduled on call during the period when the enemy counterattack from that locality would be most appropriate according to the expected development of our attack.

Fires on enemy reserves are executed for the purposes of immobilizing those units at the time when the enemy could use them most appropriately according to the expected development of our attack. The most efficient fire of this character would be one which dispersed these reserves at the very moment the order reached them to go into action. To fire earlier would be but to

²According to latest figures, 168 light and 40 medium would be correct.

³40 by latest figures.

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warn them to move—they would go elsewhere and not be located when their neutralization was essential. To fire later would be to find them already gone. In execution, the concentrations should be sudden and as severe as possible in order to produce the utmost moral effect. Logically, the fire should first be placed on the reserve bivouac area, if it can be found, and then shifted to the protective concentrations on the area from which it should counterattack as previously discussed.

It has been pointed out that the harassing and distant interdiction fires and the bulk of the counterbattery should be out of the way before H hour. The protective concentrations and fires on enemy reserves come up later. Batteries of the general support artillery which are not engaged at H hour as discussed above are available to reenforce the fires of the direct support artillery. These batteries furnish the division commander with a powerful means with which he can influence the course of the action. Initially their fire should be placed where it will contribute most to the success of the main effort. Later it is shifted according to the changes in the situation. To be most effective the fire should supplement that of the direct support artillery. In order to secure this coordination and still insure that the fire is placed where desired, the division artillery commander should allocate the available fire power to the various direct support units, directing that it be employed in certain specific areas. The direct support units in arranging their schedule fires select the targets to be fired upon by the medium howitzers and furnish them the necessary overlays⁴ together with a statement of the times during which the various targets should be kept neutralized.

The time of firing on targets selected for the general support artillery should not require more than general coordination with the actual advance of our troops provided this does not differ radically from the expected development of the attack. The direct support artillery can be expected to react quickly to a change in the infantry situation. In the case of the general support artillery, the information has to go from the light battalion to the light regiment and then to the howitzer battalion before the change is

⁴When a map substitute is used, the firing charts used by the howitzers and the light artillery must be coordinated if this transfer of missions is to be effected.

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made. In addition, the fire of the howitzers should not be placed closer than five hundred yards to our advancing troops. For example, the reenforcing fires of the howitzers normally will be found along the battalion and regimental reserve lines when the assault is made on the enemy main line of resistance. The howitzer fire, jumping from main ridge to main ridge, is not concerned with minor delays in the attack. The direct support fires cover the gap between the assaulting troops and the ridge where the howitzer fires are falling and, as the direct support fires begin to arrive on that ridge, the howitzer fires move on.

The medium howitzers are capable of laying down a much more effective smoke screen than are the light guns. Where smoke missions are necessary, they thus logically fall to the general support artillery where possible. These missions may be either in the nature of fires reenforcing the direct support artillery when their primary purpose is to protect against the action of enemy infantry weapons or counterbattery when they are designed primarily to neutralize enemy observation. As reenforcing fires, the request for them should come from the direct support artillery, as they must be coordinated with the expected development of the attack. As a sort of supplementary counterbattery they should be arranged by the howitzer regiment which is responsible for counterbattery. In any case, the smoking of large areas for extended periods is not practicable. When available hostile observation is concentrated in a more or less limited area the use of smoke is very effective.

As in the case of the direct support artillery, the general support artillery must be prepared to take under fire promptly targets of opportunity which appear in its normal zone. Normally, the targets of opportunity for the direct support artillery are found in the forward areas of the battlefield—in the area forward of what would correspond to the enemy regimental reserve line. These targets are located usually by liaison or forward observers. The howitzer targets usually are in rear of that line and are located normally by balloon or airplane observers, although the liaison observers of the direct support artillery may occasionally locate targets suitable for howitzer fire. Mostly, these targets consist of enemy reserves in movement, truck or troop columns on the road.

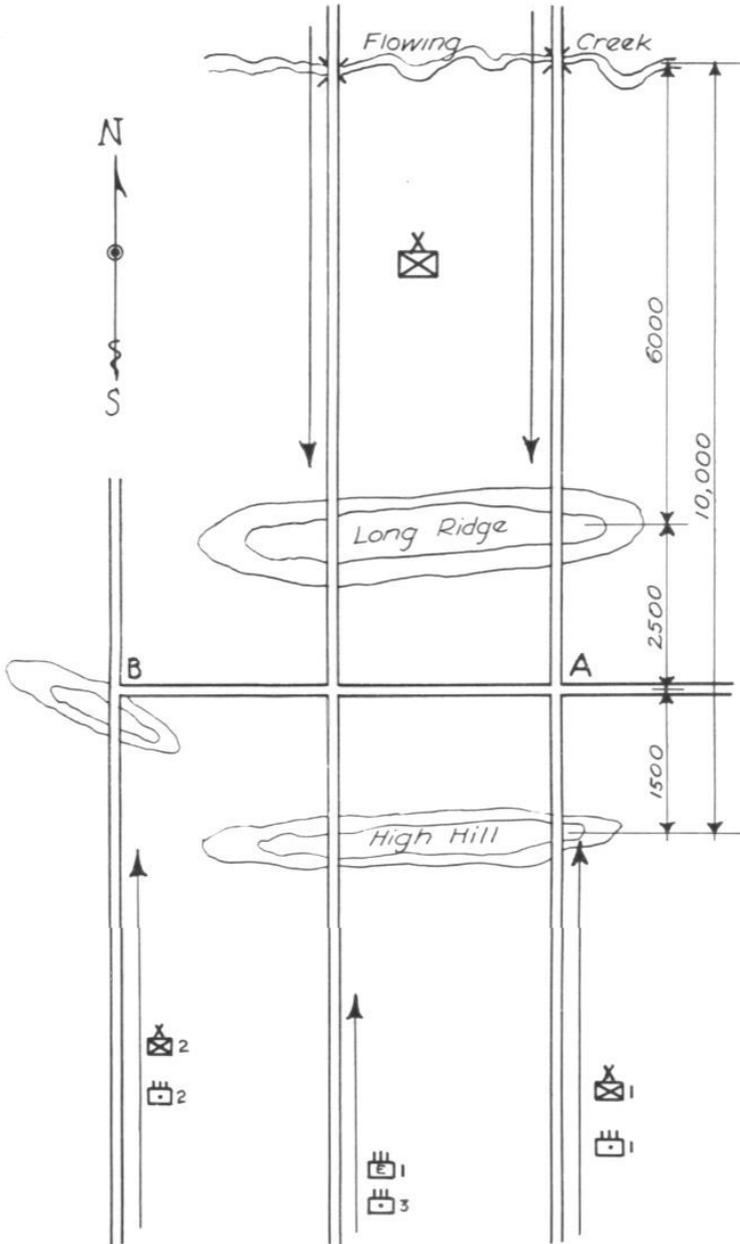


Figure 1

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or batteries located in action. The fire direction chart⁵ is used as in the direct support artillery in order quickly to concentrate on these targets.

To illustrate the points which have been covered, assume a particular situation as indicated by Figure 1.

Air observers report that a Red reenforced brigade is crossing Flowing Creek and moving south toward Long Ridge in two columns. About half the Red force is across the creek. G-2 estimates that the Reds are going to try to hold Long Ridge to check the Blue advance.

The Blue 1st Division is marching in three columns as shown. The general composition of the three columns is indicated with symbols. The division commander tentatively decides to develop with a view to enveloping the Red right flank if subsequent developments indicate that the G-2 estimate is correct.

In the situation assumed, a battalion of medium howitzers might well be pushed without delay to the vicinity of High Hill to interdict the enemy routes of advance. This distant interdiction fire will have a double effect: it will delay materially the enemy's occupation of Long Ridge in force; infantry subjected to fire which it cannot return feels helpless and, if the fire is effective, a lowering of morale is not unlikely. Airplane observation or photographic strips obviously are necessary to make the fire effective.

The question may well be asked why should not the advance guard light artillery be used for this purpose. The answer is that initially it would be used in this manner but, lacking the range, it would be forced to confine its efforts to the heads of columns. The howitzers can reach the bridges over Flowing Creek and can thus cause a much more serious delay. Also, when the opposing advance guards become engaged, the advance guard artillery will be called upon to fulfill its direct support role and will not be available for this task.

Assume next that the situation has developed as shown in Figure 2. The enemy columns are commencing to deploy on Long Ridge. An enemy battery at C is firing effectively and interfering

⁵A detailed explanation of this chart may be found in paragraphs 143 to 145 of FA Book 224. In publications of a later date than FA Book 224 this chart is referred to as the observed fire chart.

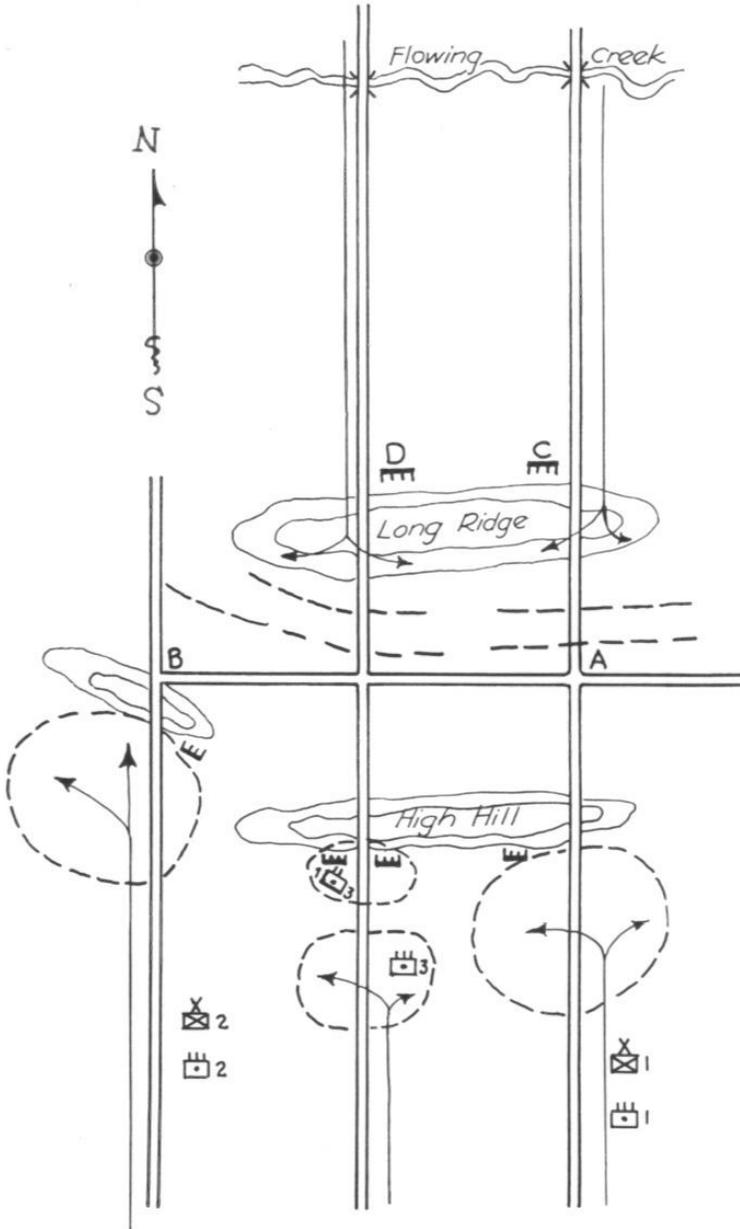


Figure 2

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with the Blue development. Another battery at D is located but is not accomplishing much.

The Blue columns are going into assembly areas, as shown in the figure, covered by advance guards along the general line of the lateral road AB. One battalion of howitzers is in action near High Hill interdicting the enemy routes of advance. Some light artillery from each column is supporting the advance guards.

In this situation the howitzer battalion should establish liaison with the advance guard artillery. Distant interdiction should be continued; the enemy battery at C should be neutralized; the one at D should be observed, data prepared and all arrangements made to open fire promptly if it becomes necessary.

Liaison is established with the advance guard artillery in order that the howitzer battalion may receive information promptly concerning changes in the situation and as to the location of targets. When the howitzer battalion is not present, the light artillery would execute any necessary counterbattery. However, with the arrival of the howitzers it is able to devote its entire attention to the support of the advance guard and preparing for the coming attack.

During this period, active measures should be instituted to secure targets for future use. The targets which particularly interest the howitzers are the locations of the enemy's artillery and his main reserves. Air or balloon observers and photographs are the usual means available to find these targets, as they normally keep defiladed from ground observation. Such facilities as are available must be used to the utmost to locate targets.

Now assume that the situation develops further somewhat like that shown in Figure 3. The enemy position has its regimental reserve line located on Long Ridge. In all, five enemy batteries have been located or suspected. Three more are believed to be present but have not been located. The enemy main reserve is believed to be in the woods at E. It is believed that this reserve will be used in a counterattack from ridge F against the flank of the enveloping force. Other data are as shown in the figure. All this information concerning the Reds was accumulated by an intensive exploitation of all sources of intelligence available to the division, such as airplane, balloon, and infantry reconnaissance and G-2 estimate.

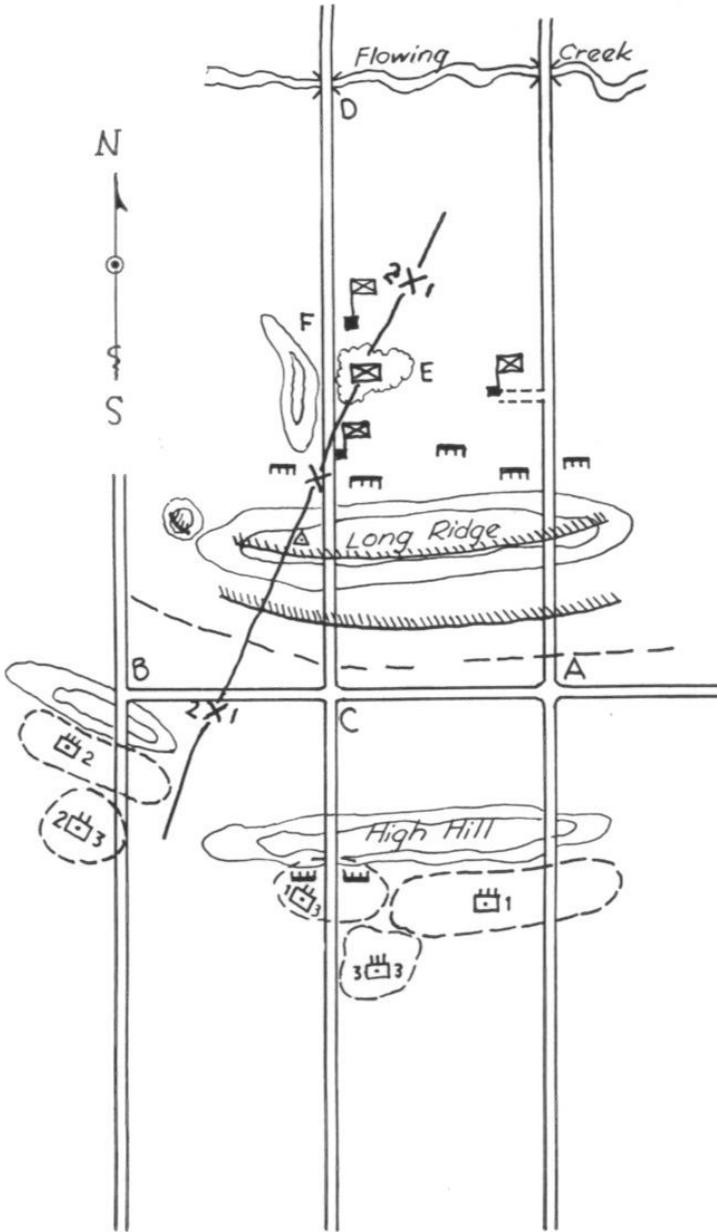


Figure 3

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The Blue 1st Division is to envelop the enemy right flank with brigades abreast, 2d Brigade on the left. The 1st Field Artillery is to support the 1st Brigade and the 2d Field Artillery the 2d Brigade. The 3d Field Artillery is to be in general support. The 1st Battalion, 3d Field Artillery, will have the zone of action of the division for its normal zone. The 2d Battalion, 3d Field Artillery, will have the zone of action of the 2d Brigade for a normal zone and reenforce the fires of the 2d Field Artillery. The 3d Battalion, 3d Field Artillery, will have the zone of action of the 1st Brigade as a normal zone and reenforce the fires of the 1st Field Artillery.

When the enemy troops have developed and no more traffic is crossing Flowing Creek, the distant interdiction mission would end. If this did not occur prior to the start of the attack it would be stopped temporarily when the attack is launched. Counterbattery would be executed against such enemy batteries as became objectionably active as previously discussed.

Just prior to the attack, a fifteen minute preparation should be fired, since enough information has been obtained to warrant it. Three counterbattery groups should be arranged and targets assigned as follows:

<i>Groups</i>	<i>Targets</i>
1st Battalion, 3d Field Artillery } 1st Battalion, 1st Field Artillery }	2 batteries
2d Battalion, 3d Field Artillery } 1st Battalion, 2d Field Artillery }	2 batteries
3d Battalion, 3d Field Artillery } 2d Battalion, 1st Field Artillery }	3 CPs 1 battery

During this period the remaining battalion of the 2d Field Artillery would concentrate on enemy observation posts along Long Ridge with particular reference to those which could observe the zone of action of the 2d Brigade.

During the attack, one battery of the 1st Battalion, 3d Field Artillery, would maintain the neutralization of the five enemy batteries, one platoon firing on three and the other on two targets. The 3d Battalion, 3d Field Artillery, would be directed to reenforce the

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fires of the 1st Field Artillery west of the road CD. The 2d Battalion, 3d Field Artillery, would be directed to reenforce the fires of the 2d Field Artillery, to prepare protective concentrations on the ridge F and to indicate tentative missions for one battery of the 1st Battalion to be fired in the absence of counterbattery or other more pressing missions. In addition to the above, the 3d Field Artillery would plan concentrations for four batteries on the reserves at E. These concentrations would be fired by the 2d and 3d Battalions just prior to the time the reserves should move to F.

It should be noted that the 2d Battalion, which is reenforcing the artillery supporting the main effort, has no restrictions placed upon the location of its fires except that it is to prepare certain protective concentrations. All fires are to be arranged in conference with the direct support artillery. In addition, one battery of the 1st Battalion is to fire in zone of action of the 2d Brigade as long as no other targets appear. The 2d Battalion is directed to secure missions for it in order to avoid possible confusion with the light artillery if more than one howitzer unit would come to arrange for targets. On the other hand, the area in which the 3d Battalion is to fire is definitely indicated. The targets, however, within this area are selected by the direct support artillery. This is done in order to insure that the fires of the 3d Battalion may also contribute to the mass of fire in front of the main effort. The mass of fire arranged to hit the enemy reserve is designed to have a devastating moral effect. If possible the reserves should be scattered. By using the howitzers for this purpose, the attention of the direct support artillery is not distracted from its primary mission.

The reenforcing howitzer fires discussed above should be selected by the direct support artillery at the same time they plan their own fires. The howitzer battalions executing these fires establish liaison with the light field artillery regiment whose fires they reenforce. The 1st Battalion establishes liaison with the balloon, if one be present, and is prepared to answer calls for fire from any airplanes. Particular attention is directed towards securing information of any new batteries reported in action, the movement of enemy reserves, or the approach of reinforcements.

The direct support artillery should handle all targets of opportunity south of the crest of Long Ridge initially. The howitzers

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should fire on those discovered north of that point. However, the basic rule regarding targets of opportunity is that the man who sees a target fires on it. Thus, a howitzer unit which was not busy on an important mission of its own would take under fire an appropriate target of opportunity in the enemy battle position if it located one.

The situation just discussed is changed when Corps Artillery is present.

When the division is operating as part of the corps, it normally receives considerable support from the corps artillery. This echelon takes over the distant interdiction and counterbattery fires, fires protective concentrations to guard against counterattacks, attends to the neutralization of the enemy main reserves and reenforces the fires of the division artillery with such units as are not engaged on other missions. Thus, we see that when the division is functioning as part of a corps, the division howitzers are relieved of all missions except that of reenforcing the direct support artillery. However, occasionally they may have to reenforce the corps artillery in counterbattery.

The organic corps artillery consists basically of two 155mm howitzer regiments and a 155mm gun regiment. The 155mm gun regiment is designed to handle the distant interdiction missions on the front of the corps. The howitzer regiments provide the counterbattery units. To assist them in counterbattery, the corps has a Sound and Flash Battalion of two batteries. Thus, counterbattery can be expected to be much more efficient than when the division is operating alone.

The counterbattery units are the ones which normally cooperate with the division artillery in the matter of reenforcing fires. Thus we should have a counterbattery groupment for each division in the corps. When we have but two divisions of the corps in line, the corps howitzers are ample to handle the mission. When three divisions are in line, a redistribution must be made. This might be accomplished by forming three groupments of two battalions each or by some other distribution. Each counterbattery groupment covers the zone of action of a division and establishes liaison with the division artillery.

The discussion above concerning distant interdiction under the

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independent division holds also as applied to the corps. Such batteries of the distant interdiction groupment as are not required for that mission reinforce the fires of the counterbattery groupments with particular attention to the one covering the division making the main effort of the corps. The 155mm gun has a traverse of 60 degrees and an effective range for neutralization of 16,000 yards, so it is well designed to cover a wide front.

Counterbattery in the corps is handled under the same principles as in the independent division. Due to special organization and more abundant artillery, more efficient performance may be expected.

Similarly, the protective concentrations and fires on enemy reserves conform to those fires in the case of the independent division. Again, due to better facilities and increased amounts of artillery, more efficient results should be obtained. When its other missions are cared for, the Corps Chief of Artillery uses the remainder of the fire power of the corps artillery to reinforce the fires of the division artillery. Missions are secured for the corps artillery from the division direct support artillery through the division artillery brigade just as discussed above for the division general support artillery. The mass of the fire should be used to contribute directly to the success of the division making the main effort. The problem of targets of opportunity exists for the corps artillery as for the division artillery. However, it is further complicated by the presence of the division artillery. The problem is met by the designation of limiting lines in depth between the normal zones of the division artillery and the corps artillery and between the corps counterbattery and long range groupments. The limiting line in depth between the division and corps artillery is usually referred to as the XX' line. It should follow generally along the first crest in rear of the enemy regimental reserve line, thus giving all the terrain from which small arms fire can be directed against the attacking infantry to the division artillery and the area in which the mass of the enemy artillery is found to the corps. A similar line, referred to as the YY' line, divides the normal zone of the counterbattery groupments from that of the long range groupment so as to give the area containing the mass of the enemy batteries to the counterbattery groupments. As

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targets of opportunity for these groupments are usually picked up by aviation, the YY' line should be identified readily from the air. Each unit concentrates its observation facilities on the area assigned to it. However, in case an important target is found beyond or short of its normal zone, a unit should not hesitate to attack it provided the unit in whose normal zone it is located is not firing upon it and apparently has not seen it. Thus we see that the Corps Artillery has a pressing need for observation over distant areas. Balloons are particularly desirable.

Within the division, the best system to handle targets of opportunity is to have the direct support artillery answer all calls from liaison and forward observers and the general support units the calls from airplanes. With the corps handling the area behind the regimental reserve line, the forward area is too shallow to be subdivided further.

Thus, we see that the main effect of the presence of the corps artillery is to increase automatically the amount of artillery available for direct support missions. This mission after all is probably the most important on the battlefield.

To coordinate efficiently a mass of artillery some sort of map or map substitute is necessary. To attempt to do without them is to go back to the days of 1914. During the early days of the war, rarely was the fire of the available artillery efficiently massed in support of the main effort of the unit. As a matter of fact, it is doubted if any unit consciously made a main effort or attempted by fire to isolate a compartment of the terrain in which a decision was to be sought. Today we are trying to supply our needs in this country with the airplane mosaic or reproductions of one together with large scale single vertical photographs of the target area. Using proper survey methods, efficient fire support can be delivered with these means. However, it requires forethought and energetic execution to avoid delay. Higher echelons must coordinate the survey work, otherwise missions will not be transferred readily from one echelon to another. Regardless of the map or map substitute used, firing data for concentrations should be checked by some form of registration.

To employ effectively the fire of a mass of artillery, an adequate amount of intelligence of the enemy as well as the necessary maps

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or map substitutes must be secured. This intelligence is obtainable provided it is sought in the right place with the right means. This fact can be verified by a study of the early battles of the World War. It is true that commanders were frequently in the dark concerning the situation; however, this can be traced in most cases to a failure to properly collect, collate and interpret the information which was available. Once available, the artillery of that period lacked the communication facilities and technique to exploit the intelligence and to mass its fire on the proper targets. In time of peace, we are prone to drift into bad habits by having too much intelligence opportunely thrust at us in map problems and maneuvers without any particular initiative on our part or indication as to how it was obtained. The answer lies not in doing without this information but in organizing properly to secure and exploit it for use in firing. IT IS THERE. WE NEED IT. GO AFTER IT.

We have no suitable data at the Field Artillery School regarding the fire power of the 155mm howitzer and gun or the 240mm howitzer. For reasons of economy, most of the firing at Fort Sill is done with the 75mm and 3" guns. We know pretty well how many rounds of 75mm shell to use on various targets. The corresponding ammunition allotments for the 155mm and 240mm are a compromise between a weight in explosive comparable to the equivalent 75mm allotment and a number of rounds which will permit of a reasonable mechanism of fire. The author seriously questions the adequacy of these allotments, although they are based upon the best obtainable data. It is believed that a test by the Field Artillery Board comparable to the shrapnel-shell tests of some years back would be of great value in determining a proper ammunition allotment for various types of targets.

The advent of the truck-drawn howitzer will do much to improve the usefulness of these weapons in an open warfare situation. The tractor-drawn 155mm howitzer, marching at the tail of the column at 3½ miles per hour, was rarely on hand early in the engagement. The corps howitzers were still more tardy. The truck-drawn howitzer can leave the road clear for marching infantry and still reach the battlefield earlier than could the older type, as it is expected to move at speeds from 7 to 15 miles per hour.

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CONCLUSION

Attention is invited to the fact that all experiences seem to indicate that success on future battlefields, as in the past, will be gained most easily when artillery fire is employed in mass to make smooth the path of the infantry.⁶ This application of fire to a tactical situation really is artillery tactics. To obtain an efficient mass of fire at the point desired requires efficient fire direction not only of one battalion but of numbers of battalions. It is not sufficient today to be a good light artilleryman. One must understand all calibers and appreciate their place in the team. It is only by effective coordination of all the echelons that the artillery will efficiently fulfill its role in battle.

⁶The reader is referred to the article on "The Battle of Buzancy" by Colonel Lanza in January-February, 1935, number of the FIELD ARTILLERY JOURNAL.

SERVICE PRACTICE IN THE NATIONAL GUARD

BY MAJOR E. A. ZUNDEL, Field Artillery

National Guard Bureau

EDITOR'S NOTE: The following Field Artillery units of the National Guard are organized, equipped and engaged in active training throughout the year:

- 18 Field Artillery Brigades, Infantry Division
- 2 Regiments and 1 Battalion, Corps Artillery
- 2 Regiments G. H. Q. Reserve Artillery
- 1 Regiment and 1 Battalion, Cavalry Division Artillery

or a total of:

- 18 Brigade Headquarters
- 15 Brigade Headquarters Batteries
- 39 Regiments and 1 Battalion (75mm Gun)
- 13 Regiments and 4 Battalions (155mm Howitzer)
- 1 Regiment (155mm Gun)
- 3 Ammunition Trains

Of the 39 Light Field Artillery Regiments, 35 are Truck-Drawn, and 4 are Horse-Drawn.

The active strength of the Field Artillery of the National Guard on January 1, 1935, was

- 2,973 Commissioned Officers
- 51 Warrant Officers
- 32,147 Enlisted Men

* * * * *

ANALYSES of reports of Service Practice of National Guard Field Artillery regiments over the past few years show consistent and steady progress in this important phase of training. The firing in practically all of the 53 regiments and 5 separate battalions is becoming more diversified, better planned and better executed. During the summer of 1934 approximately 1,500 problems were fired with service ammunition, of which more than half were with lateral, air, forward observation and transfers of fire.

It may be asked how the National Guard, with a prescribed 72 hours' armory drill and 15 days' field training, can attain proficiency in the preparation and conduct of fire except in the most simple axial problems. A study of the reports indicates that the advance can be attributed to a number of factors, among which are the following:

1. Better preliminary instruction, planning and organization for the practice.
2. Improvement of ranges.
3. Motorization.
4. Greater use of sub-caliber ammunition.
5. Extension Courses and the Field Artillery School.

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The preliminary armory instruction is not limited to the hours prescribed for drill. Many extra hours of gunners' instruction and individual instruction are given in addition to the normal weekly drill.

Officers' schools in the preparation and conduct of fire are held in which the officers are generally divided into three groups, according to their proficiency. The classification of officers is made by a board of three officers consisting of the regimental or battalion commander, the instructor and another officer of the unit who is a graduate of the Field Artillery School.

Group A is made up of officers who have graduated from the Field Artillery School and those who have demonstrated their theoretical knowledge and practical ability in all methods of preparation of fire and in the conduct of axial and lateral problems.

Group B consists of those officers who have qualified in the rapid preparation of fire and demonstrated their ability to conduct axial precision and percussion bracket adjustments.

Group C includes the newly commissioned officers who must be given elementary instruction in the preparation and conduct of fire; use of firing tables; sequence of commands; safety regulations, etc. After this classification, progressive instruction of each group can be given. When the field training period arrives the officers are reclassified, and each one seeks his own level according to the ability he has developed at firing schools.

An examination of several reports showing the actual procedure of the preliminary instruction may prove of interest. One regiment reports one firing school per week for nine months preceding camp, in which the subjects map reading, preparation of fire, conduct of fire and fire direction were covered. The training of the executives included laying with the compass, referring the pieces and adjusting the sheaf parallel by actual firing. Telephone operators, recorders, gunners and chiefs of section were used during firing of the trainer battery. In the final classification of officers for firing, 20 were placed in Group A, which qualified them for all methods of adjustment; 16 were placed in Group B, and 13 in Group C. This same regiment reports a very high standard of expert and first-class gunners has been set up. This has served to limit the number of men qualified, but has greatly improved the service practice. All officers, section chiefs, gunners

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and selected privates were required to qualify at least as 2d class gunners before camp.

Another regiment reports regular weekly schools throughout the year. Also each Sunday for ten weeks prior to camp the officers and necessary enlisted personnel went out into the open with the 22-caliber battery and fired many problems with axial and lateral observation, thus supplementing the armory blackboard and terrain board practice before the actual service practice.

The organization of the practice has kept pace with the preliminary instruction. One regiment has this to say, in part:

"Range Finder Corporals took great pride in measuring the ranges. At least 90% of the ranges were measured in this way.

* * * Range finder K factors, as usual, proved to be extremely valuable as a means of conserving ammunition."

The instructor of one regiment states: "The range finder or air mosaic was used in the determination of 87% of the ranges and of these 70% had an initial range error of 100 yards or less." This same instructor reports the average deflection error of the regiment as 29 mils for axial problems and 21.5 mils in lateral problems, the deflection in the latter case being determined from an air mosaic.

The ranges being used by the various organizations are gradually being enlarged and cleared or the regiments are seeking others which are more suitable for service practice. For a number of years a considerable proportion of the National Guard ranges permitted very small lateral shifts and were limited in range. The larger ones now permit more varied types of firing and better integration of gunnery and tactics. A typical example of the improvement in ranges can be found in the First Corps Area. Formerly three light regiments trained at Fort Devens, where the facilities limited the lateral shift to several hundred mils and a maximum range change of about 1,000 yards; the fourth light regiment fired on an even more restricted range in Maine. The medium regiment had to travel to Tobyhanna, Pennsylvania, for their firing and the expense was such that they were able to fire only about once in three years. The present policy is to send all of these regiments to Fort Ethan Allen, Vermont, where a much better range is available.

SERVICE PRACTICE IN THE NATIONAL GUARD

Whatever the merits of truck-drawn artillery may be, it is pretty generally conceded that it has played no small part in the progress of service practice in the National Guard. It has permitted more men to be thrown into the gun crews, has allowed an expansion from a two-gun battery to a three or even four-gun battery, and has provided considerably more time for the service of the piece. Regiments which were formerly limited to a very small radius of action have been able to go further and take advantage of more varied ranges and more positions on the same range. The motors have been used for transporting officers to regimental firing schools where this instruction can be carried on in a much more uniform manner. * * * An excellent example of the use of motors to improve instruction can be found in Wisconsin, where all officer personnel from more or less widely scattered points were assembled at the stations of the three instructors for bi-monthly schools. This permitted use of the artillery trainer for all units. The battery officers in one case travelled a total of 4,536 miles to be present at all the sessions. Many a die-hard horseman who at first balked motorization will now admit it is beneficial to the National Guard.

The introduction of 37mm subcaliber some few years ago in the Guard met with resistance in some quarters. It is now used almost entirely for the inexperienced officers. Some regiments fire practically all of their axial problems with this type of ammunition, reserving their service ammunition for lateral and other adjustments. Due to the small amount of ammunition available, subcaliber has been employed extensively for moving targets and in fire direction and other tactical problems. One report states that a battalion fired 63 problems with subcaliber including axial bracket and precision, moving target, transfers of fire, a battalion concentration and small angle "T" lateral. Another regiment reports that 50% of the time devoted to subcaliber practice was given to fire direction exercises.

The Field Artillery School has probably played the most important part in the improvement of the practice. To date 636 officers of the National Guard have graduated from Fort Sill, of whom 360 are at present in the service. The present policy is to have eventually a graduate of the school in each battery and on the Staff of each higher Field Artillery unit. This, together with

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proposed more rigid entrance requirements, will immeasurably increase the efficiency of all batteries.

The Army Extension Courses likewise assist the officer personnel in getting a better theoretical knowledge of preparation and conduct of fire. Most states make enrollment in the extension courses mandatory. On December 31, 1934, 2,363 National Guard Field Artillery officers and 2,410 enlisted men were enrolled. Last school year the National Guard field artillerymen completed approximately 23,000 subcourses or 131,000 hours' work.

A further examination of the records is illuminating. A 155 Howitzer regiment fired 33 problems with service ammunition, in addition to its subcaliber. All of these problems involved lateral, combined or air observation and more than half were bracket adjustments. The average number of rounds per problem was about 6. Fire direction and all axial problems were fired with subcaliber. A light regiment reports one school each week throughout the year on preparation and conduct of fire, with final examination prior to camp to determine proficiency of officers; a total of 57 problems fired, half of which were time bracket and the other half lateral precision, bracket and air adjustment, and fire direction problems with 37mm ammunition. The instructor's comments give the average time for preparation of axial time bracket problems as 5.5 minutes and for lateral 4.9 minutes; liaison (forward observer) fires were used to good effect; fire direction and critique of problems was well done.

Still another light battalion reports 14 problems fired with service ammunition, which included a high burst transfer, axial time bracket and lateral time bracket and precision; different methods of obtaining initial data were required such as compass, use of orienting line, OP instrument as aiming point, distant aiming point and lining in.

After a careful study of all reports, the following regiments, whose service practice appeared particularly meritorious, were commended by the Chief of the National Guard Bureau: 2d Bn 143d FA—California; 2d Bn 148th FA—Washington; 103d FA—Rhode Island; 105th FA—New York; 108th FA—Pennsylvania; 176th FA—Pennsylvania; 110th FA—Maryland; 135th FA—Ohio; 128th FA—Missouri; 70th FA Brig. Oklahoma, consisting of 158th FA, 160th FA and 189th FA.

RESTITUTION BY TRACING PAPER INTERSECTION

BY 1ST LIEUTENANT W. N. GILLMORE, Field Artillery

A rapid method of restitution or replotting targets which appear upon an intelligence or large scale photo to a smaller scale mosaic firing chart, or fire control data sheet.

A RMY Regulations 100-15, C2, state that the map of the scale 1:62,500 "is the general purpose map for field operations and, when supplemented by aerial photographs and fire-control data sheets, provides all the topographical data which will ordinarily be available in time of war." A map of this scale is entirely unsatisfactory for use by the Field Artillery in the computation of firing data. It has been determined that the smallest scale firing chart from which data can be accurately computed is of the scale 1:20,000.

In regard to the 1:20,000 scale map, regulations state, "A map of this scale for any extended area in which military operations are under way cannot be expected in time of war, and consequently the use of this map should not be permitted in training in the field." In other words, we of the artillery are not to expect maps from which to figure firing data in future operations against an enemy. We can expect the Engineers to furnish fire control data sheets, and the Air Corps to furnish strip mosaics of the area we are operating in, taken from airplanes operating around 20,000 feet and supplemented with low altitude, large scale intelligence photographs of enemy positions.

The problem then presents itself as one of restitution or a replotting of targets that appear upon the intelligence photo to that of the smaller scale mosaic or fire control data sheet.

There are three methods in general use at the present time to accomplish this — the inspection method, the similar polygon method and the tracing paper resection method.

The inspection method, as the name implies, is the replotting, by eye, of targets appearing on the intelligence photo to the firing chart. The inspection method is fast and will be fairly accurate when the area contains many objects, both natural and artificial, appearing on both the large scale photo and firing chart and therefore capable of being used for orientation.* The inspection

*Note: During the remainder of this discussion, whenever firing chart is referred to, either small scale mosaic or fire *control* data sheet could be substituted.

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method becomes slow and inaccurate when the number of these objects is few and not easily recognizable. In either case the speed and accuracy of the replot is directly dependent upon the skill and training of the operator in handling air photos.

The similar polygon method is but one step removed from the inspection method. It consists of selecting a number of points which appear on the intelligence photo and the firing chart and drawing similar polygons, using these points as vertices, upon both the intelligence photo and firing chart. By inspection, the location of the target in the small scale photo polygon is determined. It is then replotted, by eye, on the mosaic or data sheet, locating it in the same relative position in the similar polygon drawn on the firing chart. Here again the replotting of the target is dependent upon the skill of the operator; considerable time is consumed in drawing the polygons upon the photo; the photo after having the lines of the polygon drawn loses clearness for any further use, and there must be three or more objects to form the vertices of the polygons.

The tracing paper resection method is precisely the same as the process employed to locate oneself upon a map, with three or more points visible and these points plotted on the map. It consists of placing a piece of tracing paper over the intelligence photo and drawing rays from the image of the point whose location on the firing chart is desired to three or more objects on this intelligence photo; then fitting the tracing paper upon the firing chart so that these rays pass through the image of the same points as shown on the firing chart. The radial center of the rays then locates the point upon the mosaic or data sheet. This method is accurate but, since it locates but one target at a time, it is very slow, and it also requires three or more objects appearing on both the large scale photo and firing chart. Each of the three systems just mentioned has its drawbacks. Either they require too many objects for orientation, involve inaccuracy of plotting, require a large amount of skill and experience, or are slow of accomplishment. It becomes apparent that if we are quickly to prepare fire from intelligence photos furnished us, we must have a more rapid means of replotting or restitution. This need becomes clearly apparent when a Battalion Commander is given one intelligence

RESTITUTION BY TRACING PAPER INTERSECTION

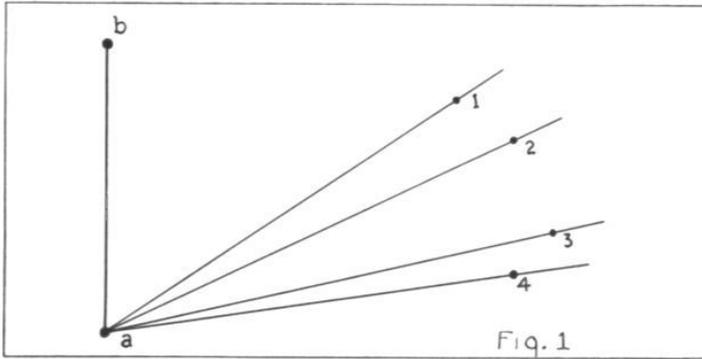
photo of a target area with around 40 targets appearing upon it. These targets must be replotted accurately on the firing chart, overlays showing these targets must then be prepared and sent to the batteries, and firing data prepared for these targets by the battery commanders. All of this must take place in a very short period of time. Any inaccuracy of plotting will make the prepared fires ineffective, and any slowness in executing the plotting and getting the overlay to the battery commander will not allow him sufficient time to compute the required firing data.

A recent development has been the provision of the half tone, or multilith, of an air photo mosaic, for use in the battery as a firing chart. These half tones or multiliths make excellent firing charts, and prominent objects show up clearly; however, the smaller detail of the normal air photo is completely missing. To attempt to plot, or reconstitute, targets from an intelligence photo to a multilith using the inspection or similar polygon method is both slow and inaccurate; and the use of the tracing paper resection method, while accurate, is entirely too slow when more than one or two targets are to be located.

In the tracing paper intersection method now to be described, we have a means of accurate and rapid replotting or restitution that requires but two orientation objects appearing upon both the large scale photo and firing chart, and is not dependent upon the skill of the operator in the use of air photographs.

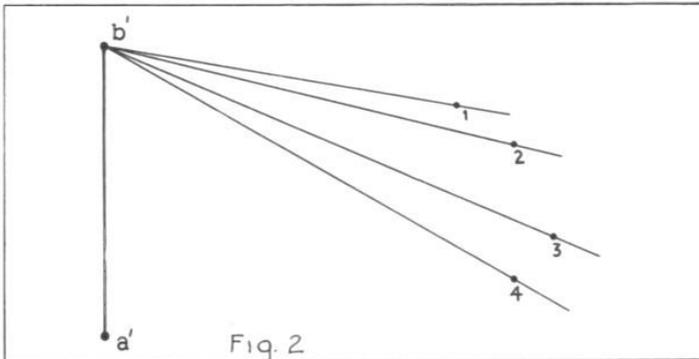
The tracing paper intersection method is based upon the premise that angular measurement, from any given point, between other points, will be the same, regardless of the scale of photo or chart. Its procedure is as follows:

Take the large scale intelligence photo upon which the targets appear and beneath it place two sheets of tracing paper. Place thumb tacks through all *three* layers, to hold them in place. With a needle prick through two objects that appear upon both the large scale photo and the firing chart (these are for orientation), and all the targets. Make sure that the needle passes through both sheets of tracing paper. On both sheets of tracing paper letter the two orientation objects and assign a number to each target. Letter one of the orientation objects as A and the other as B. (Note: These objects should be of the same general level as that



TRACING PAPER WITH *a* AS CENTER WITH RAYS DRAWN TO ORIENTING POINT *b* AND EACH OF NUMBERED TARGETS 1-2-3-4

of the target area, since difference in altitude will cause lateral displacement towards the sides of the photo. The objects also should be so selected, if possible, that A, B and the general target area form an equilateral triangle). Letter, on the firing chart, the two objects selected for orientation as A and B to correspond with the lettering given these points on the large scale photo (for clarity letter the points pricked through on the tracing paper as *a*, *b*, etc., on one sheet and *a'*, *b'*, etc., on the other). Take one of the sheets of tracing paper and through the point *a*, draw rays through each of the numbered and lettered holes in the tracing paper (See Fig. No. 1); place the tracing paper with *a* over A on the firing chart. Move the tracing paper about A until the ray *a-b* passes over the point B. Take the other piece of tracing paper with holes lettered *a'*, *b'* and through the point *b'* draw rays to each of the numbered and lettered holes (See Fig. No. 2). Place

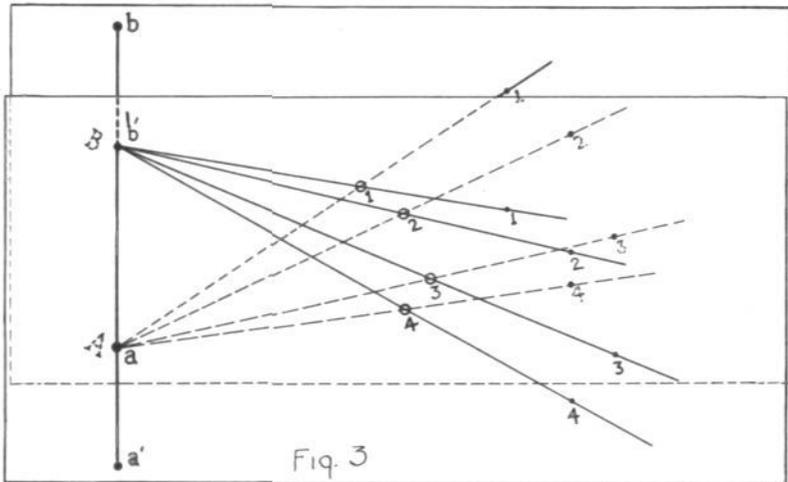


TRACING PAPER WITH *b'* AS CENTER WITH RAYS DRAWN TO ORIENTING POINT *a'* AND EACH OF NUMBERED TARGETS 1-2-3-4

RESTITUTION BY TRACING PAPER INTERSECTION

the tracing paper so b' falls at B on the firing chart. Revolve the tracing paper which has b' as the center of the rays about B until the ray $b'-a'$ passes over A. With thumb tacks fasten the two sheets of tracing paper and the firing chart together.

The intersection of any given line from a , passing through a numbered target with that of the line from b' , passing through the same numbered target will indicate the location of the target on the firing chart (See Fig. No. 3). With a needle prick through at these intersections. Lift the tracing paper and number the targets on the firing chart. The targets have been replotted on the firing chart from the intelligence photo.



SHOWING TWO TRACING PAPERS IN POSITION ON FIRING CHART. b' AT B ON THE FIRING CHART, a AT A ON THE FIRING CHART. THE INTERSECTION OF THE RAYS FROM a AND b' INDICATED BY CIRCLES. THE TARGETS ON THE FIRING CHART WILL BE DIRECTLY BENEATH THE INTERSECTIONS.

It has been shown by tests made by a number of officers inexperienced in the use of air photos that, using the tracing paper intersection method of restitution, an average error of 20 yards in deflection and range may be expected when using an intelligence photo the scale of which is 1:15,000 and replotted on a 1:20,000 multilith. In a period of one hour 20 targets may be replotted, overlays of these targets prepared and sent to the batteries, and basic data figured by the battery commander for fire upon these targets.



ARTILLERY SECTION OF THE REVOLUTIONARY WAR

NEW RIDING HALL AT FORT MYER

WITH the Secretary of War as the guest of honor, the new riding hall at Fort Myer, Virginia, was opened with two performances of a military pageant on January 12, 1935. With every seat sold nearly a week before the show, the officers and men of the garrison under the direction of the post commander, Col. Kenyon A. Joyce, 3rd Cavalry, set a new high standard of colorful and thrilling entertainment before two audiences which included the Secretary of State, the Assistant Secretary of War and many members of the Diplomatic Corps.

The first event on the program was a pageant, "The History of the United States Army," written and directed by Capt. H. W. Blakeley, 16th F. A. With a musical setting by the mounted regimental band of the 3rd Cavalry, which played music of the period represented by each unit, groups of soldiers were presented armed, equipped and uniformed as were their predecessors in 1776, 1812, 1846, 1861, during the Indian Wars. 1898 and 1918. The final group to enter the hall showed the highly trained technicians who are the soldiers of today with their radios, automatic weapons and

NEW RIDING HALL AT FORT MYER

scout cars. The music for this modern group was, appropriately, "There Is Something About a Soldier."

The rest of the program follows:

Squadron parade, 2nd Squadron, 3rd Cavalry

Jump ride. Troop E, 3rd Cavalry

Musical ride

Driving drill, Battery C. 16th Field Artillery

Tandem jump ride, Troop F, 3rd Cavalry

Gymnastic ride. Machine Gun Troop, 3rd Cavalry

The Cobbler Hounds, Lt. Col. and Mrs. George S. Patton, Jr.,
Joint Masters

Hunt Ride

Rodeo, Troop F. 3rd Cavalry

Cavalry Weapons Ride, Machine Gun Troop, 3rd Cavalry.

Lt. Col. George S. Patton, Jr., 3rd Cavalry, assisted by Capt. Thomas W. Ligon, 3rd Cavalry, and Capt. Blakeley, was director of the entire program, while Lt. Col. Jacob L. Devers, 16th F. A., was in charge of the ticket and other administrative arrangements.

The new riding hall replaces the one destroyed by fire in February,



"PREPARE TO MOUNT" IN 1776

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1934. The ring is one hundred by two hundred feet and there are seats for 1,800 people arranged in stadium fashion on three sides. There is also a sound proof control booth with a loud speaker system, light and signal bell controls, and telephone communication.

The regular Friday afternoon exhibition rides were resumed on January 18, the guest of honor being Maj. Gen. A. Drum, Deputy Chief of Staff. He was received by a guard of honor from the 10th Cavalry under command of 1st Lieut. Gordon Rogers. Battery "A", 16th Field Artillery, Capt. William H. Colbern, commanding, fired the prescribed salute as Gen. Drum entered the post.



CIVIL WAR GUN

MARSHAL TURENNE AND HIS GUNS AMONG THE DUNES

BY FLETCHER PRATT

IT IS difficult for us today to realize how thoroughly the political and military thought of the 17th century was dominated by fear of Spain. With its vast possessions in Austria, Italy and the Low Countries, the ruling house of Austria-Spain had a strategic strangle-hold on half Europe; the inexhaustible mines of America gave it a financial strangle-hold on all of it, and the marvelous steadiness of the Spanish foot enabled her to make good the claim of supremacy whenever it was challenged on the battlefield. Germany was a geographical expression; Eastern Europe outside the continental system as yet; the south in the hands of the moribund Turkish Empire. Only the Norman north stood out against an Hispanic Europe; England by floating away from the rest of the world out onto the seas behind the sure defense of her navy; Holland by submerging her few miserable acres beneath cut dikes. Sweden had entered the lists against the overawing Spanish monarchy and Gustavus Adolphus had dealt it some terrible blows, but with the death of that great king the Swedish power had become a thing without life, a fair and stately citadel of northern granite, which could hold what it had gained but achieve nothing more.

There remained France, a France sadly different from the great days of Francis I and Marignano, long prostrate under the futile wars of religion into which her energies had flowed when the defeat of Pavia had denied her any possibility of normal expansion. Religious disunion had brought political disunity in its train; the voracious Spanish monarchy had gnawed off several delicious morsels of territory and made more than one convulsive effort to gulp down the whole. Fortunately for France, she produced two great rulers in succession—Henri IV and Richelieu. The first gave her unity, the second strength, and at the end Richelieu had dared to undertake an offensive by his alliance with the Swedes who were the Empire's most formidable enemies.

Yet the issue was far from decided; the Peace of Westphalia which closed the Thirty Years' War was a peace for central Europe

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alone. With the Swedes eliminated from the combination, the House of Austria was free to throw its whole weight on France. The opportunity was peculiarly favorable; Richelieu had passed into the wings with his master, Louis XIII; the successor of one was the young king, Louis XIV, the successor of the other was Cardinal Mazarin, an adroit cleric incapable either of dominating or controlling the proud and rebellious princes of the realm. There was a period of confused civil strife, called the Fronde, so complicated that not even its participants could understand it. Spain took a hand and the muddy mixture jelled out into a Franco-Spanish war with the Prince of Condé, the most illustrious general in the French service, on the Spanish side.

The French high commander was the Marshal Vicomte de Turenne, a remarkable man. In sharp distinction to the usual French nobleman, who considered the acceptance of any rank less than a generalship as beneath his dignity, he had worked his way up from the bottom, and won successive promotions on sheer merit. What was more unusual still, he gave his special attention to two branches of military service which were then considered, respectively, as beneath the notice of a soldier and beyond his capacity to assimilate—viz, the S.O.S. and the artillery. The then normal method of quartermaster-generals was to plunder the nearest town or village, a procedure very convenient for Imperial armies, which did most of their fighting in invaded, and, therefore, presumably inimical territory, but one which could not be applied by a French service engaged in a life-and-death defensive on home ground, and moreover on home ground already pillaged to death. The young Turenne had seen and marvelled at the Swedish system of buying provisions instead of confiscating them. As he rose in rank, he introduced it into whatever portions of the French army he commanded, and added two improvements of his own—conveniently located magazines of provisions at strategic points in the rear and supply trains to bring them to the front. It was his skill at handling such questions that brought Turenne his first independent command, in the Franco-Swedish wars in Austria. And in his first campaign, he demonstrated the soundness of the new doctrine by literally eating his opponent out of the disputed territory without the necessity of battle.

MARSHAL TURENNE AND HIS GUNS AMONG THE DUNES

Once in the saddle Turenne began to ride his other hobby-horse, the improvement of the artillery service. There was plenty of room for betterment. The whole service, as with all European powers but the Swedes, was then in the hands of private contractors, who had no connection whatever with the military establishment; the cannoneers accompanying the army as hired hacks and working under rules of their own. Beside its four guns, every battery must be accompanied by one cart of tools, three of powder, eight loaded with shot, cartridges and wicks, another five of rolled lead and various oddments, not to mention the carriages which transported the master-gunner and his people. The whole made a circus parade which took no less than 118 horses to drag around. As the contractor was paid by the weight of shot delivered, the pieces were heavy as possible, usually the 24- or 48-pounders of the early days of the century. Their rate of fire was impossibly slow, some six or eight shots an hour, and they were impossibly cumbersome: an army moved with them as a man might who had an iron ball chained to his foot.

Monsieur le Maréchal (Turenne had won the grade by a glittering series of campaigns in Bavaria) had served under Torstensson and seen the fast-moving, hard-hitting guns of Gustavus Adolphus: he was profoundly dissatisfied with the whole contract system and wished to sweep it out root and branch in favor of a national artillery service. He studied guns himself; learned that the elaborate veil of mystery with which the gunners surrounded the "secrets" of their art was largely a veil of mystification, and he wanted to be the real as well as the nominal commander of all the units of his army. "You must have small and great cannon," he pleads, in a memorial to the king, "but most small, because they will more easily be removed from place to place than great." He even went the length of demanding pieces so light they could be mounted on a carriage drawn by a single horse and keep up with the battle-lines.

This was 1650, and Turenne had neither of the two advantages that afterwards came to him—the reputation of the first captain in Europe and the support of the great war minister, the able and ruthless Louvois. The contractors, highly-placed financial nobles, retained their grip on the artillery service. But Turenne, by refusing

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to have their heavy guns in his armies, forced them into mechanical improvements. For the ancient 24-pounders, a new series of four and six-pound guns was substituted, and what was equally important, elevating screws were installed on all the guns then in service. Believe it or not, before Turenne's time, the guns were propped up with bricks to get the correct elevation, and in other countries they continued to think this way best—till after the battle of which we are speaking.

The new French artillery service had little opportunity to show its special excellences in the years immediately following these improvements. For one thing, it was an age of personality, in which the mechanical factor was as much neglected as it is emphasized today. For another thing the character of the war was not one to emphasize fast-moving artillery. The desultory civil war in the north of France had become the war with Spain along the frontiers of the Low Countries. Turenne was tangled in a struggle of fortified posts and delicate maneuvering, in which the only combats were those of surprise and ambush in which artillery always stands at fifty per cent discount, and the slow, pounding sieges, in which a 118-horse battery of 24-pounders does quite as well as any other kind. When the French guns moved up to the parallels around a town on the same day the foot arrived and began to shoot with the speed of musketry and an accuracy never before heard of, the result was attributed to the personal skill of the commander—which, indeed, was enough to account for almost anything.

For Turenne was practically carrying the whole war on his shoulders. He had every difficulty; one by one the other marshals went to pieces, turned traitor, or were knocked out. D'Aumont was taken prisoner when a night attack on Ostend failed; Humières entered the Spanish service; d'Hocquincourt went over to the enemy and took with him the keys of the great fortress of Heslin; Don John of Austria beat La Ferté in a battle and ruined his reputation; and to cap matters, Normandy revolted across the French supply lines in the winter of 1657—the best soldiers in the army were drawn off to keep it down and Turenne was left half-paralyzed. Across the Channel, Oliver Cromwell, who regarded the progress of the Spanish arms with no friendly eye, had indeed formed an alliance with Louis and sent 6,000 of his incomparable

MARSHAL TURENNE AND HIS GUNS AMONG THE DUNES

soldiers, but he demanded the fortress of Dunkirk as the price of his aid, and when the revolt of Normandy in the winter of '57 seemed to remove the last chance of his obtaining it, threatened to withdraw.

The spring of 1658 thus opened with French affairs at the last pitch of desperation, nearly all Flanders in Spanish hands, and a huge army under Condé, "the great Condé," and Don John of Austria, gathering from its winter cantonments. Turenne had wintered his smaller forces at St. Venant, near the coast. Dunkirk was his obvious objective, the key of the campaign; from political reasons, because unless he attacked it he would lose the English alliance, and that alliance provided the sea-communications which were the only means of supplying his army with the Norman revolt unsuppressed; from strategic reasons, because the fall of the place would outflank the whole Spanish cordon of forts in the Netherlands.

Unfortunately the Spaniards were also aware of the importance of Dunkirk: during the winter they had put the Marquis of Leyden, one of the ablest men in their service, into the place with three thousand men. The country all round had been inundated by cutting the dikes and the only lines of approach were covered by a triangle of powerfully fortified towns—Furnes, Bergen and Gravelines. To attack the place was impossible; to besiege it more than impossible, since it would involve dragging the ponderous guns of the train through a country three feet under water.

But since it was impossible, Turenne resolved to do that very thing. He concentrated early in April with not more than 15,000 men, and set out on a mad, electric march, through the floods straight on Dunkirk. The water stood to the waists of the men; they drove right on through it, making road as they went with stones and fascines. Near Bergen they struck a dike that lifted its nose a few inches above the water; there was a fort half way along to hold it, but Turenne pushed in so fast that he was storming the parapet before the news of his coming reached the defenders. He had fired the whole marching column with his own energy; they felt themselves on the edge of great events and performed incredible exertions without a murmur. It was the spirit of Cromwell's Ironsides, extended to the whole army of which

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they now formed a part. And behind the surging column the guns rumbled along, the new light guns Turenne had brought into the service "because they will be more easily removed from place to place." The old ones could never have done it.

They won through; Dunkirk was blockaded and the siege begun under enormous difficulties, for the whole country was loose, shifting sands, partly under water. As fast as parapets were put up the wind blew them away; the cannon sucked down into the uncertain ground and there was not a stone or a piece of wood within miles to make platforms or revetments. The soldiers slept without tents, exposed to the pelting rain of a Flanders spring, and had little to eat till an English fleet came down the Channel with wood and supplies.

Before the gaps were quite closed, the Marquis of Leyden succeeded in running messages through to Don John and Condé. They were thunderstruck, at first frankly incredulous, then as it appeared that the news was true, and the crazy Frenchman actually laying their town under siege, came rolling down on him with what troops they could gather in a hurry, 14,000 men. They came along the coast, a less arduous route than the one Turenne had taken, but even there the speed of their march was such that the slow-moving artillery had to be left behind. The lack worried neither Don John nor Condé; they were three to two of the French in cavalry, then considered the important arm, and Condé was the best leader of horse in the world, with the impeccable Spanish foot to support him.

They came along the beach; Turenne took a few regiments of his own cavalry out to meet them and fell on the head of their column in a spectacular night cavalry attack. He slew the traitorous d'Hocquincourt and ruffled up their march so much that he gained another precious three days, in which a convoy of English ships brought him much-needed ammunition.

The Spaniards were checked, but not stopped. They rushed on, intending to burst through the siege-lines by a coup-de-main, and for lack of material to make trenches Turenne could not build strong enough to resist them. He detailed 1,000 of his men under General de Pradel to hold the lines, and with the rest turned toward the oncoming host in the narrow panel of land between the

MARSHAL TURENNE AND HIS GUNS AMONG THE DUNES

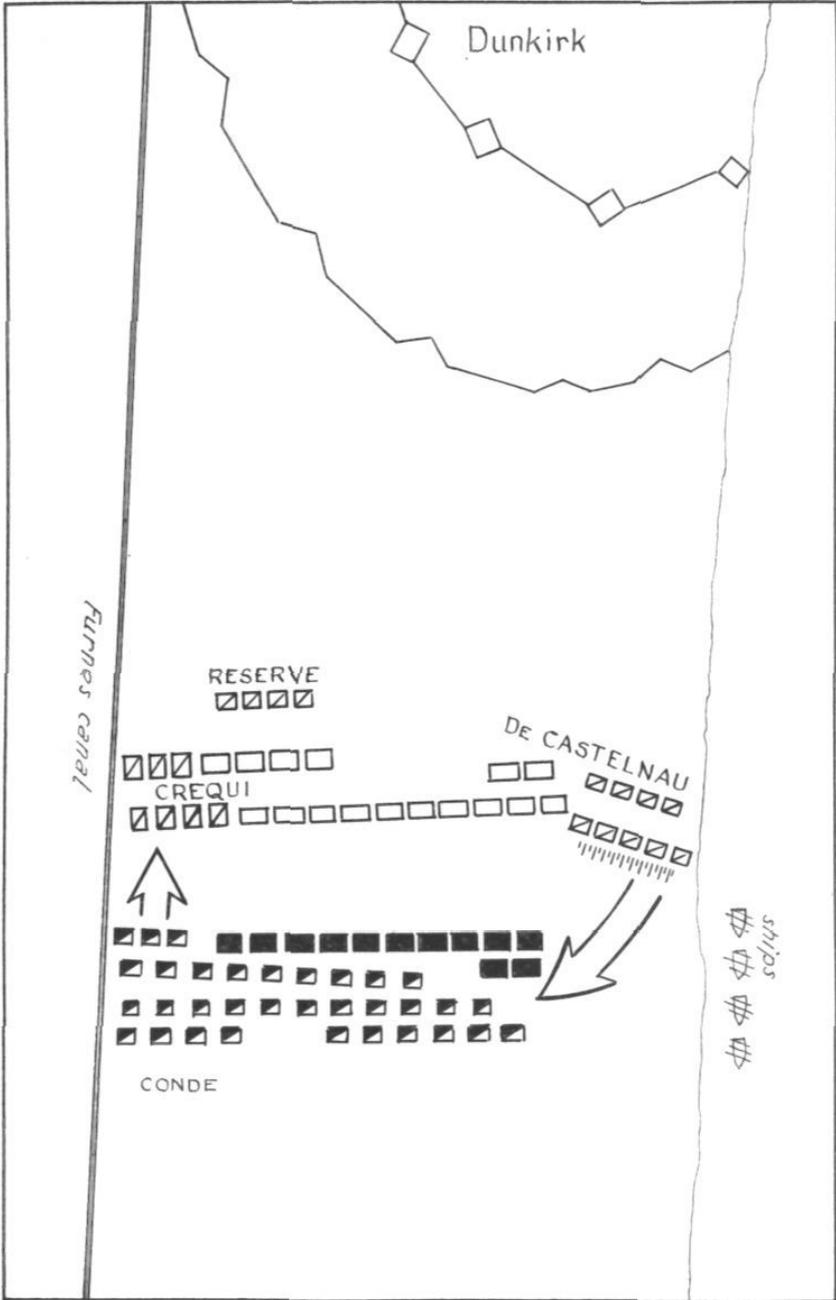
beach and the big canal that led to Furnes. The two forces camped behind such crude field-works as they could throw up in the sands, two thousand yards apart (a distance that tells a good deal about the effective range of both small-arms and artillery) and both began to throw bridges across the canal. They would be useless for heavy movements, for the ground to which they led was ankledeep, but might be of service in an emergency. Nature had locked the two armies into position for a straight parallel-order fight, with both flanks covered by impassable bodies of water, and God on the side of the biggest battalions.

The Spaniards had little doubt of the issue; they meant to come driving in with the day; but Marshal Turenne was dissatisfied. As he sat late by his campfire, wrapped in his soldier's cloak, trying to find a plan, a page was brought to him, a French page in the service of the traitor Humières, who had deserted his master to return to his country. Turenne questioned the boy narrowly about arrangements in the enemy camp. "They have left their guns behind them," said the lad. The marshal stood up. "Then, by the splendor of Heaven, we will attack them in the morning and beat them!" he cried; he had made his plan in one of those instantaneous bursts of inspiration that are given to so few men.

In the morning he drew out of his lines, 6,000 cavalry, 8,000 foot and ten pieces of artillery, all of the new, light guns. His formation held little of the original, an arrangement in two lines, 5,000 infantry with 3,000 horse on their flanks in the first line, 3,000 infantry and 2,000 cavalry in the second and a heavy flying column or reserve of 1,000 more riders, with the ten guns all on the left or beach flank. But the use he proposed to make of this hackneyed formation exhibited the power and originality of the general's mind. Turenne had grasped perfectly the fact that among the billowing sands of the dunes horse was actually less mobile than infantry, and he proposed to use this fact to destroy the Spanish army.

On the French right, next to the canal, the cavalry was disposed loosely and in depth, for defense, with the bulk of the second-line infantry behind to give it stiffness: General Créqui commanded here. In the center the infantry was ployed into the little, tight knots usual for charging horsemen, with instructions to drive right

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MARSHAL TURENNE AND HIS GUNS AMONG THE DUNES

in. On the French left, where the hard ground of the beach gave it more mobility, the cavalry was ranked in the usual squadrons, but even here it was not to charge home, merely act as an artillery guard, and menace the flank of any force that threatened to stop the advance of the guns. Advance of the guns? Yes, for Turenne was to embark on the incredible and revolutionary step of an *artillery charge*. His parallel order was in effect an oblique order with the right wing for the pivot; the lighter vessels of the English fleet were to come in along the shore and cannonade the Spanish right till it weakened; then Turenne's artillery, guarded by the cavalry, would drive in to break the weakened flank and roll up the line, while the hard-hitting English infantry should attack the Spaniards front and flank. The Marquis de Castelnau was in charge of this wing; General Morgan commanded the British.

On the other side Don John and Condé had also realized the cloying effect of the sand dunes through which they would have to make their way. Condé wanted to retire; the Spaniard gave him a sour look and a parade of arguments about military honor. While they were arguing the French solved the problem for them by coming out in order of battle; Don John perked up at once, he saw his way clear now. The Spanish foot he placed in a front line across the dunes, its flank somewhat back from the beach to avoid the cannon-balls from the ships, which were now sweeping down. They were to hold their position no matter what assailed them, and Don John arranged them not badly, with all the musketeers in the front line to shoot the sting out of any assault while the attackers were struggling through the sliding dunes. There were 6,000 of them, less than the French, but men of wonderful stomach for battle. Behind the right and center was cavalry, six lines deep, ready to deal an overwhelming counterstroke when the flood of attack should ebb back from the Spanish pikes. The exiled English Duke of York was in command of the right wing; Marshal Caracena had the center; Condé himself was on the Spanish left, where the cavalry lapped beyond the infantry lines and he meant to make a charge. It was to him that the six-line formation was due; cavalry would tire quickly in the sand, he knew, but should be good for a brief charge, and the successive lines would give him good shock effect, one line advancing slowly behind the other till close

in, then striking sharp and quick.

Nevertheless Condé did not like the look of the English frigates along the shore and still less that of the guns on the French left; "Have you ever been in a battle?" he asked the Duke of Gloucester, who rode with him, and when the latter said "No," retorted, "Watch us lose a big one in the next half-hour."

But when the signal was given, he went in with a shout, as though bound for victory and certain of the event. His first line clashed with Créqui; there was a blaze of pistol-fire, then the squadrons of Condé's second line came through the intervals of the first at the trot, and those of the third at something approaching a gallop. The successive shocks were too much for Créqui, caught his defenders with their pistols empty; his formations began to break up and Turenne's great left half-wheel was almost deprived of its pivot. The French leader, riding with his second line, had a keen eye; if Créqui went so would the whole battle. He ordered up the reserve cavalry, and headed it onto Condé in one solid column, drove him back for four hundred paces. The two cavalry forces hung there, duelling fiercely with sword and pistol, the result in doubt, with Condé calling up new troopers from the Spanish center and trying to get his advance back into the swing that would carry away the French right.

On the other flank the anchor of the Spanish line was a regiment of infantry posted on a high dune. The ships warped in and pounded them with cannon-balls; they opened out to avoid the fire, but dared not open too far; the balls took heavy toll, and they were forced to call more infantry from the center to maintain the position. As they did so de Castelnau brought his cavalry down in a sweep round their flank, with Turenne's active guns moving forward in the squadron intervals. It was slow work for the horse; the artillery leap-frogged the advance by sections—every time the front line reached the top of one of the dunes, which rise one behind another like waves, a section of artillery would halt and fire while those behind limbered up and galloped past and those in front crossed the valley to the next dune.

The Spaniards had no guns of their own; they could not make the slightest reply. They were hurt, shaken, disordered when the English foot came storming up the dune against them. But the

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advance of the English blanketed the artillery, at least in part; the Spaniards, not without right, held themselves for the best soldiers in the world. They stood up manfully to receive Cromwell's men, and twice repulsed them in a heavy hand-to-hand combat of muskets and pikes at the end of the line. Meanwhile the French infantry had closed with the disgarnished center of Don John's array, already hard hit by the murderous enfilade it had suffered from the guns. The French, remember, were in tight knots, pikemen in front, for a shock-action attack; they hit hard; their blow carried too much weight for the thinned center of the Spanish line, they went right through, and the whole Spanish center streamed away toward the rear.

The English caught up the movement and swung forward against the peak of the line in a third attack, swinging clubbed muskets—"The French fought well, but the English behaved like devils unchained," said old Marshal Caracena afterward. The Spaniards tried to form square but it was too late for that, there were too many gaps, the English never stopped coming on, they got into all the interstices, the Spanish formation broke up and nearly every man of the devoted band was killed.

Out behind them the Duke of York had thrown forward his wing of horse against de Castelnau and the cannon, in behind the Spanish right. For all their improvements, Turenne's guns were slow firers; they only got in three or four shots against the oncoming cavalry, but these three or four discharges did a lot of execution, taking all the fire out of the charge. There was a brief, hard struggle; de Castelnau was killed at the head of his men, then the Spanish horsemen went tumbling back as their foot had done, all broken and disordered, to mingle with the fugitives from the center. In the press Caracena came across the Duke of York—"Charge them!" he shouted; "Why do you not charge them?" "I have just done so," replied the duke, "and been roundly worsted for my pains. Do you charge them if you think you can." Caracena tried; he managed to rally some few squadrons and lead them back for a last effort. They met the English coming down the side of the dune where they had won their victory and cut up the first rank or two but that was as far as the matter went; the rest closed up and met Caracena with a blazing volley, de Castelnau's

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men closed in from the flank and the whole right and center of the Spanish line dissolved.

There remained only Condé, but Condé was a master battle-captain. The squadrons from the center he had formed behind those struggling with Turenne and Créqui. While the English were advancing up the big dune and center meeting center, he hurled the new masses in onto the French right. Not even Turenne could hold his men up to the shock, and the French right was driven in for six hundred paces as the Spanish wing had been driven back four hundred. But that was the end of it; Turenne's horsemen took refuge behind the second line of infantry he had planted there for just such an emergency and Condé could neither break nor budge the foot. He tried twice; as he gathered his forces for a third effort those infernal French guns popped over the dunes and began firing into the rear of his men, while the French foot swung in on their flank in a charge of foot against cavalry that added the finishing touch. Condé could no longer hold his men together; they fled and the battle was won.

Much more than that was won as well; Dunkirk surrendered a few days later and within the month the Spaniards were suing for peace. They might well—Turenne's victory had been destructively complete. Along that narrow peninsula of sand there was little chance for escape; the pursuit dogged the Spaniards' footsteps all the way to Furnes, and beside the 1,000 casualties and 3,000 prisoners they lost on the field of battle, Turenne rounded up or dispersed most of the rest. The Spanish army was, for practical purposes, wiped out, and with its loss the defense of the Spanish Netherlands became an impossibility, for England held the sea communications, and before reinforcements could be brought round by land through Italy, Switzerland and the Rhine. Turenne would have had every fortress in the country.

The battle of the Dunes was thus one of the truly decisive battles of the world, assuring forever the end of Spanish domination in Europe. It had received less attention than it deserves, perhaps because no great cause depended immediately and at first hand upon its result, perhaps because the whole battle, like so many of Turenne's, is stamped with an originality that gives it an otherworldly. Alice-in-Wonderland character that seems to place it

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completely out of relation to any conditions another commander may meet. It is not a good "book-battle"; there is no dramatic suspense or see-saw of contending forces. Turenne had planned too well; the result was never in doubt beyond the first moment of Condé's charge; the worst the French could possibly get was a draw. And as for the lessons to be learned from it, it is not every day that one finds ground on which infantry is more mobile than cavalry and may charge against the latter with good prospect of success, and it is highly unlikely that the device of an artillery charge will be tried frequently. Turenne's contemporaries, like many critics since, set down his victory to his happy talent for the utilization of special conditions.

But the conditions of the battlefield are always special; Turenne's genius lay not so much in doing the merely unexpected, as in using the current conditions to take advantage of fixed and eternal factors. The use he made of his more mobile force is interesting, but using mobility is an old story; every commander tries for it. The really striking thing about the Battle of the Dunes is the fact that Turenne first conferred an extraordinary mobility on his artillery by lightening its equipment and, having done this, he shoved it up to the skirmish-line, so to speak, and kept it there. Such boldness was not seen again till the advent of Napoleon—"En définitive," says Col. Camon, the penetrating French critic, "la bataille est constituée comme elle sera cent cinquante ans plus tard." The whole combat is, indeed, a symphony in A—A for artillery. By the threat of the English frigates' guns, Turenne succeeded in turning the Spanish right (note how the ships' guns were utilized as artillery of position); by the use of his own—and ten guns only, the slow-firing guns of 1650!—he successively demolished the Spanish right, their center, their reserve, and finally their left. When the objective moved out of easy gun-range the artillery chased it. And what is perhaps more important still, this most glorious of Turenne's victories raised the successful marshal to such a pinnacle of renown that no recommendation he made could henceforth be disregarded. It brought him the support and cooperation of the energetic Louvois; the two men reorganized the French army on a model of their own and made their nation the first military power of Europe and their king *Le Roi Soleil*.

COURSES AT THE FIELD ARTILLERY SCHOOL

ON February 3rd, last, a new course for officers was inaugurated at the Field Artillery School—the Advanced Course in Communication. This course is to cover a period of approximately five months, being scheduled to close on June 29th. Four officers are enrolled therein.

A full consideration of the vital importance of communication has led to the conclusion that the training of Field Artillery would be greatly facilitated and materially improved by the establishment of this course. The basic objective of this course is the provision of a quota of trained officers in order to meet the immediate necessity of placing tactical communication officers in all field artillery units above the battery.

Efficient signal communication is a prerequisite to effective service of the Field Artillery in combat. Particularly is this so in establishing liaison with the Infantry, which is of such great importance and so difficult to maintain. A substantial increase in the number of officers trained each year as Field Artillery communication officers is urgently needed to meet the requirements of this Arm. The duties of these officers are of such specialized character that satisfactory results will rarely be possible without previous appropriate training.

After thorough investigation, it has been found that the course at the Signal School, although excellent, does not fulfill the requirements of the Field Artillery. At this School the amount of practical Field Artillery communication is limited as compared to the amount of such instruction which could be given at the Field Artillery School. This is apparently due to the restricted reservation, lack of troops and the limited number of field problems at the Signal School. At the Field Artillery School the student would approach communication with the Field Artillery viewpoint, that is, as a practical application of signal communication to the lower units. This is a very different problem from communication as applied to the higher units.

A summary of the Advanced Course in Communication follows:

COURSES AT THE FIELD ARTILLERY SCHOOL

SUMMARY OF COURSE

<i>Subject</i>	<i>Hours</i>
Electricity and Magnetism	72
Radio Telegraphy and Telephony	116
Wire Communication	108
Tactical Field Artillery Communication System.....	76
Radio Procedure	127
Visual Signaling	33
Message Center	37
Training Methods	35
Field Exercises	162
Miscellaneous	44

Each arm has a limitation placed on the total number of officers that may be assigned to duty as students at the special service schools and civilian institutions. This number for the Field Artillery (58) is very limited. In carrying out the policy of sending all field artillery officers to the Regular Course at the Field Artillery School upon the completion of four years' service as a commissioned officer in the Field Artillery, most of this quota is used. This leaves very few student officers for other courses. In order to increase the number of students in the Advanced Course in Motors, it has been decided, commencing with the School Year 1935-36, to limit this course to five months, and to send eight officers thereto. There will also be available eight officers to attend the Communication Course of five months in the second half of the school year.

A tentative allotment of field artillery officers as students during the School Year 1935-36 follows:

<i>Field Artillery School</i>	<i>No. of Officers</i>
Regular Course (10 months)	46
Advanced Course in Horsemanship (10 months).....	3
Advanced Course in Motors (5 months)	8
Advanced Course in Communication (5 months)	8
<i>University of Pennsylvania</i>	
Sound Ranging Course (9 months)	1

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The schedule of courses at the Field Artillery School during the School Year 1935-36 is as follows:

Officers Courses:

Regular Course	Sept. 3/35	June 27/36
National Guard & Reserve Officers' Course (Fall)	Sept. 3/35	Nov. 30/35
National Guard & Reserve Officers' Course (Spring)	March 2/36	May 30/36
Advanced Course in Horsemanship	Sept. 3/35	June 27/36
Advanced Course in Motors	Sept. 3/35	Feb. 1/36
Advanced Course in Communication	Feb. 3/36	June 27/36

Enlisted Men's Courses:

Motor Mechanics (Fall)	Sept. 3/35	Dec. 21/35
Motor Mechanics (Spring)	March 9/36	June 27/36
Horseshoers (Fall)	Sept. 3/35	Dec. 21/35
Horseshoers (Spring)	March 9/36	June 27/36
Saddlers (Fall)	Sept. 3/35	Dec. 21/35
Saddlers (Spring)	March 9/36	June 27/36
Battery Mechanics	March 9/36	June 27/36
Communication	Feb. 24/36	June 27/36



THE 4TH GUARD FIELD ARTILLERY REGIMENT IN THE WORLD WAR

BY CAPTAIN THOMAS NORTH, Field Artillery

Translated and digested from "Das 4 Garde-Feldartillerie-Regiment im Weltkrieg"

THE enemy's view of a campaign is usually at least as interesting to read as our own, and the recently published regimental history of the 4th Guard Field Artillery is a pertinent instance. It tells the story of a German field artillery regiment of the regular army which served from the early days of August, 1914, with its text-book movements, through the four drab years that lay beyond, and up to the disillusionments of the armistice. The story speaks not only in the generalities of regimental headquarters but also in terms of the dramatic experiences of the junior officers and the men. To us it reflects in a measure the experiences of our own field artillery in the war, and, moreover, depicts with reasonable fidelity the color of the opening days of a campaign wherein the meeting engagement of our own map exercises comes to pass.

The Regiment entered Belgium with the Guard Corps and made its first contact with the enemy in the region of Namur. The first casualty was the regimental commander, who was killed by rifle fire at a battery which had been hurriedly put into position to cover the advance of the remainder of the column against a minor delaying patrol. Then followed the invasion of France and the battle of Guise, concerning which a battery commander remarks: "By contrast with a planned attack in which one has some sort of an idea of what is going on through reconnaissance, detailed orders, and special preparations, in a meeting engagement the commanders of lower units grope in the dark. Positions are occupied fortuitously, you fire on targets which the battalion commander designates or which strike you as appropriate, and you try to get the best cover you can from enemy fire. Your occasional glimpses of the enemy and of your own troops, and the information which you can glean from neighboring units or higher echelons, are far from enough to equip you to form even an approximate picture of what is happening even in your own part of the battlefield."

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The Regiment fought its share in the torrid days of early September in Champagne, always with but the vaguest idea as to the operations as a whole, participating in the local success which lay within its range of vision and mystified by the order to retreat. During this first month's fighting its six batteries sustained over one hundred casualties. It is noteworthy that in this open warfare the field artillery suffered heavily from enemy fire on the teams and limbers, which were customarily held within a few hundred yards of the guns and which probably offered a target more apt to catch the eye of the observer than the pieces themselves. The effect upon the mobility of the batteries was serious.

From the Marne battlefield the Regiment was hurried to the north flank in the race to the sea, covering during one 72-hour period a distance of 90 miles, thereby outstripping its supply services and being reduced to the precarious subsistence afforded by living off an invaded country. One veteran recalls the painful impression caused by the efforts of a foraging party who returned with some attractive-looking cans which, when opened at the kitchen, were found to contain—paint! By the first week in October open warfare was but history.

It is surprising to read that the Germans, like the Allies, felt keenly their relative shortage of artillery ammunition. The French artillery became bolder and bolder, firing bursts of fire throughout the day on trenches and rear areas, whereas every German round had to be wrung from a parsimonious higher echelon. As a result, as early as November, 1914, the infantry was bitterly complaining of unsatisfactory artillery support. Read in the light of the emphatic recommendations of the British and French anent their own inferiority in ammunition supply, this is a curious commentary upon the credibility of more or less experienced observers.

Through the next four years the Regiment saw plenty of service on the western and eastern fronts. Early in 1917 it was endowed with a third battalion and constituted the organic artillery of the 5th Guard Division. In 1918 it took part in the major offensives, beginning with that of March 21. Its first direct contact with American troops was in the Meuse-Argonne. Here it occupied positions in the valley of the Aire generally opposite our 35th and 28th Divisions.

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On September 25 the regiment supported a raid which returned with eight French prisoners by whose statements the Germans were able to fix the exact date and hour of the expected American attack. At 2:30 a.m. on September 26 a direct hit put out of action one of the battery commanders and his entire party. By 8:00 a.m. it was reported that the American infantry and tanks had crossed the Cheppy-Montfaucon road—the first rational information vouchsafed since the beginning of the attack. Two batteries which had been sent to the west of the Argonne during the night were hastily recalled and during the evening of September 26 went into position near Tronsol Farm, as the advance of our 91st Division was causing some concern. The batteries nearer to the front wrought havoc upon the dense masses of American troops; two guns of one battery, the German infantry having fallen back, took under fire the Americans who were attacking Baulny and even added the fire of its machine-guns. The next day one battery near the south edge of Montrebeau Wood could not be withdrawn apace with its retiring infantry; the battery commander therefore destroyed the breech-blocks and abandoned the pieces, withdrawing with men and limbers.

The batteries severely punished our 35th Division as time and again it pushed forward to seize Montrebeau Wood. The history speaks of the flatly impossible tactics of the Americans which invited such devastating fires. Accompanying pieces with direct laying were particularly effective. The voice that cries from the housetops to urge preparedness by training may pass unheeded, but the candid contempt of our erstwhile enemy should touch our vanity!

Each infantry regiment in line was allotted a battery for antitank fires, placed in position or held in readiness. One gun alone, in the vicinity of Montrebeau Wood, accounted for six tanks. Another, on October 4, engaged what are called "fast tanks," one of which attacked the gun frontally and was stopped at 150 yards. At that moment two others appeared on the right and took the gun under fire; the crew threw the trail around, engaged these two tanks, putting one out of action and persuading the other to retire, and then withdrew under the enemy's machine-gun fire. One battery near Exermont on the same day was surrounded by tanks

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which had broken through the infantry and was lost to the Americans.

In this attack of October 4 the batteries were subjected to severe counterbattery punishment. The vigorous advance of our 1st Division wore down the resistance on its front and its accompanying fires caused more and more losses to the 4th Field Artillery Regiment. The tanks finally proved too numerous for the German antitank pieces, the only weapons to which they were vulnerable. In some cases batteries were withdrawn under the very noses of the advancing American troops, but the resulting dispersion and confusion materially delayed the reassembling of units to the rear.

So much emphasis is laid upon the work of the anti-tank guns that, weighing post-war tank programs, one is led to wonder whether the mere detailing of a few guns from the divisional artillery is anything but a poor and inadequate makeshift with the additional disadvantage of incapacitating the divisional artillery from performing its primary mission.

Of our artillery preparation for the attack of October 4 the history states that "it was fired with a lavish use of guns and ammunition. The barrages and interdiction fires on our routes of approach had been worked out by the enemy down to the finest detail and were a model of workmanship," but the credit is given not to "the apparently systemless American Artillery" but to the "French artillery which had relieved it"—a caustic observation which is certainly not entirely justified and which is food for research.

In these ten days at the opening of the Meuse-Argonne battle the Regiment lost 38 dead, 141 wounded, and 132 horses in addition to considerable matériel. It was relieved, and replacements of men and equipment being not forthcoming, it was reduced about October 18 to two battalions of four batteries each, each battery having three pieces and caissons. Its Division reentered the line in the Woevre, to be attacked on November 9 by our 81st Division. The rear areas suffered considerably from our long-range fire, and the Americans seemed to have learned from experience to avoid mass attacks. Then came the armistice and the inglorious dissolution of the Regiment under the terms of the Treaty of Versailles

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The history ends with an appendix by General Tix, Chief Veterinarian, who states very aptly that such a work would be incomplete without a thought for the artilleryman's faithful helper, the horse, and for the countless victims among them which the bitter struggle caused.

Initially the Regiment was equipped with excellent animals coming principally from the German remount depots as four-year-olds which were thoroughly trained to saddle and draft. Their first test of war was the long advance through Belgium, where marches of thirty or more miles a day were accomplished with generally satisfactory results, over good but hard roads; the exertion proved hardest on the horses mobilized at the outbreak of the war, which numbered an addition of 734,000 to the peace strength of 142,000. As the invasion pushed deeper into France and Belgium food for both men and animals gradually became worse, with the outbreak of diseases as a consequence, notably mange, pneumonia and glanders. Veterinary hospitals were established for the treatment of these diseases, and other unserviceable animals rendered unfit by exhaustion, wounds, etc., were here cared for. As an instance, in May, 1915, the 4th Field Artillery Regiment lost 50 horses, of which 24 died of exhaustion alone.

The chief cause of this increasing debility was the exertion required in hauling over the poor roads, and the poor shelter, in Champagne during January, 1915; 131 cases of pneumonia resulted in the 4th Field Artillery, requiring a long rest period for these animals, and, of course, the remaining horses were overworked. So, convalescence was curtailed. Another cause for the surprising exhaustion of many horses was the repeated reduction of the oat ration to 2 or 4 pounds, together with an almost complete absence of roughage. Sugar, molasses, starch were tried as substitutes. Everyone did his best to "rustle" for his animals and was thankful for anything which might fill their stomachs, if only the straw from the roof thatchings.

Theory and practice contradicted each other. During peacetime, feeding with rye or fresh hay was frowned upon. In the field one was delighted if he could but turn his beast loose in a hay or rye field, and it was most rare that such an offense against the rules of animal dieting would produce colic. Thoroughbreds stood

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exertion and starvation better than the cold-blooded animals. The latter stood up well under march or draft as long as the food was adequate at least as to volume. Otherwise they died in a remarkably short time from complete exhaustion or had to be left behind.

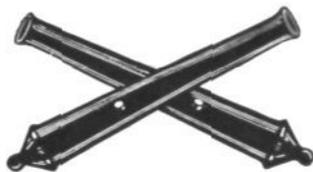
General Tix discusses the characteristics of the various strains of German horses, and remarks that for formations requiring not only heavy draft at the walk but also occasional efforts at the trot, the heavy thoroughbred or mixed-blooded animal was particularly suitable, citing the Danish horse.

To control glanders periodical blood samples were taken from all horses and were tested in the laboratories, of which more than 200 were set up in the field and at home. With a positive reaction the horse had to be destroyed. To confirm the diagnosis the mallein test was also applied. These measures resulted in the relatively rapid eradication of this plague, which had hardly been known in Germany before the war but which found new sources of infection in France and particularly in Russian Poland.

Pneumonia, which had laid up so many horses in the past, also lost its malignant character for, with a timely treatment with Salvarsan injections, fatal cases became rare. The sick animals had to be promptly released to the veterinary hospital and many weeks of convalescence were necessary before they could be returned to the troops.

Lice were troublesome but less harmful than mange, for which mange-hospitals were maintained. As long as this malady was treated by rubbing applications the losses were very considerable, but with the adoption of the treatment by gas having a sulphur base and used in gas chambers the pest was controlled.

Notwithstanding all of these measures, however, two and one-half million horses died during the war on the various German fronts.



A FEW NOTES ON LUBRICATION OF MOTOR VEHICLES

BY 1ST LIEUTENANT F. B. PORTER, 9th Field Artillery

THE question of proper lubrication maintenance for motor vehicles is a subject much discussed but as a general rule one which is not carried out by practical application.

During the years which have passed since the World War, few of us had given sufficient intelligent thought to the lubrication of the old vehicles which were furnished us. Many of these old vehicles failed us from faulty lubrication, not because of neglect but due to inexperience on the part of both officers and enlisted men as to what was proper lubrication. These conditions must be corrected by thorough study, and the use of a simple lubrication chart.

The lubrication charts used for the old vehicles were drawn up on the idea of daily, weekly, monthly or some such periodic lubrication. The result was that many parts of vehicles such as wheel bearings and clutch throw out bearing were over lubricated, while other parts such as shackle bolts, universal joints, and king pins were deficient in lubrication.

With the passing of the old vehicles and the motorization of many units with new and modern vehicles a more common sense method as outlined by the manufacturer should be used. This method uses lubricants in proportion to the miles the vehicle operates.

The following plan based in general on the above idea is a simple and practical method of being reasonably certain that all vehicles are properly lubricated at the proper time:

1. The Battery Commander should hold the Motor Sergeant responsible that proper lubrication is accomplished at the proper time. The Motor Sergeant should be required to have one of his mechanics properly trained in the use of lubricants on the vehicles in his organization (grease mechanic).
2. Training for drivers should be given in "Lubrication by Detail" until each driver should be thoroughly familiar with lubricants and where to apply them to his vehicle.

CHART I
LUBRICATION CHART
HEADQUARTERS BATTERY, 9TH F A

TYPE	Dodge 1½ Ton			TYPE			Chevrolet Reconnaissance						Chevrolet			Pickup
	U. S. A. NO.	34397	34400	34401	34403	34404	U. S. A. NO.	20708	20710	20712	20711	20719	21172	21176	21188	
(Each 1000 miles)	Last Lube	Last Lube	Last Lube	Last Lube	Last Lube	Last Lube	(Each 1000 miles)	Last Lube								
GROUP 1.	GROUP 1.			GROUP 1.			GROUP 1.						GROUP 1.			
Crankcase	2000	4000	2000	3000	1000	1000	Crankcase	1000	0	2000	1000	500	0	500	500	
Spring shackles	2000	4000	2000	3000	1000	1000	Spring Bolts	1000	0	2000	1000	0	0	0	0	
Water Pump	2000	4000	2000	3000	1000	1000	Water Pump	1000	0	2000	1000	0	0	0	0	
Tie Rod Ball Joints	2000	4000	2000	3000	1000	1000	Steering Knuckles	1000	0	2000	1000	0	0	0	0	
Spring Bolts	2000	4000	2000	3000	1000	1000	Tie Rod Joints	1000	0	2000	1000	0	0	0	0	
Propeller Shaft & Joints	2000	4000	2000	3000	1000	1000	Spring Shackles	1000	0	2000	1000	0	0	0	0	
Drag Link Ball Joints	2000	4000	2000	3000	1000	1000	Drag Link Joints	1000	0	2000	1000	0	0	0	0	
Battery	2000	4000	2000	3000	1000	1000	Battery	1000	0	2000	1000	0	0	0	0	
Shock Absorbers	2000	4000	2000	3000	1000	1000	Shock Absorbers	1000	0	2000	1000	0	0	0	0	
(Each 2000 miles)							Steering Gear	1000	0	2000	1000	0	0	0	0	
GROUP 2.							Brake Rod Pins	1000	0	2000	1000	0	0	0	0	
Universal Drive Assembly	2000	4000	2000	2000	0	0	Spring Saddles	1000	0	2000	1000	0	0	0	0	
Air Cleaner	2000	4000	2000	2000	0	0	Distributor Shaft	1000	0	2000	1000	0	0	0	0	
Clutch Release Bearing	2000	4000	2000	2000	0	0	Starter	1000	0	2000	1000	0	0	0	0	
Distributor	2000	4000	2000	2000	0	0	Propeller Shaft Ext.	1000	0	2000	1000	0	0	0	0	
(Each 6000 miles)							Propeller Shaft Bearing	1000	0	2000	1000	0	0	0	0	
GROUP 3.							(Each 5000 miles)									
Generator	0	0	0	0	0	0	GROUP 2.									
Front & Rear Wheel Bearings	0	0	0	0	0	0	Accelerating Pump Shaft	0	0	0	0	0	0	0	0	
Steering Gear	0	0	0	0	0	0	(Each 10,000 miles)									
Starter	0	0	0	0	0	0	GROUP 3.									
Pedal & Brake Shaft & Linkage	0	0	0	0	0	0	Air Cleaner	0	0	0	0	0	0	0	0	
Transmission	0	0	0	0	0	0	Transmission	0	0	0	0	0	0	0	0	
Transfer Case	0	0	0	0	0	0	Rear Axle Housing	0	0	0	0	0	0	0	0	
Front & Rear Axle	0	0	0	0	0	0	Remarks: Crankcase oil changed on new vehicles at 500 miles.									
(Each 10,000 miles)																
GROUP 4.																
Oil Cleaner	0	0	0	0	0	0										

A FEW NOTES ON LUBRICATION OF MOTOR VEHICLES

3. No lubrication should be done except on the orders of the Motor Sergeant.
4. Lubrication should be done in the shop and should be *checked* during each operation by the Motor Sergeant or Grease Mechanic.
5. Failure of any part due to lubrication should be the basis for charges against both the driver and the motor sergeant.
6. During monthly and bimonthly inspections, proper lubrication should be the main object of the inspecting officer, rather than mechanical defects.
7. A permanent chart painted on a panel may be used to keep a proper record of lubrications and to act as a source of information for the driver performing the lubrication. It should be placed on the wall near the point where the vehicles are to be lubricated, and visible from the position of the vehicle (Chart I).

Group 1 for any type of vehicle includes all points shown on the manufacturer's lubrication chart for 1,000 miles, group 2 for 2,000 miles, etc. To ascertain when a vehicle must be lubricated the motor sergeant watches his trip ticket records. Any vehicle showing 1,000 miles or near that figure is ordered into the shop for lubrication. If 1,000 miles is registered on the speedometer "Group 1" is lubricated and checked. If 2,000 miles is shown on the speedometer then "Groups 1 and 2" are lubricated, etc. When a vehicle is ordered into the shop for lubrication the motor sergeant directs the attention of the driver to the chart and tells him to lubricate "Group 1," "Group 2," etc.

Entries under the "Last Lube" columns are entries made by the motor sergeant with chalk and should show the speedometer reading at the time each item under a group was lubricated. Due to the fact that conditions of weather, seasonal changes, break in of a new vehicle, and temperature in some localities, may vary the 1,000 mile rate of change, these columns may not show even thousands.

To take care of the lubrication record in the field a typewritten copy of this chart (Chart II) as pertains to each vehicle is made and posted in the corner of the windshield with shellac or varnish.

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CHART II

	Dodge 1½ ton		Dodge 1½ ton
TYPE		TYPE	
U. S. A. NO.	34397	U. S. A. NO.	34397
(Each 1000 miles)	Last	(Each 6000 miles)	Last
GROUP 1.	Lube	GROUP 3.	Lube
Crankcase	2000	Generator	0
Spring Shackles	2000	Front & Rear Wheel Bearings	0
Water Pump	2000	Steering Gear	0
Tie Rod Ball Joints	2000	Starter	0
Spring Bolts	2000	Pedal & Brake Shaft & Linkage...	0
Propeller Shaft & Joints.....	2000	Transmission	0
Drag Link Ball Joints.....	2000	Transfer Case	0
Battery	2000	Front & Rear Axle.....	0
Shock Absorbers	2000		
(Each 2000 miles)		(Each 10,000 miles)	
GROUP 2.		GROUP 4.	
Universal Drive Assembly	2000	Oil Cleaner	0
Air Cleaner	2000		
Clutch Release Bearing	2000		
Distributor	2000		

Entries on this record are made in pencil, and may be consolidated on a small copy of the master chart in the possession of the motor sergeant. If the organization returns to its post the data shown on the motor sergeant's chart should be entered on the master chart.

From the standpoint of the Battery Commander he can quickly check the lubrication in his organization by comparing the speedometer readings with this chart.

In conclusion if the Battery Officers will give the same attention to lubrication details on these new vehicles as was given to the care of animals, they may reasonably expect efficient and faithful service from them for many years.

THE MAINTENANCE OF FIELD ARTILLERY MOTORIZED UNITS AND THE CONTROL OF ITS MOTORIZED SUPPLY TRAINS

BY MAJOR J. H. WALLACE, Field Artillery

(From a lecture delivered before the Quartermaster Corps Motor Transport School)

OUR experiences in maintenance of wheeled vehicles have been sufficiently limited as to make it impracticable to go into detail as to just what work is to be done in our various echelons. In fact, a certain flexibility must be and is now permitted by regulations.

On December 1st, 1934, a reorganization of the Field Artillery went into effect.

a. Motorized Light Artillery in Continental U. S.

Before that date the Field Artillery had, in continental United States, one battalion of two batteries at Fort Hoyle and one battalion of three batteries at Fort Sill, both experimental units of truck-drawn light field artillery. The reorganization has given us eleven battalions of two batteries each and one additional battery of truck-drawn light artillery. One of those battalions at Fort Knox is to receive special half-track trucks and scout cars next summer to equip it for support of mechanized cavalry.

b. Medium and Heavy Artillery in Continental U. S.

Before the reorganization we had five battalions of two batteries each of medium artillery (155mm howitzer) and one battalion of heavy artillery, all tractor drawn. We now have six battalions of two batteries each of medium artillery, truck-drawn, and no change in the heavy artillery except that one battery of heavy artillery has been equipped with heavy half-track vehicles, known as Linn tractors, as prime movers.

c. Motorized Field Trains.

In addition to the motorized battalions and regiments, 5 regiments and seven separate battalions, or a total of seventeen animal-drawn battalions, including two of pack artillery, have been equipped with motor vehicles in lieu of escort wagons for their service batteries.

d. Hawaii and Philippines.

The three regiments of light and one regiment of medium artillery

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in Hawaii and the Philippines have been converted from tractor-drawn to truck-drawn.

e. Summing up, the regular army field artillery has had an increase from less than 400 to over 2,000 wheeled motor vehicles.

The truck-drawn battalions will each be provided with four or five tractors of appropriate size for emergency use. Experience will show to what extent tractors are necessary and whether this allotment is sufficient. Experimentation is also proceeding with a light tractor capable of some 20 to 25 miles per hour maximum speed.

Heretofore, our experience in maintenance has been largely with the Ordnance Department for tractors, and with the Quartermaster Corps and Veterinary Corps for maintenance of vehicles and of animals. With the extensive conversion to truck units described, we are now dependent to a great extent upon the Quartermaster Corps. By cooperation between the Ordnance Department and the Field Artillery a workable scheme for maintenance of tractor-drawn units has been set up which has been successful in keeping these units functioning. We are looking to the Quartermaster Corps to work with us in evolving a system which will keep our truck units in operation, and we have the experience in tractor maintenance to guide us considerably.

The system developed must be one that will work under war conditions. That part of the maintenance performed by the Field Artillery must, in general, require no equipment which cannot be taken into the field.

Our principal objective is to keep the vehicles in operation. We have no desire to do any more mechanical work than is absolutely necessary to keep our organizations operating efficiently, and to cut to the minimum the time losses of vehicles undergoing maintenance work or repairs.

According to present regulations there are two echelons of maintenance for which the arm is responsible. The 1st echelon is the responsibility of the driver, the 2nd of the unit commander.

These echelons are classified as preventive maintenance. In performing this we aim to prevent our vehicles having to be laid up through going to shops for extensive repairs. Instead of having two definite echelons we visualize a variable division between

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the driver, the battery, and the regimental service battery dependent upon the types of vehicles to be maintained. The first echelon we place in the battery. The primary requisite for the functioning of this echelon is discipline. The battery officers and NCOs are responsible that the drivers are properly instructed in regulations covering driving and that they obey these regulations.

The first step in preventive maintenance is preventing accidents. Accidents attributable to the driver put far more of a load on maintenance facilities than any other cause. With proper training and discipline the frequency of accidents should be far less than it is in civilian truck fleets. It may be valuable to instruct a driver in how to fill out an accident report but we will devote far more effort to instructing him in how to avoid having accidents.

The next step lies in preventing injuries to the vehicles through lack of proper care. The instructions for the driver are simple inasmuch as he is to keep his vehicle clean, to report at regular intervals for servicing, keep bolts tightened, detect and report to the motor sergeant immediately any unusual noises or other indications of improper functioning.

An important point in preventive maintenance so far as the driver is concerned lies in preventing him from making adjustments or repairs without competent supervision. The tendency on the part of most drivers is to try to improve the performance of his vehicle by constantly tampering with it. This must be prevented.

Light batteries have in peace some 18, and medium and heavy batteries some 25 wheeled motor vehicles. These may be light passenger and 1½ ton vehicles, or they may include three-, four- or up to ten-ton trucks. In general the work responsibility in a battery includes tightening, lubrication, and general service work on the vehicle, including care of upholstery, canvas, leather, etc. Certain adjustments of external parts such as brakes, lights, carburetors, and replacements of simple installations may be performed under direction of the battery motor officer and motor sergeant. Dependent principally upon the types of vehicles, the regimental commander will establish limits as to the work which may be done by battery personnel and that which should be done in the next echelon.

In the regimental service battery there is set up the 2nd echelon

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of maintenance. The personnel of this echelon includes one or more motor officers and such NCOs and mechanics as may be necessary for the work to be done. The number of vehicles assigned to the regiment and their types will be the determining factors. In peace-time we plan to have one motor maintenance section for a regiment at a single station, and in war-time this will be expanded to provide one section for each battalion of the regiment, as well as one for care of vehicles of the regimental headquarters and service batteries. These sections, although capable of operating separately, will constitute a single echelon and be coordinated by the regimental motor officer.

The sections in this echelon may include crews for special work such as trouble-shooting, ignition and carburetion, power train (transmission, differential, shafts and axles), brakes and steering. To just what extent we may apply the special provision in War Department Circular 1-10, which authorizes that appropriate 3rd echelon work may be done in 2nd echelon establishments, will depend upon experience and upon agreements reached between the using arm and the supply service. As a general proposition it is suggested that the work-time authorized for 2nd echelon jobs should be limited to about six hours.

What tools should be issued to the driver, to the battery, and to the 2nd echelon is a subject receiving serious study at this time. In general a few simple tools are necessary on the vehicle for changing wheels or tires, for tightening nuts or cap screws around leaky gaskets, removing spark plugs, etc.

Two or three sets of appropriate hand tools are issued to the battery motor sergeant and mechanics. There should also be issued to the battery a limited number of spare parts, such as spark plugs, lamps, wiring, carburetor, ignition device, generator, battery, front and rear springs, etc.

The 2nd echelon should be supplied with tool sets appropriate for the work authorized to be performed in removing and replacing equipment, motor testing, etc., and a small stock of spare parts including those items carried in the battery, and a spare motor, sub-transmission, etc. A limit to the issue to this echelon might be set up as not to exceed one truck-load of tools and spare parts of the type of truck used as the prime mover for the gun,

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i. e., 1½ tons in a 75mm gun regiment. This echelon is provided with one or more wrecking trucks, capable of towing a damaged vehicle to place convenient for repair.

The proposed supply chain is 3rd echelon through 2nd echelon to battery. Certain variations may be found desirable in peacetime operations, whereby batteries will requisition direct upon the Post Quartermaster (3rd echelon) for expendable supplies.

Experience in maintenance of Ordnance vehicles has resulted in general in a policy of having field artillery mechanics perform all the operations of which they are capable and for which the necessary tools are or can be provided without overloading the using arm. Just as in the past stable sergeants and stable orderlies administered treatment to sick animals under supervision of veterinarians, and only serious cases were transferred to veterinary hospitals, so do we anticipate that field artillery repair personnel under direction of trained motor officers, either field artillery or quartermaster corps, will perform all operations in maintenance of wheeled motor vehicles of which they are capable with tools appropriate to their establishment and which do not require an excessive time.

This would appear to be at variance with the earlier statement that we have no desire to do any more mechanical work than is essential to keep our organizations operating efficiently. We stick by both statements. If a truck breaks an axle or a universal, it will be much easier to send a man in a pickup truck to the quartermaster 3rd echelon for a new part and have our 2nd echelon make the replacement than to tow or carry the disabled vehicle to the rear or wait for the quartermaster shop to send up and do the job.

However, we cannot solve our maintenance system academically. After experience in the next year or two we will find all our troubles are not over through displacing animals by motors. It is obvious that as now set up the motor maintenance personnel of the division quartermaster and ordnance units is hopelessly small to take care of the thousands of motor vehicles in the division, some 1,000 to 1,250 of which will be in the field artillery brigade, more than that in the division trains, and nearly as many again in the other combat units.

Our experience in truck-drawn units to date having been limited

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to the battalion, we have operated with the 2nd echelon in the battalion. In the operation of the experimental battalion at Fort Sill three vehicles have been used in the battery: a pickup truck for the motor sergeant, a station wagon for the motor officer and a tender or trouble truck for supply and towing duty. A similar group is assigned to the battalion motor maintenance section. In the battalion motor officer's station wagon is a radio set which communicates with the battalion commander, reporting to him at regular intervals, say every five miles, that "all is all right," or making immediate report of any vehicle troubles. He takes such action on the road as may be necessary to see that disabled vehicles are towed if they can be, drawing on the column ahead for assistance if necessary. If repair jobs must be done on the spot he takes the necessary steps to direct the work and to see that men and vehicles left behind will be guided to their destination.

When radio is not available other means are used for keeping the battalion commander informed of the progress of the column through messengers in motorcycles or other light vehicles.

Motorized Supply Trains. The motorized supply units of the arm are the battalion combat train and the brigade ammunition train for ammunition, the regimental service battery for other supplies.

From a tactical standpoint the firing batteries carry a limited amount of ammunition corresponding to the rifle ammunition the infantry soldier carries in his belt. When guns are emplaced for action of sufficient magnitude the combat train issues its load to the gun positions and goes back to refill. In a major action the vehicles of a motorized combat train would pass to the control of the brigade ammunition train commander until they are refilled and returned to their battalion. In the meantime the brigade ammunition train, made up of three ammunition batteries corresponding to the regiments of the brigade, one for each 75mm regiment and one for the 155mm howitzer regiment, delivers ammunition to the firing battery positions and goes back to the railhead or refilling point for refill and return. As nearly as a parallel can be drawn with infantry, the brigade ammunition train is the brigade reserve.

When the batteries are animal-drawn, the battalion combat train is also animal drawn. In this case the brigade ammunition train

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will deliver ammunition to the firing battery positions if practicable, otherwise to a distributing point where the combat train, supplemented if necessary by the battery ammunition vehicles, gets the ammunition and delivers it to the batteries.

This shuttling back and forth will naturally continue until the ammunition needs have been met and all train vehicles refilled.

The principal requirements in handling the motorized units are that groups of about 18 or 20 trucks are kept together, that the officer in charge has his instructions, is furnished with guides as needed, and that he has a small maintenance group, similar to that in a battery, to make roadside repairs. When guides are necessary, a system using two reconnaissance cars is resorted to—one ahead of the column and one following. The leading car drops off road markers ahead of the column and the other picks them up after the column has passed. Having picked up the last marker, the rear reconnaissance car passes the column. The officer guide takes this car and leaves the other car to pick up markers. Many variations of this use of guides and markers are applicable dependent upon the length and difficulty of the route.

The regimental service battery is motorized whether the remainder of the regiment has animal or motor transport. It procures rations, gasoline and lubricants, forage if required, and other supplies and delivers them to the batteries. In general the same rules as to knowing their instructions apply here. The trucks are kept in groups in going to the rear for supplies. For the issue of supplies to the batteries they are guided from the service battery bivouac to the battery bivouacs by agents sent from the batteries.

The movements of our ammunition and service battery columns in the rear areas will, of course, be regulated by division or higher staff through orders and through the use of military police. These orders will probably prescribe what routes are available, and at what hours they may be used, the speeds, sizes of convoy groups, etc. We have found that a group of about 20 vehicles moving at an average speed of about 20 miles an hour should occupy almost a mile of road. A unit of this size can be handled by one commander, and is adapted to ease and safety of movement. It has a convenient and satisfactory time length for closure to reduce distances for passing main arteries or heavy traffic points. A small

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maintenance group, corresponding to that of a battery, is required to accompany such a unit. It may be well enough in peace time, when the route is known and traffic permits, to allow trucks to move out more or less individually. But we are training for wartime conditions when traffic will be all that the roads can stand—when many drivers will lose their way if not under control.

Summing up:

a. Proper maintenance depends upon:

(1) Discipline and training of drivers and of noncommissioned officers to insure that the number of disabled vehicles is held to a minimum.

(2) Establishment of a routine which will provide for lubrication, brake adjustment and other details of regular servicing.

(3) Technical inspections by competent personnel which will result in timely replacements or repairs being made and avoid to a large extent break-downs at inconvenient times.

(4) Division as to the limits of work responsibility for the echelons of maintenance.

(5) Equipment of drivers, battery mechanics, and service battery repair sections with appropriate tools and stocks of parts.

b. Proper control of supply columns depends upon:

(1) Compliance with general regulations governing the speeds, sizes of march units, etc.

(2) Specific instructions as to routes, times when these may be used, and instructions as to the officer commanding the convoy covering what he is to do, where, and when he is to do it.

(3) The convoy commander handling his group of vehicles as a march unit, having with him a small section for roadside maintenance.

With the main objective before us of developing a system which will work to keep our motor transport in operation under war conditions, the Field Artillery and the Quartermaster Corps should have a pleasant and interesting time working out the details as to tools, parts to be carried, and division of responsibility for work.

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BY COLONEL RENÉ ALTMAYER, *Revue Militaire Française*, July, 1934

A Digest by Major J. S. Wood, Field Artillery

UP to the present time, the German high command, although not unmindful of the lessons of the World War nor of the possibilities of the future, has remained faithful to the doctrines evolved prior to 1914 and to the military tradition of Frederick, Clausewitz, Moltke and Schlieffen. In order to understand these doctrines, one must attempt to penetrate the German manner of thought, particularly of modern German thought, so different from that of the French.

The Frenchman thinks individually. He writes or speaks to express ideas purely, without any immediate concern as to their realization; or to analyze his sentiments; or again, too often, simply to produce harmonious and sonorous phrases. The German, on the other hand, thinks collectively and dynamically. He writes and speaks in view of some action toward which he is irresistibly drawn. The writings of Clausewitz, Moltke, and Schlieffen express the collective military thought of their time; and the executants of 1866, 1870, and 1914 were impelled toward the translation of this thought into action.

EVOLUTION OF THE MODERN DOCTRINE

Frederick the Great.—Frederick changed the warfare of his time by attention to the mobility and training of his armies, which enabled him to move obliquely against the flanks or rear of the linear formations then in vogue. Menacing the opposing line by a secondary effort well supported by infantry and artillery fire, he moved the mass of his forces to envelop or surround the enemy in rapid and decisive fashion. The Prussian generals who followed Frederick retained only the form of his system; but the heritage of military study directed by the King himself and the presence of subordinate officers trained in this manner were responsible for the rapidity of the Prussian recovery between 1806 and 1813.

Clausewitz.—The Prussian military renaissance after Jena found expression in the doctrines expounded by Clausewitz, the disciple of Scharnhorst and of Gneisenau. From 1806 to 1848.

a period during which the French army lost even its Napoleonic tradition, Clausewitz and his fellow officers labored ardently to prepare for war. Clausewitz himself was, properly speaking, more of a theorist than a man of action. He never commanded troops, spending his service on the staff and later as professor and director of the Military Academy where he wrote *The Theory of War* and his *Principles for the Conduct of War*.

He was a deep student of the contemporary philosophy of Kant, Fichte, and Hegel—whence his habit of studying all sides of a question, and whence his obscurity to our minds. To the Germans, however, he did not present the same difficulty; and they were able to transform his abstractions into concrete and tangible military realities.

Clausewitz's analysis of war—its nature, basis, object, and its forms—is a deep and penetrating study. To him, war in its nature is merely an instrument of state policy to which all war plans must be subordinated. He finds its proper basis not in numbers, formations, nor particular kinds of organization and training, but in the moral forces of the army and the nation. In execution these forces must be evidenced by vigor, speed, secrecy, and surprise.

For Clausewitz, as for Gneisenau, the object of war is the destruction of the enemy's army in combat. However, in his doctrine, the form of operations leading to this result is not necessarily entirely offensive. In strategy, as well as in tactics, he shows a marked sympathy for the defensive—offensive, which he holds to be strongest form of warfare. The Clausewitz form of offensive strategy consists of an advance straight toward the enemy by the shortest line, with all forces united in space and time. He opposed the Scharnhorst idea of separating in order to march concentrically on the enemy. In combat, he sees a phase of destruction by fire power, followed by a decisive phase of shock action, actual or menaced. He indicates the desirability of enveloping one or both flanks during this phase, but with a certain timidity and concern as to separating the frontal and flanking action.

Moltke.—Moltke, a man of wide culture, high character, and sound sense, was chief of the Great General Staff from 1857 to

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1882. He enjoyed the entire confidence of his sovereign, and he worked in a favorable atmosphere. The government and the nation were in active accord as to the necessity for military effort; and the German army had striven to prepare itself practically for war. It possessed a trained staff, an active center of higher military study, and it was familiar with two-sided exercises and maneuvers of all units and all arms.

The influence of Moltke in the fashioning and training of this army was predominant. His strategy and his manner of command may be criticized; but there can be no criticism of the manner in which he organized and prepared the army for victory.

Insofar as the nature, the basis, and the object of war are concerned, there is complete agreement between the doctrines of Moltke and Clausewitz. In fact, these essential principles of Clausewitz's still remain unchanged in the Prussian doctrine. In strategy and tactics, however, Moltke departs from the conceptions of his teacher.

The strategy of Moltke, like that of Clausewitz, favors the defensive—offensive, at least in theory. The early plans both for operations against Austria and against France were based on such action. For the actual organization of his offensive maneuvers, however, Moltke returned to the Scharnhorst system of separating his forces after mobilization, marching them concentrically toward the enemy, and then maneuvering in convergent directions. He writes, "—to maneuver, remain separated as long as possible: for battle, assemble in good time, down to the last battalion." This led him to foresee a semi-deployed advance for his armies, with no general advance guard; a full utilization of all roads by marching in division rather than corps columns; and a constant care for direction before and during battle.

For full success, such a system requires particularly accurate information of the enemy. Moltke, however, after once deciding on a reasonable hypothesis of enemy action and issuing his directives accordingly, left the execution to his subordinates without much further concern as to information and security. Against his passive adversaries, the success was great; but one can not prophesy equal success for a like method when confronting an active and resolute enemy. Carried to extremes, this conception

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led to the absenteeism of the German supreme command at the Marne in 1914.

Moltke aimed at creating a favorable tactical situation by a final short march to bring his columns simultaneously on the front and flanks of the enemy. This he held to be the most difficult of all missions for the strategist. In the resulting tactical maneuver, he visualized an envelopment of one or both flanks combined with a frontal action. "Fix, envelop, and destroy"—this comprises Moltke's tactics. He was not wedded blindly to the offensive, however. He opposed frontal assaults against an enemy in position; and found attack justified and imperative only when the favorable conditions were created before battle.

Schlieffen.—From 1870 to 1914 the doctrines of Moltke, modified only to conform to the evolution of weapons and means of combat, were considered as the German military gospel. They were expounded by an array of brilliant writers, such as Balk, Bugolavoski, von der Goltz, among whom Count Schlieffen took precedence owing to his position as chief of the Great General Staff for fifteen years.

Many commanders of the World War received their training under Schlieffen, among others Stein, von Kuhl, Groener, Hinderburg, and Ludendorff, who was a particular favorite. Schlieffen's writings, particularly his *Cannae* and his *Frederick the Great*, exercised great influence on German military thought prior to the war, and are equally in vogue today.

The theories of Schlieffen tend to constitute a purely German doctrine, in direct line with and developing to an extreme degree, the principles of Frederick and Moltke. Basing his doctrine on Moltke's and Clausewitz's conception of war as the supreme manifestation of national life and policy, he sought no ordinary battle as an objective. With an ardent desire to conquer, but also with a certain indifference to the realities of the current European situation, he visualized rapid and complete destruction of the enemy in combat.

As an advocate of flank action in strategy and tactics. Schlieffen outdistances Moltke. "This is the essential fact of all military history" for "the method is not to take the bull by the horns, but to strike him dead in a mortal spot": and this spot is

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always on the flanks or, preferably, the rear of the enemy. Although the blow may be parried, the assailant can still count on shaking the mental activity and morale of the enemy, with a consequent disorder in his reactions. The action indicated is not a timid overlapping of the flank by the lateral displacement of reserves; but a complete envelopment of one or both flanks by large scale movements in directions carefully planned to create strategic surprise, aimed at the enemy rear and supported by reserves deeply echeloned behind the marching wing. Once faced toward their distant strategic objectives, however, the large units are to move in a cohesive fashion, "guides on the line", with no loss of tactical unity. And, in truth, the German movement in 1914 showed no inferiority in this respect.

The main practical results of these theories were as follows: First, we note the massing of reserves where the decision is sought, *i. e.*, behind one or both flanks. The German strategic and tactical dispositions in 1914 bear evidence of this. The corollary development of fortification on certain parts of the front and the acceptance of defensive combat if necessary must also be noted. Second, we have the desire to gain contact with and to fix the enemy front as rapidly as possible, without recourse to prolonged offensive effort; hence the advance in linear order of shallow columns (brigade columns in Schlieffen's plans) except on the flanks. Next, we find no idea of determining the decisive point according to information furnished by advance guard actions. This point is settled beforehand, hence no strategic advance guard and no demand on the tactical advance guards except that they secure the rapid development of the main bodies. Last, we see again, as in the Moltke system, the subordination of search for information to speed and vigor of execution, entailing the same error of attributing to the enemy only those reactions that favor the contemplated maneuver.

THE PRESENT DOCTRINE

With these conceptions—a combination of the philosophic principles of Clausewitz and the strategic and tactical principles of Frederick and Moltke, Frederick, particularly—the German army entered the lists in 1914. Were these principles to be renounced after the defeat of 1918? Not at all! The regulations for maneuver

and combat of the combined arms, popularly called the *Fug* (*Führung und Gefecht der verbundenen Waffen*, published in 1921 and recently revised), largely confirm and continue the pre-war doctrines.

Preliminary Considerations.—In examining the present application of these doctrines, it is necessary first to consider the nature of the military forces that the Germans expect to possess. Undoubtedly, they intend to exploit their advanced technical resources; utilizing aircraft in mass from the outset, making an intensive use of gas and smoke, and employing the latest forms of motorized and mechanized weapons.

Recent German studies visualize much use of motorized and mechanized units both in reconnaissance and in combat. Certain of these units, with a radius of action of 125 to 165 miles a day, will execute distant reconnaissance. They will operate in strict liaison with the aviation, avoiding combat and seeking out the enemy main body. As they act according to cavalry principles, they are to be a part of that arm. For combat, mechanized units of the general reserve, composed mainly of light tanks with a radius of action of 65 to 125 miles a day, are to engage in surprise mass action at decisive points, particularly against the enemy flanks and rear. With such views, naturally, anti-tank defense is considered especially important, the tank itself being the favored weapon for this use.

The field service regulations (*Fug*) are written, of course, for large units, organized and equipped in modern fashion. Although the questions of morale and of using small professional armies have been much discussed by German military authorities, such as von Taysen and von Seeckt, there is every evidence that the development and training of large masses of militia is not being neglected in spite of the Versailles Treaty. Under the present régime, particularly, the reorganization and modernization of the Reichswehr has been accelerated. The trend here is toward increasing the mobility of large units, motorizing services and technical arms, augmenting anti-tank and special units, and employing the cavalry corps rather than the division.

Guiding Principles.—First among the guiding principles of the post-war doctrine is the appeal to morale, to initiative and force

in leadership. The personal exercise of command is emphasized; and the regulations prescribe that command posts of all units, from general headquarters to battalion, be pushed well forward—a reaction, perhaps, against the remote control of the high command in 1914.

Second is the emphasis on offensive action and war of movement, with a consequent decentralization of command and a preference for the infantry division over the corps as the unit of combat. The tendency is to extend this decentralization even to the equipment and use of the infantry regiment as a complete combat unit. No blind reliance on the offensive is implied, however; the defensive is simply regarded as an indecisive form of action, to be limited in extent and degree as much as possible.

Third is the continued insistence on flank action and envelopment. It appears certain that this maneuver will be the aim of all units, from the group of armies on down, at the beginning of a new war. The doctrine is still the traditional "*umfassen, einschliessen, vernichten*"—fix, envelop, and destroy—of Moltke.

Finally there is the oft repeated assertion of the importance of mobility and surprise. The first is to be obtained by lightening the large units, motorizing their service and artillery, perfecting the railways, and increasing motor transport of troops; the latter by stratagem and, mainly, secrecy—camouflage, night operations, use of smoke clouds.

The present doctrine also recognizes information of the enemy as of vital importance in the decision and charges every commander with the duty of obtaining it before and during battle. The fear of being outflanked leads to the employment of a screen of covering forces to mask the movement of large units.

The Offensive.—The field service regulations cover four phases of offensive combat—the meeting engagement, the attack against a position defense, against a zone defense, and against permanent fortifications. The meeting engagement is given much more detailed consideration than the others.

In the *rencontre*, the commander, well forward and constantly in touch with his information and security detachments, will make a rapid estimate of the situation to determine the "*Schwerpunkt*" (decisive point of attack) which is located *a priori* on one or both

flanks. He will then issue orders as quickly as possible to the advance guard, the artillery, and the main body. In general, the advance guard mission will be to gain the time and space necessary for deploying the main body. It will then be engaged in a more or less reinforced action to fix the enemy front and allow the commander to concentrate in the decisive direction. The artillery will be deployed rapidly, with as large a proportion as possible in the general axis of the *Schwerpunkt*, and will immediately engage the enemy artillery. Covered by the advance guard and the artillery, the main body will move in the designated directions for eventual deployment in the various provisional zones of action. If the information warrants, definite objectives and zones may be assigned at once to the moving columns in order to gain time by attack from approach formation. However launched, the attack will be pushed as rapidly as possible on the usual limited frontages, with infantry and artillery in close liaison. There will be no assignment of intermediate objectives for halting and reorganizing the infantry. A deep advance and search for flanking action is demanded of all units. Once shaken, the enemy is to be subjected to direct pursuit coupled with the advance of mechanized or cavalry columns and aviation to cut off his retreat.

For the other attack situations, the principles are the same. In the attack against a position defense, however, the decision cannot be made before the enemy covering forces are driven back and the front defined (by reconnaissance in force if necessary), allowing a methodical deployment against the main line of resistance. Against a zone defense, there is little possibility of other than frontal action. Surprise is sought by attacking on as wide a front as possible in order to conceal the direction of the main effort.

In none of these forms of attack is there any idea of designating intermediate objectives for halts and reorganization. The rule seems to be to push forward as rapidly as permitted by the speed of displacement of supporting artillery. The use of reserve artillery, limbered, to facilitate rapid displacement is indicated.

The Defensive.—The principles of defensive action given by the German regulations are the usual ones—organization of the ground, coordinated fire power, importance of information, necessity for reserves—together with an insistence on the constant need

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for misleading the enemy as to the nature of the defense. The means indicated for this are an unequal distribution of sector troops, the organization of dummy positions, night transformation of existing defenses, and increased mobility of reserves.

The defense is based on the organization of centers of resistance whose forward line constitutes the main line of resistance—a line facilitating powerful combined infantry and artillery fire and covering the artillery observation posts. It should be protected against sudden attack by tanks and should offer a base of departure for offensive action. Normally, the position of resistance will be protected by an outpost position. The number and the disposition of sector troops depend on the terrain and the necessity for constituting strong reserves.

These prescriptions are the commonly accepted ones. However, certain tendencies should be noted—the constitution of strong points defended by all types of weapons, including infantry cannon; the importance of concealment; the increased depth of artillery deployment; the normal assignment of tanks and artillery as component parts of large reserve units; the use of screening forces on advanced positions. The general conduct of the defense presents only two unusual features—in case of marked inferiority, the resort to combat on successive positions, varying the form of defense as much as possible; and the effort to obtain mobility of all defense elements, even down to the minor infantry units which are enjoined to vary their dispositions and their emplacements.

Considerable attention is given to the *hinhaltender Kampf* or delaying action. This form of combat, designed to gain time and wear down the enemy, is visualized for the division and larger commands, as well as for lesser units. It implies a constant alternation between strong resistance and rapid withdrawal to positions in rear, the utilization of rear detachments to force early deployment of the enemy, and the full employment of long range fire from machine guns and artillery. The distance between successive positions must be sufficient to cause a displacement of the enemy artillery. Withdrawal from one position to the next will be ordered by the superior commander whenever possible. Forced withdrawal presents the same difficulties to the Germans as to others. The questions of when to break off combat and by whose

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order are as much discussed among them as elsewhere.

The German idea of defense is apparently to form a system which, without loss of power, will mystify and mislead. To this end, particular attention is given to the use of every ruse, to dispersion of ground works and troops, and to variety and suppleness in action. Evidently such results cannot be obtained without highly trained troops and vigorous, skillful leaders. Whether or not the German army can attain this ideal is unknown; but it is certain that the Germans themselves consider their army "the best trained in the world."

APPLICATION OF THE DOCTRINE

The fall maneuvers of 1927, 1928, and 1930 were marked by the application of these ideas. Only moving situations were studied, the large units being placed initially at distances and intervals of 100 to 200 kilometers in order to provide opportunity for maneuver and for flank action. The troops were required to make the necessary movements which involved marches of 40 kilometers per day for infantry and 70 to 100 kilometers for cavalry during several consecutive days.

The cavalry has played a particularly important role in these maneuvers. In 1927 one phase of the problem was devoted to the action of a cavalry corps in forcing a screen. In 1927 the same sort of mission was carried out by a cavalry division operating at a distance of 200 kilometers.

Meeting engagements and attempts at envelopment of one or both flanks were the rule. In this action, the forces assigned for fixing the enemy front were kept at a minimum; for example, in one maneuver, one infantry and one cavalry division along the front with three infantry divisions and one cavalry division on the flank. Divisions operating on the flanks often made marked changes of direction. In general, forces on the defensive resorted to maneuver in retreat, constantly seeking opportunities for counter attack against the enemy flanks.

The latest types of equipment and the most modern procedure were either actually represented or considered in all situations. The use of camouflage in all its forms seemed to be common practice in all units. Night marches and maneuvers were generally employed.

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No maneuvers were held in 1931; but those of 1932 were of particular interest from both political and military viewpoints. Much publicity was given to the operations, which were based on the situation of a Red force with modern equipment advancing from Posen toward Berlin against a Blue army with the actual organization and equipment of the Reichsheer. The purely military object of the maneuver was to reach definite conclusions regarding motorization, mechanization, anti-tank defense, and particularly the equipment and handling of large cavalry forces.

* * * * *

Thus we see the influence of tradition in the evolution and modern development of the German military doctrine. From the time of Frederick and through the hands of Clausewitz, Moltke, and Schlieffen down to the present, this doctrine has evidenced a remarkable unity of thought. Insofar as strategy and general tactics are concerned, the question of whether such rigidity lends force to the conceptions is an open one. However, it must be recognized that unity of thought and of execution offer definite advantages in securing convergence of effort and economy of force in combat.

In any event, the definite, methodical and energetic manner in which the German army has prepared itself for war throughout a hundred years should stimulate our own efforts. As Marshal Foch wrote more than thirty years ago. "On the battlefield there is no time for study; one simply does his best to apply what he knows. To accomplish even a little, one must know a great deal."

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