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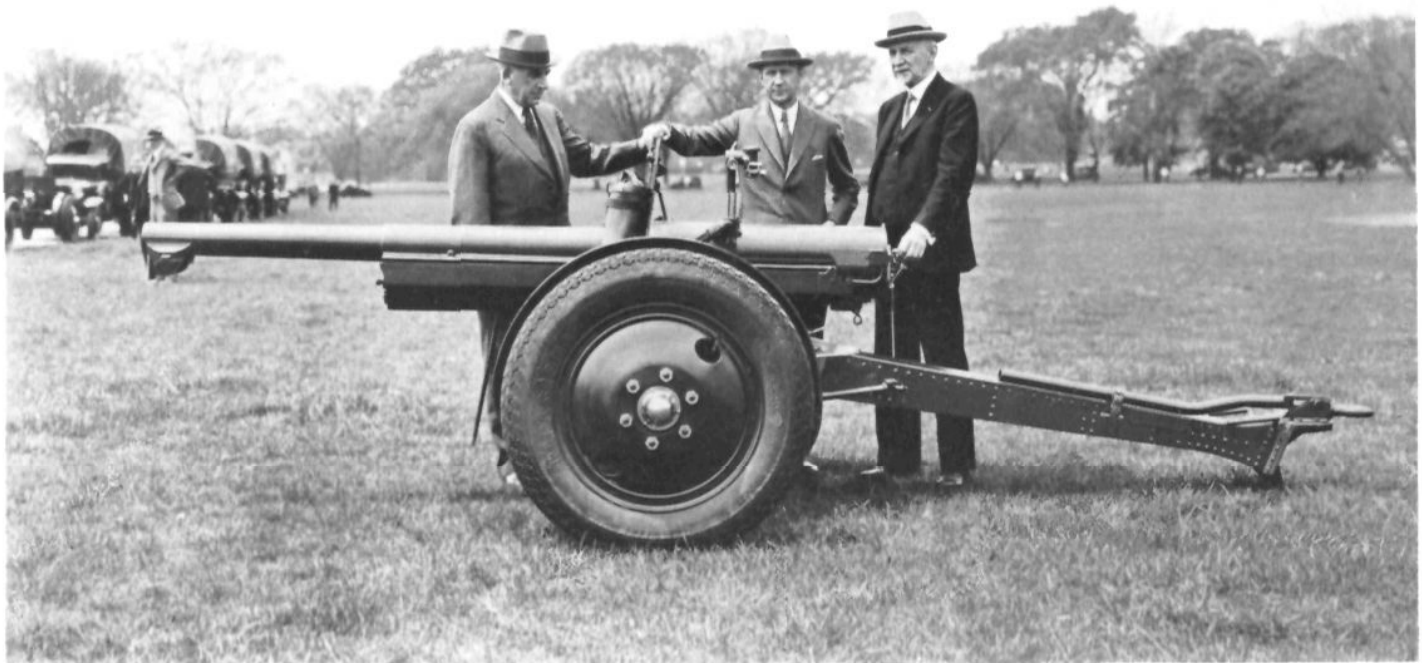

THE 75MM GUN (FRENCH) WITH CARRIAGE MODIFIED FOR HIGH ROAD SPEEDS BEING INSPECTED BY (LEFT TO RIGHT): MAJ. GEN. HARRY G. BISHOP, CHIEF OF FIELD ARTILLERY; MAJ. GEN. G. V. H. MOSELEY, JR., DEPUTY CHIEF OF STAFF, AND GEN. PEYTON C. MARCH, WORLD WAR CHIEF OF STAFF

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THE TRUCK DRAWN BATTERY

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GENERAL CONSIDERATIONS

THE probability that most Field Artillery units must eventually be motorized has become increasingly apparent during the past few years. The lack of sufficient modern motor vehicles, however, has acted as a check to the many tests which the Chief of Field Artillery has desired to make in determining just how far, in the present age, motorization should be extended. If an arbitrary decision were to be made to motorize certain of our horse drawn units, it is apparent that, due to the lack of funds for providing and maintaining sufficient automotive vehicles, they would be immobilized most of the time.

Plans which contemplate the eventual motorization of light artillery units are also limited by the present War Department policy on this subject, bearing the date of November 14, 1928, which reads partly as follows: "The War Department contemplates no departure at present from the principle that divisional light artillery is horse drawn."

In the interim, the animals in our existing horse drawn units are being reduced by old age and injuries faster than the present procurement programs can provide replacement. Just now, a summary survey of the animal resources of this country presents a very disquieting eventuality if an attempt is made to maintain the policy that all light artillery will be horse drawn. If the decrease of animals on our farms and ranches continues to follow the graph line shown in Figure 1, we may, in a few years, be forced to motorize the Field Artillery regardless of existing policies and plans.

On the other hand, during the past year, especially, there has been such a large demand for horses by farmers who are replacing tractors with animals, that this demand may insure, within a few years, an adequate supply of draft horses. In horse breeding,

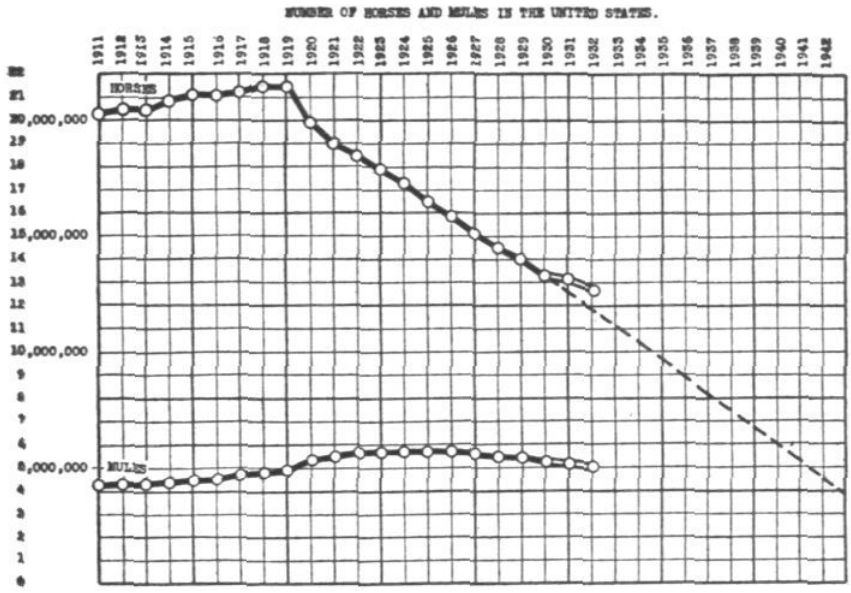


FIGURE 1.—NUMBER OF HORSES AND MULES IN THE U. S. BY YEARS. DATA BASED ON YEARBOOK FOR 1930 OF THE DEPARTMENT OF AGRICULTURE. FIGURES SINCE 1930 FURNISHED BY REMOUNT BRANCH, Q. M. C.

as in any other commercial enterprise, the supply for commercial purposes may be expected to equal the demand.

Sufficient experimentation has been accomplished with tractor drawn and portée light artillery to conclude that both are feasible for the accomplishment of specific missions. Both, however, possess inherent defects which may be outlined as follows:

Tractor Drawn Artillery, using the present crawler type tractor, is excessively noisy and is incapable of meeting the strategical speed requirements of modern tactics. In addition, this type of prime mover has no cargo nor personnel transport capacities and, in general, is an item unfamiliar to the average American. Competent drivers are scarce and additional drivers require special training. The quantity of track laying tractors in existence today is limited; their initial cost is an important consideration in times of peace.

Portée Artillery, while possessing necessary strategic mobility on good roads, is of doubtful reliability as soon as it leaves solid footing. Its vehicular loads are top-heavy and, in order to be capable of transporting the heavy pay-loads placed on them, its

trucks must necessarily be large, heavy and costly while the gun load prevents cargo carrying. The latter characteristics embody great expense both in initial outlay and in maintenance. Portée artillery is slow in occupying and in leaving its positions. Either during transport or in the vicinity of the positions it presents a conspicuous target to the enemy.

A visualization of the ideal prime mover for motorized light artillery embodies a combination of characteristics which cannot be completely fulfilled by the adaptation of any of the automotive developments of the present age. The prime mover should be a vehicle capable of satisfactory strategical and tactical mobility over average terrain. In addition to towing a field gun with its carriage modified to permit high speed traction, the prime mover should be able to transport the gun squad, its equipment, a supply of ammunition, and the necessary accessories and equipment pertaining to the operations of the section.

Pending the discovery of a more efficient method of transport, the potentialities of truck drawn artillery appear to meet the above qualifications more closely than any other type now under study and test by this or any other nation.

It is fully realized this type of transport may not prove to be uniformly efficient under all conditions of terrain and weather. However, it does appear to be the most practicable type at hand, considering the possibilities of obtaining such equipment in these frugal times of peace with the well grounded assurance that this type of equipment will also be immediately available in an emergency.

The advocates of truck drawn artillery, as individuals, do not predict an utopian solution of the motor problem in the adoption of this type of equipment. *It is imperative, however, that some decision be made as to our motor requirements and definite policies established if we expect to progress with the other arms in the development of motor transportation*.

It is not expected that a decision to equip a large proportion of our light field artillery as truck drawn units would receive the uniform concurrence of the Arm. However, after some fourteen years of backing and filling, during which time we have made very limited progress in motorization due to the incubus of our

present worn out motor equipment, some such decision is warranted. Consequently, to those who expect to establish a definite demur against truck-drawn transport, the request made by Bairnsfather's "Old Bill" appears in order: "If you knows of a Better 'Ole, go to it.'"

* * * *

Something of the background in the form of a pre-view of the underlying principles of vehicular development projects of our Army is deemed necessary before proceeding further in this discussion.

The Quartermaster General, materializing the policies of an excellently conceived program in the development of military automotive vehicles, has completed and issued for test, pilot models of trucks which are far in advance of any type of vehicle the Army has used in the past, and, apparently, much more efficient, for our requirements, than most commercial products on the present markets.

His plan embodies the assembly of military vehicles utilizing proven commercial units which provide a maximum degree of interchangeability between the different types of vehicles produced. Axle assemblies, transmission, engine units, transfer cases, wheels, tires and other units found in one type of truck are exactly the same as those in most of the other vehicles produced under this program. One truck may therefore be laid up temporarily and its units used to keep the remainder of the fleet in operation until the required assemblies are sent up from the repair units. In the advent of a broken connecting rod or a burned out bearing the treatment would be to replace the complete engine unit with another from the stock of assemblies carried in the repair units, or from a "laid up" vehicle.

Regardless of the exact fulfilment of this theory, it is certain that we need not be again confronted with the situations which occurred during the last war, when some 200 different makes of automotive vehicles were purchased and used in France, necessitating the procurement of a most intricate stock of spare parts and repair material costing some $150,000,000.00. Even with that expenditure to insure the repair and maintenance of these vehicles we are informed that less than half of the vehicles on hand could be kept in operation.

Concurrent tests conducted at the Quartermaster Depot at Holabird and by the Field Artillery Board at Fort Bragg have proven conclusively the satisfactory capabilities of a number of these vehicular types in meeting the automotive requirements of our Arm. See Page 262.

In synopsis, these tests have indicated that the Quartermaster Corps' 4 wheel, 4-wheel-drive, 1¼-ton Franklin engined truck is satisfactory in fulfilling our requirements for light cargo trucks, light repair trucks, kitchen trucks, water and ration trucks, radio trucks, and as a prime mover for light artillery in the G. H. Q. Reserve. The 6 wheel, 6-wheel drive representative of this group will, no doubt, make possible the extension of the use of this class of vehicle.

The Quartermaster Corps' 2-ton, 4 wheel, 4-wheel-drive truck apparently fulfills our requirements for general cargo trucks. Under the present ratings of the commercial field this vehicle would be listed as a 3-ton truck. The need of a heavier cargo truck is not indicated.

The Quartermaster Corps' 3-ton, 6 wheel, 6-wheel-drive truck may prove to be a satisfactory prime mover for the 155mm howitzer, M1918; the 7½-ton, 6 wheel, 6-wheel-drive truck is tentatively contemplated as a prime mover for the 240mm howitzer and the new 155mm howitzer, while the 10-ton, 6 wheel, 6-wheel-drive truck has been proven satisfactory as a prime mover for the 155mm gun and the 8-inch howitzer.

Were funds available to permit the issue of a sufficient number of the above vehicles to meet our present requirements, further concern would be greatly alleviated. However, it does not appear that funds will ever be available in time of peace to equip the entire Field Artillery with these vehicles. An appreciable length of time will exist, after M-day before all types of vehicles contemplated under the Quartermaster General's plan can be produced in quantity.

The requirements of all arms and services for trucks of the 7½-ton and 10-ton class will be small in both peace and war. There should be no great obstacle in the procurement of these types of vehicles either from commercial substitutes or from the Quartermaster Corps groups. The procurement of Quartermaster

Corps' 3-ton trucks or commercial substitutes as prime movers for the 155mm howitzer should not be difficult. The procurement of the Quartermaster Corps' 2-ton trucks, or substitutes, as cargo vehicles also will not present a problem since commercial substitutes of the 2-ton truck can be readily supplied from the 2-ton commercial field, with further recourse to the 1½-ton field, if necessary.

Our immediate mission, apparently, is to obtain sufficient automotive vehicles for peace time research; types which will exist in sufficient quantity upon the advent of an emergency to provide the requirements of our units between M-day and that period when the Quartermaster General's plan can produce quantity replacements.

It is the general opinion that we must rely chiefly upon modified commercial products for our peace time light truck requirements. On the other hand commercial producers are becoming impressed with the types of vehicles assembled by the Quartermaster Corps until, today, it is no problem to obtain the exact duplication of these vehicles from a large number of commercial manufacturers, who have adopted the principles of this plan.

On June 30, 1931, a standard 1½-ton Ford truck, equipped with a Warford Transmission and a set of Hipkins Tracks, was procured for the Field Artillery Board for test as a prime mover for light artillery and for light cargo vehicular requirements.

The truck has a standard 131-inch wheel base chassis and was equipped with dual rear wheels. The body is a commercial type, somewhat longer than the standard stake body and wide enough to portée the 75mm gun, M1897. (The portée idea was still existent at this time).

Special modifications included the attachment of an artillery pintle to the rear end of the frame of the truck, the assembly of the Warford Transmission, and the procurement of a set of Hipkins Tracks.

The Warford Transmission is a gear assembly unit which is placed in the drive path immediately behind the standard transmission housing. It provides an additional selection of speeds so that the standard transmission with its four speeds forward and

one reverse speed now affords a selection of twelve speeds forward and three speeds in reverse.

While the standard 1½-ton, 2-wheel-drive truck is able to negotiate some of the terrain conditions and transport requirements of the military light truck field, it was found by experiments at Aberdeen Proving Ground and at the Field Artillery Board that a sub-transmission such as the Warford was desirable as a modification of these trucks when used as prime movers for the light field gun. The cost of the Warford Transmission is around $100. Quantity commercial production of this type of equipment is practically assured. There are a number of other sub-transmission units on the market today apparently equal in operation to the Warford type. It is the writer's belief that this type of equipment will soon appear as standard equipment in representatives of the light truck field.

The Hipkins Track was developed by Mr. O. F. Hipkins, a former employee of the Ordnance Department. The track consists of a series of U-shaped steel plates attached at the center by a steel chain. The tracks are assembled on the wheels by laying the plates on the ground and by running the rear wheels upon them so that the chain lies between the tires of each wheel. The ends of the chain are then pulled together and locked. (See page 261.)

A Ford truck was equipped with this device and, in demonstrations at Aberdeen Proving Grounds, it was able to tow a 75mm gun over exceedingly difficult terrain including swampland, steep slopes, shell holes, and deep sand. In order to ascertain the maximum drawbar pull of this vehicle so equipped, a dynamometer was attached to the truck and a 155mm GPF gun was attached to the dynomometer as shown on page 261. The truck was able to tow this load over soft, muddy terrain.

At the time of these tests, a Citroen-Kegresse tractor, a recent development adopted by the French Army, was also tested. Both at Aberdeen and at the Field Artillery Board the concurrent tests of the two vehicles proved the superiority of the Ford truck.

On a trip to Fort Bragg, the members of the Field Artillery Board were found to be very enthusiastic over the performance of the pilot truck and in the tests I witnessed the performance of this vehicle, as a prime mover, was remarkable. Loaded with about a

ton and a quarter of concrete slabs, with a weight of 3600 pounds in tow (a 75mm gun, M1897, on the Fort Sill bogie) the truck negotiated all tests given it with apparent ease (see page 261). In very deep sand, where an appreciable grade was encountered, the lowest gear selection was often necessary, but it seemed impossible to stall the truck. Under the heaviest going, when the wheels of the truck and the bogie were almost up to their hubs in sand, the truck moved along, up the grades, with no apparent labor on the part of the engine and no perceptible increase in engine heat. Several times during these pulls the spade of the gun, due to the depth of the bogie and truck wheels in the sand, was plowing an eight-inch furrow in the hard crown of the road!

Preliminary reports on the operation tests of this vehicle were so gratifying that the Chief of Field Artillery, in the summer of 1931, gave the impetus to a study which culminated in the procurement of the vehicles for the test of a truck drawn battery.

* * *

The resultant study was based on Ford vehicles, although it was apparently unimportant what make of vehicle might be obtained. The chief stipulations were that the make of vehicle purchased should exist in sufficient numbers to insure quantity procurement at any time, and should be a proven product of the commercial field. In addition to these provisions, it was desirable that all types of vehicles, constituting the battery's automotive equipment, should be supplied by one manufacturer, for the obvious facilitation of maintenance and repair within the unit.

Approving this study, the Chief of Field Artillery, on September 1, 1931, requested that the sum of $12,000.00 be allotted for the procurement of eleven 1½-ton commercial type trucks and five station wagons including the necessary vehicular accessories, equipment, and modifications.

The various sections of the General Staff were enthusiastic in the acceptance of this project which received the War Department's approval on November 9, 1931. Bids were opened at Holabird on February 10, 1932, and the award of the contract was made to the Ford Company.

The vehicles were delivered to representatives of the Quartermaster Corps at Detroit on March 30, 1932, and with the exception

of the four "gun trucks" which were driven to Rock Island Arsenal to pick up the guns, the convoy arrived at Holabird on April 1, 1932, to receive special body modifications and the installation of pintles.

It may be of interest at this time to include a synopsis of the log kept on the four gun trucks during the trip from Rock Island Arsenal to the Holabird Depot. Each truck towed a 75mm gun, M1897, each gun being mounted on a specially modified carriage, the principal characteristics of which include pneumatic tires and high speed bearings. (See frontispiece.)

The trucks departed from Rock Island, Illinois, April 4, and arrived at the Holabird Quartermaster Depot, Baltimore, Maryland, after delivering the guns at Aberdeen Proving Grounds on April 7.

The length of this trip was 874.2 miles. Records of gasoline consumption showed an average of approximately 11 miles per gallon per vehicle. The average speed in flat country was 26 miles per hour; coming across the mountains the average speed was 17.6 miles per hour. On steep grades and in the mountains, second gear in direct drive had to be used with an average speed of 10 to 12 miles per hour.

The vehicles were delivered to Field Artillery personnel at Holabird on April 29. Captain A. L. Campbell, recently the motor representative on the Field Artillery Board, had been assigned as the Battery Commander of this unit, which is manned by the personnel of Battery "D," 17th Field Artillery, at Fort Bragg.

Following a demonstration for the Cadets of the Military Academy at Aberdeen on May 2, and a demonstration in Washington on the return trip to Fort Bragg, the battery was organized and placed under the control of the Field Artillery Board for tests to determine its tactical and strategical possibilities. This test will last approximately two months. Following this period the battery personnel revert to regimental control. Later in the winter it is contemplated that the battery personnel will be returned to the jurisdiction of the Board and for a period of one month will go north for winter maneuvers. In the spring, just prior to the tactical exercises

at the Field Artillery School, the battery will proceed to Fort Sill, where it will take part in the spring maneuvers, after which the materiel will be assigned to one of the batteries at Fort Sill and the personnel of the battery will return to its station at Fort Bragg.

No one can make any definite predictions at this time as to the possible outcome of this experiment. If the equipment and the organization is successful, the debate as to the identity of the individual who first fostered the truck-drawn idea will go on forever; if the experiment is a "flop," there will be a mad scramble to get in the ranks of the "I told you so's."

Anyhow it will be interesting.

THE MATERIEL IN GENERAL

The Chief of Field Artillery decided that the number and types of vehicles should be kept to the lowest possible operating minimum.

Station wagons were chosen as light reconnaissance cars, to be used in reconnaissance operations and for the transport of the officers and keymen of the departments of the battery.

Other transport requirements were to be met by the use of the eleven trucks assigned the battery. The four trucks to be used as prime movers, in addition to pulling the guns, transport the gun squads, their individual equipment, materiel accessories and equipment, and approximately 50 rounds of ammunition. An additional truck, transporting supplies and accessories for the firing battery, is available as a substitute in the event of necessary prime mover replacement.

A truck for wire laying and communication equipment is assigned battery headquarters. The remainder of the trucks are assigned the maintenance section and consist of one 6 wheel, 4-wheel-drive repair and trouble truck, a kitchen truck, a water and ration truck, and two supply trucks. (See page 255.)

THE TRUCKS

The 1½-ton commercial type truck is rated in pay load capacity on the basis of a cargo of 1½-tons. This pay load, on the vehicle, is taken as the maximum for military requirements and usages,

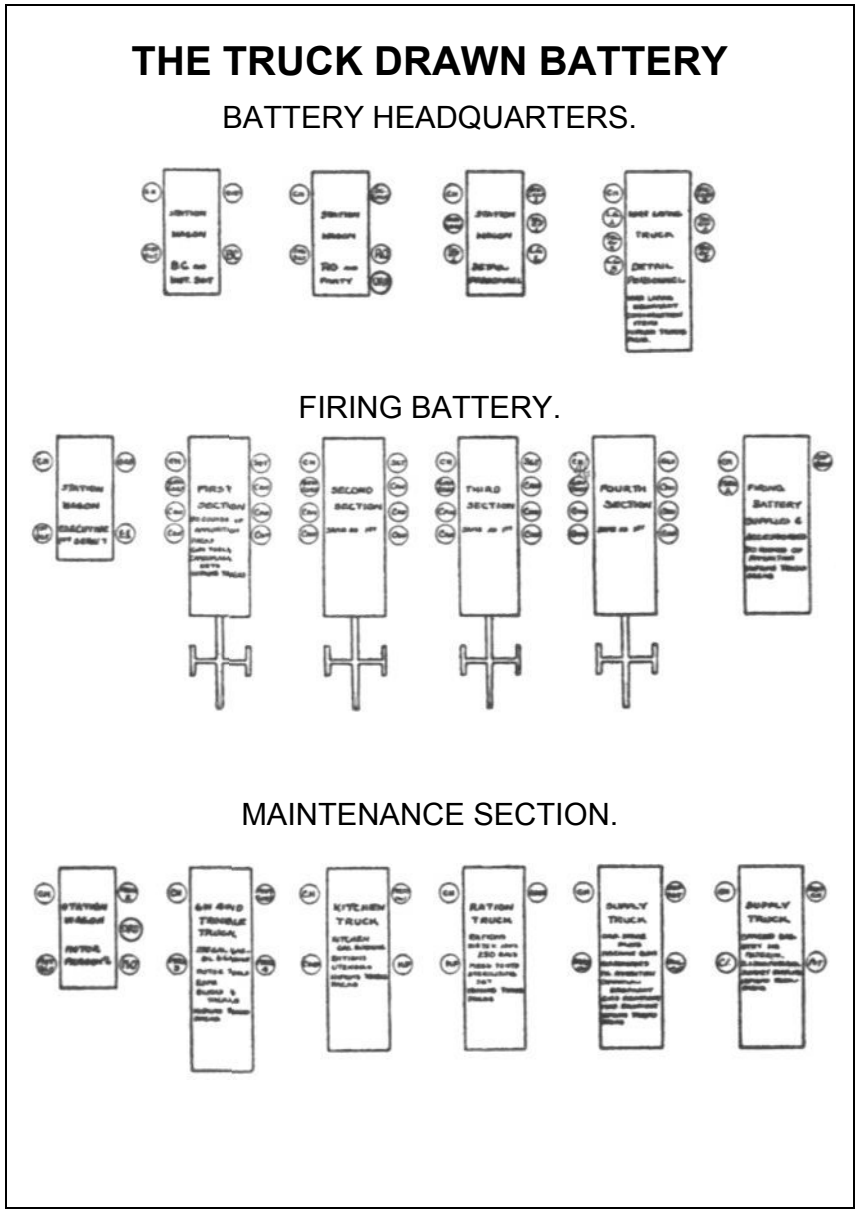

THE TRUCK DRAWN BATTERY
BATTERY HEADQUARTERS.
FIRING BATTERY.
MAINTENANCE SECTION.

FIGURE 2

although civilian organizations are daily trucking more than three tons in like vehicles with no apparent difficulty or increased mechanical depreciation.

The trucks are furnished with closed cabs and heavy duty express bodies, on 131-inch wheel base chassis. Dual rear wheels, carrying 6×20 six-ply tires, afford extra floatation and power and provide for the attachment of the Hipkins Tracks.

Each truck is equipped with artillery type pintles and tow hooks. Two spare wheels with spare tires and tubes are carried in fender wells on each vehicle. Other modifications include tool racks and track boxes, which are installed under the body of the truck. Brush guards, attached to the front horn of the frame are installed to afford protection to the radiator, the lamps, and the front end in general.

Five of the standard trucks are equipped with Warford transmissions. These vehicles will be available as prime movers in the firing battery and for laying wire.

NO TRAILERS

Apparently no four wheeled trailer of the draw-bar type has any permanence on the highways of today despite the many "antiwhip" developments. However, in the truck-drawn battery we are committed to the towing of the four guns, as trailers. No other trailed load is contemplated. The kitchen trailer is eliminated by the use of a kitchen unit which may readily be entrucked and detrucked at will. The battery water trailer is eliminated by the use of an entrucked oval tank, mounted on a frame which, in turn, is mounted on swivel rollers. This tank has a capacity of approximately 130 gallons, has a filling pump and hose and is transported in the ration and water truck in the maintenance section.

THE GUNS

Since the wheels and wheel bearings of the 75mm gun carriage, M. 1897, do not permit high speed transport, the original plans contemplated the use of pneumatic tire bogies for the tow-transport of the guns. Since that time General Bishop has eliminated the bogie as a method of transport in the Field Artillery on the

grounds that it is an unnecessary, extra vehicle. The Ordnance Department has, therefore, for the test of the truck-drawn battery, following ideas originating in the office of the Chief of Field Artillery, developed a modification which, when applied to the present 75mm gun carriage MIAI (French), provides high speed bearings and pneumatic motor-car wheels, in lieu of the service wheels. See frontispiece and page 263.

In this construction, the service wheels are removed and auxiliary axles are slipped over the spindles of the service axles. The auxiliary axles are free to rotate on the spindles when the piece is traversed, although the movement is small; the rotation is controlled by radius rods, one end of the rod being attached to the trail and the other end to the auxiliary axle, eight inches below the center of rotation. The auxiliary axle is retained on the service axle by means of a collar, a key, a screw, and a lock washer. As the radius rods interfere with the present service seats, new seats are provided. A handspike is furnished, attached to the trail. The auxiliary axles carry commercial steel wheels with roller bearings and 7.5×24 inch balloon tires. The brake system has been removed.

To take the firing strains from the balloon tires, steel wheel segments are provided which revolve on bearings on the auxiliary axles. When in firing position the steel segments are used; when the battery is to be moved out of position the steel segments are locked in position to permit the carriage to run on its balloon tires.

The observations made of the action of these carriages on the trip from Rock Island Arsenal to the Holabird Depot indicate that this type of carriage is an excellent road vehicle both as to ease of pulling and in tracking ability. The maintenance of the carriage is simple; greasing is not required oftener than every 1,000 miles. The carriage can be manhandled on hard roads by two men as far as limbering and unlimbering movement is concerned.

The cost of these modifications is small.

PERSONNEL

The truck drawn battery was not organized to be a de luxe organization, either from the standpoint of numbers of vehicles or

from the standpoint of the numbers of its men. It was organized to provide a minimum number of vehicles and the smallest number of men with which the battery could possibly operate as an efficient organization of Field Artillery.

A "TROUBLE" VEHICLE

Any such motorization project in the past has included at least one crawler type tractor in its list of vehicles for the rescue of mired wheeled vehicles. During the tests of the truck drawn battery at Fort Bragg a Caterpillar "10" tractor will be available in the advent a decision is made to include this vehicle in the materiel of the battery. Such a tractor will weigh about 4,300 pounds and will either require a special trailer or the assignment of a medium sized truck for its portée transport; both these methods of transport are not now favorably considered for motorization projects of our Arm. The writer believes that ingenuity on the part of the personnel of a truck drawn battery will equal one tractor and release the unit from the incubus of "toting" this vehicle about in anticipation of its possible use.

A "trouble shooter" for the battery has been provided by the assignment of a 6 wheel, 4-wheel drive truck. This vehicle is a standard 1½ ton Ford Truck which has been modified by the addition of a commercialized unit which supplies an additional driving axle and dual wheels. This vehicle is assigned the motor maintenance personnel of the battery and will operate as a repair truck in addition to its availability as a towing truck for mired vehicles.

THE STATION WAGONS

The five station wagons, which are assigned as indicated in Fig. 4 are provided for reconnaissance purposes or for the transportation of personnel not specifically allocated to the trucks.

The station wagon weighs but little more than a light coach or sedan and is built on the same chassis as a passenger car. It will go anywhere a light passenger vehicle will go, will transport a larger number of passengers, affords protection for field headquarters in inclement weather and at night, and, by the removal of the rear seats, it readily becomes a light truck. With the addition

of the new low-pressure tires, this vehicle is visualized as a light reconnaissance vehicle for all calibres of this arm.

The station wagons are all equipped with dome lights to afford sufficient light for map reading and other operations at night. In addition, the two vehicles assigned the battery detail are equipped with map tables and side and rear canvas flies.

ASSIGNMENT OF PERSONNEL

If we start with an organization which, under test proves to be too reduced in personnel or equipment, it will be a simple process to diagnose this condition and prescribe the necessary treatment. If the initial organization is padded at the start, practical reconstruction is impossible since it is a human trait, not limited to the military, to fight to the last ditch to retain property in hand, regardless of the fact that this extra equipment may be entirely useless.

The battery details of the last war now appear very small and inadequate when compared with the details of the horse-drawn batteries of today. We pause to wonder how we ever accomplished our missions in France without being surrounded by the present glee club which stalks the battery commander over hill and dale and then sits down on the highest point on the skyline. (The detail now tentatively assigned the Truck-Drawn battery may be further reduced.)

However, as we look back on our motorized organization studies of the past, we are confronted with the fact that there has never been a real opportunity to properly ascertain the strength and organization of a motorized battery's detail. In the first place, we have never had sufficient reconnaissance vehicles to conduct a proper test. Since practically all the changes made in the battery detail since the war have been to increase and specialize its members, with the advent of the truck-drawn battery there now appears an excellent opportunity to ascertain the smallest number of detail personnel which will be able to function efficiently in a motorized unit in the field.

In the gun squads, a gunner-corporal and five cannoneers are deemed sufficient for the service of the guns. Manhandling the guns has been greatly simplified by the advent of the new carriage modification.

As proposed by contemporary students of the subject, two permanent kitchen police are assigned the kitchen, an orderly is assigned each officer, and a tailor and a barber, who are expected to function, normally, as assistants to the supply sergeant, appear in the maintenance section. Since the pilot battery has been organized to function as a separate unit, the battery agent has been omitted and a battery clerk added.

Just what the battery's ultimate war strength and organization will be, cannot be visualized at this time. It is likewise impossible to ascertain, until a thorough test has been made, what its peace strength and organization should be. At present it is organized as a purely experimental peace time unit. In time of war, such an unit would require additions both in vehicles and personnel to be able to fulfill its normal missions and functions.

With the test of the truck-drawn battery occupying the center of interest in Field Artillery developments at present, summaries and predictions are running rampant. Judging by expressed opinions, the Arm contains almost an equal number of "Antis" and "Pros."

Whatever the outcome may be, the test of this battery will be interesting and instructive. If it is proven that truck-drawn light artillery is impracticable, we will at least be able to lay that idea on the shelf while we search further afield in the lists of motor developments.

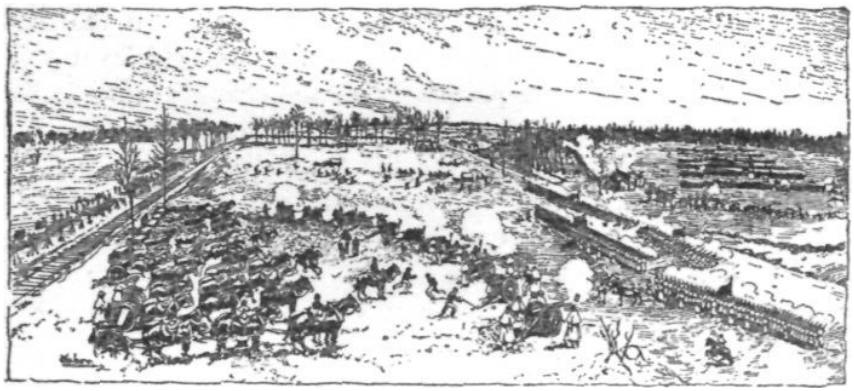
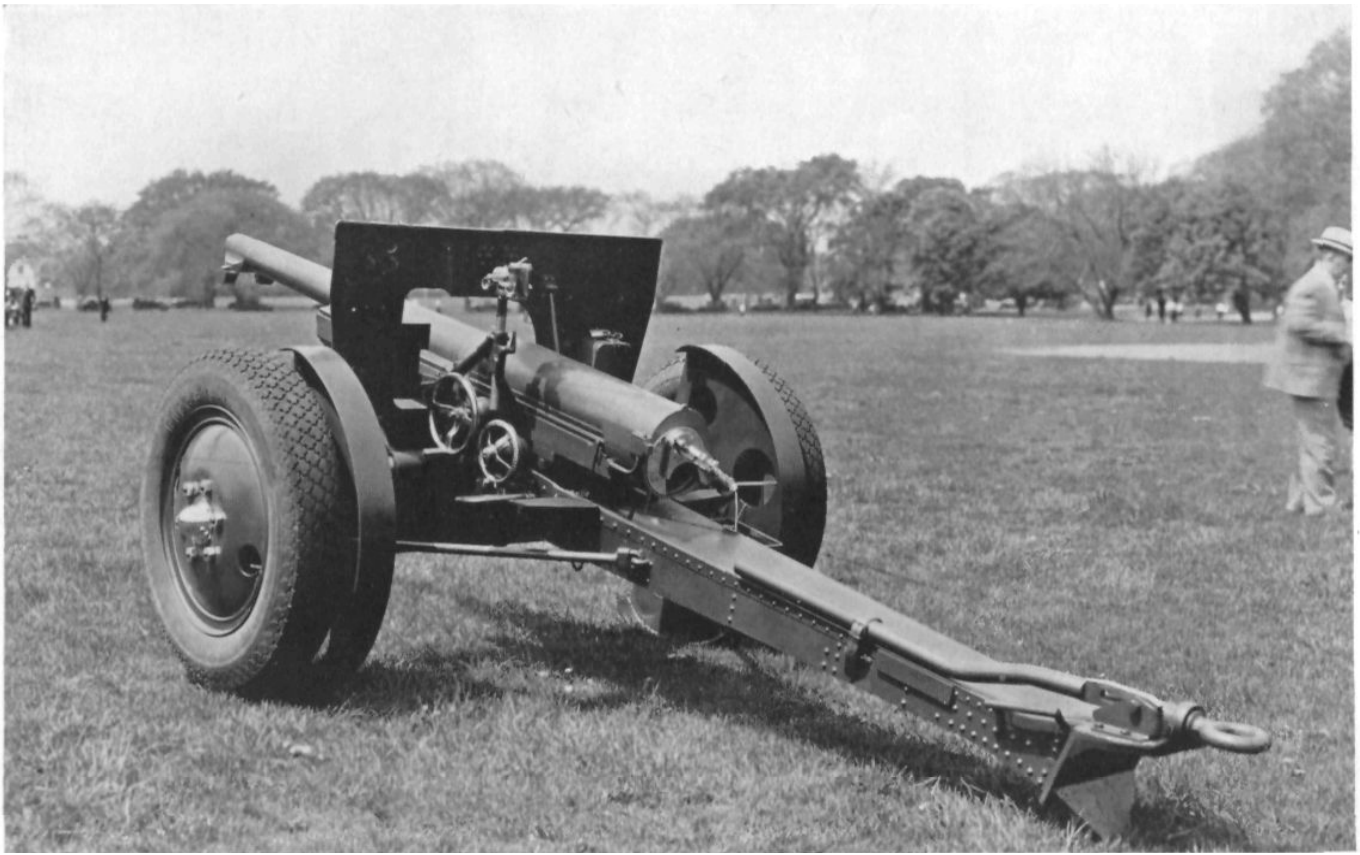


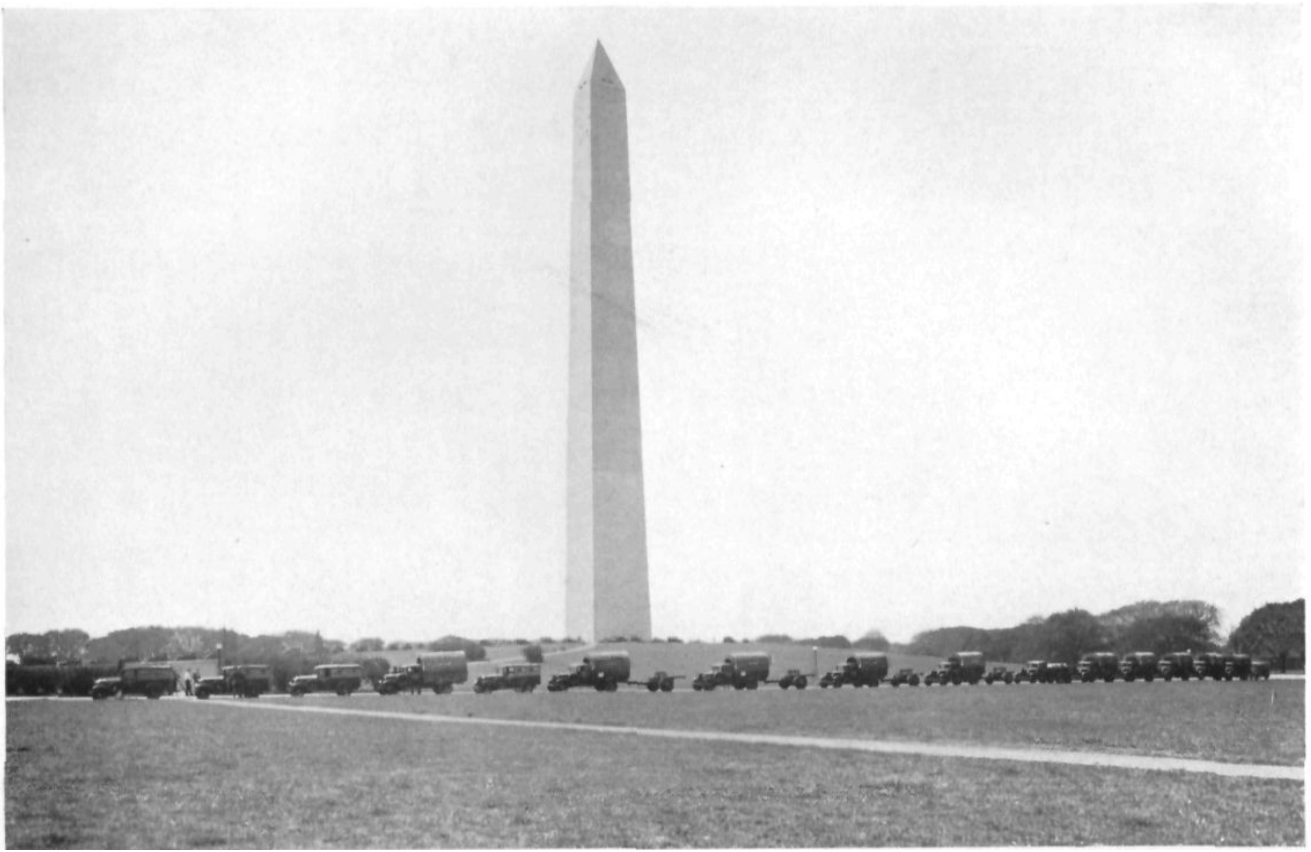
FIGURE 3.—DYNOMOMETER TEST OF A FORD TRUCK WITH SUB-TRANSMISSION AND HIPKINS TRACKS. TOTAL WEIGHT OF GUN AND DYNOMETER, APPROXIMATELY 30,000 POUNDS

FIGURE 4.—THE PILOT MODEL TRUCK AND THE FORT SILL BOGIE. THIS TYPE OF BODY HAS BEEN REPLACED BY AN ALL METAL BODY, AND THE BOGIE ELIMINATED IN THE TRUCK DRAWN BATTERY

FIGURE 5.—PILOT MODELS OF Q. M. C. DEVELOPMENT PROGRAM VEHICLES UPPER LEFT: GROUP I. Q. M. C. 4-WHEEL, 4-WHEEL-DRIVE 1½-TON TRUCK PULLING 75MM GUN. UPPER RIGHT: GROUP III. Q. M. C. 4-WHEEL, 4-WHEEL-DRIVE 3 TO 4-TON TRUCK PULLING 155MM HOWITZER. LOWERS GROUP V. Q. M. C. 6-WHEEL, 6-WHEEL-DRIVE, 10-TON TRUCK PULLING 155MM GUN



THE 75MM GUN CARRIAGE AS MODIFIED FOR USE WITH THE TRUCK DRAWN BATTERY (SEE PAGE 257)



THE TRUCK DRAWN BATTERY PASSING THROUGH WASHINGTON EN ROUTE TO FORT BRAGG, N. C., FROM HOLABIRD DEPOT, MD.

FRENCH ARTILLERY DOCTRINE

(The following is a digest by Major John S. Wood, F. A., of the course in artillery given at the Ecole de Guerre under the direction of Colonel de la Porte du Theil. Major Wood was a student there in 1929-1931.—EDITOR.)

SECTION I—ARTILLERY FIRE

BY MEANS of his artillery a commander, even of the highest grade, is able to intervene immediately and forcibly in battle with powerful concentrations of fire over extensive and deep zones of action.

EFFECTS OF FIRE

The effects of fire are of two sorts: material and moral, whence the distinction between fire for destruction and fire for neutralization. The artilleryman, however, attaches no great importance to this distinction. He knows that the effectiveness of neutralization depends on the actual losses produced by his fire and by the constant threat of such losses. Hence, on the battlefield, he seeks to place his projectiles on his objective. He relies only on adjusted and precise fire.

ZONE FIRE

The real objective of the artillery is man. Material targets are attacked only for the purpose of opening a way to the infantryman, who goes forward seeking the enemy wherever he may be. But, to reach mobile targets, their zone of immediate movement must be covered by fire. Hence, fire against personnel must be zone fire, a term too often interpreted as implying lack of precision in comparison with destruction fire.

The two types of fire are different, but each requires exactness of preparation. In destruction fire, the purpose is to place one projectile on a target of generally small dimensions. In zone fire, the object is to secure a uniform distribution of projectiles over a zone whose dimensions are often great but always definitely limited.

Zone fire is effective only when sufficient density is obtained within a certain time; hence, the employment of artillery in mass action.

EFFECTS OF MASS

Military history abounds in examples of the timely and successful use of artillery in mass. Prior to the introduction of the modern rapid fire field piece, the feeble effect of projectiles and

the slowness of fire necessitated a massing of batteries and of fire, as at Wagram and Friedland.

Under modern conditions, the problem has changed. Mass action is still necessary, but for other reasons.

To escape fire, infantry has dispersed and disappeared from view on the modern battlefield. The artilleryman knows only that the enemy occupies a certain wide and deep zone, which must be covered with the deadly bursts of many projectiles. Thus is imposed the notion of surface which today requires, even with the rapid fire gun, the employment of artillery in mass.

The post-war regulations express this idea as follows:

> "To maneuver artillery fire is to combine and coordinate the action of different units for the attack of the various objectives assigned by the higher command.
>
> "Maximum effect will be attained usually by attacking the objectives with sudden, and powerful concentrations of fire."

The term *concentration* is often loosely used. Properly construed, however, it is simply an expression of the following ideas:

Against personnel, artillery fire is effective, in general, only for a very short time.

Even if the effectiveness can be prolonged, the resultant losses do not produce as great moral effect as those suddenly incurred.

As the output of a single piece or battery is limited, it is usually necessary to converge the fire of several batteries on the same objective in order to obtain a sufficient number of projectiles in the required time.

Fire which converges from different directions on a single objective is difficult to avoid by maneuver, hence its demoralizing effect is great.

All the above is a matter of tactical command. The firing units, individually, execute each mission with the maximum precision possible, just as if each were the only one firing.

To command artillery is to maneuver its fire.

Maneuver of fire is the main essential in the tactical employment of artillery. Therefore, the *organization of command* and the *maneuver of materiel and munitions* must be considered in relation to maneuver of fire.

SECTION II—THE ORGANIZATION OF COMMAND

Powerful mass action of artillery requires centralization of command. But power is not the sole consideration. Prompt response to calls for fire is also essential. A proper organization must provide a just equilibrium between these often conflicting requirements.

At first glance, the solution would appear to be to give to each echelon of command the artillery corresponding to its assigned role in combat. Within limits, this is possible. However, there is never a sufficient amount of artillery available to set aside a distinct portion for each role, nor can the various cannon be too strictly specialized in their tasks. Many are capable of handling more than one type of mission.

We must organize the artillery command according to the missions assigned the artillery in combat. The principal ones are:

Destruction of obstacles which impede the infantry advance.
Direct support and protection of the infantry maneuver.
Counter-battery.
Fire against enemy communications.

Since the first two missions require close cooperation with the infantry, it is customary to assign them to the division artillery. The third is carried out over wide fronts to a considerable depth and is normally assigned to a different command: the corps artillery. The fourth mission may concern either the divisions, corps or army, depending on the range of the objective, and is split up among the artilleries accordingly.

Such specialization, however, must not be too rigid. At times, the concentration of all available artillery on a single objective may be necessary. Nor is the same solution arrived at in all armies: the Germans handle nearly all artillery missions by means of divisional artillery, counter-battery missions in particular.

But why stop at the division? Why not distribute the artillery, like tanks, among the infantry regiments so that each colonel would dispose independently of the guns which support him?

The answer is that the action of one regiment is not an isolated affair. The possibilities of fire of the supporting artillery are too great to be limited to a single regimental zone of action. The division commander must always be able to adapt his maneuver to unexpected developments of combat. He cannot act at once with

a powerful part of his reserve—the artillery—if he has parcelled it out among the infantry colonels to be utilized as they see fit. *Unity of control of the artillery is the main factor in securing unity in combat*.

Nevertheless, it is necessary at times to place the fire of sufficient artillery at the direct disposal of infantry commanders; whence a certain indispensable breaking up of division artillery.

Granting this, another question arises. If the division is the true combat unit of the combined arms, why not distribute all the artillery among the divisions, maintaining the corps artillery only for the purpose of being able to vary the allotment according to circumstances? In other words, why have an echelon of artillery command in the corps? Such was the doctrine prior to 1914.

Everyone realizes that the artillery of a modern corps must fully utilize its possibilities of engaging the enemy at long range and of acting powerfully against enemy artillery. The organization of a special artillery staff to handle these missions evidently simplifies the task of divisional artillery commanders, who can then concern themselves more completely with their difficult mission of adapting their fire to the needs of the infantry. But this is not the main reason for a corps artillery command.

The artillery by means of its power and its stability constitutes the framework of combat from beginning to end. It is the *mass of maneuver* with which a commander may force his plan into effect in spite of enemy opposition. It is the artillery that is first engaged at critical moments to counter an enemy menace, at least until the reserve troops can intervene. The artillery is an *ideal reserve*, since it may be utilized in its entirety without being expended. Finally, it is the essential instrument for distant combat.

To fulfill its role, the corps artillery must be able to concentrate its fire at will in support of the main effort and, also, to maintain continuity of action, particularly during displacement or relief of the division artilleries. This means centralized control of all its missions—the task of the corps artillery commander.

The same reasons apply when the army is considered, although to a lesser degree, due to the great extent of front covered.

Thus we have in each large unit a single chief who is responsible for the appropriate maneuver of artillery fire. Similarly, with each infantry regiment engaged we have the commander of

the artillery which acts in direct support of the infantry maneuver.

The various types of missions, however, are not to be considered as pertaining solely to one or another echelon of command; for example, division artillery may sometimes be charged with counter-battery missions. *The one indispensable requirement is that each artillery command be assigned definite missions and that it be given the means to fulfill them*.

NORMAL ZONES

The organization of command outlined above assures proper artillery action in any preconceived plan of fire. But the best of plans "gang aft agley" in combat, and the artillery must be able to adapt its fire to a changing situation without waiting for orders from higher authority. It must keep in close touch with the combat by its own observation and laison. It must be given the initiative to act rapidly against unexpected targets. Hence we have the idea of *normal zones* of action within which an artillery commander is charged with the execution of fire missions on his own immediate responsibility and initiative.

The organization of our artillery command is based, then, on the following factors:

The general plan of fire, whence the *missions* assigned;

The chief who receives one or several of these missions;

The means at his disposal;

A normal zone for each commander.

ARTILLERY GROUPMENTS

The large quantity of artillery engaged often necessitates dividing it into groupments to facilitate command.

A *groupment* is composed of various battalions or batteries placed under the same command for the execution of a *common mission* in the *same normal zone*.

The groupment commander has not only a tactical but a technical role of great importance in the direction of the topographical operations, observation, signal communications and fire control among his units.

DECISIONS AND ORDERS

The commander of a large unit is responsible for the following decisions regarding his artillery:

The general plan for maneuver of fire.

The initiative to be left to subordinate commanders, the ammunition to be expended, the terrain to be covered.

The distribution of his artillery to his subordinates, according to the missions assigned them.

The coordination and priority of artillery effort in handling the various simultaneous missions which develop.

The plan for the employment of his artillery is a measure of the vigor of a commander's tactical conceptions. The handling of it in action is an indication of his will and activity in combat.

In these plans and in action, the artillery commander participates both as technical adviser and as tactical commander. But he makes no decisions, except those regarding the measures of execution. He submits his propositions regarding the employment of the artillery in the general action. These are usually written and in such form that they may be incorporated in whole or in part in the field orders of the higher commander. They comprise:

The plan of fire.

The organization of groupments and the assignment of zones.

Development and displacement.

Ammunition expenditure and supply.

The various technical arrangements (observation, communications, etc.).

DIVISION ARTILLERY

The division artillery commander exercises command of all the organic or attached artillery placed by the corps commander at the disposal of the division. In accordance with the decision of the division commander, he constitutes his artillery into groupments in *direct support* and in *general support* and distributes his missions among them.

The groupments in direct support, in the general proportion of one to each infantry regiment engaged, furnish the close support demanded by the infantry colonels.

The groupments in general support are reserved by the division commander for his own use in promptly extending or reinforcing the action of the direct support artillery.

CORPS ARTILLERY

The corps artillery comprises a headquarters and the organic

corps artillery units, and such reinforcing units from the general reserve as the corps commander decides not to attach to his divisions. The headquarters consists of the colonel commanding the organic heavy artillery of the corps and his staff. The whole is placed under the direct orders of a general officer who is the corps chief of artillery.

The roles of these commanders are not always understood. The colonel commanding the heavy artillery occupies a position analogous to that of a division artillery commander, directing a certain number of groupments in combat. The corps chief of artillery directs the maneuver of fire of all the artillery of the corps, whereas the commander of the heavy artillery directs only a part—generally the long range attack—under the orders of the corps chief of artillery.

The corps artillery is organized for combat into groupments of variable strength, depending on the enemy artillery to be attacked. Furthermore these groupments are usually organized so as to be able to assist the divisions by using the fire of certain corps groupments to extend or reinforce the fire of nearby division artilleries with which they are in direct communication. The corps artillery groupments may assist the division artillery with which they are associated either through the intervention of the corps commander or on their own initiative.

These corps artillery groupments, however, are not in any sense placed under the orders of the division artillery commanders with whom they are associated. They simply arrange for cooperation with one or more of the division artilleries. The same remark applies to groupments of army artillery when adapted to the corps. Groupments not adapted are placed in general support by the corps commander.

(*To be continued*)

TYPE PROBLEMS

Lateral, Precision, Large T

Target Description: Gun emplacement. *Mission*: To destroy. *Type*: Precision, Lateral large T. *Matériel*: French 75mm, Model 1897. *Ammunition*: Shell Mark I, Fuze short. *Visibility*: Excellent. *Wind direction*: Left to right. *Initial deflection obtained*: Estimated. OP on the left.

T=600, R=5,000, r=4,000, c=6.4, d=60/4=15, s=60/5=12, c/d=.4, c/s=.5. Initial commands:

No. 1 adjust
Base Deflection right 230
Shell Mk. I, fuze short
No. 1, 1 round
Quadrant

Commands	Elev.	Rd. No.	Dev.	Sensings Rn.	Sensings Def.	Remarks
	185	1	120 L	?	?	120×c/d=48 185–48=137 (or 135)
	135	2	5 left	?	?	5×c/d=2 135–2=133
	133	3	Line	–	–	R 120 calls for 120× c/s=120×.5=60
R 120	193	4	15 L	?	?	Factor c/s proved to be too large. 15×c/d=6 193–6=187
	187	5	3 R	+	+	On line at 188. Split deflection bracket. 188–133=55 2 2 27 or 28. 188–28=160 Student fired at 162; note result.
L 60	162	6	5 L	?	+	On line at: c/d×5=2 162–2=160. Split deflection and range 133 to 160= 27/2=14. 133+14= 147. Student fired at 149.
L 30	149	7	1 L	–	–	Split again.
R 15	154	8	L	–	–	160–149=12/2=6 148–6=154
R 8	161	9	3 L	+	?	Fork is 6
3 R	158	10	3 L	–	?	
		11	2 R	+	?	
		12	3 L	+	?	
	158	13	L	–	–	
		14	3 R	–	?	
		15	2 R	–	?	
L 4	158	Cease Firing, end of problem.				

Summary: Errors in initial data: Deflection 109 mils; Range 17%. Classification: Satisfactory. General comments: Errors in initial data were excessive. Adjustment handled very well except for slight errors in splitting elevation brackets. Attention is called to the fact that deflection is the controlling factor in large T until a 16 mil bracket is obtained.

Lateral, Precision, Large T

Target Description: Gun emplacement. *Mission*: To destroy. *Type*: Precision, Lateral (Large T). *Matériel*: French 75mm gun, Model 1897. *Ammunition*: Shell Mk. I, fuze short. *Visibility*: Excellent. *Initial data obtained*: Plotted. OP on the left.

T=470, R=4,600, r=4,000, c=5.9, S=10.8, d=11.4, c/d=.5, c/s=.5.

Initial commands:

No. 1 Adjust
Base deflection right 150
Shell Mk. I, fuze short
No. 1, 1 round
Quadrant

Commands	Elev.	Rd. No.	Dev.	Sensings Rn.	Sensings Def.	Remarks
	160	1	7 Right	?	+	7×.5=3.5 or 4. On line at 164 BC believed deflection was close so he shifted 30 mils.
L 30	149	2	6 Right	?	+	Another sensing of deflection on drift of smoke. Shift of left 30 proved to be too small. 6×.5=3. On the line at 152 Bracket (shots on line): Deflection 30 mils, elevation 12 mils: i. e., for a change of 30 mils. in deflection he had to make 12 mils. change in range from line to line shot.
L 30	140	3	10 Left	–	–	Sensed on terrain. 10×.5=5. On line at 135. Bracket: Deflection, 30 mils; elevation, 17 mils.
R 15	144	4	Line	–	–	
R 8	150	5	5 Left	+	–	Fork taken as 6 mils. BC desired to obtain a one fork range bracket.
R 4 3 rds.	147	6		–	–	
		7		+	+	
		8		–	?	147+(4/12 of 6)=149
	147	9		–	?	
		10		–	?	
		11		–	?	
6 rds.	149	Cease Firing, end of problem.				

Summary: Errors in initial data: Deflection, 33 mils; range, 190 yards or 4.3%. Ammunition expended, 11 rounds. Classification: Satisfactory. General comments: The officer firing this problem saved several rounds by his ability to make terrain sensings and by taking advantage of the drift of the smoke. Attention is called, reference changing the factor c/s, to par. 85 g. and to par. 86-5 b. 430-85. Had the officer not changed his factor c/s and continued to use his original factor, i. e., 15 mils elevation for 30 mils. deflection shift, he would have obtained the same result.

Lateral, Percussion Bracket, Large T

Target Description: 37mm gun firing from vicinity of point of trees. *Mission*: To neutralize. *Type*: Percussion Bracket Lateral, Large T. *Matériel*: French 75mm gun, Model 1897. *Ammunition*: Shell Mk. I, fuze long. *Visibility*: Very good. *Wind direction*: Left to right. *Initial data obtained*: Deflection, shift without instruments, range estimated. OP on the left of the gun target line.

T=400, R=3,000, r=2,600, S=13, d=15.

Initial commands:
Battery adjust
Base Deflection, left 190
Site +5
Shell Mk. I, fuze long
No. 1, 1 rd.
Without quadrant

Remarks
Previous fire had been with No. 4 adjusting on a target for destruction, using quadrant.

Commands	Range	Rd. No.	Deviations as observed at OP but not announced	Sensings Rn.	Sensings Def.	Remarks
	3000	1	30 Left	+	+	Sensed on terrain.
Left 100	2200	2	25 Left	?	?	Failed to make range change from point on line at 2800. 100/13=800 yards.
	2000	3	5 Right	–	–	25/15=200 yards 2200–200=2000.
Right 50	2400	4	6 Left	+	+	
Left 25 Btry. Rt.	2200	5	Line	+		Deflection sensed as correct on terrain by instructor. B. C. sensed deflection over for sheaf as a whole on the line over obtained from No. 1.
		6	10 Left	+	Over	
		7	20 Left	+		
		8	20 Left	?		
Left 13 On No. 2 Open 6 Btry. 1 rd.	2100					

Summary: Errors in initial data: Deflection 75 mils. R; Range + 900 yards or 43%. Time from identification of target to announcement of first range, 1 min. 20 seconds. Average sensings and commands, 16.2 seconds. Total time of problem, 4 min. 19 secs. Ammunition expended, 8 rounds. Classification: Satisfactory. General comments: Two main errors were committed in this problem resulting in only partially effective fire and some waste of time and ammunition. First, the battery commander used a flank gun with which to adjust and failed to take that into consideration when going to effect. Second, round 2 should have been fired at 2000. Round 1 would theoretically have been a line over had it been fired at 3000—30/15 or 2800. Therefore, the range should have been changed 100/13 or 800 yds. from 2800 to stay on the line for a change in deflection of 100 mils.

Lateral, Percussion Bracket, Large T

Target Description: Enemy machine guns in vicinity of a terrain feature. *Mission*: To neutralize. *Type*: Percussion Bracket Lateral, Large T. *Matériel*: French 75mm gun, Model 1897. *Ammunition*: Shell Mk. I, fuze long. *Visibility*: Excellent. *Wind Direction:* Right to left. *Initial data obtained*: Deflection and range, rapid plotting using range finder ranges. OP on the left of the gun target line.

T=440, R=2800, r=2400, S=16, d=18.

Initial commands:
Base deflection, right 140
Site +5
Shell Mk. I, fuze long
No. 2, 1 rd.

Commands	Range	Rd. No.	Deviations as observed from OP but not announced	Sensings Rn.	Sensings Def.	Remarks
	2800	1	35 Right	?	?	35/18=2 or 200 yds. range change to get on line.
	3000	2	5 Left	+	+	
Left 50	2700	3	Line	–	–	50/16=3 or 300 yds. range change to stay on line. Could have brought in btry. at this range.
Right 25 Btry. left	2800	4	20 Right	–		
		5	10 Right	–	Short	
		6	7 Left	?		
		7	5 Left	?		
Right 13 On No. 2 Open 4 Btry. 1 rd.	2900	8	5 Right	–		Did not use zone fire until more accurate information was obtained regarding deflection.
		9	8 Left	+	Correct	
		10	Line	–		
		11	15 Left	?		
Zone 3000	2800					

Summary: Errors in initial data: Deflection, 12 mils.; Range, 100 yards or 3.4%. Time from identification of target to announcement of first range, 1 min. 28 secs. Average sensing and commands, 8.8 seconds. Total time of problem, 3 minutes 41 seconds. Ammunition expended, 11 rounds. Classification: Satisfactory. General Comments: an excellent problem.

THE R. O. T. C. AT V. M. I.

BY CADET E. R. TRAPNELL, 1ST CLASS

AN institution rich in tradition and renown for discipline, with a military history surpassed only by West Point, the Virginia Military Institute at Lexington, is an ideal establishment for a thorough R. O. T. C. course. A full description of the Field Artillery unit here would incur too much detail, but a brief sketch of the V. M. I. will serve to make clear the very favorable conditions under which the Cavalry, the Infantry, and the Field Artillery carry out their respective training programs.

The Virginia Military Institute was established in 1839 and through ninety years of conspicuous service has earned the sobriquet of the "West Point of the South." Its graduates have served almost en masse in every major conflict in which the United States has engaged since the founding of the school. During the Civil War many of the cadets withdrew from the Institute in order to serve in the field. Those who remained were used in the training program, and in May, 1864, the entire Corps of Cadets fought as a unit at the Battle of New Market, gaining for itself immortal fame in an heroic charge in face of heavy fire.

Over 2,000 V. M. I. men took part in the World War in the Army, Navy, and Marine Corps of the United States, aside from officers in the British, French, and Chinese armies. Of this number 1,200 were commissioned officers, over eighty per cent of whom engaged in actual combat. More than eighty-two per cent of the V. M. I. men between the ages of 17 and 40 were in the service. Casualties totalled 200 and decorations for bravery 108. The list of commissioned personnel follows:

5	Brigadier Generals.
45	Colonels.
47	Lieutenant Colonels.
144	Majors.
319	Captains.
318	First Lieutenants.
320	Second Lieutenants.

In 1917 V. M. I. was selected by the War Department as a Junior Training Camp and in 1918 the battalion was organized as a Students' Army Training Corps, being the only college in the country which the War Department deemed capable of keeping its military standards up to the highest point of efficiency without the aid of additional tactical officers. At the Institute was established

the largest collegiate Marine unit in the country, and here eighteen hundred men were turned out for the nation's emergency.

Since the war the growth of the Institute has been rapid. In 1924 Major-General William H. Cocke succeeded Major-General Edward West Nichols as Superintendent and continued as such until 1929, when Major-General John Archer Lejeune, retired head of the United States Marine Corps, became the Institute's fifth Commanding Officer.

Although the R. O. T. C. is comparatively a new part of the army's training program, its work was no innovation to V. M. I., nor did it cause any great change in the military department. The Institute has the only Field Artillery and Cavalry units in the Third Corps Area, and in order to concentrate on these branches, the Engineering unit was discontinued several years ago. The R. O. T. C. work is compulsory for all cadets; and as the position and history of V. M. I. demand a cadet corps of the highest efficiency and appearance, the R. O. T. C. activities have been superposed upon an already busy, as well as broad, military schedule.

The life in barracks is similar in many respects to that of West Point, and each day's schedule is carried out with strict adherence to correct military practice and to the best interests of high academic standards. The Cadet gray uniform is worn at all times with prescribed dress for all occasions. Quarters are inspected regularly and strictly. The year round program includes each week four daily drills of at least half an hour (an hour for mounted drill), five daily battalion or regimental parades, seven daily formal guard mountings and one inspection under arms. Once each month a battery of Field Artillery, a troop of Cavalry, and a battalion of Infantry are formed for a Garrison Review.

A full guard is maintained at all times and all duties allocated to guard personnel in the Regular Army are carried out here. The regulation of the guard duty is the strictest phase of the entire military administration, and the daily mounting of this guard is marked by a military precision and appearance that are the result of traditional excellence and practice.

There are at present eight Regular Army officers on duty here, four of whom are in the Field Artillery, two in the Cavalry, and two in the Infantry. Major R. S. Dodson, Field Artillery, is Professor of Military Science and Tactics and Commandant of

Cadets and is assisted by a number of the academic instructors who are V. M. I. graduates and Reserve officers as well as by the staff of Regular Army officers.

The regiment of something over seven hundred cadets is divided into two battalions of three companies each. The Second Battalion is composed of Field Artillery students only, each company forming a battery when not engaged in Infantry drill. The two Cavalry companies of the First Battalion are drilled in a similar manner, and the third company of the First Battalion is organized as a company of Infantry for training in that branch of the R. O. T. C. All companies are equipped for action as Infantry; Cadet commissioned officers, the highest of whom is a Captain and Regimental Commander, are taken from the First Class while sergeants and corporals are taken from the Second and Third Classes respectively.

There is equipment for a regiment of Infantry, also automatic rifles, light mortars and 37mm guns; a quota of about 70 cavalry horses and 80 artillery horses; ordnance of various kinds; two batteries of French 75's with caissons and limbers, forge limber, battery reel cart, artillery repair truck, and fire control instruments for both batteries, together with the necessary complement of tractors, cargo and ammunition trucks.

An enlisted detachment of 33 men, recruited locally, is maintained to care for the animals and property. Incidentally the conduct of this group of men is exemplary, and there are very few infringements of discipline.

The place of the R. O. T. C. in the administration of the military and academic departments of V. M. I. is shown by the following schedule reprinted from the catalogue of the Institute:

DESCRIPTION OF COURSES

Military Science 4a and 4b

2 hours in laboratory period a week, each term.

All Units are given infantry drill, practical and theoretical; rifle marksmanship; and such miscellaneous instruction as personal hygiene, sanitation, first aid, scouting and patrolling, company formations, and basic instruction in respective units.

Military Science 3a and 3b

2 hours in laboratory period a week, each term.

Cavalry Unit: Equitation and cavalry drill; selection and care of animals; map reading and military sketching; automatic rifle; pistol and rifle marksmanship; musketry; and combat principles.

Field Artillery Unit: Fundamentals of military service; gunnery; equitation and horsemanship; material; care of animals; field artillery signal communication;

pistol marksmanship; map reading; military sketching; and machine gun instruction.

Infantry Unit: Drill and command; map making and military sketching; infantry weapons; rifle marksmanship; scouting and patrolling; musketry; and pistol marksmanship.

Military Science 2a and 2b

2 hours in recitation period a week, each term.
2 hours in laboratory period a week, each term.

Cavalry Unit: Equitation and cavalry drill; selection and care of animals; field engineering; cavalry weapons; pistol and rifle marksmanship; cavalry communications; and combat principles.

Field Artillery Unit: Advanced gunnery; conduct of fire; functions of the battery detail; and the field artillery driver.

Infantry Unit: Command and leadership; field engineering; infantry weapons; military sketching and mapping; rifle marksmanship; and combat principles.

Military Science 1a and 1b

4 hours a week, in laboratory period, each term.

All Units: Leadership; military history and policy of the United States; military law and rules of land warfare; administration; and O. R. C. (Officers' Reserve Corps) regulations.

Cavalry Unit: Combat principles; equitation and cavalry drill; use of sabre, mounted; and practical packing.

Field Artillery Unit: Tactical employment of field artillery; organization and tactics; and administration.

Infantry Unit: Command and leadership; combat principles; infantry weapons; and pistol marksmanship.

Supplementing this instruction the cadets engage in drills, field exercises and ceremonies from four until five P. M. each day.

Each spring the Corps, organized as a battery of Field Artillery, a troop of Cavalry, and a battalion of Infantry, undertakes a practice march of from three to six days'duration, during which time the battery conducts service practice. The close affiliation of the three units naturally results in students being familiar with the work and practices of all three, but there is also a spirit existing in each unit which makes for a high morale as well as a high standard of work.

The same regulations regarding the period of training in summer camps for all R. O. T. C. students apply to V. M. I. as to other schools, and each year the entire Second Class leaves for the various posts immediately after the Finals exercises. Last summer about 65 Field Artillerymen trained at Fort Hoyle, Maryland; about 35 Cavalrymen at Fort Myer, Virginia; and about 25 Infantrymen at Fort George G. Meade, Maryland. The work of these three units received, as V. M. I. units have in the past, high tribute from the commanding and instructing officers of the various posts. The exacting regulations under which the cadets live during the school year make camp a respite and is reflected in the work of the men while at camp.

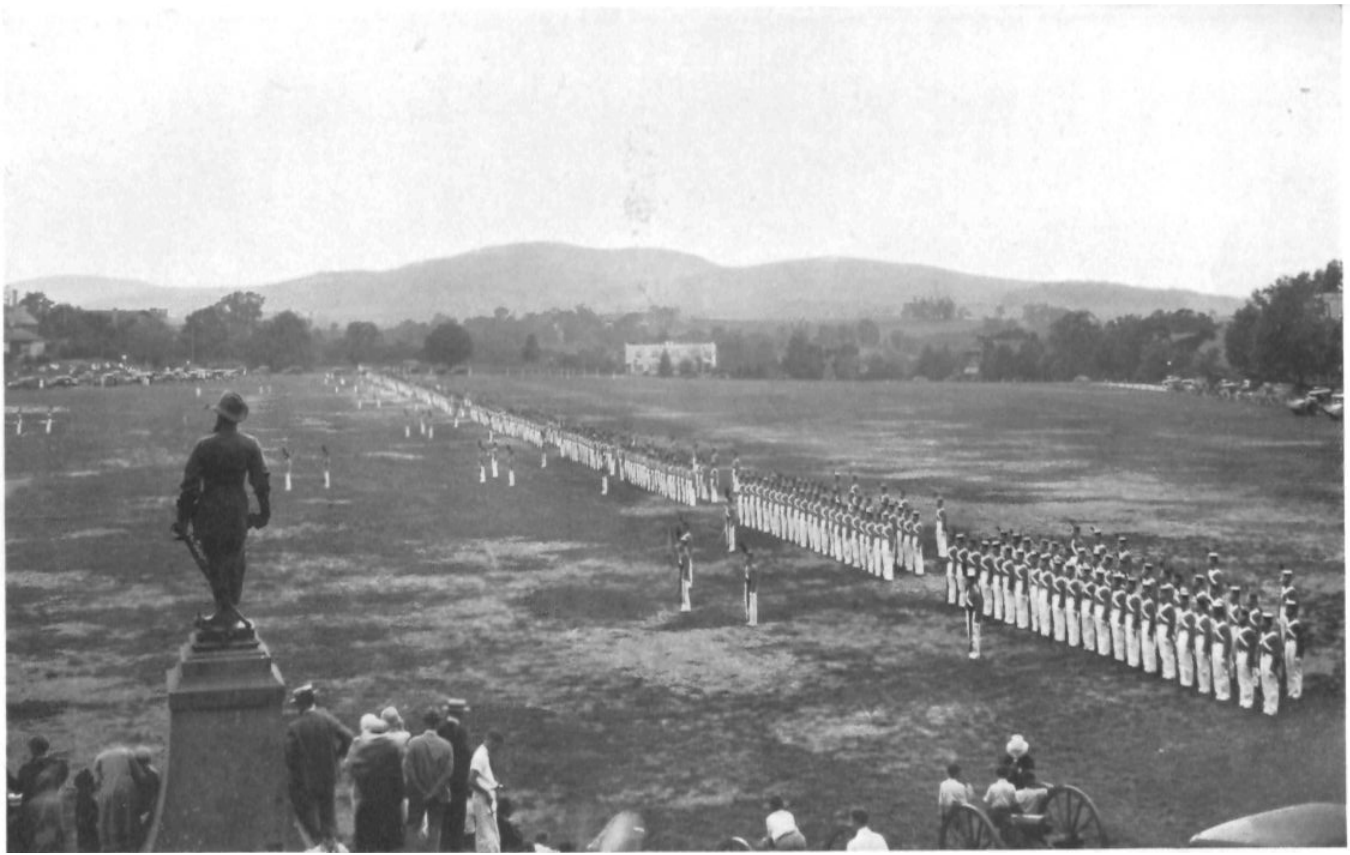
The report of all government inspection of the Institute during the last decade have given all branches of the R. O. T. C. an excellent rating. The following paragraphs taken from the inspecting officers' reports are indicative of the type of recommendations which the R. O. T. C. at V. M. I. receives:

"It is my opinion that this institution in fulfilling its R. O. T. C. mission has reached the highest standard possible under the limitation of applied hours."

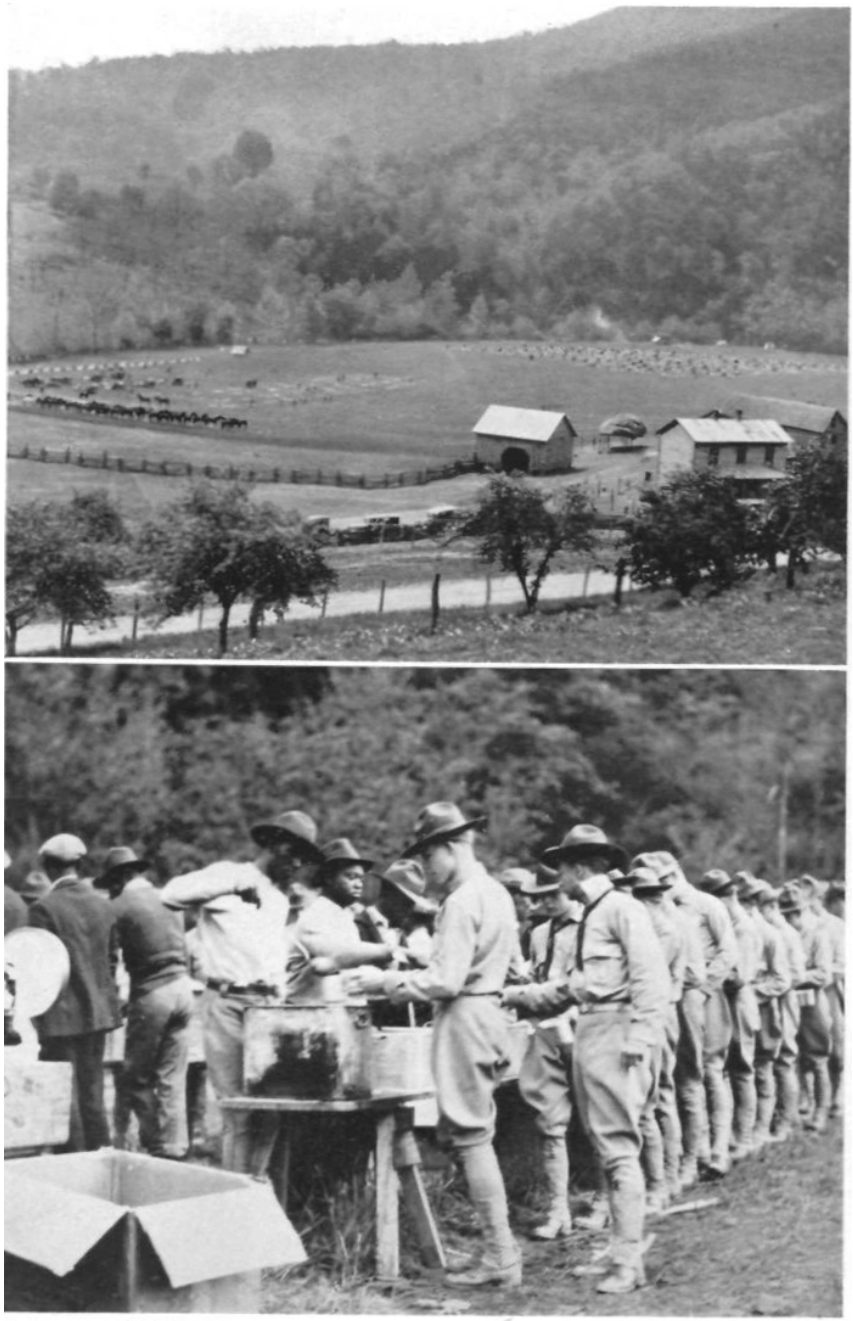
"The Virginia Military Institute is outstanding in its excellence as a reservoir for the procurement of officers both regular and reserve."

The efficient military organization of V. M. I. and the high place which the Corps has won as a military unit is due in no small measure to the type of officers who have been detailed here. It has been customary to detail as many V. M. I. men as possible to this work, and the results of such a policy are obvious. Those officers, however, who have not been graduates of V. M. I. have brought in new blood, as it were, that has been decidedly beneficial to the Institute.

The foundation of the entire system and all its accomplishments is the spirit that exists within the Corps. It is the pride in the name which their predecessors have won for them that keeps the V. M. I. Cadets ever striving for perfection.

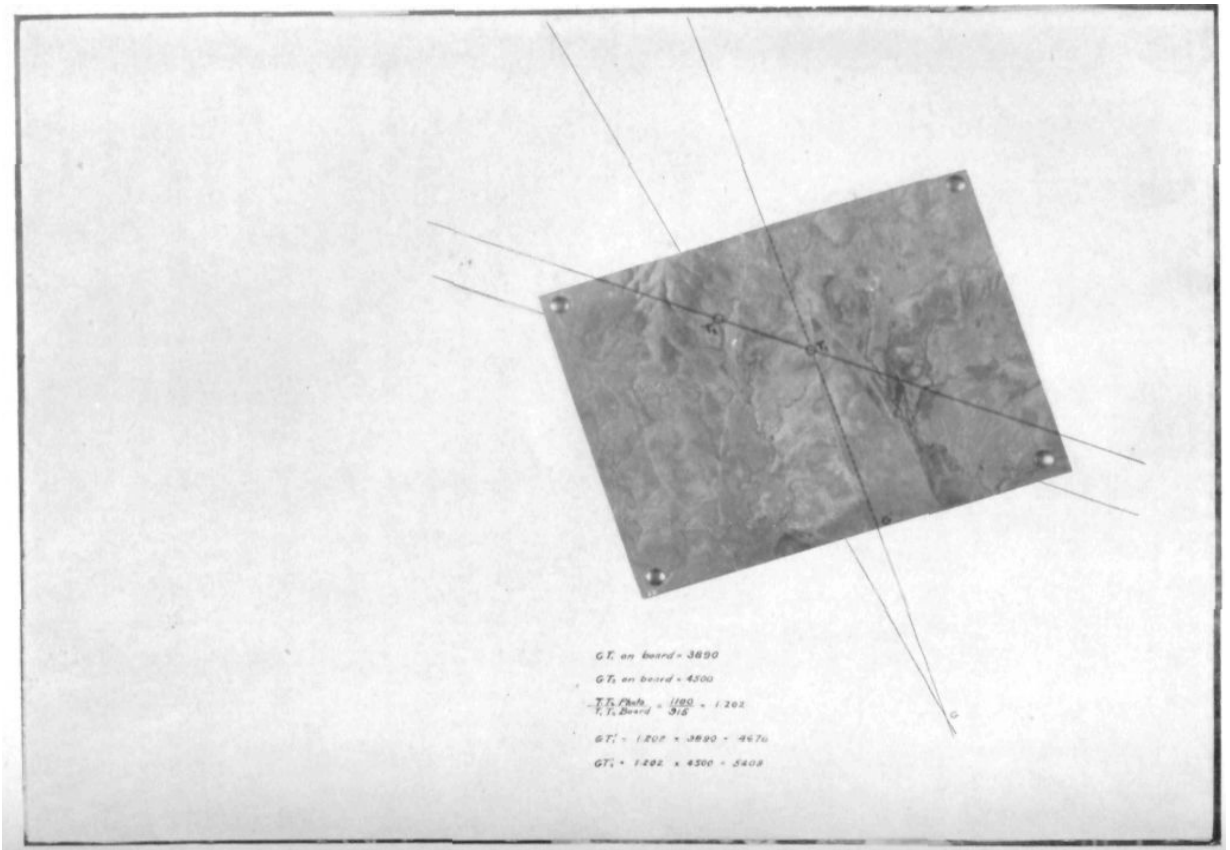


THE V. M. I. CORPS FORMED AS A REGIMENT OF INFANTRY FOR PARADE



SPRING CAMP SCENES AT ARTILLERY R. O. T. C. CAMP. V. M. I.

ARTILLERY FIRING AND MARCHING AT V. M. I.



THE PLANE TABLE WITH SINGLE PHOTO TACKED TO IT

A FIRING CHART MADE FROM A SINGLE AIR PHOTOGRAPH

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IT IS A FACT, emphasized in the World War and confirmed by post-war developments in tactics and material, that the greater part of Field Artillery fire is either entirely unobserved or controlled by air observers. The map, air photograph, and firing chart therefore assume increased importance, furnishing, as they do, the only convenient terrestrial method of controlling this fire.

In spite of our efforts at preparedness, common sense tells us that we cannot depend on an adequate supply of good fire control maps of any particular section in which we may be forced to operate. In addition, although a well prepared strip mosaic of air photographs is an admirable substitute for a map, it may not be immediately available due to the time and equipment required for laying and reproducing. Consequently, until we are supplied with fire control map or mosaic we are dependent upon a firing chart, made by ourselves, and supported by any maps, air photographs and other topographical information obtainable.

It is the purpose of this article to show that an accurate firing chart may be very quickly built up from a single vertical air photograph of the target area in question. Such a photograph, not quite 7×9 inches, includes an area three thousand by four thousand yards when taken at an altitude giving an approximate scale of 1/20,000. The scale itself, as we shall see, is not important except as it affects visibility of detail and area covered. The supply of such a photograph to batteries and battalions is a much simpler matter than is the case with a mosaic. It is a print, made from a single negative, involving no laying or reproducing process with its attendant necessary technical skill and loss of time. Such prints have actually been delivered at a command post forty minutes after exposure, the negative being either developed in the plane or dropped at a dark room truck in the forward area. Although the above example is an extreme case of speed and the resulting quick work print is legible for only a limited time, dependent upon its exposure to strong light, it serves to show the

practicability of supply even in a moving situation. Let us suppose then that such a photograph is supplied to our battery.

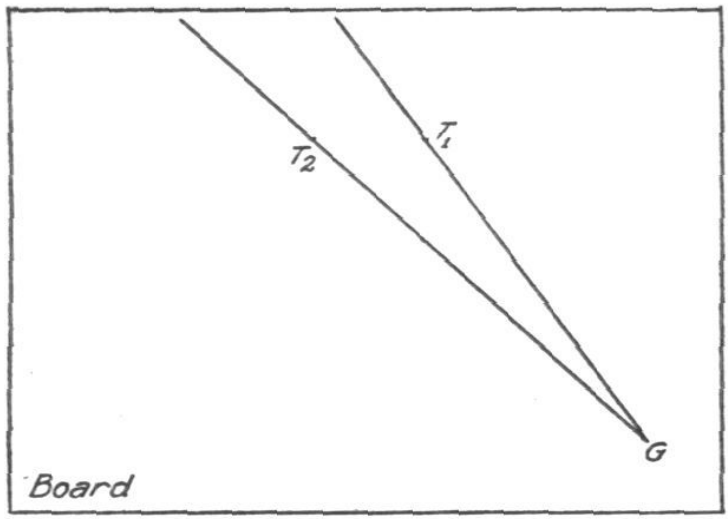


Figure 1

The battery commander or reconnaissance officer at once identifies on the print two points, T_1 and T_2, visible from his observation post, and adjusts on these as accurately as possible. On his plane table which is covered with a clean sheet of paper, not necessarily gridded, he draws two rays so that the angle between them equals the difference of the adjusted deflections to T_1 and T_2, stripped of drift. Each of these targets is now plotted with a 1/20,000 scale on its own ray at a distance from the intersection G equal to the adjusted range, less site (Fig. 1).

Example: Adjustment with French 75mm gun, shell Mark I, short fuze:

T_1; Adjusted elevation 86.2; site + 5; GT_1=3000.

T_2; Adjusted elevation 111.4; site + 8; GT_2=3500.

If for any reason the angles of site cannot be calculated accurately, both targets can be plotted as if at the altitude of the lower one, T_1 in the example. In this case the plotted range GT_2 to the higher target would be corrected either by the difference

in site measured at the observation post or by a position correction corresponding to the difference in altitudes of the targets. The resulting plot would differ slightly in scale from that of Figure 1 but would be similar, the error introduced being usually less than half of one per cent for range.

So far we have the positions of the guns, T_1 and T_2 plotted to a 1/20,000 scale as in Figure 1. There remains the operation of orienting the photograph on the board so that T_1 and T_2 in the photo fall on the plotted rays GT_1 and GT_2 respectively and the line T_1T_2 on the photo is parallel to T_1T_2 on the board, the resulting assembly representing the gun position and target area in their proper relation according to the scale of the photograph. This operation requires determination of the scale of the photo compared to that used in Fig. 1; replotting the two targets on the board to the scale of the photo; and placing the print on the board so that the photographic images T_1 and T_2 coincide with these replotted positions. Detailed procedure follows.

To Determine the Scale of the Photograph.—The distance T_1T_2 is measured on both picture and board, and the ratio $\frac{\text{Photo distance}}{\text{Board distance}}$ is found. For example: T_1T_2 on the print measures 930 yards, T_1T_2 on the board measures 735 yards. Resulting ratio $\frac{930}{735} = 1.265$ can now be used for changing board distances to their photographic equivalents.

Replotting to Scale of Photograph.—The ranges GT_1 and GT_2 on the board are multiplied by the ratio just found and the resulting ranges GT_1' and GGT_2' are plotted along the respective rays. In the example $GT_1'=1.265\times3000=3795$. $GT_2'=1.265\times3500=4428$. (See Fig. 2), all distances being measured with 1/20,000 scale.

Orienting the Photograph on the Board.—Draw T_1T_2 on board and photograph, carrying the latter line to the margins of the print. Draw T_1T_2 producing it several inches in each direction. Note that $T_1'T_2'$ is equal to T_1T_2 on the photograph and is parallel to T_1T_2 on the board. Now if the photograph can be placed on the board so that the photographic images of T_1 and T_2 are directly over T_1' and T_2' respectively we have accomplished our orientation. There are several ways of doing this. A fine needle

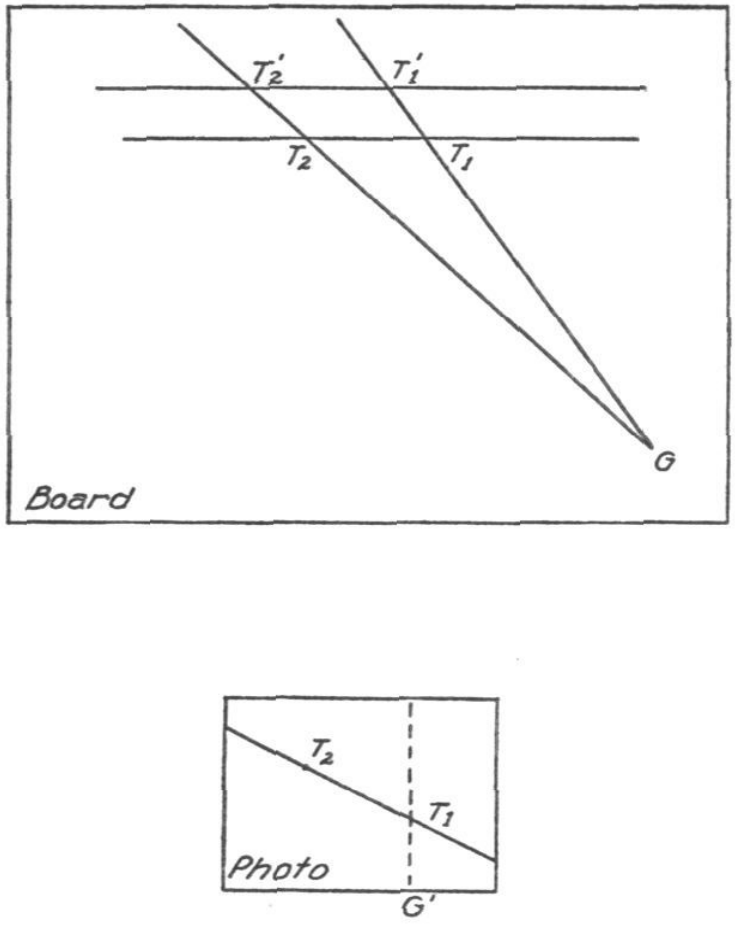


Figure 2

can be put through the photograph at T_1, pricked into T_1', and the picture turned about until T_1T_2 on the photo coincides with $T_1'T_2'$ (see Fig. 3). A second method is to draw the gun-target line through T_1 on the photograph by making the angle T_2T_1G' (Fig. 3) equal to the angle $T_2'T_1'G$ on the board with a protractor. The print is then merely placed as shown so that T_2T_1 and T_1G' coincide respectively with $T_2'T_1'$ and $T_1'G$. A light prick-through at T_1 and T_2 will show whether any error has been made. After the orientation has been checked carefully the photograph

is firmly fastened in place with thumb tacks and the firing chart is complete.

It is evident that in making the assembly we do not need any positive orientation or known scale on the photograph itself. If a line of known direction is visible on the picture, for example a main road or section line, and the scale is known, the whole process is simplified. We can then use one check point T_1, draw

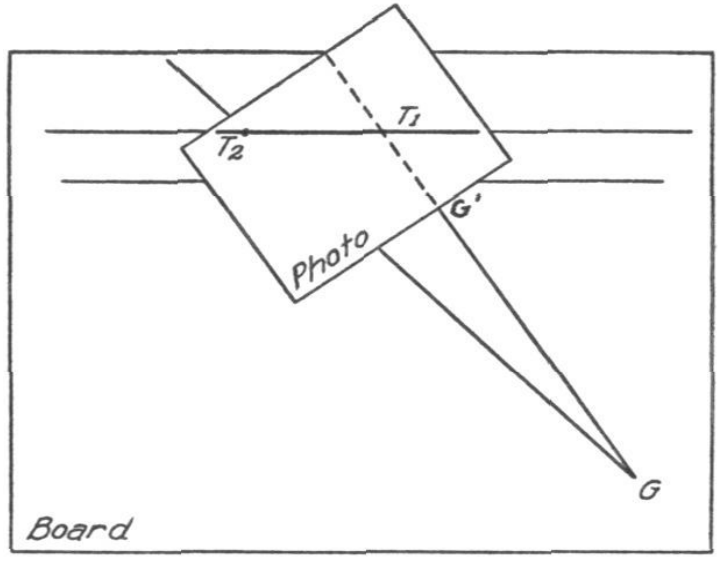


Figure 3

the direction of the gun-target line by means of its relation to the known direction, and plot the gun position on this ray at a distance equal to the range from the guns to the check point measured with photo scale. If the scale is unknown but a line of known direction is visible, we can reduce the assembly to the above case by finding the scale as already explained.

In using the chart it will be noted that, regardless of the scale used in the original plot (Fig. 1) the scale of Fig. 3 is that of the photograph. Therefore the reduction factor $\frac{\text{board distance } T_1T_2}{\text{photo distance } T_1T_2}$ (reciprocal of ratio found above) must be used to convert any

ranges measured with the plotting scale. In obtaining initial data for any target in the area the deflection can be measured as a shift from either T_1 or T_2 with correction for drift applied. Range is scaled as shown above. The target map range here is equivalent to the target initial range in a K Transfer, the K being automatically applied to all ranges by basing the original plot on the adjusted ranges to the check points T_1 and T_2. After the chart has been in use for some time it will usually be found necessary to establish a K for transfer purposes due to change in weather conditions. Site to invisible targets must be estimated or obtained from a map as in the case of any firing chart.

As an alternative to the initial adjustments and plot (Fig. 1) a chart was built up, using range finder ranges and aiming circle azimuths to guns, T_1, and T_2. Although a check adjustment and K Transfer gave in this case relatively small errors in deflection and range, it is probable that this method will not be generally satisfactory for unobserved fires, the probable error of the range finder being too great. A better alternative would be an initial location of T_1 and T_2 by intersection from observation posts at ends of a measured base and location of the guns by traverse, a plan which would make possible the application of a photograph to a firing chart already on a grid sheet.

To obtain the greatest possible accuracy in a firing chart of this type the most important consideration is the choice of the two points T_1 and T_2. Since the principal source of error is in the orientation of the photograph on the board, it can be readily seen from a study of Fig. 3 that the ideal set-up would be two points at different ranges and the same deflection, a condition which would give correct orientation in spite of any error in the plotted range of either point. The other extreme, i. e., T_1 and T_2 at the same range and different deflections, gives in general the greatest error in orientation, the full amount of any range error in the plot being incorporated in the placing of the photograph. In addition, since the photograph is to be oriented by the direction of T_1T_2, it is evident that the accuracy of orientation will vary directly as the length of this line. As a last consideration, better results will be obtained if T_1 and T_2 are chosen as near the same altitude as possible since this reduces the chance of site error in the original plot. Level ground would be the ideal, for

although the radial displacement of elevated objects on a single vertical photograph is ordinarily insufficient to cause trouble, a great difference in altitude would undoubtedly decrease the accuracy.

The above firing chart has been used at the Field Artillery School by both instructors and students with very good results. Fire was placed on various targets with a mean deflection error of less than 3 mils and mean range error of 42 yards, an accuracy comparable to a K Transfer with a good fire control map. The considerations of ease of manufacture, time, and detail shown, all favor this firing chart as compared with the grid sheet, and the fact that the photograph when produced to scale can be superimposed on any 1/20,000 grid already in use makes its employment practical at any time as a valuable accessory to the usual firing chart.

HORSE SHOW TROPHY FOR FORT SILL

A BEAUTIFUL permanent trophy has recently been received from Major General Bishop, Chief of Field Artillery, by General Cruikshank, Commandant of the Field Artillery School, to be awarded annually to the officer winning the championship of the Advanced Course in Horsemanship at the school.

The cup, which is the personal gift of General Bishop, is of silver on an ebony base and is 18 inches in height. It will be kept permanently at the Field Artillery School, the name of each winner to be engraved on it annually. Small replicas will be supplied for the personal possession of the individual champions.

According to present plans it will be competed for at the Fort Sill horse show in June and will be awarded to the officer whose horses upon final test at the end of the year secure the most points out of a total of ten possible, divided as follows: 4 for Officer's Charger; 2 for Schooled Horse; 2 for Jumper, and 1 each for two Polo Ponies.

SATURDAY MORNING SERVICE PRACTICE AT THE FIELD ARTILLERY SCHOOL

BY CAPT. JOHN M. DEVINE, F. A.
Instructor in Gunnery at the Field Artillery School

At the Field Artillery School service practices are held on Saturday mornings by the Gunnery Department and all gunnery instructors not actually holding classes attend. Conduct of fire requires practice even for experienced officers and new instructors need a little brushing up before the school year starts. The Saturday morning service practices are in the nature of demonstrations for students, troops and instructors and test firings of new guns and new ammunition. At the same time new methods and modifications of old methods are tried out.

During the first part of the year, September to Christmas, the firing periods are devoted almost entirely to reviewing methods taught to students in the classroom. Problems are assigned, fired and critiqued just as at any other service practice. Starting with axial precision, each method of conduct of fire is taken up in turn until the whole subject has been covered. Careful records are kept of these service practices, particularly as to time and accuracy. The statistics obtained during these periods are used as a guide in determining the standards to be expected of students.

In order to keep ahead of the students the service practices in the early fall must run right along according to schedule. There are three classes is gunnery starting in the middle of September, all of them progressing at different rates of speed, and the instructors must keep ahead of the fastest one. In addition to the usual types of conduct of fire there are four important demonstrations, each of which is rehearsed by the instructors before it is given for any class. One period, therefore, is the most that can be devoted to any particular type of fire, and sometimes two or even three methods are taken up in a single morning.

For the type of firing done during the fall season, no special preparation, other than studying the appropriate paragraphs in the text, is necessary. All fire is observed and rapid methods are used.

After Christmas, these Saturday morning periods are devoted

to test and experimental firing. This phase is much more interesting than the first, but it also entails a great deal more work.

Test firing with new weapons or new types of ammunition usually requires an elaborate set-up, particularly when accuracy tests are being made, but otherwise the tests offer no special difficulty. During the spring of 1932, five periods are devoted to this type of firing.

In testing new developments, two important things are always considered: Is the new idea simpler than the old? Does it require any additional equipment? If it is not simpler, it will have a hard time justifying its claim to consideration; simplicity of method even at the sacrifice of some accuracy is much to be desired. The same is true if the new idea calls for additional equipment. The Field Artillery has about all it can handle; no more is desired unless absolutely essential.

Firing is not carried out haphazardly but follows a definite development plan. The plan is intended to keep the science of gunnery, as taught here, up to date. The general aim is to increase the effectiveness of artillery fire by taking advantage of improvements in other lines of endeavor which affect artillery. The actual firing is, of course, only a small part of the labor involved. An idea is advanced, argued, modified, and argued some more. When the idea has finally crystalized it is tried out at the next firing period. One test is rarely enough to prove anything, and the particular idea is tested on successive Saturday mornings until it has either been discarded or accepted.

At present one of the major problems of the Field Artillery is the development of satisfactory methods for increasing the effectiveness of unobserved fires when no maps are available. During the World War a large percentage of artillery fire was unobserved and elaborate methods of preparation of data were developed. These methods were satisfactory but were, from the nature of the case, based on stabilization and good maps. In the event of another war we have no assurance that either of these two conditions will exist. But the necessity for firing on unseen targets will be as pressing as ever and we must find ways to do it effectively.

The strip mosaic, when available, solves the problem in a very

satisfactory manner. This fact is well established, and the use of the mosaic instead of a map is a regular part of the course of instruction. The use of the mosaic was described in some detail by Lieutenants E. L. Sibert and C. C. Blanchard in the FIELD ARTILLERY JOURNALS of November-December, 1930, and September-October, 1931.

But mosaics are still to be found at Saturday morning service practices being used in comparison, or rather in competition, with maps and with firing charts. Because of the accuracy of detail on the mosaic, survey work is very much simplified and location of points even in the target area is comparatively easy. On the other hand determination of altitude from the mosaic is not quite so simple. How do these things balance each other in the results obtained? Statistics are kept and so far are very favorable to the mosaic. *When a practicable method of determining altitude from the air photo is devised, the case for the mosaic will be complete*. A method was tested last fall but discarded as not sufficiently simple for general use. As a matter of fact the question of exact altitude is important only for flat-trajectory weapons, and with these its importance decreases as the range increases. Since at short ranges the terrain is more likely to be visible, this defect of the mosaic is not so very serious.

If we have a strip mosaic we can get along very well without a map, but in a rapidly changing situation strip mosaics may not be available. The photography, assembly and reproduction all take time. We cannot rely on having a mosaic, particularly during the early stages of an engagement.

But, with present methods of quick photography we should be able to get a single air photo of the target area. And with such a photo the problem of making a firing chart is pretty well solved. The idea for this method was advanced last February and it was tried out the following Saturday morning at Service Practice. It worked with astonishing accuracy. It was merely a simple method of orienting the photo on the plane table and plotting the gun position with respect to the photo. It has been tried a number of times since, by both students and instructors, and always with success. It appears to be one answer to the vexing question

of making a firing chart. The method is described in detail on pages 285 to 291 in this issue.

Then there is the case where no maps and no air photos whatever are available. In such a case building up a firing chart is essential and there are many difficulties to be overcome. Plotting targets is, of course, the real problem. A target cannot be plotted unless it can be seen and most targets are not visible from the usual OP. However, the artillery can always get an observer as far forward as the infantry and such an observer can probably see the targets that are causing the infantry trouble. Also he can probably see critical points, terrain features, etc., on which fire may be necessary in the near future. If this observer has communication to the artillery battalion he can adjust the fire of one battery on important points or targets. These targets can then be plotted on the firing chart of the battalion using the adjusted data (Compass and Range) of the battery firing. The targets having been plotted, data for all batteries can be prepared on these targets. This method is simple, it applies equally whether the observer is a liaison officer, an air observer, at a forward OP or at one of the usual OP's. It was tried repeatedly this spring and a little later was used in fire direction problems with the Advanced Class. The observer in most cases was the liaison officer and the usual means of communication was the 77-B radio set. Results have been uniformly successful.

The other side of this question is how the forward observer (or liaison officer) is to put the fire of the battery on the target. There are, in general, three methods:

1. He may report the location of the target, by coordinates or other means.
2. He may ask for a battery and conduct fire on the target.
3. He may *observe* fire on the target.

All of these methods have been tried repeatedly. Gunnery Instructors conducted tests until ideas crystalized. During the current year some of this work has been done by students. Statistics have been kept and comparisons drawn. The problem of the liaison officer, which is the problem involved, is important. Here are some comments based on the results obtained. In all cases the targets were selected and designated by infantry officers representing assault battalion commanders.

1. Liaison officer reporting the location of the target.

This of course is applicable when a map or strip mosaic is available. Locations on a mosaic are usually much more accurate than on a map. This method is slower than either of the others. As a rule, at least one sensing is necessary to put the fire on the target. The method employed was as follows:

a. Liaison officer reports location and nature of target to battalion.
b. Battalion either relays location to battery or prepares data for battery.
c. Battery fires through 200-yard zone with center of impact on plotted location.
d. Liaison officer reports location of center of impact of zone with respect to target.
e. Battery then corrects data and fires for effect.

If more than one battery is to fire the mission, batteries fire successively and the liaison officer reports on each. A number of variations in procedure were tried at different times.

2. Liaison officer conducting fire.

There are many objections to the liaison officer conducting fire, all of which can be eliminated in any special case. With reliable telephone communication and some preliminary understanding in order to get the first round off promptly, the liaison officer can conduct fire as well as anyone else. With radio communication the results were not so good. Direct radio to the battery is usually impracticable. The fire-control code is more complicated than the air-ground code and more likely to cause errors. The absence of telephone communication and the recurrence of unforeseen difficulties with consequent delays in firing led to the development of the third method.

3. Liaison officer *observing* fire.

In this method the liaison officer observes fire, reporting errors (in yards) in direction and range, in exactly the same manner as in air observation. The air-ground code, familiar to all radio operators, is used. This method was a success from the first attempt and appears to be the solution to the problem. The laison officer calls for a round on the base point, smoke if necessary, and senses that round with respect to the target. If he does not know the location of the battery he may sense the first shot, for example,

as "500 over." The next round will be 500 yards short of the base point and the liaison officer knows the direction of fire at once and also has a scale in yards marked out on the ground. The adjustment is then carried out as in air observation.

The ladder method of ranging was found very useful in this connection. A ladder, 200 yards between bursts, with the sheaf converged, gives the observer the line of fire and also a ground scale. Sensings are made on the center of the ladder.

During the current year a large number of problems have been fired using this method by both students and instructors. The time from the designation of the target by the infantry commander to fire for effect on the target averaged less than 15 minutes. Experienced officers required between 5 and 7 minutes for an adjustment; officers with less experience required between 10 and 15 minutes. In most cases the officer firing was using the method for the first time. The usual means of communication was the 77-B portable radio set.

The fire of one battery having been adjusted on a target, there remains the problem of putting the other batteries on it if necessary. Of course one battery may be sufficient to accomplish the mission, but the superiority of a battalion concentration over that of a single battery points to the necessity of some rapid method of putting the fire of the entire battalion on a target on which one battery has adjusted. This is another phase of the general problem that has had considerable attention during the current year. The target can be plotted on the firing chart using the adjusted gun data (compass and range) of the battery firing. The location thus found can be sent to the batteries, or the battalion staff can calculate direction and elevation for the batteries. Both of these schemes have been tried. In general, it is quicker and more accurate to have the battalion staff calculate the data and send the direction (compass, or shift from base deflection), the site, and the range to the batteries. For problems fired at several periods the average time from the identification of the target by the liaison officer to the time when a battalion concentration could have been fired on the target was 12 minutes.

An improvement in the method of quickly concentrating the fire of the battalion on a particular target has now reached the test

stage and will have been demonstrated before this article appears.

Observation of fire by liaison officers and from the air has again brought up the question of ladder methods of ranging. This is an old subject and has been argued many times. It has been tried frequently during the present school year with varied success. In general, with axial observation, the ladder is not as satisfactory as the usual method of ranging. In exceptional cases—excellent observation, no other batteries firing, etc.—it saves time and ammunition. Otherwise, it is more likely to waste both. With lateral observation, a ladder serves to mark out the line of fire and makes deflection sensing easier. Whether or not this advantage is sufficient to offset the disadvantage of a new and different command is still being argued. With air observation or forward observation the ladder method has a marked advantage particularly if a distinctive type of ammunition is fired, e. g. smoke. The ladder gives the observer a scale on the ground and, if the sheaf is converged, marks the line of fire on the ground. The latter is very important if the observer is in some doubt as to just where the battery is.

Adjustment of fire at night is another question of importance. Our present system of High Burst Ranging requires a fairly elaborate communication system which may not always be practicable. To overcome this defect, sound-flash ranging was developed. This is a simple system of adjusting the range with a stop watch, taking advantage of the fact that the rate of travel of sound in air is quite uniform and its velocity may easily be determined. The method was described in the FIELD ARTILLERY JOURNAL of July-August, 1931. Comparative tests show that this method compares very favorably with High Burst Ranging. In fact, results over a considerable period are all in favor of Sound-Flash Ranging. The chief defect of the method is the difficulty of hearing the burst. When a time fuze for shell is perfected, this objection will be overcome and night adjustment will always be practicable.

Since staggered positions will probably be the rule in the future, staggered positions were used this year until a satisfactory solution to the problem of handling the distribution was found. A simple device for solving this problem was described in the FIELD ARTILLERY JOURNAL of March-April, 1932.

The evolution of the tank has added another to the problems which the Field Artillery must face and the perfect solution has not yet been found. Firing at tanks is a part of the service practice of all classes and it comes in for its share of consideration. A description of the direct laying methods used at the school last year and some statistical data on the results obtained were published in the FIELD ARTILLERY JOURNAL of January-February, 1932. Some improvement in methods have been made and more data will be available at the end of the present year. The Range Finder method, developed at the school, appears to give the best results. At the first trial of this method last year the target, moving 15 miles per hour, was destroyed by the 5th shot. On the second trial the 5th and 6th shots were hits. With a range finder adjusted at approximately the range at which it is to be used, every shot fired should be effective for range.

With indirect laying on moving targets results have not yet been satisfactory. The problem is very difficult with present battery equipment. Later this spring, when the press of class work is less, more work will be done along these lines.

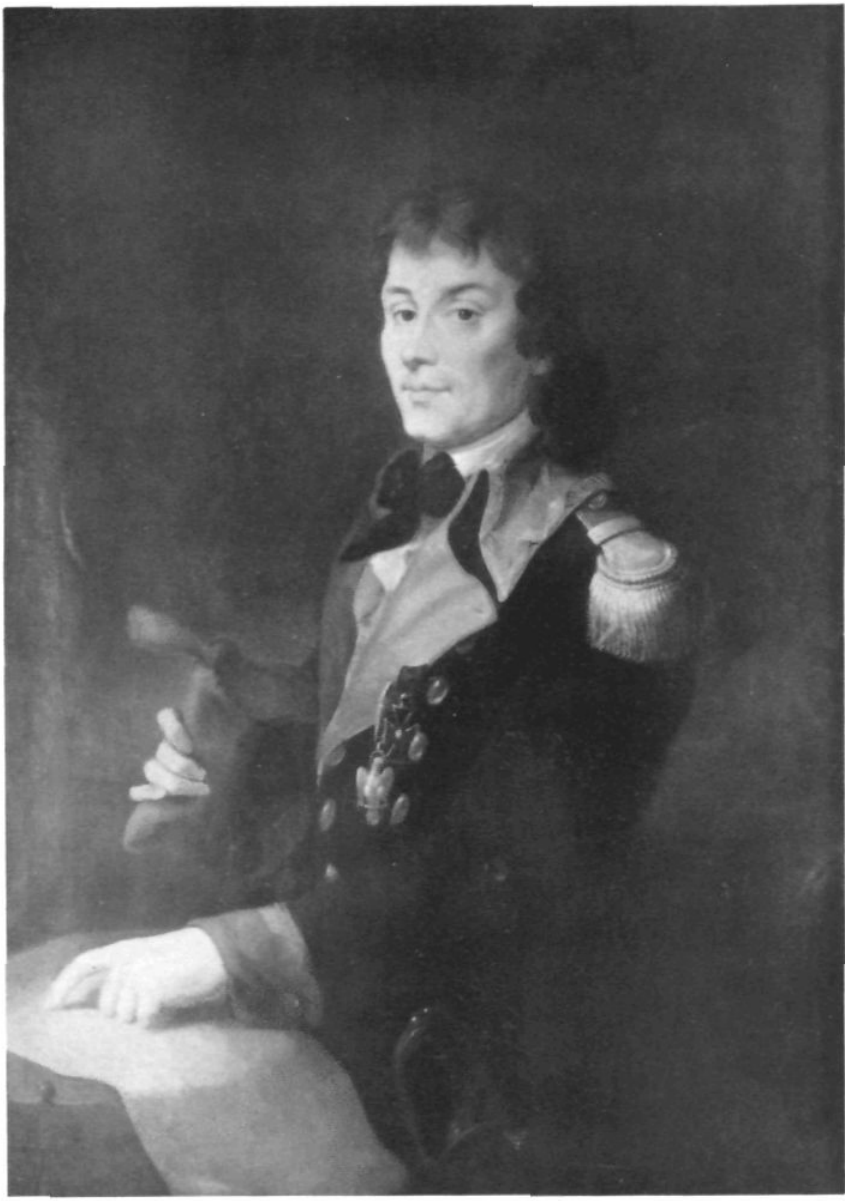
Air adjustment on moving targets is another problem which presents difficulties. If the target is small, moving rapidly and unrestricted as to direction, effective fire is practically impossible. Under any other conditions a skillful air observer, with rapid communications should be able to get some fire on the target. More tests on this point are already planned for this spring.

There are so many ramifications of Field Artillery and so many possible lines of development that this list might go on indefinitely. But I think I have covered enough to give some idea what the purpose of the Saturday Service Practice is, what has been accomplished so far, and a hint or so as to the future.

All of the ideas advanced are not directly connected with service practice; many of them can be tried without the accompaniment of firing and these I have not touched upon.

Since the Field Artillery School has no Advanced Class in Gunnery and no experimental section to insure continuity in the development of firing methods, the experimental work must be carried on simultaneously with the regular instruction. A great deal has been accomplished but there is always more to be done.

GUNNERY INSTRUCTORS, THE FIELD ARTILLERY SCHOOL, 1931-1932
TOP ROW: LT. C. C. BLANCHARD, LT. R. M. WICKS, LT. G. V. KEYSER, CENTER ROW: CAPT. J. C. ADAMS, CAPT. W. A. CAMPBELL., CAPT. J. F. BRITTINGHAM, CAPT. R. G. BARKALOW, CAPT. R. D. DELEHANTY, CAPT. J. M. LENTZ. BOTTOM ROW: CAPT. J. M. DEVINE, MAJ. ORLANDO WARD, MAJ. CARLOS BREWER, DIRECTOR, MAJ. STANLEY BACON, CAPT. S. F. DUNN



GENERAL TADEUSZ KOSCIUSZKO

PORTRAIT BY GRASSI, PROPERTY OF MR. TYTUS FILIPOWICZ, POLISH AMBASSADOR TO THE UNITED STATES

KOSCIUSZKO—FOREFATHER of AMERICAN ARTILLERY

BY ELIZABETH CAMILLE BRINK
Military Intelligence Division, General Staff

IN this year that marks the 200th anniversary of the birth of the Father of Our Country, the American artilleryman may well pause to pay honor and respect to Kosciuszko, whose name will be associated with George Washington and the founders of the American Republic as long as history endures. A worn and faded manual which now reposes in the Library of Congress at Washington is the testimonial of his services to our Field Artillery. The "Maneuvers of Horse Artillery," adapted to the service of the United States was prepared by Kosciuszko at Paris in 1800, at the request of General William R. Davie, then American Minister to France. Translated by Colonel Jonathan Williams eight years later, a copy of the manual was presented to President Jefferson, who, despite his ideas of peaceable coercion, had, nevertheless, the foresight to realize that a time might come when the Field Artillery manual would be needed. That time was near at hand. In 1812 the United States and Great Britain were at war, and we had no system of artillery regulations except those prepared by Kosciuszko. The manual was then purchased from the West Point Philosophical Society for $200, and the "Exercises for Cannon" and "Maneuvers for Horse Artillery" were officially distributed to the service by the War Department with the now time-worn formula "for the information and guidance of all concerned." The Field Artilleryman of today, poring over the musty pages of the manual, will see in Kosciuszko a kindred soul—a true artilleryman, who worked to make easier the path of the infantry.

Probably little had been done in artillery development in America up to the outbreak of the War of 1812; the "Advertisement" of Kosciuszko's work expresses a familiar and recurring condition in our service until the systematic development of military study which began after the Spanish American War. The manual suggests the specialization which was made of the handling of artillery in 1812, and reflects the change in artillery organization, introduced in Europe some time before this, away

from batteries composed of unrelated drivers, gun handlers, mechanics and artillerists and toward the homogeneous self-contained battery organization as we know it today.

It covers both garrison and field artillery. Part I, Section I, deals with "Exercises of Cannon," 42, 32, 24 and 18, 12 and 9 pounders—prescription of methods in use until the adoption of the breech loading cannon. The numbering off of the gun squads and the assignment of specific duties to each number, were effected very much as now prescribed. The cannoneers were designated as "matrosses" while the experts who attended the priming and firing of the piece were designated as Gunner of the Left and Gunner of the Right. The manual says: "Gunners are necessary in the exercise and management of artillery. If the laws do not recognize men of this grade, they must be selected for the occasion from among the matrosses."

The arrangement about each gun was as follows:

On the Left	*On the Right*
The balls	Sponge and rammer
The wads	Ladle and worm.
A wedge	Two handspikes
Two handspikes	A gunner's belt complete
One pert-fire stock	A cask or tub of water
One lint-stock	
A broom	

Elevating screws to point the guns for range were just appearing; they were absent in most of the matériel, and elevation was varied by the adjustment of two elevating "coins" placed under the breech of each gun. There was little apparatus for pointing or aiming. Only in the case of the field howitzer do we find the use of such apparatus: "If it be necessary to throw a shell beyond the point blank range, the fire must be at an angle of elevation, and this is determined by a quadrant, often by what is called a wooden hausse, but much more usually by the eye."

The precautions taken today against accidents on account of misfires and prematures had their counterparts then. The possibility of sparks in the bore and the use of loose powder to prime the vent led to definite precautions in case the cannon should be

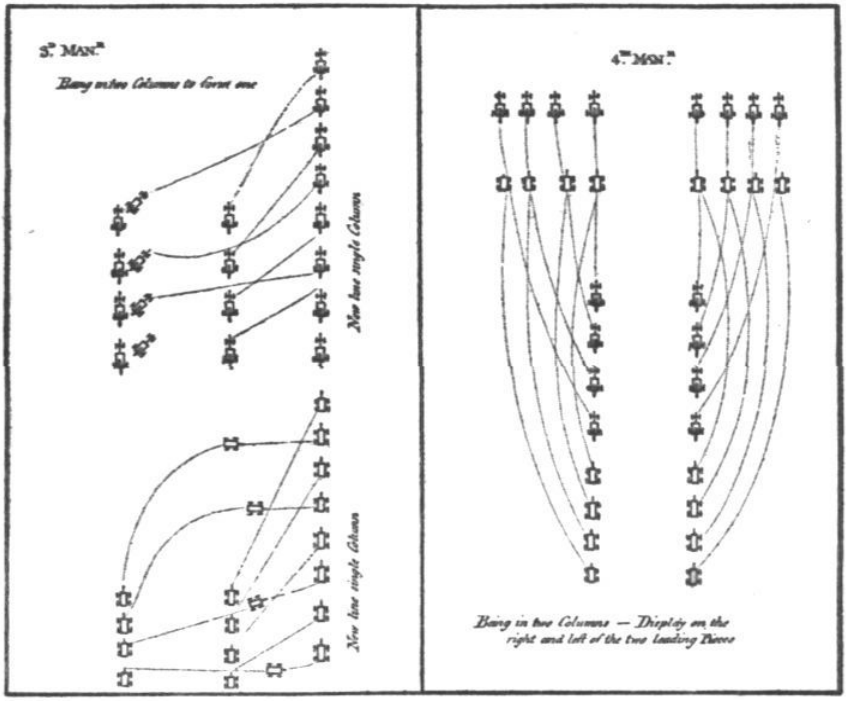
discharged while in the process of loading. For example under "Ram-Cartridge!" the following caution is given: *"Note*: No. 1 sinks his body at each stroke, bends his right knee, throws back his left hand and arm, and keeps his body clear of the muzzle to avoid accidents." And also, "When the gun has been fired ten or twelve times, it becomes necessary to wash it out with the sponge dipped in water, so as to cool the metal, and thereby prevent explosion"; and further: "As the pointing of the guns, both in garrison and in the field, is of great importance, this duty ought never to devolve on any other than commissioned officers, except in case of necessity."

The portion of the manual on "Exercise of Field Artillery" corresponds to our duties of the cannoneers, carriages unlimbered. It prescribes the maneuvering of the batteries upon the firing line, after the guns had been detached from their horsed limbers at the point of deployment. It foresees the impracticability of horsed maneuvers upon the battlefield proper; the rapid deployment of the guns upon the firing line by means of horsed transport was recognized and provided for under "Horse Artillery." As used in the manual, the term "Field Artillery" has reference to unlimbered guns, maneuvered with the infantry on or near the front line by the artillery personnel, while the term "Horse Artillery" has reference to limbered artillery which makes use of its mobility suddenly to seize a favorable firing position, and to follow the battle by means of horsed transport.

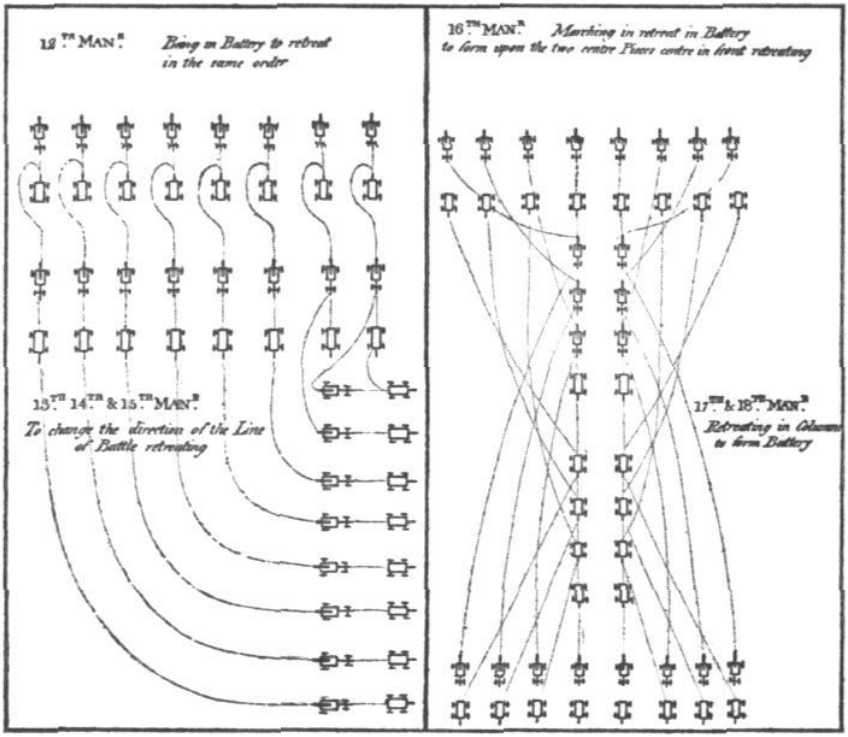
The maneuvers described both for Field Artillery and Horse Artillery are for the 4 and 6 pounders and the field howitzer. Whether the guns were delivered to the point of deployment by cart, by improvised horsed transport or by horsed limbers, in the battle line they were transported by man power, by means of the bricole, the drag rope or the prolonge. The bricole was recommended in preference to the drag rope; it consisted of a sort of man harness made up of "a strap and trace, hook and ring, the strap to pass over the shoulder and to meet under the opposite arm. The trace was of good twisted rope, one end fastened to the ring on the strap, the other end to the hooks of the carriage, and serves to put the piece in motion." In this way the whole gun squad was hooked to the carriage to provide battlefield transport.

The necessity for and the difficulty of insuring organized and coordinated infantry support was recognized. The manual notes: "According to modern improvements, the artillery in time of action, though acting in *concert* with the infantry, is so far detached from it, as to assume what are called batteries of position on the flanks, especially when in a situation to enfilade the enemy's line; and the movements and evolutions of either of these arms are not permitted to impede or embarrass those of the other." And "In most cases the artillery must be governed in its maneuvers by the words of command given by the commanding officer of the line, repeated by each commanding officer of a battery, or half battery."

In Part II, Maneuvers for Horse Artillery, Kosciusko describes the maneuvers for horse-drawn artillery, with carriages limbered. Horse artillery, as used in the manual, is the maneuvering of the 4 and 6-pounders and the field howitzer by means



THE THIRD AND FOURTH MANOEUVRES FROM KOSCIUSZKO'S ARTILLERY DRILL REGULATIONS



THE TWELFTH AND SIXTEENTH MANOEUVRES. KOSCIUSZKO'S ARTILLERY DRILL REGULATIONS CONTAINED THIRTY OF THESE MANOEUVRES

of horse traction in place of man power. Thirty maneuvers for entering or leaving action, action to the front, rear and flanks, change of front, etc., are described. "In order to execute these with the utmost celerity, so that the enemy may suffer the effect of the attack before he can perceive its cause, and, being unsuspicious of the quarter from which it comes or the time at which it is made, he may be unprepared to resist or avoid it, the aid of horses is indispensable; and the rapidity of their motion, in comparison to the ordinary and laborious use of men with drag ropes or bricoles, constitutes the whole advantage that Horse Artillery has over that of the Field, which is common to all armies." The maneuvers described are for a battery of six or eight pieces and caissons; they are similar to the mounted maneuvers prescribed for the old 3.2 matériel, and their influence upon our present mounted maneuvers is discernable. As a whole the manual is a vivid illustration of the development in the employment of artillery

at the present time as contrasted with the way it was used when Kosciuszko wrote the manual for the first American Army established under the Constitution.

A few words about the thrilling life of this great soldier and patriot should be interesting at this time. Fortune placed Kosciuszko in his early life in a variety of situations. The younger son of a poor but noble Lithuanian family, he was educated to be a military engineer and became a star graduate of the Royal Academy at Warsaw. Through scholarships awarded him he was permitted to study for five years in the institutions of learning of the principal European capitals where advanced study in military engineering gave him a position of eminence in his chosen profession with which later he was to distinguish himself in the service he rendered Washington and the Continental Army.

Hardly had Kosciuszko finished his education when he became imbued with the cause of liberty and of fighting for a freedom denied his own country. Turn back the pages of history one hundred and fifty-six years, to the year of 1776. It is the time of the American Revolution. The soldier pioneers are streaming through the passes—up the Shenandoah Valley, through Virginia and Pennsylvania and on to Philadelphia, "the City of Brotherly Love." Through the mountains, by wagon train, by flatboat, by horse, and afoot they came, not forgetting their rifles. Washington had blazed the trail. In Philadelphia the American soldier was first to know the beloved Polish patriot, who, impelled by his hatred of oppression and ardor for the cause of liberty, had, upon learning in Paris of the struggle between Britain and her North American colonies, hastened across the Atlantic and associated himself with the patriots of our revolutionary period. "I have come," said he, presenting himself to Washington at Philadelphia, "to fight for the cause of American independence." He was the first of the noted galaxy of foreign officers who volunteered for the cause of the Colonies and to join the armies of Washington.

The highly trained technician arrived at a time of great moment. His first service was to fortify Philadelphia, at that time one of the vital nerve centers of the new-born Republic, against attack by the British fleet. For this vital contribution Congress awarded him the rank of Colonel in the Engineering Corps. His next assignment was with Gates' army of the North in 1777. This

was the beginning of a dark period for Washington's Army. With little clothing and poor food, and having suffered one defeat after another, the army learned that General Burgoyne was coming down through New York from the north. Having demonstrated his ability in the fortification of Philadelphia, Kosciuszko was now commissioned to devise a plan for the defense of Saratoga and to check the British advance. He fortified Bemis Heights. Burgoyne's force was crushed by the Americans in the Saratoga Valley and hope flamed anew in the American colonies. The successful operations which led to the surrender of Burgoyne at Saratoga, and the part which Kosciuszko played in this battle reveals his inestimable worth to the Continental Army. It was the turning point in the War, for a victory by Burgoyne at that time might have brought in its wake complete disintegration of the Continental Army and placed an entirely new face upon subsequent world history. General Gates acknowledged his indebtedness to the Polish engineer in his official report to Congress, and Washington, reporting the value of his work, stated: "Kosciuszko is a gentleman of science and merit." Jefferson credits Kosciuszko with selecting the Saratoga positions from which the Americans fought, and with covering the weak points with redoubts from the hill to the river. Following the decisive and victorious engagement at Saratoga, the independence of the United States was recognized by many European powers.

Historians point to Kosciuszko's fortification of West Point on the Hudson, as his greatest achievement in the War for American independence. He is supposed to have chosen the West Point site, where years afterwards a monument was erected to his memory as "the hero of two worlds." West Point then controlled the main line of communication from New England to the central and southern colonies. The importance of its fortification was that the Hudson River was the only route by which the British could operate with troops from Canada or the north, hence, it was a position regarded by Washington as indispensable. So Kosciuszko pushed the work on his fortifications so rapidly that in 1778 the gigantic task was completed and West Point was impregnable. He also laid out additional forts to protect West Point in case British forces were sent from New York. Washington, again recognizing

his merit, says in a dispatch: "to his care and sedulous appreciation, the American people are indebted for the defenses of West Point."

Kosciuszko was then, in 1780, made engineer in the Army of the South, with Washington's most valued and trusted officer, General Nathaniel Greene, in command. Later, Kosciuszko succeeded Laurens in charge of military intelligence. His service in the south covered virtually the whole range of modern staff work—from supply to operations and troop movements. At those times when operations often became guerilla warfare, the brilliant Kosciuszko, despite his rank, fought with the rest as a common soldier. The means he devised for rapid movement of troops and provisions and his improvised pontoon bridges, often served as a way to escape for the American columns retreating from Cornwallis and the King's forces. "His zeal for public service seems incomparable," wrote Greene of the young Polish engineer.

He remained in the south until the end of the war. When the United States became a reality Congress passed a resolution: "That the Secretary of War transmit to Koscuiszko the brevet commission of Brigadier General, and signify to that officer that Congress entertains a high sense of his loyal, fruitful and meritorious services." An area of land where Columbus, Ohio, now stands was also designated to him; and he was one of the three distinguished foreigners to be elected as members of the "Society of the Cincinnati," established in 1783. But Kosciuszko, unwilling to accept payment for his services to America, willed the money and lands offered to him to Thomas Jefferson. The famous document that Kosciuszko left with Jefferson at Philadelphia reveals the strength and purity of the principles of liberty in the heart of the Pole. Having seen slavery in all its phases in the south, he foresaw a broader scope of human freedom in America, the goal of liberty extending to all peoples. Kosciuszko's will stands out as a flaming torch lighting the path of human progress.

> "I, Tadeusz Kosciuszko, being just on my departure from America, do hereby declare and direct that, should I make no other testimentary disposition of my property in the United States, I hereby authorize my friend, Thomas Jefferson, to employ the whole thereof in purchasing

> negroes from among his own slaves, or any others, and giving them liberty in my name; in giving them an education in trade or otherwise; in having them instructed for their new condition in the duties of morality, which may make them good neighbors, good fathers and mothers, husbands and wives, in their duty as citizens, teaching them to be defenders of their liberty and country, of the good order of society, and in whatsoever may make them happy and useful; and I make the said Thomas Jefferson executor of this.
>
> 5th of May, 1798.
>
> T. KOSCIUSZKO."

Of Kosciuszko, Jefferson wrote: "He is as pure a son of liberty as I have ever known, and of that liberty which is to go to all, and not to the few and rich alone." These qualities of character later brought him to a high place in Poland, where he continued to be the idol long after the cause he so valiantly fought for was lost.

In America Kosciuszko saw the genesis of an experiment which later was to prove of great value to him in Poland. The valiant struggle for independence of the ill-equipped colonial farmers and their success against one of the best trained armies in the world led the Polish patriot to visualize a day when his own peasant population might successfully throw off the foreign yoke and build up a national life of their own. Kosciuszko made a noble attempt to realize this dream. Confirmed and strengthened in his ideals by his association with Washington and those who fought for American independence, when Kosciuszko returned to his native land he was soon to play a conspicuous part in the cause of liberty. In 1791, the attempt to resist the tyranny of Russia, and to free his native land from the despotic and deadening influences which that power so long exercised over Poland's destinies, called forth the supreme efforts of the noble Polish patriot. His conduct at this time was such as to merit the everlasting esteem of all the world.

The voice of Kosciuszko, calling upon his countrymen to deliver their land from a servile yoke, raised the whole Polish nation in arms. His proclamation for liberty breathed a spirit of patriotic

self-devotion which rekindled a sympathetic feeling in every land. The simple peasants awakened to their first feeling of national consciousness and rallied round him. Using the implements of husbandry for war, the peasantry, arming themselves with pikes and scythes, rushed fearlessly upon the cannoneers of the north.

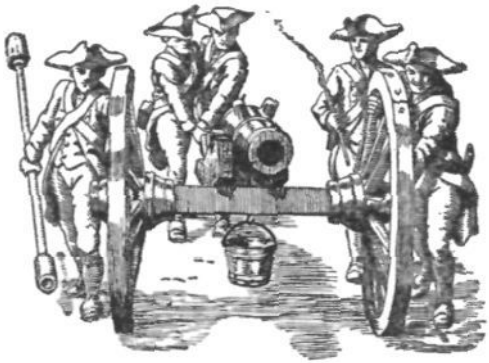
An incident which sheds glory upon Kosciuszko was his attack on the Prussian army in 1792. An army of 40,000 soldiers commanded by Frederick William in person, was advancing upon Warsaw. With 15,000 men, Kosciuszko attacked this formidable army in a long and bloody engagement. Though the Prussian army was not driven from the field, the object of the attack was gained, for so great was the setback given to the Prussians and so small the loss to Kosciuszko's troops, that he was able to turn upon and cut to pieces the Russian forces encamped near Warsaw, and to establish himself in a position to defend the city. In the meantime Kosciuszko had organized a successful war of diversion in southern Prussia which caused Frederick William to withdraw his army for the protection of his own dominions. But fortune, which had thus far followed his banner, as he long and successfully resisted the concentrated attack of an overwhelming Russian force, was soon to desert him and Poland; single-handed Poland could not contend with the colossal power of Russia aided by the disciplined Prussian armies. In the end the army and purposes of Kosciuszko were defeated when in a later battle he fell covered with wounds. With him fell the hopes of Poland, whose national existence was soon extinguished and whose territory was divided among the conquerors. His failure remains one of the most noble and tragic struggles for national freedom.

Revenging herself for the frequent defeat of her armies the Empress Catherine of Russia imprisoned Kosciuszko. He was confined in a dungeon and set at liberty only after her death. High honors were offered him by the young Czar if he would enter the Russian service, but Kosciuszko declined and became an exile from his country. The wounds from which he never recovered made it almost impossible for him to walk, yet they did not deter him from revisiting his friends in America in 1798, where he was acclaimed as a true friend of the Republic which he called his second fatherland. It was then that he left his

famous will with Jefferson. In 1817 at the age of 71 he died in a Swiss village where he lived with some friends. His body was removed in great state to Cracow where it was buried in the cathedral by the side of Polish Kings.

So in this year of grace 1932, when we are celebrating the birth of the Father of Our Country, and recalling the stirring events of 1776, let us not forget that we are indebted to Kosciuszko for an important part of the early development of our army. There is no measure by which we can weigh the services of the noble Pole to our nation. To name a few of his services to our army is not enough, for that only explains in part why we honor and revere him at this present time. But there is a further reason; the name of Kisciuszko represents the character of achievement that we all admire. It embodies and visualizes that for which America stands. The years that followed his service to America and brought his whole life to bear upon his own national problems reveal a sureness and courage which are inspiring.

Throughout history his name will remain as a symbol of liberty and patriotism. Outside the city of Cracow an imposing monument bears this eloquent inscription: "Kosciuszko, the Friend of Washington." Close by the White House in the capital of our nation stands his statue with the inscription: "And Freedom shrieked as Kosciuszko Fell."



THE SIXTH FIELD ARTILLERY TROPHY

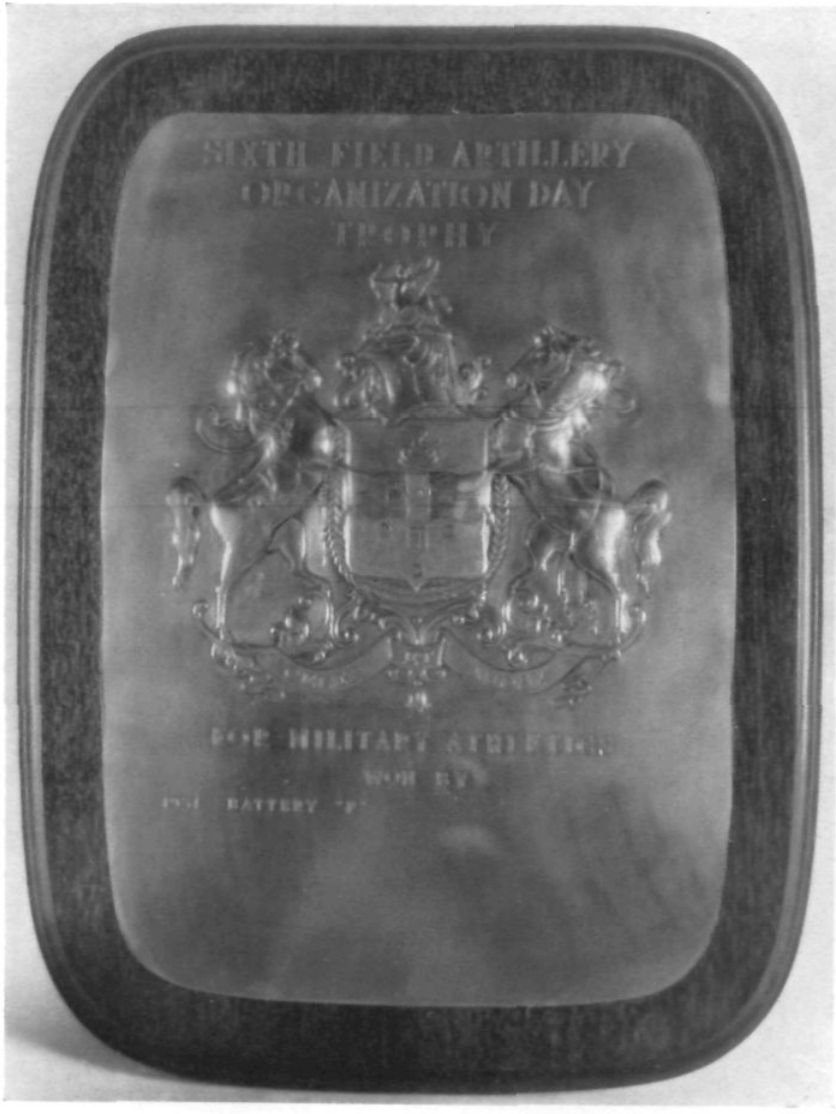
2ND LIEUT. GEORGE M. WERTZ, JR., 6TH FIELD ARTILLERY

THE determination to win is a characteristic based on those fundamental qualities of good sportsmanship so essential in a first class military organization. In order to develop this quality in a physical and moral sense the Army has recognized for years the value of athletic competition. At a meeting of the officers of the Sixth Field Artillery it was agreed that the Annual Athletic Field Meet held on Regimental Day occupied an important place in the development of the regiment for service, that those individuals excelling in physical fitness should be rewarded by individual trophies, and that the battery winning this competition should be presented a handsome and fitting trophy.

The Sixth Field Artillery Trophy is such an award. It was purchased in 1931, the cost being prorated among the various organizations. On May 31st of the same year Battery "F" had the distinction of winning the trophy at its first appearance. The military athletics of the day were in commemoration of the organization of the regiment in 1907. The program included various races, mounted wrestling, tug of war, and other athletic events. Competition was keen, and the day was marked by splendid cooperation and good sportsmanship.

The trophy encourages effort at these contests. It consists of a handsome silver engraving of the Regimental Seal, mounted on oak. Below the seal is a space for the letters of the winning batteries and the dates on which the trophy was won. Each winning battery holds the trophy until the next organization day, when it is again presented to the command which secures the most points in the field. Finally it will be placed permanently in the possession of the organization winning it five times.

The value of the trophy lies not in its magnificence nor in its cost, but rather in the spirit behind it. For the old soldier it is associated with years of hard work and sacrifice. To the young blood it is a material representation of the spirit of comradeship. For both it is a spur to duty and devotion.


SIXTH FIELD ARTILLERY
ORGANIZATION DAY
TROPHY

THE FORT SILL TEAM, WINNERS OF THE INTERPOST TELEGRAPHIC JUMPING COMPETITION
LEFT TO RIGHT: LIEUT. McKINNON ON JOHNNY WALKER; LIEUT. BURITT ON ROMONA; LIEUT. DAWSON ON JUDGE

INTERPOST TELEGRAPHIC JUMPING COMPETITION

ON the evening of March eleventh a very novel and interesting interpost jumping competition was held between Fort Myer, Fort Riley, Fort Leavenworth and Fort Sill. Last year Major John A. Crane, Director of the Department of Animal Transport at the Field Artillery School, conceived the idea of a telegraphic jumping contest with Fort Riley. Arrangements were made to have identical courses set up in the riding halls at these two posts and direct telegraphic communication was established from hall to hall. Two events were scheduled, of which Fort Riley won the team event and Fort Sill the individual event last year.

So keen was the interest aroused by this event that it was determined to enlarge the competition. This year invitations were sent out by the Commandant at Fort Sill to Fort Riley, Fort Myer and Fort Leavenworth for an interpost competition. Two events were scheduled as before, one an individual event, each post to be limited to six entries, the other a three-man-team event. Entries from Fort Riley and Fort Sill were confined to the Advanced Classes in Equitation at these posts.

The same course was used for both events, namely 3 feet natural rails at the end of the hall, triple in and out, 4 feet along the side, one diagonal of a stone wall 4 feet 6 inches, double oxer 3 feet 6 inches with six foot spread, over the natural rails again, a triple bar along the side 4 feet 6 inches with a six foot spread and the other diagonal, a 4 foot picket fence and 4 foot 6 inch gate. This course was set up in the Fort Sill Riding Hall, which was improvised from an old hangar. The other posts agreed to set up their courses in a like space and were somewhat handicapped by the unaccustomed cramped quarters.

The Western Union Telegraph Company established direct wire communication from Fort Myer through Fort Leavenworth and Fort Riley to Fort Sill, all riding halls being on the same wire, so that communication from each post went directly to the other three.

The following rules were finally established after correspondence with all concerned.

Horses to be jumped in the following order, Fort Myer, Fort Leavenworth, Fort Riley, Fort Sill.

The score of each horse to be telegraphed to the other stations on his completion of the course.

In the team event, the team having the largest aggregate score to win.

A time limit of 10 minutes and 45 seconds to be allowed to complete the course. Any horse not completing the course within the time limit to be eliminated. Time to be taken from the landing of the front feet over the first jump (a) to the landing of the front feet over the last jump (j).

Faults to be scored as follows:

		Faults
(a)	Knocking down obstacle with hind legs	2
	Knocking down obstacle with front legs	3
	Horse or rider or rider and horse falling	4
	First refusal or bolting at any one jump	1
	Second refusal or bolting in succession at same jump	2
	Third refusal or bolting in succession at same jump	*Debarred*
	Touch with hind legs without knocking down obstacle	½
	Touch with front legs without knocking down obstacles.	1

(b) "Slip fillets" to be placed on all jumps (except brush) and whether or not the horse knocks off a "slip fillet" shall be the absolute criterion as to whether he is to be faulted as "touching with hind or fore legs without knocking down obstacle. A block falling on the stone wall without the "slip fillet" falling is a knock down.

(c) Only the major fault made at each jump to be counted.

(d) A refusal or run out to be adjudged when a horse definitely committeed by the rider to jump approaches to within 24 feet of the obstacle and fails to take it.

(e) A front knock down to be adjudged when a horse touches any part of an obstacle with front legs, and any part of the obstacle (slip fillet excepted) falls. The purpose of this is to cover the case of when a horse strikes in front and completes the knock down with his hind legs.

(f) A front knock down to be adjudged when a horse breasts

an obstacle, knocks down all or a portion of it and passes completely over any part of it, and a refusal when he fails to pass completely over any portion of it.

(g) In all cases of a double fault, only the major fault to be adjudged.

(h) The wings are not considered as part of the obstacle. A touch or knock down of wings is not to be adjudged a fault.

The Judges were as follows:

Lt. Colonel Kinzie B. Edmunds, Chief Judge

FORT SILL, OKLAHOMA

Baron Anton Frhr. Von Bechtolsheim, Hauptmann in Reichswehrministerum German Army
Captain Robert E. Watkins ..... Cav.
Lieut. Camron Sudasna ..... Siamese Army

FORT MYER, VIRGINIA

Major Alexander D. Surles ..... Cav.
Captain George D. Shea ..... F. A.
Captain Lucian K. Truscott ..... Cav.
Captain Thomas W. Ligon ..... Cav.

FORT LEAVENWORTH, KANSAS

Major N. Butler Briscoe ..... Cav.
Captain Charles H. Gerhardt ..... Cav.
Captain Marcus E. Jones ..... Cav.

FORT RILEY, KANSAS

Major Ira T. Wyche ..... F. A.

The show started promptly with Fort Myer jumping the first horse and telegraphing the score; this was followed by horses at Fort Leavenworth, Fort Riley and Fort Sill. Four horses made perfect scores and it was necessary to jump off. One jump off decided all four places, first going to Dandy Dude, of Fort Leavenworth, ridden by Captain Davis; second to Squire, of Fort Myer, ridden by Lieut. Bennett; third to Chink, of Fort Riley, ridden by Lieut. Matterson; fourth to Wop, of Fort Leavenworth, ridden by Major Lyman. Fort Sill was much disappointed not to place in this event. In the team event the competition was keen, Fort Sill finally winning by the last horses making a perfect score.

A silver plate, suitably engraved, was the trophy for the individual event, and a very handsome bowl, made by Kirk of Baltimore, was the permanent trophy for the team event. Individual cups were given to the three riders. Great interest was shown at all four posts in this competition, the halls at each post having

capacity crowds. Aside from the trophies, the total cost of the competition was only $76.00, certainly an economical way to conduct a horse show between such widely scattered posts.

A list of the entries, with the scores made follows. These scores are remarkably high for the type of course.

CLASS I

INDIVIDUAL JUMPING

Horse	*Rider*	*Station*	*Score*	
Squire	Lt. Bennett	Fort Myer, Va.	100	—98½
Garcon	Lt. Rogers	Fort Myer, Va.	94	
Miss America	Col. George	Fort Myer, Va.	94½	
Flash	Capt. Smith	Fort Myer, Va.	96	
Roffe	Lt. Bugher	Fort Myer, Va.	96	
Temptation	Lt. Bennett	Fort Myer, Va.	97	
Mussolini	Capt. Hester	Fort Riley, Kans.	95½	
Chink	Lt. Matterson	Fort Riley, Kans.	100	—98
Snake	Lt. Babcock	Fort Riley, Kans.	98	
Jim Short	Lt. Willems	Fort Riley, Kans.	97	
Rob Boy	Lt. Palmer	Fort Riley, Kans.	94	
Gerry Owen	Lt. Meehan	Fort Riley, Kans.	97	
Maui Girl	Major Lyman	Fort Leavenworth, Kans.	98½	
Prominent Tom	Captain Davis	Fort Leavenworth, Kans.	98	
Wop	Major Lyman	Fort Leavenworth, Kans.	100	—97
Tiny Foot	Capt. Febiger	Fort Leavenworth, Kans.	94	
Dandy Dude	Capt. Davis	Fort Leavenworth, Kans.	100	—99½
Dynamite	Capt. Febiger	Scratched		
Alcazar	Lt. Dawson	Fort Sill, Okla.	94½	
Drummer Boy	Lt. Burritt	Fort Sill, Okla.	95½	
Tornado	Lt. Hastings	Fort Sill, Okla.	98	
Triangle	Lt. Hastings	Fort Sill, Okla.	97	
Johnny Walker	Lt. McKinnon	Fort Sill, Okla.	99	
Carlisle	Lt. McKinnon	Fort Sill, Okla.	98	

CLASS II

TEAM JUMPING

Horse	*Rider*	*Station*	*Score*	
Squire	Lt. Bennett	Fort Myer, Va.	96	
Jack Snipe	Capt. Smith	Fort Myer, Va.	99	
Miss America	Col. George	Fort Myer, Va.	99	
			294	
		Total		98
Eagle	Lt. Winn	Fort Riley, Kans.	98½	
Mr. Green	Lt. Henzlaff	Fort Riley, Kans.	98½	
Mussolini	Capt. Hester	Fort Riley, Kans.	96	
			293	
		Total		97 2/3
Maui Girl	Major Lyman	Fort Leavenworth, Kans.	96	
Dandy Dude	Capt. Febiger	Fort Leavenworth, Kans.	99	
Prominent Tom	Capt. Davis	Fort Leavenworth, Kans.	100	
			295	
		Total		98½
Judge	Lieut. Dawson	Fort Sill, Okla.	100	
Romona	Lieut. Burritt	Fort Sill, Okla.	100	
Johnny Walker	Lieut. Hastings	Fort Sill, Okla.	97	
			297	
		Total		99

EVOLUTION OF FIELD ARTILLERY TACTICS DURING AND AS A RESULT OF THE WORLD WAR*

BY MAJOR VINCENT MEYER, F. A.

MOBILITY AND MOTORIZATION

To effect strategical and tactical surprise, and to improve liaison and the effectiveness of artillery fire by prompt forward displacement of materiel during an attack, mobility is indispensable. If artillery is wanting in mobility, an attack may utterly fail, because, though its ranges are ever being increased by new designs, artillery must always begin moving forward by echelon at the first practicable opportunity after the launching of an attack. Its displacement should be made at a high rate of speed and with a certainty that physical conditions of the terrain will not interfere with its movement.

We have seen the fallacy of the belief existing in some minds before the World War that heavier calibers were immobile because they were moved by mechanical traction.

Certainly the tendency toward tractors, trucks or some sort of self-propelled automotive vehicle for moving artillery is becoming more pronounced as time goes on. The Caliber Board remarks: "It may be safely stated that from a study of the World War a break-through against an organized enemy is not possible with animal traction alone."

It is a far cry from 1913 when a beginning in the motorization of our Field Artillery was made by the purchase of *one* tractor! The following year our Ordnance Department commenced serious and practical experiments with the crawler-tractors as a means of artillery transportation. In 1916, tractors and trucks were provided for the heavier types of materiel. In 1917, our FIELD ARTILLERY JOURNAL wrote that no gun or howitzer appeared to be too heavy for use in field operations or to be classed as Field Artillery, due to the fact that the mobility of these weapons had been solved by the use of the tractor and the railroads to such an extent that the heavy pieces appeared to all intents and purposes as mobile as the light field gun. It was admitted, however, that the roads and the general condition of the

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The first installment of this article appeared in the March-April number of THE FIELD ARTILLERY JOURNAL.

terrain were positive determining factors in the ability to get such weapons to the front.

All the combatants during the course of the war sought for an increase in mobility and they sought it through mechanical means. Naturally such means had not attained the efficiency they now have and much was left unaccomplished when the war ended. It was wisely realized during and since the war that developments in the mobility of motive power for moving ammunition must go hand in hand with the increasing mobility of the cannon.

Mechanical transportation is now in such a state of development that, so far as artillery is concerned, its advantages over animal traction are not open to argument. This by no means implies the elimination of animal traction at least for some years to come because in any major war we will have need of every bit of motive power we can get hold of. However, the tendency is toward mechanical power that will function quite as efficiently as animal power whether it be through the heavy mud roads of the Middle West, or the deep sands of the Southwest. When such condition is assured, there should be no further need of animal traction for artillery.

It is quite evident that the miles and miles of wretched roads in this country make our problem entirely different from that of the European continent with its first class highways where everything seems to be "going motor." At the same time, it does look as though our particular problem were reaching a not far distant solution when we consider the possibilities of the convertible wheel to track laying type vehicle. There is food for rumination in an article appearing in a recent issue of the FIELD ARTILLERY JOURNAL which says that the ideal in mechanical transportation for Field Artillery "is an all-purpose chassis capable of high road speeds with good cross-country ability, yet able to travel for long periods at the marching rate of Infantry on foot . . . . Attainment of this ideal is not impossible. Realization is being rapidly approached in the modern six-wheeled trucks, with detachable crawler-treads."

CONCENTRATION OF ARTILLERY IN MASS

The longer the World War lasted the greater became the concentration of artillery on the various fronts where offensives

were scheduled, until in October, 1917, at La Malmaison, the apogee in mass concentration was reached with 40 French batteries of all kinds and calibers for each 1,000 yards of front! The artillery preparation lasted six days and was the heaviest concentration put over by the French. It is of interest to note in passing that the French had a particular purpose in view in this offensive. The morale of the French soldier was none too good at this period of the war and the loss in man-power had been tremendous. In order to boost the morale with a minimum loss of man-power, it was decided to make a series of strictly limited objective attacks along the front, and allow matériel rather than man-power to gain the victory. La Malmaison was one of these morale-boosting attacks.

During 1918, the Germans in their offensives often used from 20 to 30 batteries per kilometer of front.

For *defensive* combat, the number of batteries for each thousand yards of front was, of course, considerably less. Toward the close of the war, the Germans used an average of 12 batteries for each thousand yards in a particularly active sector. General Balck gives 6 to 9 batteries per kilometer, but he states that his number is exclusively of the Artillery Reserve, which it is highly desirable to have near at hand. The following table gives a fair idea of the number of batteries used in *defense* under varying conditions of activity at the front.

NUMBER OF BATTERIES PER THOUSAND YARDS OF DEFENSIVE FRONT

Batteries	*Quiet Sector*	*Active Sector*	*Against Major Offensive*
Light	2	3	4 or 5
Medium and Heavy	1	2	4 or 5
TOTAL	3	5	8 or 10

It would seem that in the future, the concentration of masses of artillery on a given front of attack will be limited by no considerations except:

(a) Strategical and tactical considerations in the Theatre of Operations which will always impose some maximum limit on the amount of reinforcing artillery which the Theatre Commander can send to a certain part of the front where an offensive is impending;

(b) Sufficient time to move in the artillery before the attack

is launched, at the same time maintaining the element of surprise in the concentration.

(c) Ability to supply the reinforcing artillery with necessary ammunition in the time allotted prior to the attack.

ARTILLERY SUPPORT DURING THE ATTACK

In the offensive, the artillery, covered by the infantry in its front will support and protect the latter by destroying or neutralizing enemy personnel, field works, weapons of defense and supply establishments. Thanks to this support and this protection, the infantry will be enabled to advance and occupy the ground. Then, under the protection of the newly established line of combat, as well as under the protection of its own fire, the artillery will displace forward and the same proceeding will begin all over again.

The French teach, and rightly, that should any part of this mutual support during the maneuver be left to chance, there will be only incomplete results or the maneuver may fail entirely. During the course of the attack, if the support of artillery is insufficient, the infantry will risk a costly check. After the breakthrough of the enemy front, if the infantry goes forward too quickly, without the artillery keeping up, the former will be deprived of its indispensable support and will not be able to accomplish a complete exploitation. Then, too, in the event of an enemy counter attack or counter offensive it may run into serious difficulties. Dissociation of the two arms and uncoordinated efforts will certainly bring about either a reverse following the first success, a checking of the maneuver, or at least a limiting of the desired result.

The question here arises as to whether or not the French teach the limited objective attack. A careful perusal of their regulations would not indicate that such is the case. They stress the necessity for rapid and continuous action, for the prompt displacement forward of the artillery, and they accentuate the importance of the exploitation following a break-through. This doctrine does not seem to indicate anything in the nature of a limited objective attack.

In the offensive against a zone defense, and such zone may have a depth as great as 9 miles, the French advocate the organization

of successive attacks for the purpose of disrupting and breaking through the enemy front. The enemy, by such continued attacks, is worn down by attrition and when the last drive is made, the attacking force promptly takes advantage of a breakthrough in a definite manner. Immediate and relentless exploitation must then be pushed to accomplish the disorganization of the enemy and prevent him reorganizing his forces.

In planning the attack of such a zone, the French make use of *phase* lines, which are the successive objective to be reached by the infantry. The attack may not rest on these phase lines even an hour or two, but meanwhile advantage is taken of the brief period to reorganize the assault battalions or to pass through new assault battalions in order to continue the attack. These phase lines are of particular importance to the supporting artillery for it allows at least a part to displace forward before the next impulse of the assault units. Thus some part of the artillery will always be within supporting distance of the infantry. It was realized by General Nivelle that the machine gun nests, which were inconspicuously sited between the more or less easily located intermediate lines of the zone defense, were the hardest problem for the artillery. Therefore, in 1916, he introduced the rolling barrage in order to neutralize these nests while the infantry attacked them, or went on by. This worked out well as long as the infantry could keep up with the rolling barrage.

A deep defensive zone is usually too formidable to break through by any other way than by attacking each successive position with the combined effort of the infantry and the artillery, unless these successive attacks were accomplished by the operations of grand masses of tanks in a sort of leap-frogging action.

During the attack of the 21st French Corps west of the Aisne on 26 September, 1918, that corps went up against a German defensive zone of 7 to 9 kilometers in depth with 12 or 15 lines of trenches and 15 to 18 bands of wire entanglements each averaging 10 meters in width. Including the outpost zone, there were five definite positions. This part of the front was particularly well organized having been practically unchanged since 1915. In planning the attack, the operation was divided into three phases, the infantry resting only one hour on the 1st Phase Line;

the advance from the other phase lines was to be ordered in accordance with the situation arising during the course of the attack.

The German Field Service Regulations stress the necessity for exploitation after penetration of a zone in quite the same manner as do the French. They further advise that, when indications point to the enemy organizing in depth for a more mobile defense, the attack will be first carried forward by *bounds*. The high command will designate in each instance the objectives to be reached by the infantry, leaving the rapid displacement by echelon of the artillery to the divisions within their respective zones of action.

Our Field Service Regulations prescribe power rather than rapidity in the opening phases of an attack against a zone. In the subsequent phases, rapidity and continuity are essential in the attack of a strongly fortified position, each unit pushing its attack in its zone of action or on its assigned direction *to the limit of its fighting powers*. And paragraph 477 of the same regulations says: "Based on the objective to be taken, the front selected for the attack, the resistance to be overcome and the available forces, a general plan of attack is prepared which determines the limits of the front of the attack and of the objective."

In the attack against a well organized zone held by a resourceful and contentious enemy, there will certainly be a decided limit to the fighting powers of the assault units. And when a unit reaches that limit, it must stop and allow another unit to pass through it. So, whether or not we provide for *phase* lines in our attack orders as do the French, or for *bounds* as do the Germans, we must certainly foresee similar temporary checks in the attack. If we provided for them in advance by some such system as phase lines or bounds, we would then be able to work out a much more systematic scheme for the forward displacement of the artillery and considerably increase its efficient functioning.

However, whether we consider the attacks are for limited or unlimited objectives, the French, Germans and Americans agree that their artillery has the primary mission at the beginning of any attack of "ripening" the position for the infantry assault. This in no way differs from the principle laid down in our 1914

Field Service Regulations. During the attack itself, whether it be under conditions of open, position or stabilized warfare, the artillery must render continuous support to the infantry throughout its attack whether it be hours or days. This again in no way differs from the principle laid down in the 1914 Field Service Regulations.

Thus the evolution of this particular phase of artillery tactics, i. e., support during an attack, has come about as the result of measures necessary to be taken to attack a defensive organization of such depth as was undreamed of prior to 1914. Artillery support of such attack must now be prescribed in minute particulars, and all possible contingencies must be provided for: the slightest detail cannot be left to chance. This, after all, is the main difference between present day problems of the artillery in support of the attack and those which were presented before the World War.

CREATION OF A G. H. Q. RESERVE OF ARTILLERY

No artillery reserve was contemplated either in our Army or the French army prior to the World War. We thought at that time that if a division had a mission to accomplish which required more artillery, such reinforcements could be borrowed from another division. The French followed the same principle and before the creation of the Artillery General Reserve, artillery was borrowed from one corps to reinforce the artillery of another corps.

The creation of the German Artillery Reserve in the autumn of 1916, and of the French Reserve Artillery in January, 1917, marked a distinct milestone in the artillery tactical development of the World War. In the French army, it was first created as a reserve of heavy artillery only, then was later extended to include all calibers.

During the latter part of 1917, the 75mm portée artillery was created. It was conceived an expedient, the shortage of horses within the French Corps forcing the motorization of part of the light regiments of the Corps Artillery. By the summer of 1918, the great value of these portée units as strategic reserves of artillery was definitely recognized and 26 regiments were assigned to the Artillery General Reserve. General Herr says that "it is under this title that it finishes the campaign, being present at all

the offensives and taking an active and glorious part in all the victories; its influence in the operations was considerable, especially in the realm of strategy."

The General Reserve of Artillery was a factor vital to the successful concentration of large masses of artillery. The High Command required a large reserve from which it could draw at any time to meet all emergencies, and large forces of artillery from this General Reserve were used first on one part of the front and then on another. Part of the General Reserve was Railway Artillery and the rest was motorized, being either Tractor Drawn or Portée. It was this mobility which gave it its value: unless it had been given real mobility there would have been no reason for its creation as a strategic reserve for it would have been unable to function as such.

Our War Department General Mobilization Plan now contemplates artillery from the General Headquarters Reserve and has apportioned to it:

(a) Six brigades of 75 guns, tractor drawn;
(b) Six brigades of 75 guns, portée;
(c) Six brigades tractor-drawn each consisting of 155-gun regiments and 240mm howitzer regiments.

In addition, there are certain other units such as 10 sound-ranging batteries.

SHRAPNEL REPLACED BY H. E. SHELL

The World War almost brought about the elimination of shrapnel from combat. Novices were unable to adjust the height of burst to give the maximum effect and shells with sensitive fuzes were everywhere preferred.

Future developments may result in a time shell entirely replacing shrapnel.

FLASH AND SOUND RANGING

Great progress was made in flash and sound ranging methods during the World War and both were frequently used.

Flash and Sound Ranging Batteries are now as basic a part of the Corps Artillery organizations as are the firing batteries.

"With an increase in the use of long range guns and in the use of more howitzers, the sound ranging batteries will become more and more indispensable to the Field Artillery. These weapons

will be able to take perfect flash defilade and take better advantages of concealment than can the present weapons, so sound will be the only way to find them."

This statement in a recent number of the FIELD ARTILLERY JOURNAL is reasonable and logical and is even more pertinent in view of the fact that since the War a 100 per cent perfect flashless powder has been developed.

EVOLUTION OF ARTILLERY STAFFS

In 1916, General Greble commanded a Provisional Artillery Brigade at Fort Bliss consisting of the 5th and 8th Field Artillery Regiments. His staff at that time consisted of two aides and about half a dozen enlisted men. The present staff for a Field Artillery Brigade consists of 12 Officers, 2 Warrant Officers and 72 Enlisted Men.

As late as July, 1918, General Headquarters at Chaumont was apparently not satisfied as to the composition of the staff for the Field Artillery Brigade of an infantry Division. On July 15, the Commanding General, 1st Field Artillery Brigade, forwarded to the Chief of Artillery, A. E. F., a letter with inclosure and diagrams giving complete information as to the actual organization and functioning of each member of the 1st F. A. Brigade Staff.

In 1911, the war strength staff of a light artillery battalion consisted of one (1) Major, two (2) other officers, nineteen (19) enlisted men.

In 1928, the Tables of Organization prescribed for the Light Artillery Battalion at war strength a staff consisting of one (1) Major, seven (7) other Officers, forty-one (41) Enlisted men.

In 1928, the Field Artillery School at Fort Sill, was starting experiments with a war strength battalion staff consisting of one (1) Major, nine (9) other Officers, eighty-eight (88) Enlisted Men.

This extraordinary increase of personnel seems absurd without investigation, but, as a matter of fact, those of us in the Advanced Class at Fort Sill in 1928, who, as Battalion Commanders worked with the regular battalion detail of seven other officers and forty-one enlisted men, found ourselves very decidedly short handed and would have welcomed the augmented experimental detail.

This growth of the Battalion Staff has been a logical development

due to the fact that the duties of the Artillery Battalion Commander have immeasurably increased since 1914, his personel responsibility now being particularly heavy in the matter of: Reconnaissance, Liaison, Communications, Fire Direction, Tactical direction of the battalion, Supervision of the Tactical and Technical training of the Battalion, Supply Supervision, including in war, the vital problem of ammunition supply, Administrative functions.

AMMUNITION

Little has been said in this paper about the amazing increase in ammunition expenditures. Figures are easily available, but they are dry in the extreme and little would be gained by tabulating ammunition consumption under the many widely varying conditions produced by the World War. Considering the rapidity of fire of modern weapons, the enormous concentrations of artillery, even to the extent of 40 batteries per thousand yards, the long preparations that are necessary in certain cases, and the continuous artillery support that must be furnished throughout a battle, it may be readily inferred that modern expenditures of ammunition are so enormous as to have been undreamed of before the World War. Furthermore, the problem of supplying ammunition is rendered increasingly difficult not only by the great *quantities* to be supplied, but also by the *weight* of the shells and powder to be transported, especially for the large calibers which modern practice has shown will accompany armies in the field.

CONCLUSION

(1) The evolution of artillery tactics is dependent almost entirely on the evolution of artillery materiel. By materiel is meant cannon and ammunition, and in addition, the motive power necessary to move the guns and the ammunition. If we increase the range and the traverse of cannon, their tactical possibilities are just that much more amplified. If we improve the speed and efficiency with which we move materiel over all conditions of road and terrain, we receive just that much more benefit from the weapons in a tactical way. If we move ammunition of great weight in great quantities and in sufficient time to be used by the weapons, we free tactical considerations from restricting bonds of Supply.

(2) The role of artillery, as a result of the World War, has shown itself of equal importance with that of the infantry. One arm cannot function without the other. Artillery has made itself invaluable because it has devedoped so rapidly and efficiently along the lines of increased ranges, augmented power and better mobility. No artillery weapon is too heavy or too large for some use with the armies in the field. And what is perhaps best of all from a strategical and tactical viewpoint, artillery has demonstrated its ability to attain complete surprise by concentrating secretly great masses of cannon.

(3) The future progress of artillery is largely bound up with two developments, viz., (a) Motorization; (b) Radio.

Motorization has unlimited possibilities. The improvements in motor design which are so continually being developed in civilian circles, has a decidedly beneficial reaction on the development of artillery materiel. For, after all, it is the civilian development of the tractor and truck which will aid us most in solving our own artillery traction problem. Through motorization will eventually come increased possibilities of mobility in maneuvering heavy weapons over all sorts and conditions of terrain.

The future possibilities of the radio mean quite as much to the artilleryman as do the possibilities of mechanical traction. When the time comes that the artillery and the infantry can communicate, i. e., actually talk, with each other through the air as naturally and easily as they could talk were their agents in the same room, then the problem of liaison is solved. The field telephone, efficient though it is, will not solve the problem as the wire net is too easily cut by enemy shell fragments or by the movement of our own troops.

(4) Artillery has demonstrated that it possesses tremendous power when a certain part of it is grouped as a strategic reserve under General Headquarters control. This is a new consideration of artillery which the World War revived from Cvil War days when General Hunt as Chief of Artillery, developed a General Reserve Artillery which was used in all major battles. By rapidly concentrating all or part of the strategic artillery reserve on a certain part of the front where most needed, the principles of Mass is carried out. Without the mobility which only mechanical

traction can give, such reserve would be useless, for its very reason for existence implies long movements far beyond the scope of animal traction.

(5) Artillery has become a much more precise science than it was before the World War. There is no limit, except the time available, to the care which should be exercised in planning its employment down to the smallest detail; nor is there any limit, except again the time available, to the accuracy with which its fires should be prepared and coordinated with all the weapons on the front of its sector. The precision methods of the *Foot* Artilleryman, which he had used in the preparation of fires for his long range fortress cannon, were laughed to scorn by the *Field* Artilleryman, until the war came and showed the latter the glaring error of his ways.

Precision of course must be balanced against speed; the opening of fire cannot be delayed for the sake of precise calculations, when speed is essential, any more than it could in 1914. But it has always been axiomatic that the more accurate the preparation of fire the quicker the adjustment and the effect. As the well-worn adage says, "It all depends on the situation." Open warfare, position warfare and stabilized warfare, each furnishes its own peculiar problems, nor can training in any one of the three be slighted at the expense of the other.

(6) The constantly changing tactics in the other arms will bring ever fresh problems for the artilleryman to meet a nd solve solve. For example, the question of proper and sufficient antitank defense by means of artillery fires with tank movements in an attack, are most pertinent at the present time. And again, in another field: the development of the new 75mm divisional gun, with its all around traverse, 80 degrees elevation, and its ability to fire at aircraft, brings up the point as to whether divisional light guns should be given three dimensional functions.

Mechanical means are continually improving and it is only by constant study, reflection and practical experience—and there will the Field Artilleryman get much of the latter under peace time conditions—that the present day "Gunner" can hope to keep up with the times.

(7) Artillery materiel must possess certain basic qualities

ballistically and tactically which are being subject to constant experiment with resulting codification of design. What was considered an ideal cannon twelve years ago is now quite a practical weapon and twelve years hence it may be obsolete. Ballistically, weapons are tending toward: Increased ranges, Better precision, Steeper angles of fall (i. e., howitzer characteristics).

Tactically, weapons are tending toward: Increased mobility, Wider fields of fire, Greater rapidity of fire, Increased power of destruction.

(8) Field Artillery in its employment finds it more and more imperative to observe the principles of: Surprise, Concentration in great masses (of fire; not necessarily of cannon), Development in depth and prompt echelonment forward, Efficiency in supply, particularly in the matter of ammunition.

(9) In the last analysis there can be no *rules* for the tactical employment of artillery. For example, divisional artillery, though normally charged with direct support may be frequently called on to aid in counterbattery; Corps Artillery normally charged with counterbattery and distant missions, must often engage in destruction at close ranges and in counter-preparation and barrage fires. Artillery must be employed with due regard to its possibilities *at the time* and to the vital needs of the action, rather than according to any rigid or blind Set of Rules.

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POLO

ARMY POLO ASSOCIATION HANDICAPS

Revised January 6th, 1932, and published by the U. S. Polo Association. Total number of players listed is 1,418, of whom 409 are Field Artillerymen. The Field Artillerymen are in italics.

Abbott, Capt. O. B. 0
Acklen, Lt. M. A. 0
Adair, Capt. H. 0
Adams, Capt. J. C. 1
Adams, Lt. J. C. L. 0
Adamson, Capt. H. 0
Adamson, Capt. J. M., Jr. 0
Adler, Capt. E. E. 0
Airan, Lt. Jesus 0
Alderman, Lt. C. 0
Alexander, Lt. H. M. 1
Alexander, Maj. W. D. 2
Allan, Lt. C. C. W. 0
Allen, Capt. C. J. 1
Allen, Capt. F. A. 0
Allen, Capt. H. B. 1
Allen, Capt. R. R. 0
Allen, Maj. T. de la M. 3
Allen, Lt. W. H. 0
Almquist, Capt. E. H. 0
Aloe, Capt. R. C. 1
Alverson, Capt. J. L. 0
Amazeen, Lt. C. P. 0
Amory, Maj. C. B. 1
Anderson, Lt. H. 0
Andrews, Lt. E. L. 0
Andrews, Maj. F. M. 1
Andrew, Maj. G. S. 1
Apgar, Lt. T. B. 0
Applegate, Lt. E. C. 0
Armstrong, Lt. DeV. P. 1
Arnold, Maj. A. V. 2
Asensio, Lt. M. J. 0
Atwell, Capt. R. N. 0
Avera, Lt. W. B. 0
Babcock, Lt. C. S., Jr. 0
Babcock, Lt. D. S. 1
Baehr, Maj. C. A. 2
Baez, Capt. R. 0
Bailey, Lt. G. W., Jr. 1
Baird, Lt. A. R. 1
Baird, Maj. H. W. 1
Baker, Lt. H. E. 2
Baker, Lt. H. D. 3
Baker, Lt. J. K. 2
Baldwin, Capt. R. O. 0
Baldwin, Lt. T. A., Jr. 0
Ballantyne, Lt. J. L. 0
Barclay, Lt. J. A. 0
Barden, Lt. A. R. S. 3
Barks, Lt. Louis 0
Barnes, Maj. J. F. 0
Barnes, Lt. V. B. 0
Barnes, Lt. W. H. 1
Barnhart, Capt. F. H. 2
Barrett, Lt. C. J., Jr. 1
Bartlett, Lt. W. H. 2
Batson, Maj. R. C. 1
Baumann, Lt. J. H. 0
Baylies, Capt. A. L. 1
Beal, Lt. O. L. 3
Beasley, Capt. R. W. 0
Beatty, Capt. G. S. 0
Beaucond, Capt. C. A. 2
Beck, Lt. D. A. 0
Beeman, Capt. H. N. 1
Beebe, Lt. R. F. 2
Beiderlinden, Lt. W. A. 1
Beishline, Lt. J. R. 0
Bell, Lt. C. B. 0
Bell, Col. O. W. 0
Bender, Capt. J. D. 1
Bennet, Lt. A. S. 0
Bennett, Lt. C. W. 0
Bennett, Lt. W. G. 0
Benney, Capt. J. F. 1
Bennison, Lt. R. T. 0
Benson, Lt. G. C. (5) 4
Berg, Lt. C. E. 2
Berg, Capt. S. 1
Berilla, Lt. G. P., Jr. 0
Bertholet, Capt. F. E. 0
Besse, Capt. A. H. 1
Bethel, Lt. J. M. 1
Bevan, Capt. W. L. 1
Beverly, Lt. G. H. 2
Beyers, Capt. J. A. 3
Biddle, Lt. W. S. 2
Bidwell, Lt. B. W. 0
Biggs, Capt. L. W. 0
Billingsley, Lt. E. A. 1
Billigsley, Lt. J. D. 0
Bing, Lt. R. C. 2
Bixel, Lt. C. P. 0
Black, Lt. J. W. 0
Black, Lt. P. J. 0
Blakeney, Lt. C. G., Jr. 0
Blakeney, Lt. C. G. 1
Blatt, Capt. R. C. 0
Bloomquist, Capt. G. F. 0

Blue, Capt. J. W. 2
Blunt, Maj. W. M. 1
Boatner, Lt. Harry W. 0
Boaz, Lt. (jg) T. D. (USN) 0
Boon, Capt. Stephen 0
Booth, Lt. C. L. 0
Booth, Lt. M. B. 1
Born, Lt. C. F. 0
Boucher, Capt. F. H. 0
Boudinot, Capt. T. E. 1
Bowley, Maj. F. W. 2
Boyden, Lt. H. D. (USMC) 0
Boye, Maj. F. W. 2
Boyers, Capt. J. A. 3
Boykin, Capt. J. G. 1
Boyle, Capt. C. E. 2
Bradford, Lt. D. E. 0
Bradley, Lt. J. S. 1
Bradley, Lt. W. J. 0
Brandt, Lt. C. A. 2
Brady, Lt. B. W. 0
Brann, Lt. D. W. 1
Brannan, Maj. F. M. 1
Branson, Capt. H. L. 2
Bratton, Lt. D. H. 0
Bratton, Maj. R. S. 0
Brendon, Lt. J. P. 0
Brennan, Lt. T. J., Jr. 0
Brett, Lt. J. Q. 0
Brewer, Maj. C. 3
Brewster, Lt. M. W. 0
Brian, Capt. A. R. 0
Bridges, Maj. B. C. 1
Bridgeman, Lt. R. H. 0
Brill, Lt. Albert 0
Brimmer, Lt. H. W. 0
Briscoe, Maj. N. B. 1
Broaddus, Capt. K. 0
Broedlow, Lt. R. W. 0
Bromley, Lt. C. V. 1
Brooks, Capt. C. T. 0
Brooks, Capt. E. F. 1
Brooks, Capt. C. T. (USMC) 0
Brooks, Capt. E. H. 0
Browder, Lt. W. F. 1
Brown, Capt. C. H. (USMC) 0
Brown, Capt. E. H. 1
Brown, Lt. H. H. 0
Brown, Maj. J. K. (5) 4
Brown, Lt. Col. Lewis, Jr. (6) 4
Brown, Lt. P. W. 0
Brown, Maj. T. K. 2
Browne, Lt. J. C. 1
Brownell, Lt. J. R. 0
Bruner, Lt. A. P. 0
Bruner, Lt. G. E. 1
Brunzell, Lt. R. D. 0
Bruton, Lt. P. G. 0
Buck, Lt. C. F. 0
Buckland, Lt. D. P. 1
Buckley, Capt. H. A. 2
Buckley, Lt. M., Jr. 1
Buechler, Capt. T. E. 2
Bulger, Capt. J. W. 0
Bullard, Maj. P. C. 1
Bunnell, Lt. F. H. 0
Burback, Lt. C. F. 0
Burcham, Lt. C. A. 0
Burdge, Lt. J. M. 0
Burgess, Capt. C. 2
Burgess, Capt. D. 3
Burgess, Lt. H. F. 0
Burgess, Lt. W. M. 0
Burkhart, Lt. E. C. 0
Burnett, Lt. E. M. 1
Burns, Lt. J. J. 1
Burnside, Lt. Walter 0
Burress, Maj. W. A. 1
Burritt, Lt. G. E., 2nd 1
Burt, Capt. W. C. 1
Busbey, Lt. George 2
Bush, Lt. J. K. 0
Butler, Lt. F. B. 0
Butler, Lt. Lawton 1
Byerly, Capt. F. S. 0
Byers, Lt. C. E. 1
Byrd, Capt. C. B. 1
Caffey, Lt. B. F. 0
Caldwell, Capt. G. L. 1
Cameron, Capt. H. H. 1
Camp, Capt. H. E. 0
Campbell, Lt. W. P. 0
Cannon, Capt. V. M. 3
Caperton, Maj. J. N. 2
Carleton, Lt. D. E. 1
Carmouche, Lt. G. H. 0
Carns, Lt. E. H. J. 0
Carpenter, Lt. F. F. 0
Carpenter, Lt. G. R. 1
Carroll, Lt. J. V. 0
Carson, Capt. M. 1
Carter, Lt. P. D. 1
Carter, Lt. R. A. 0
Catalan, Lt. N. 0
Causey, Lt. L. 0
Cavanaugh, Lt. A. A. 0
Cavelli, Lt. Charles, Jr. 0
Cella, Lt. J. A. 0
Chaffee, Lt. Col. A. R. 2
Chaffee, Lt. F. H. 0

Chamberlain, Lt. J. L. 0
Chamberlin, Maj. H. D. (5) 4
Chandler, Maj. C. P. 3
Chandler, Lt. R. E. 0
Chapman, Lt. C. P. 2
Chesire, Capt. H. H. 0
Cheves, Capt. G. X. 2
Child, Capt. F. M. 0
Clark, Lt. C. H. 0
Clark, Maj. C. L. 2
Clark, Capt. S. F. 1
Claussen, Lt. George C. 0
Clay, Lt. R. P., 2nd 1
Claybrook, Lt. J. H., Jr. 2
Clendenen, Lt. C. C. 0
Clifford, Maj. C. L. 2
Clover, Capt. George 0
Cloverdale, Lt. G. B. 0
Clyburn, Lt. J. W. 3
Cloe, Maj. R. L. 1
Coiner, Capt. B. H. 0
Cole, Capt. C. B. 0
Cole, Lt. L. F. 0
Cole, Capt. J. T. 2
Collier, Lt. J. H. 0
Collier, Capt. W. A. 1
Collins, Lt. J. F. 0
Colwell, Capt. J. K. 0
Comfort, Lt. F. 1
Condon, Lt. R. 2
Conlon, Lt. C. L. 1
Connally, Lt. W. P. 0
Connell, Lt. S. M. 2
Conrad, Lt. G. B. 1
Constant, Maj. S. V. 0
Cook, Lt. B. S. 0
Cook, Capt. J. G. 0
Cook, Lt. R. L. 0
Cooksen, Lt. F. E. 0
Cooksey, Capt. R. W. 1
Coombs, Lt. R. H. 0
Cooper, Lt. R. C. 0
Cornog, Lt. W. W. 0
Corridon, Lt. J. H. 2
Cort, Lt. Hugh 2
Coughlin, Lt. W. L. 1
Coulter, Capt. H. K. 4
Counihan, Lt. T. J. 0
Coverdale, Lt. G. B. 1
Covey, Lt. P. R. 1
Cox, Capt. C. R. 0
Cox, Lt. J. W., Jr. 0
Craig, Capt. Charles 0
Craig, Capt. R. E. 3
Craig, Capt. W. H. 3
Cramer, Capt. Charles 0
Cramer, Capt. L. V. 0
Crane, Capt. D. L. 2
Craw, Lt. D. T. 3
Crawford, Lt. H. 1
Creary, Lt. J. H. 0
Creed, Maj. R. L. 3
Crehan, Lt. J. P. 1
Crittenberger, Maj. W. D. 1
Crockett, Capt. G. K. 0
Croswell, Lt. H. B. 0
Crowe, Lt. W. J. 1
Culberson, Maj. W. L. 0
Cullinane, Capt. D. B. 0
Cullen, Maj. F. L. 0
Cullins, Lt. H. 3
Culton, Lt. H. G. 3
Cunningham, Maj. J. W. 1
Curtis, Capt. C. S. 0
Curtis, Capt. Ivan 0
Curtis, Lt. J. O., Jr. 0
Curtis, Lt. R. W. 1
Cusack, Lt. G. K. 2
Cutler, Lt. A. W. 1
Daly, Capt. J. 0
Daly, Lt. J. B. 0
Daly, Maj. J. O. 1
Daniels, Capt. E. M. 2
Darrell, Lt. R. H. 0
Dasher, Lt. C. L. 1
Davidson, Lt. J. A. 0
Davies, Lt. T. H. 0
Davies, Pvt. T. E. (USMC) 0
Davis, Capt. C. E. 4
Davis, Capt. J. F. 1
Davis, Lt. L. C. 0
Davis, Capt. W. D. 0
Davison, Lt. H. W. 0
Davison, Maj. P. R. 1
Dawley, Maj. E. J. 2
Dean, Lt. R. 0
Dean, Capt. W. H. 1
Dean. Lt. W. F. 0
DeBardeleben, Lt. D. 1
De Graaf, Lt. G. 1
DeLangton, Capt. F. C. 1
Delany, Lt. N. J. 1
DeLong, Capt. J. C. 1
Delorimer, Capt. A. 1
del Valle, Maj. P. A. (USMC) 0
Deepland, Capt. L. A. 0
Deery, Lt. J. J. 0
Dencker, Lt. W. L. 1
Derrick, Maj. J. D. 0
Devereux, Lt. J. P. S. (USMC) 0

Fitzgibbons, Lt. J. J. 0
Fleming, Capt. P. C. 3
Fletcher, Lt. L. S. 0
Fletcher, Lt. W. T. 0
Floyd, Lt. R. B. 0
Fooks, Lt. N. I. 0
Forbes, Lt. W. R. 0
Ford, Lt. W. W. 0
Forde, Lt. H. M. 0
Foreman, Lt. T. O. 0
Forster, Capt. H. W. 0
Forsyth, Lt. A. E. 2
Forsythe, Capt. J. D. 1
Foster, Lt. F. C. 0
Foster, Capt. Harry 0
Foster, Capt. I. L. 0
Foster, Lt. R. T. 0
Fowler, Lt. H. C. 0
Fox, Capt. A. P. 1
Foy, Capt. L. W. 0
Foy, Col. R. C. 1
Frakes, Capt. E. N. 0
Franke, Maj. G. H. 2
Franklin, Capt. E. A. 1
Franklin, Maj. E. L. 2
Fraser, Lt. F. G. 0
Frasier, Capt. L. H. 0
Frasier, Maj. L. S. 0
French, Capt. P. H. 0
Frierson, Lt. A. A. 1
Fry, Capt. H. G. 1
Fuller, Maj. H. H. 1
Fuller, Lt. J. G. 0
Fuller, Lt. W. A. 0
Fulton, Lt. A. L. 0
Gaffey, Capt. H. J. 1
Galloway, Lt. D. H. 1
Gammon, Capt. J. P. 2
Ganahl, Lt. J., Jr. 1
Gannon, Lt. M. V. 0
Gantt, Capt. H. P. 0
Garcia, Lt. H. F. 0
Gardner, Lt. R. A. 1
Garrecht, Lt. F. A., Jr. 2
Garver, Lt. R. T. 0
Gatchell, Capt. W. C. 1
Gates, Maj. O. I. 1
Gaugler, Maj. R. 0
Gay, Capt. H. R. 0
Geary, Lt. J. A. 0
Gee, Capt. C. F. 1
Gendreau, Lt. Com. E. A. M. (MC USN) 0
Geoffrey, Lt. H. H. 0
George, Lt. A. 3
George, Capt. H. H. 1
Gerfen, Capt. R. P. 0
Gerhardt, Capt. C. H. (7) 6
Gerhardt, Lt. W. R. 1
Gervais, Lt. R. L. 1
Gibbons, Capt. J. R. L. 1
Gibbs, Lt. G. W. 0
Gibbs, Capt. R. C. 3
Gibney, Capt. L. G. 1
Gibson, Lt. J. K. 0
Giddons, Lt. M. A. 0
Gilford, Lt. L. W. 0
Gilmore, Lt. W. N. 0
Gielsteen, Lt. E. 1
Goetz, Lt. R. W. 0
Goldman, Capt. A. M. 0
Goldsmith, Lt. R. W. 0
Gomez, Lt. V. Z. 0
Good, Lt. George F. (USMC) 0
Goodell, Lt. F. Q. 0
Goodwin, Lt. A. C. 0
Goodwin, Capt. S. R. 0
Gordan, Capt. R. A. 1
Gossett, Capt. H. H. 1
Gould, Lt. H. W. 1
Graham, Lt. L. S. 1
Grant, Lt. M. F. 1
Greear, Lt. W. H. 1
Green, Capt. W. C. 1
Greene, Lt. J. N. 0
Greene, Capt. M. H. 0
Greene, Pvt. W. L. (USMC) 0
Greenhalgh, Lt. P. R. 0
Greenwald, Maj. K. C. (5) 4
Greiner, Lt. E. C. 1
Grener, Lt. L. M. 0
Griffin, Lt. C. R. 0
Griffing, Lt. L. S. 0
Griffiss, Lt. T. 1
Griffith, Lt. J. H. 1
Grisham, Lt. W. F. 0
Grizzard, Lt. H. N. 0
Groninger, Maj. H. M. 1
Gross, Lt. C. R. 1
Gross, Lt. J. 2
Gross, Lt. M. E. 0
Grove, Lt. W. R. 0
Grubbs, Lt. H. Y. 2
Grubbs, Lt. W. E. 0
Guenther, Capt. G. B. 1
Guernsey, Lt. H. J. 2
Gunby, Lt. T. S. 1
Gunn, Lt. D. N. 0
Haddock, Capt. G. B. 0
Hains, Lt. P. C. 0

Halff, Lt. M. H. 0
Hall, Capt. C. R. 0
Hall, Lt. W. E. 0
Halloran, Capt. M. 0
Hamby, Capt. W. R. 1
Hames, Lt. S. T. 0
Hamilton, Lt. F. L. 1
Hamilton, Capt. J. M. 0
Hamilton, Lt. W. L. 0
Hamlett, Lt. B. 0
Hammond, Capt. A. K. 1
Handy, Lt. R. J. 0
Haney, Lt. L. W. 0
Hanna, Capt. L. M. 0
Hanson, Capt. T. J. 0
Hardin, Lt. J. L. 1
Harding, Lt. H. 0
Harding, Lt. J. G. 0
Hardy, Maj. E. N. 2
Hardy, Lt. W. H. 0
Harkins, Lt. P. D. 2
Harmon, Capt. E. N. 1
Harmon, Maj. M. F. 0
Harris, Lt. A. E. 0
Harris, Maj. A. R. 1
Harris, Lt. L. 1
Harris, Capt. T. A. 2
Harrison, Lt. E. L. 1
Harrison, Capt. W. K., Jr. 0
Harrold, Lt. C. J. 0
Harrold, Lt. T. L. 0
Harshberger, Capt. F. M. 0
Hart, Lt. C. E. 0
Hart, Capt. E. F. 1
Hartman, Capt. J. L. 0
Hasbrouck, Lt. S. V. 0
Haskell, Lt. J. F. 3
Haskell, Lt. L. W. 0
Hastey, Capt. T. W. 2
Haugen, Lt. O. D. 0
Hawley, Capt. D. C. 0
Hayden, Lt. G. 0
Hayden, Lt. J. C. 0
Haydon, Capt. P. S. 1
Haynes, Lt. P. O. 0
Hays, Capt. G. P. 2
Hazelrigg, Capt. W. R. 1
Heacock, Lt. W. O. 0
Healy, Lt. D. F., Jr. 0
Healy, Capt. J. H. 2
Hedekin, Lt. D. 0
Heiberg, Lt. H. H. D. 0
Henning, Lt. F. A. 2
Henry, Lt. C. E. 0
Hensey, Lt. W. R. 1
Herendeen, Lt. E. 1
Heriot, Lt. J. M. 0
Heron, Maj. G. J. F. 0
Herron, Capt. Thos. 2
Herr, Maj. Frederick 1
Herr, Lt.-Col. J. K. (5) 3
Hershey, Capt. L. B. 0
Hettinger, Capt. J. A. 1
Hickman, Lt. G. W. 1
Hierholzer, Lt. F. 0
Higgins, Lt. A. E. 2
Higley, Maj. H. D. 3
Hill, Capt. J. B. 0
Hill, Lt. James 0
Hill, Lt. W. H. 1
Hilliard, Lt. L. L. 0
Hilton, Capt. S. C. 0
Hinds, Lt. J. H. 0
Hine, Lt. H. C. 2
Hines, Lt. J. L. 1
Hinrichs, Lt. J. H. 0
Hinton, Lt. John 0
Hodes, Lt. H. I. 1
Hoffman, Lt. H. F. T. 0
Hogan, Lt. E. L. 1
Holbrook, Lt. W. A., Jr. 2
Holderness, Maj. A. W. 2
Holland, Lt. J. P. 0
Holle, Lt. C. G. 0
Holley, Lt. J. E. 0
Hollis, Lt. R. P. 0
Hollman, Lt. J. L. 0
Holman, Maj. O. I. 1
Holt, Capt. H. G. 1
Holt, Capt. R. T. 1
Holweger, Lt. C. P. 0
Holsworth, Lt. B. A. 0
Hood, Capt. J. D. 2
Hood, Lt. R. B. 0
Hopkins, Lt. E. O. 1
Horger, Capt. C. A. 2
Horner, Lt. A. A. 0
Hornor, Lt. J. L. 0
Horton, Lt. J. B. 3
Horton, Lt. T. R. 0
Houghton, Capt. W. 2
Houston, Capt. L. V. 0
Howard, Capt. A. H. 0
Howard, Lt. C. E. N. 0
Howard, Lt. J. G. 0
Howarth, Lt. W. L. 0
Howell, Maj. R. M. 2
Howze, Lt. H. H. 1
Howze, Lt. R. L., Jr. 1
Hoyle, Lt.-Col. R. E. de R. 3

Hubard, Lt. R. B. 0
Hudgins, Capt. P. H. 1
Hudson, Lt. G. B. 1
Huff, Lt. R. P. 0
Huggins, Lt. W. C. 0
Hughes, Lt. C. E. 2
Hunter, Capt. R. G. 2
Hunter, Lt. W. H. 0
Hurt, Capt. C. M. 1
Hurt, Lt. S. R. 1
Hutcheson, Lt. C. R. 0
Hutchings, Lt. E. A. 0
Hutchins, Lt. R. B. 1
Hutchinson, Lt. C. B. 2
Huthsteiner, Capt. G. E. (6) 5
Hutton, Lt. C. I. 0
Ireland, Lt. R. E. 2
Irving, Lt. F. G. 0
Irving, Capt. J. H. 1
Irwin, Lt. F. G. 0
Isaacson, Lt. H. S. 0
Isker, Capt. R. A. 0
Jacobs, Lt. B. R. 4
Jacobs, Capt. F. S. 1
Jacoby, Lt. L. E. 2
Jadwin, Lt. C. C. 3
Jark, Lt. C. H. 0
Jay, Capt. H. D. 1
Jedlicka, Capt. F. C. 0
Jenkins, Maj. J. M., Jr. 1
Jernigan, Lt. H. S. 1
Jerome, Lt. C. C. (USMC) 0
Jeter, Lt. J. R. 0
Jett, Lt. R. S. 2
John, Lt. H. J. 0
Johns, Capt. D. F. 1
Johns, Lt. W. E. 0
Johnson, Lt. A. W. 1
Johnson, Lt. Douglas V. 0
Johnson, Lt. E. G. 0
Johnson, Lt. H. W. 3
Johnson, Lt. K. L. 0
Johnson, Lt. M. C. 0
Johnson, Capt. N. C. 1
Johnson, Lt. O. V. 0
Johnson, Capt. R. A. 1
Johnson, Capt. W. O. 0
Johnson, Lt. Wilhelm 0
Johnston, Lt. E. C. 0
Johnston, Lt.-Col. Gordon 2
Johnston, Capt. J. C. 1
Jones, Capt. C. C. 0
Jones, Lt. E. D. 1
Jones, Maj. H. L. C. 1
Jones, Capt. K. K. 0
Jones, Lt. M. D., Jr. 1
Jones, Capt. M. E. 2
Jones, Lt. M. McD. 5
Jordan, Lt. H. H. 0
Judge, Lt. L. L. 1
Justice, Lt. B. W. 1
Justus, Lt. V. W. 0
Kane, Lt. O. K. 0
Kastner, Lt. A. E. 2
Keatinge, Capt. J. H. 2
Keefe, Lt. T. F. 2
Keeley, Lt. J. F. 0
Keerans, Lt. C. L. 0
Kehn, Lt. H. D. 0
Kelly, Lt. J. E. 1
Kenahan, Capt. W. 1
Kendall, Lt. P. G. 1
Kennedy, Lt. J. P. 0
Kernan, Capt. Harold 2
Kerr, Lt. E. V. 0
Ketchum, Lt. H. W. 0
Key, Capt. J. D. 1
Keyes, Lt. Allen L. 0
Kiefer, Lt. H. W. 4
Kielsmeier, Capt. S. G. 1
Kilburn, Capt. C. S. 3
King, Maj. C. B. 2
King, Capt. G. A. 1
King, Capt. R. J. 0
Kinnison, Lt. H. L., Jr. 1
Kirkendall, Lt. J. P. 0
Kirkpatrick, Lt. F. S. 1
Kitson, Lt. A. P. 0
Kitts, Lt. I. L. 1
Klepinger, Lt. W. J. 0
Kloepfer, Capt. H. E. 1
Kluss, Lt. Walter L. 1
Knadler, Capt. V. L. 0
Knapp, Capt. R. H. 1
Knight, Lt. Harry 0
Knudsen, Lt. C. 1
Koch, Lt.-Col. Stanley 1
Koester, Capt. F. J. 2
Koszewski, Lt. S. S. 0
Kotzebue, Lt. L. I. 1
Kruger, Lt. H. W. 0
Kuter, Lt. L. S. 0
Kutz, Lt. C. R. 0
Lacey, Maj. A. T. 1
Ladue, Lt. L. K. 3
Lafferty, Maj. F. R. 0
Lambert, Capt. J. I. 0
Langevin, Lt. J. L. 0
Langhorne, Col. G. T. 1
Land, Lt. C. 1

Malone, Lt. A. J. K. 0
Mandell, Maj. H. C. 1
Manley, Capt. N. C. 0
Manning, Lt. B. F. 0
Mansfield, Lt. C. J. 0
Manuel, Lt. T. B. 1
Manzano, Lt. N. L. 0
Maraist, Capt. R. V. 2
March, Lt. F. A. 0
Margetts, Lt.-Col. N. E. 3
Marriott, Lt. O. R. 0
Marshall, Capt. Samuel 0
Martin, Lt. C. H. 1
Martin, Lt.-Col. I. S. 1
Martin, Capt. L. LeR. 1
Martin, Capt. L. O. 0
Martin, Lt. O. W. 1
Mason, Lt. D. P. 2
Massey, Lt. Clyde 0
Massey, Capt. O. M. 0
Mathewson, Lt. L. 0
Matlack, Lt. J. B. 0
Matte, Capt. P. J. 0
Matteson, Lt. M. H. 0
Matthews, Lt. A. G. 0
Matthews, Lt. C. M. 0
Matthews, Lt. J. J. 1
Mauger, Lt. G. R. 1
Maxwell, Capt. R. R. 1
May, Lt. E. T. 0
May, Capt. Wm. 0
Meade, Capt. W. A. 0
Meador, Capt. M. F. 2
Mechling, Lt. E. P. 0
Medin, Lt. S. M. 0
Meehan, Lt. C. G. 0
Megargee, Lt. Stanleigh 1
Melanson, Lt. A. J. 0
Menoher, Maj. P. 1
Meriwether, Lt. E. C. 0
Merrick, Lt. J. G. 0
Merrill, Lt. F. D. 1
Metcalf, Lt. F. A. 2
Mewshaw, Lt. H. G. 1
Meyer, Lt. C. W. 0
Meyer, Lt. T. E. 0
Meyers, Lt. S. L. 0
Michela, Lt. J. A. 0
Millener, Lt. G. A. 0
Miller, Lt. A. M., Jr. 1
Miller, Capt. C. S. 0
Miller, Lt. P. R. M. 2
Miller, Capt. T. R. 0
Miller, Lt. V. R. 0
Miller, Lt. W. B. 1
Milliken, Maj. J. 2
Miner, Capt. Jno. W. 0
Minniece, Lt. J. G. 0
Minuth, Capt. H. C. 0
Mitchell, Lt. P. J. 0
Mitchell, Lt. W. L. 0
Molitor, Lt. E. S. 1
Molloy, Lt. H. T. 1
Monhollan, Lt. J. E. 0
Monroe, Lt. H. M. 0
Mood, Lt. O. C. 0
Moon, Lt. J. R. 0
Moore, Capt. A. P. 2
Moore, Lt. D. M. 0
Moore, Capt. H. K. 1
Moore, Lt. J. G. 0
Moore, Lt. J. M. 0
Moore, Capt. L. R. 1
Moores, Lt. Z. W. 2
Morin, Lt. W. A. M. 0
Morris, Capt. P. H. 2
Morrison, Lt. C. E. 1
Morrow, Maj. N. P. 0
Morrow, Lt. S. L. 0
Morse, Lt. F. H. 0
Morse, Lt. G. V. 0
Mudgett, Lt. G. C. 2
Muller, Lt. W. J. 0
Murphy, Lt. E. J. 0
Murphy, Lt. H. B. 0
Murphy, Lt. J. B. 2
Murphy, Capt. W. W. 0
Murray, Capt. C. I. (USMC) 0
Murtaugh, Lt. J. O. 1
Myers, Lt. S. L. 0
Neal, Lt. R. M. 1
Neary, Lt. J. S. 0
Neate, Capt. N. M. 1
Neilson, Capt. H. H. 0
Nelson, Lt. D. H. 1
Nelson, Capt. F. 0
Nelson, Lt. R. J. 0
Neu, Capt. J. P. 1
Neundorfer, Capt. O. J. 0
Neven, Lt. S. M. 0

Newall, Capt. O. C. ... 0
Newman, Lt. H. S. ... 0
Newman, Lt. O. P. ... 1
Nichols, Capt. J. A. ... 1
Noble, Lt. C. H. ... 2
Noel, Lt. W. K. ... 0
Norton, Capt. A. H. ... 1
Nowack, Sgt. G. J. (USMC) ... 0
Nutter, Lt. W. H. ... 0
Oakes, Lt. J. C. ... 0
Oberst, Lt. F. X. ... 0
Ochs, Capt. W. V. D. ... 2
O'Connell, Lt. W. W. ... 1
O'Connor, Maj. J. A. ... 1
O'Connor, Lt. W. ... 1
Odle, Warrant Officer, B. ... 2
O'Keefe, Capt. D. ... 1
Oliver, Maj. L. E. ... 0
Oliver, Lt. R. C. ... 0
O'Meara, Lt. A. P. ... 0
Olsen, Capt. A. G. ... 0
Opperman, Capt. L. A. ... 0
Oreth, Capt. I. M. ... 0
O'Shea, Lt. Kevin ... 1
Paine, Lt.-Col. G. H. ... 1
Palmer, Lt. C. D. ... 2
Palmer, Capt. C. H. ... 1
Palmer, Lt. R. D. ... 0
Paquet, Lt. L. C. ... 0
Parker, Maj. C. ... 3
Parker, Maj.-Gen. Frank ... 1
Parker, Capt. H. B. ... 0
Parker, Capt. R. S. ... 0
Parmley, Lt. L. F. ... 0
Partridge, Lt. R. C. ... 0
Paterson, Maj. R. B. ... 0
Patton, Maj. G. S. ... 4
Pearce, Lt. C. N. ... 0
Pegg, Lt. L. D. ... 0
Pence, Lt. G. D. ... 1
Pennell, Lt.-Col. R. McT. ... 2
Perry, Capt. R. F. ... 1
Perry, Lt. M. O. ... 0
Peyton, Maj. B. R. ... 1
Peyton, Maj. T. G. ... 0
Pfaff, Lt. Roy (USN) ... 0
Pharr, Lt. Marion M. ... 0
Phelps, Lt. J. V. ... 1
Phillips, Capt. R. E. ... 0
Pickering, Capt. C. E. ... 0
Pickett, Capt. C. ... 0
Pierce, Capt. C. A. ... 0
Pierce, Capt. J. A. ... 0
Pierce, Lt. J. R. ... 1
Pierce, Lt. J. T. ... 1
Pierce, Lt. W. F. ... 0
Pikington, Capt. G. C. ... 1
Pinkerton, Lt. C. R. ... 0
Poindexter, Capt. W. O. ... 1
Poole, Maj. T. ... 0
Porter, Lt. R. W., Jr. ... 0
Ports, Lt. R. A. ... 0
Potter, Capt. H. N. (USMC) ... 0
Potter, Lt. M. M. ... 0
Potts, Maj. John (USMC) ... 0
Powers, Maj. W. C., Jr. (USMC) ... 0
Price, Lt. G. S. ... 1
Price, Capt. T. E. ... 1
Prickett, Maj. F. B. ... 2
Pride, Lt. R. T. ... 0
Proctor, Capt. G. ... 2
Prouty, Lt. S. M. ... 0
Prunty, Lt. C. H. ... 0
Purdie, Capt. K. S. ... 0
Pyle, Lt. C. A. ... 1
Quekemeyer, Lt. R. K. ... 0
Quill, Lt. J. B. ... 0
Raguse, Lt. C. A. W. ... 1
Ramey, Capt. R. F. ... 1
Ranck, Lt. J. R. ... 0
Randal, Lt.-Col. M. G. ... 0
Rapp, Lt. L. B. ... 0
Rasbach, Lt. J. B. ... 1
Rasor, Capt. W. I. ... 2
Rathien, Capt. H. F. ... 0
Raymond, Lt. R. R. ... 0
Rayner, Maj. H. M. ... 0
Read, Lt. G. W., Jr. ... 4
Reardon, Lt. W. J. ... 1
Reber, Lt. Miles ... 0
Redman, Capt. John W. ... 0
Reed, Lt. A. ... 0
Reed, Lt. C. H. ... 2
Reed, Lt. H. D. ... 3
Reed, Lt. James ... 0
Rees, Lt. J. E. ... 1
Reigner, Capt. L. E. ... 0
Rehm, Lt. G. A. ... 0
Reid, Lt. G. J. ... 1
Reinberg, Capt. W. H. W. ... 1

Reinhardt, Lt. G. C. 0
Reipe, Lt. J. H. 1
Renfro, Lt. C. D. 0
Renshaw, Capt. S. B. 0
Reybold, Lt. J. B. 0
Reynolds, Lt. R. D. 0
Rhinehardt, Maj. C. K. 1
Rhodes, Lt. E. L. 1
Rice, Capt. E. L. 1
Richardson, Capt. H. O. 0
Richmond, Maj. J. F. 2
Ridge, Lt. P. A. 1
Rieman, Capt. G. 0
Riggs, Lt. B. L. 0
Riggs, Lt. T. S. 1
Ritchie, Lt. W. L. 1
Robenson, Maj. J. A. 1
Roberson, Capt. W. S. 1
Roberts, Lt. F. A. 1
Robinett, Capt. P. M. 1
Robins, Lt. C. P., Jr. 0
Robins, Maj. T. M. 1
Robinson, Capt. A. K. 0
Robinson, Capt. H. W. 0
Robinson, Capt. J. S. 1
Robinson, Lt. T. 3
Rodes, Capt. P. P. (*7*) 6
Rodgers, Lt. L. H. 3
Rodwell, Capt. J. S. 1
Roemer, Lt. L. E. 0
Roemer, Capt. T. M. 0
Roffe, Maj. A. W. 0
Rogers, Lt. G. B. 2
Rogers, Capt. J. C. 2
Rogers, Capt. R. W. 0
Rogers, Capt. F. O. (USMC) 0
Roper, Lt. H. M. 0
Rose, Capt. M. 0
Ross, Lt. J. 0
Ross, Capt. M. 1
Round, Lt. R. E. 0
Roxbury, Lt. E. J. 2
Royce, Lt. C. H. 0
Royse, Capt. F. E. 1
Ruffner, Lt. C. L. 0
Rumbough, Capt. D. S. 1
Rundel, Capt. R. M. 0
Rupertus, Maj. W. H. (USMC) 0
Russell, Capt. A. J. 0
Russell, Capt. Randolph 0
Russell, Capt. R. W. 1
Ryan, Lt. J. L. 0
Ryder, Capt. I. E. 0
Samouce, Lt. J. A. 1
Samouce, Lt. W. A. 1
Sancomb, Lt. P. B. 0
Sands, Maj. A. L. P. 1
Sandlin, Capt. E. O. 0
Sappington, Maj. W. F. 0
Sargent, Lt. C. E. 1
Sasse, Maj. R. I. 2
Sawtelle, Lt. D. W. 1
Schaffer, Lt. W. H. 0
Scherer, Lt. H. F. 0
Schlatter, Lt. D. M. 0
Schmidt, Capt. F. O. 0
Schoor, Lt. D. M. 0
Schriver, Lt. A. J., Jr. 0
Schucker, Capt. F. R. 0
Schull, Lt. H. W. 0
Schuyler, Capt. R. L. 0
Schwab, Lt. J. A. 0
Scott, Capt. D. M. 3
Scott, Lt. J. D. 2
Searby, Lt. E. W. 1
Searight, Lt. H. F. 0
Searle, Capt. A. C. 1
Segundo, Lt. F. V. 0
Seitz, Lt. J. F. R. 0
Selee, Lt. R. 0
Selleck, Maj. C. A. 0
Sells, Lt. J. K. 0
Sexton, Lt. W. T. 1
Seymour, Capt. R. T. 1
Shaifer, Maj. E. F. 0
Shannon, Capt. C. A. 0
Sharp, Capt. F. D. 3
Shaw, Capt. C. R. 1
Shaw, Lt. V. F. 0
Shea, Lt. A. F. 2
Shea, Capt. G. D. 1
Shea, Capt. P. E. 0
Shearer, Capt. D. McD. 1
Sheehan, Lt. T. F. 0
Sheets, Capt. A. M. 0
Sheldon, Lt. C. A. 0
Shelley, Col. J. E. 0
Shelton, Capt. J. M. 0
Shepard, Lt. L. 0
Shepherd, Capt. L. C. (USMC) 0
Sherburne, Col. T. L. 0
Sherburne, Lt. T. L., Jr. 1
Sherwood, Capt. P. H. 2
Short, Capt. J. C. 3
Shubert, Warrant Officer 1
Shugg, Maj. R. P. 1
Shumate, Lt. P. W. 0
Simmonds, Lt. C. D. 0
Simpson, Lt. J. R. 1
Sims, Lt. T. A. 0

Sinclair, Lt. F. H. 0
Skelton, Lt. W. G. 1
Skerry, Capt. L. M. 0
Slack, Lt. J. E. 1
Slider, Lt. R. H. 0
Slocum, Capt. L. H. 1
Smedburg, Col. W. R. 0
Smith, Lt. C. A. 1
Smith, Maj. C. C. 6
Smith, Lt. D. B. 1
Smith, Capt. G. I. 3
Smith, Lt. G. S. 2
Smith, Maj. H. J. M. 2
Smith, Lt. J. 0
Smith, Capt. John A. (5) 4
Smith, Lt. L. G. 3
Smith, Lt. P. W. 0
Smock, Capt. S. C. 0
Snyder, Lt. C. E. 1
Snyder, Lt. J. A. 1
Solem, Lt. A. E. 1
Sothern, Capt. R. J. 0
Soule, Lt. R. H. 0
Sperry, Capt. J. R. 0
Spettel, Lt. F. J. 1
Spicer, Capt. C. B. 0
St. John, Maj. A. 1
Stadler, Lt. J. H. 2
Stafford, Capt. C. L. 3
Stancisco, Lt. S. E. 0
Stearley, Lt. R. F. 2
Steele, Lt. C. E. 0
Steiger, Capt. W. C. 0
Stephenson, Lt. W. G. 1
Sterling, Lt. J. M. 0
Stevenson, Lt. H. W. 0
Stevenson, Lt. W. G. 0
Stewart, Capt. S. G. 1
Stillinger, Lt. O. H. 0
Stillman, Lt. J. H. (USMC) 0
Stober, Lt. M. F. 1
Stockton, Lt. M. L. 2
Stodter, Lt. J. H. 0
Stone, Lt. A. G. 0
Stratton, Lt. C. W. 0
Stratton, Lt. J. H. 0
Strawn, Capt. C. C. 0
Strickland, Lt. F. H. 1
Strickler, Lt. D. G. 1
Strohbehn, Lt. E. L. 1
Stoughton, Lt. T. R. 0
Strong, Maj. C. H. 0
Strong, Lt. P. N. 1
Stubblebine, Lt. A. N. 0
Sturman, Lt. J. F. 0
Sugg, Lt. O. D. 0
Sugrue, Lt. C. D. 0
Summers, Lt. D. H. 0
Sundt, Lt. D. N. 0
Surles, Maj. A. D. 2
Sutherland, Lt. O. R. 0
Sutton, Lt. H. T. 1
Svenson, Lt. E. 0
Sweeney, Lt. W. C. 0
Sweet, Capt. J. B. 0
Swift, Lt.-Col. I. P. 3
Swift, Lt. I. P. 1
Swing, Maj. J. M. 3
Swofford, Lt. R. P. 0
Syme, Lt. L. D. 0
Talbott, Maj. R., Jr. 1
Tallent, Capt. R. E. 0
Tansey, Lt. T. H. 1
Tapping, Lt. F. H. 0
Tate, Lt. F. J. 1
Tate, Capt. J. S. 4
Taulbee, Maj. E. W. 1
Tausch, Lt. E. R. 0
Taylor, Lt. R. L. 1
Taylor, Lt. D. A. 0
Taylor, Capt. J. B. 1
Taylor, Capt. P. E. 0
Thayer, Capt. A. P. 2
Thayer, Lt. B. G. 2
Theimer, Lt. J. E. 0
Theis, Lt. H. J. 0
Thomas, Lt.-Col. R. S. 0
Thompson, Lt. F. J. 0
Thompson, Capt. G. D. 1
Thompson, Maj. J. B. 2
Thompson, Lt. P. S. 1
Thomson, Lt. E. F. 2
Thornburgh, Lt. T. T. 3
Thornton, Lt. H. J. 0
Thorp, Lt. C. A. 1
Thorpe, Lt. G. C. 0
Thorpe, Lt. W. 0
Tillson, Maj. J. C. F., Jr. 0
Timmons, Lt. J. W., Jr. 1
Timothy, Lt. R. W. 0
Todd, Capt. W. N. 0
Tolson, Maj. G. I. 1
Tombough, Lt. P. E. 1
Tompkins, Lt.-Col. D. D. 1
Toole, Capt. L. E. 0
Torbett, Lt. O. C. 1
Trapolino, Lt. T. F. 0
Trapnell, Lt. T. J. 1
Trent, Lt. J. F. 0
Trew, Lt. F. G. 1

Trudeau, Lt. A. G. 0
Truscott, Capt. L. K. 4
Truxes, Maj. A. H. 1
Turner, Lt. F. T. 0
Tyndall, Lt. B. A. 0
Uncles, Lt. J. F. 0
Unger, Capt. C. H. 1
Upton, Capt. P. R. 1
Vail, Capt. B. B. 0
Valentine, Lt. C. H. 0
Vance, Lt. L. C. 0
Van Houten, Lt. J. G. 2
Van Natta, Lt.-Col. T. F. 0
Van Natta, Lt. T. F. 1
Van Wyck, Lt. H. 2
Van Tuyl, Lt. H. E. 0
Vepsala, Lt. A. E. 0
Vincent, Lt. J. W. 0
Vocke, Lt. L. 1
Voight, Capt. T. E. 4
von Kessler, Maj. W. C. 0
Wahl, Capt. G. D. 1
Wakefield, Lt. M. F. 1
Waldron, Capt. N. E. 1
Walker, Lt. E. A. 1
Walker, Lt. H. E. 0
Walker, Capt. I. G. 1
Walker, Lt. J. H. 1
Walker, Lt. J. S. 0
Walker, Lt. S. P. 2
Walker, Lt. W. A. 0
Wall, Maj. J. F. 1
Waller, Lt. J. D. (USMC) 0
Ward, Lt. J. T. 2
Ward, Lt. R. W. 0
Washburn, Capt. J. H. 1
Waters, Lt. J. K. 0
Waters, Lt. W. C. 0
Watkins, Capt. H. E. 0
Watson, Lt. A. 0
Watson, Capt. H. L. 1
Watt, Lt. D. A. 0
Watters, Lt. W. E. 0
Wedemeyer, Lt. W. A. 0
Wehle, Lt. P. C. 0
Welch, Capt. G. B. 0
Wells, Lt. J. B. 0
Wells, Lt. L. F. 0
Wenzlaff, Lt. T. C. 0
Wesner, Lt. C. 0
West, Lt. G. W. 0
Westlund, Lt. C. W. 1
Westphalinger, Lt. H. R. 1
Wharton, Lt. S. F. 0
Wheaton, Lt. J. R. 0
Whelan, Lt. J. A., Jr. 0
Whelan, Lt. P. C. 0
Whelchel, Lt. W. W. 0
Whisner, Capt. E. B. 2
Whistler, Lt. J. M. 0
White, Lt. A. F. 0
White, Lt. H. V. 0
White, Lt. I. D. 2
White, Capt. Samuel 0
Whitehead, Lt. T. E. 0
Whitehouse, Lt. B. M. 0
Whitley, Lt. H. S. 0
Whitmore, Lt. C. S. 1
Whitted, Lt. T. B. 0
Wickham, Capt. F. O. 0
Wiener, Capt. W. M. 0
Wilder, Maj. C. J. 2
Wilkinson, Capt. C. A. (7) 6
Williams, Capt. A. W. 0
Williams, Maj. C. S. 0
Williams, Capt. E. A. 1
Williams, Lt. E. T. 2
Williams, Col. G. 0
Williams, Lt. I. J. 0
Williams, Lt. J. F. 2
Willliams, Lt. J. H. 0
Williams, Lt. L. O. 0
Williams, Lt. P. L. 0
Williams, Capt. S. T. 1
Williamson, Lt. G. McK. 0
Williamson, Capt. M. S. 0
Williamson, Lt. R. E. S. 0
Willis, Lt. A. N. 0
Willis, Lt. J. B. 0
Willis, Capt. R. B. 1
Willson, Lt. R. T. 0
Wilson, Lt. Col. A. H. (6) 4
Wilson, Capt. C. H. 1
Wilson, Lt. G. H. 0
Wilson, Lt. O. O. 2
Winans, Maj.-Gen. E. B. 0
Winfree, Lt.-Col. S. W. 1
Wing, Capt. A. G. 1
Wing, Lt. F. F. Jr. 1
Wingfield, Lt. L. R. 1
Winn, Lt. J. S., Jr. 1
Winn, Lt. N. M. 0
Wise, Capt. K. B. 1
Wiselogel, Lt. C. O. 0
Withers, Lt. W. P. 0
Wofford, Lt. J. W. 3
Wolfe, Lt. F. C. 0
Wolfe, Capt. W. R. 1
Wood, Maj. D. S. 3
Wood, Lt. W. H. 0

Wood, Capt. M. R. 0
Woodbury, Lt. M. C. 0
Woodruff, Capt. R. C. 1
Works, Lt. J. M. 1
Wren, Lt. W. B. 0
Wright, Lt. W. H. S. 0
Wyman, Lt. W. G. 0
Yale, Lt. W. W. 1
Yancey, Lt. W. J. T. 0
Yeats, Lt. J. J. 2
Yeo, Lt. S. 0
Yeomans, Lt. P. E. 1
Young, Lt. E. W. 0
Young, Lt. L. F. 0
Young, Capt. M. L. 1
Younger, Capt. J. W. 1
Zeller, Lt. H. M. 0
Zimmerman, Lt. J. B. 0

FIELD ARTILLERY NOTES

81mm Stokes-Brandt Mortar Tests

The Field Artillery Board has completed its tests and report on the 81mm Stokes-Brandt mortar. This weapon was described and illustrated in the March-April number of the FIELD ARTILLERY JOURNAL. The Board recommended that this mortar be adopted as standard for the Field Artillery for use as an accompanying gun and for such other special Field Artillery uses to which it is adapted.

Extensive tests were made at Fort Bragg with a view to solving the accompanying gun problem by means of the 81mm Stokes-Brandt mortar. The tests covered mobility, vulnerability, functioning of the matériel, accuracy, possibility of fire, effectiveness of projectile, determination of how close to our Infantry lines the mortar could be fired, tactical sufficiency as accompanying gun and tactical uses other than as an accompanying gun.

Transport Tests at Bragg

Upon the return of the Sterling engined, 10-ton, 6-wheel, 6-wheel drive truck from Camp Holabird, Maryland, to Fort Bragg, North Carolina, a test of the new lubricating device for the 155mm gun carriage, M1918, will be inaugurated.

The Field Artillery Board is still testing the Indiana, Coleman 5-ton and GMC with Coleman 4-wheel drive trucks in order to determine their economy life. It is expected that the Board will furnish a report to the Chief of Field Artillery on the adaptability of these trucks to Field Artillery requirements within the next month.

Tests of the White 8-ton and the Mack 8-ton prime movers have been completed by the Field Artillery Board and reported upon. These heavy prime movers were tested to determine their usefulness for towing 155 GPF gun, the 240mm howitzer and the 8-inch howitzer. The Board found them unsatisfactory for towing the 155 GPF and the 8-inch howitzer, but approved them for limited procurement with a view to determining their suitability as a substitute prime mover for the 240mm howitzer.

Tests of Radio Telephone-Telegraph Sets

The Field Artillery Board is conducting a series of interesting

tests of the RCA-Victor ultra high frequency radio telephone-telegraph sets called SCR-183-T4. These sets have been successfully used to establish communication by radio telephone between the observation post and the guns of a 75mm gun battery. Communication was also established between an observation balloon and the battery. These tests were conducted during actual service practice with axial and lateral observation, using both 37mm and 75mm service ammunition. Similar tests will be conducted with batteries of larger calibers.

As these radio sets were assembled for installation in aircraft, they do not lend themselves well to Field Artillery purposes in their present assemblies. Experiments with a view to making recommendations along this line are now being made.

Dependable communication by radio telephone may be expected up to 2 miles with these sets. Communication by radio telegraph has been maintained satisfactorily up to 4 miles. The range obtainable depends to a large extent upon the terrain.

Tests will continue as outlined above. Tests to determine the suitability of this type radio set for liaison communication will also be made.

Field Artillery Uses of 37mm Gun

The Field Artillery Board has been testing the improved 37mm gun for use against fast moving tanks and armored cars. It is intended to complete this test in June by firing armor-piercing projectiles at obsolete war-time tanks. In view of the fact that destruction of attacking tanks and armored cars is a Field Artillery mission, these tests are being conducted to determine the kind of weapon best suited for such work. The Board is starting its tests with the 37mm gun, chiefly because it is inconspicuous and can be left in position at all times to be used only on antitank missions. If this weapon should prove suitable as regards penetration, flexibility of fire and vulnerability it would probably be accepted as standard, but if it is found that the 37mm gun and its ammunition are not powerful enough, then it will be necessary to try out some heavier and more powerful weapon. There is also a possibility that as a result of these tests, weapons of even smaller caliber may be tried out for anti-tank and anti-armored

car missions. It is possible that a weapon of small caliber with very high muzzle velocity could be used effectively to stop tanks.

105mm Howitzer Tests

The Field Artillery Board has completed the test firing of 105 howitzer H. E. shell, M1, with fuze P. D. and M39, for range, accuracy and crater characteristics. Preparations are being made to obtain data as regards fragmentation and effect; this firing should begin about the middle of May.

155mm Howitzer T1

The Field Artillery Board has recommended against the standardization of the 155mm howitzer, T1 (maximum range 16,390 yards). They recommended reducing the weight of this weapon in order to facilitate man-handling and also improving the carriage so as to obtain more mobility. The T1, 155mm howitzer weighs 14,300 pounds in battery, whereas the old World War type weighed only 8,260. 6,000 pounds increased weight gave about 1,000 yards increased range for each 1,000 pounds increased weight, which was considered excessive.

Caterpillar Tractor

The Ordnance Department has taken steps to revise their Book of Standards to indicate satisfactory tractors under their respective requirements as follows: Tractor, light: Caterpillar "20" tractor; Caterpillar "25" tractor. Tractor, medium: Caterpillar "30" tractor; Caterpillar "35" tractor. Tractor, heavy: Caterpillar "60" tractor, Caterpillar "65" tractor.

Quick Release Lunette

At the request of the Field Artillery one lunette, T2 for use with 75mm gun caisson, has been manufactured at the Rock Island Arsenal and shipped to the Aberdeen Proving Ground. This lunette is provided with a quick-release device for quickly unlimbering the caisson from its limber and it is intended to enable a machine gun, which is carried on it, to be placed in action quickly against low flying aircraft.

Colonel Margetts Dies on West Coast

Lieutenant Colonel Nelson E. Margetts, Field Artillery, former aide-de-camp to General Pershing and military attaché to

China, died on April 17, 1932, at Letterman General Hospital, San Francisco.

This distinguished Field Artilleryman was born in Salt Lake City, Utah, May 27, 1879. He served in the Spanish-American War and has been on duty in Alaska, China and the Philippine Islands and throughout Europe.

In 1913 he was ordered to France and in 1914 was detailed to assist American citizens who, on account of the war, were unable to secure transportation or funds to return to the United States. In May, 1917, he was aide-de-camp to General Pershing and returned to France in June with the general staff.

In 1919 he joined the Army of Occupation in Germany, where he later became chief of artillery. Returning to the United States in November, 1920, he was ordered to Camp Meade, Md., in command of the Seventy-ninth Field Artillery. On March 26, 1924, he was promoted Lieutenant Colonel and detailed on the general staff as chief of the military attaché section and foreign liaison officer. In December, 1929, he was ordered to Peiping, China, as military attaché, which post he held at the time of his death.

He was a notable linguist and had been decorated with the Moroccan Peace Medal, the Norwegian Order of St. Olav, the Royal Order of the Sword of Sweden, and with the French Legion of Honor.

He is survived by his wife, Mrs. Mabel B. Margetts, of Fort Mason, Calif.

Lieutenant Huffman Killed at Monterey

On April 22, 1932, Second Lieutenant George R. Huffman, 76th Field Artillery, died as the result of a fall of his horse at the Presidio of Monterey, California.

Lieutenant Huffman had at the time of his untimely death completed but little more than seven months of actual service with the regiment and arm to which he was posted following graduation from the Military Academy in June, 1931. But in this short time he had proven himself a most promising officer, a loyal friend and comrade, a fine upstanding type of soldier, citizen and gentleman.

Field Artillery School Graduation

The Spring class of battery officers from the National Guard and Reserve completed their three-month period of instruction April 23, 1932, at the Field Artillery School and received their diplomas from Brigadier General Wm. M. Cruikshank, Commandant. Twenty-five captains and lieutenants from twenty different states comprised the class.

The exercises were held in the Officers' Club and in addition to General Cruikshank, Lieutenant Colonel Lesley J. McNair, assistant commandant, made a brief talk. The invocation was pronounced by Chaplain Branham and the benediction by Chaplain Kilkenny. Colors, standards and guidons of the organizations of the post were massed by the stage and music was furnished by the 1st Field Artillery Orchestra.

The following is the list of the graduates:

Capt. J. W. Carruthers, Kans. N. G.; Capt. H. E. Derby, Mich. N. G.; Capt. H. C. Fisher, Ill. N. G.; Capt. M. E, Mollett, Kans. N. G.; Capt. Walter Ruddy, N. Y. N. G.; Capt. C. R. Taylor, Okla. N. G.; Capt. O. R. Thompson, Ind. N. G.; Capt. J. B, Ward, Oreg. N. G.; Capt. N. E. Whitney, Me. N. G.; 1st Lieut. B. O. Beck, Ill.-Res.; 1st Lieut. M. E. Conway, Colo. N. G.; 1st Lieut. E. R. Gregg, Ky. N. G.; 1st Lieut. F. B. Johnson, Pa.-Res.; 1st Lieut. R. N. Myers, Pa. N. G.; 1st Lieut. B. K. Newman, Conn. N. G.; 1st Lieut. C. E. Stotler, Idaho N. G.; 1st Lieut. G. B. Wilder, Ala. N. G.; 2d Lieut. T. W. Andrews, Texas N. G.; 2d Lieut. M. B. Carlton, Fla. N. G.; 2d Lieut. George Dettelback, N. Y. N. G.; 2d Lieut. R. A. Livingstone, R. I. N. G.; 2d Lieut. A. J. Salmon, N. J. N. G.; 2d Lieut. S. R. Sheppard, N. J. N. G.

Schedules of Courses at the Field Artillery School

OFFICERS

Battery officers, R. A., Sept. 12, 1932-June 9, 1933; Advanced course, R. A., Sept. 12, 1932-June 9, 1933; Refresher course, R. A., March 27, 1933-May 27, 1933; Adv. Horsemanship, R. A., Sept. 12, 1932-June 9, 1933; Adv. Motors, R. A., Sept. 12, 1932-June 9, 1933; N. G. and R. B. O. (fall), N. G. and R. B. O., Sept. 12, 1932-Dec. 10, 1932; N. G. and R. B. O. (spring), N. G.

and R. B. O., Jan. 23, 1933-April 22, 1933; N. G. and R. F. O., N. G. and R. F. O., Jan. 2, 1933-Feb. 11, 1933.

ENLISTED MEN

Motor mechanics, R. A. and N. G., Sept. 12, 1932-Jan. 21, 1933; Horseshoers, R. A. and N. G., Sept. 12, 1932-Jan. 21, 1933; Saddlers (fall) R. A. and N. G., Sept. 12, 1932-Jan. 21, 1933; Saddlers (spring), R. A. and N. G., Jan. 30, 1933-June 9, 1933; Battery mechanics, R. A. and N. G., Jan. 30, 1933-June 9, 1933; Communication, R. A. and N. G., Jan. 30, 1933-June 9, 1933.

Allotment of Graduates of the 1932 Class, United States Military Academy

The Secretary of War has directed that the present first class, United States Military Academy, consisting of 260 cadets, be assigned to branches on graduation as follows:

Engineer Corps	14
Signal Corps	2
Cavalry	14
Coast Artillery Corps	53
Field Artillery	55
Infantry	122

Graduates will be assigned to branches of their choice within the above limits.

Five graduates may be detailed to the Quartermaster Corps, irrespective of the branch to which assigned.

All graduates requesting detail in the Air Corps and found physically qualified will be so detailed irrespective of the branch to which assigned.

Artillery Hunt Racers

Four officers and six horses from Fort Sill carry the colors of the Field Artillery in three of the outstanding race meets of the year—the Fort Leavenworth Hunt races on May 6, the Mission Valley Hunt races at Kansas City, Mo., on May 14, and the Cavalry School Hunt races at Fort Riley, Kans., on June 1. The trip is being made by motor overland, and at Fort Leaven-worth the party will be increased by Capt. H. B. Hester and

Lieut. J. M. Willems, Field Artillery officers now on duty at Fort Riley.

The officer riders making the trip are Lieuts. R. L. Taylor, Bryan Evans, E. W. Searby, and J. E. Theimer, and the horses entered for the Field Artillery are John Lucas, Gaunt, Bill Ennis, Quinette, Wild Bil, and Lucius II. The first four of these are entered in the Skinny Wainwright cup race and will be ridden by Capt. Hester and Lieuts. Evans, Searby, and Willems, respectively. The last two horses named, together with Bill Ennis, will make up the entry list in the Fort Leavenworth Hunt cup race and will be ridden by Lieuts. Searby, Evans, and Willems, respectively.

Exhibition Drill at Atlantic City

Battery C, 16th Field Artillery, commanded by Capt. H. W. Blakeley, returned to its station at Fort Myer, Va., on Monday after a week's absence during which it put on five exhibition drills at the Atlantic City horse show. The show was held in the Auditorium, the largest building of its kind in the world, and the battery was able to put on an even more spectacular drill than at the national horse show in Madison Square Garden, New York, last fall.

The Atlantic City *Evening Union* said: "The exhibition of horsemanship staged by the famous Gray Horse Battery from Fort Myer, Va., took the galleries by storm and was conceded the greatest event ever staged in Atlantic City's Auditorium.

The battery made the trip to and from Atlantic City in a special train of ten cars. In addition to Capt. Blakeley, the officers who made the trip were 1st Lieut. J. L. Chamberlain and 2d Lieut. Albert Watson.