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75 MM. GUN WITH T3 MOUNT CONSTRUCTED AT WATERTOWN ARSENAL AND TESTED AT ABERDEEN

# THE FIELD ARTILLERY JOURNAL

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## DIVISION ARTILLERY IN THE NEXT WAR

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DEVELOPMENTS during and since the war are tending to render the existing Field Artillery materiel obsolescent. It is a well-known fact that new field guns and carriages of the division, corps, and army types have been built since the war which are greatly superior to the war types in that the guns give greater ranges. However, none of the war types and few of the post-war types of artillery meet the demands which will be required of them in future wars.

High speed targets in various forms are gradually entering the field of fire of all types of field guns, such as the new high speed trucks used as prime movers for artillery and for carrying infantry, and tanks having cross-country mobility and speeds unthought of heretofore. Even more menacing than the high speed tanks and trucks are the many types of aircraft, carrying bombs and machine guns, which may swoop down upon our troops without warning.

It is well known to all Field Artillery officers and to others who have given thought to the problem that the present types of Field Artillery, as exemplified for instance by the famous French 75 mm. gun, are wholly incapable of dealing with these high-speed targets. Few of the carriages for these guns permit sufficient elevation for firing at aerial targets, nor have they sufficient speed in traversing or elevating.

Unfortunately, not only the guns and the carriages, but also the fire control instruments, which have been developed for use of Field Artillery, are wholly unsuitable for use against high-speed targets. The fire control instruments used by a Field Artillery battery have been developed on the principle of keeping this equipment as light and as simple as possible. Practically all firing data must be computed slowly and laboriously by the personnel of the battery. It is evident that such methods are unsatisfactory when attempting to fire guns continuously at moving targets.

With luck a battery of divisional guns using present types of field carriages and fire control might destroy a high-speed tank, but there is no assurance that it could do so. It would be absolutely impossible to bring effective fire upon an airplane traveling at a speed of 100 miles per hour or more, and to attempt it would be purely a waste of ammunition. Present methods of fire control are being adhered to altho the increased ranges of the post-war guns necessitate refinements in fire control instruments and methods.

Furthermore, practically all existing Field Artillery carriages up to this time are defective from the standpoint of modern high-speed transportation in that they cannot be hauled at speeds greater than about 15 miles per hour without seriously damaging the gun carriages and their mechanisms. All the artillery of the World War period was limited in this respect since it had been designed with the idea of using horses or the slow-speed tractors available at that time for tractive forces. Since the war, trucks have been built, which are capable of hauling gun carriages at high speeds. This commercial development makes it imperative that gun carriages of the future be so constructed that advantage can be taken of these high speeds, not only on good roads, but also when the gun carriages are trailed across country.

These new conditions, which have been briefly outlined above, call for Field Artillery of a new type. Present ideas concerning fire control must be revised, and the fire control equipment of the battery must be augmented so that batteries can bring effective fire, not only against stationary ground targets, but also against rapidly moving ground targets, and with equal accuracy and facility against high-speed targets in the air.

A type of field gun carriage, which has been developed with the idea of meeting the new requirements referred to above, has been recently completed at Watertown Arsenal. This carriage mounts the high velocity 75 mm. field gun (muzzle velocity 2175 ft. seconds), which gives a maximum range of 15,000 yards with a 15-lb. projectile.

In order to meet the requirements of high-speed transportation, the new carriage has been equipped with wheels mounting

balloon tires and having roller bearings at the hubs. The design is such that either single or dual tires can be mounted, and the recently developed puncture-proof inner tubes are used. While the dual tires increase the weight of the gun carriage about 400 lbs., it is believed that tests will show the advantages of having the additional tire contact area. Furthermore, the two additional wheels and tires may be considered as spares, in which case, if one of the tires were damaged, the vehicle would not have to stop. The increased ground

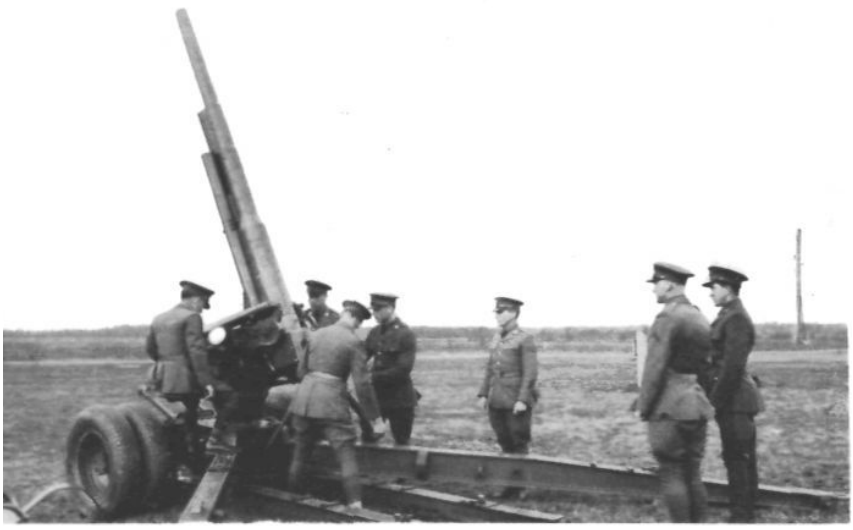


FIG. 1. FIRING WITHOUT REMOVING WHEELS

contact area makes it possible for the vehicle to pass thru sand and soft mud. The construction is such that the gun carriage proper is carried on the wheels and axle as a sprung load.

The gun can be fired by opening out the rear trails and supporting the front part of the carriage by means of the two spare trails (See Fig. 1). Two outriggers with built-in screw jacks are placed on the ground under the carriage pedestal. When in place, the screw jacks are tightened against the bottom of the carriage, thus the vertical component of the firing load enters the ground thru these two outriggers which serve to protect the balloon

tires, roller bearings and the spring suspension from the firing load. The gun can be fired in this manner thru an angle of traverse of 90° and at elevations from 0° to+80°.

If all-around fire is desired, the carriage can be put in a second firing position. In this case, the two outriggers are used for raising and lowering the carriage. The wheel and axle assembly can be quickly removed from the pedestal of the gun carriage, and the latter lowered to the ground. The two spare outriggers are then put into place to complete the base for the carriage. In this position the gun can be fired through 360° of traverse and at angles of elevation from 0° to+80°. The top carriage can be cross-levelled plus or minus 6° or a total of 12°. Spirit levels are attached to the top carriage to be used when cross leveling the gun trunnions. Thus the trunnions can be made level before firing either from the first or second position. Cross-leveling of the carriage is a necessity, if the gun is to be fired by mechanical methods at moving targets. Furthermore, it insures more accurate fire, when firing by regular Field Artillery methods.

In arsenal trials, using untrained men, the carriage was put in the first firing position (for 90° traverse) from the traveling

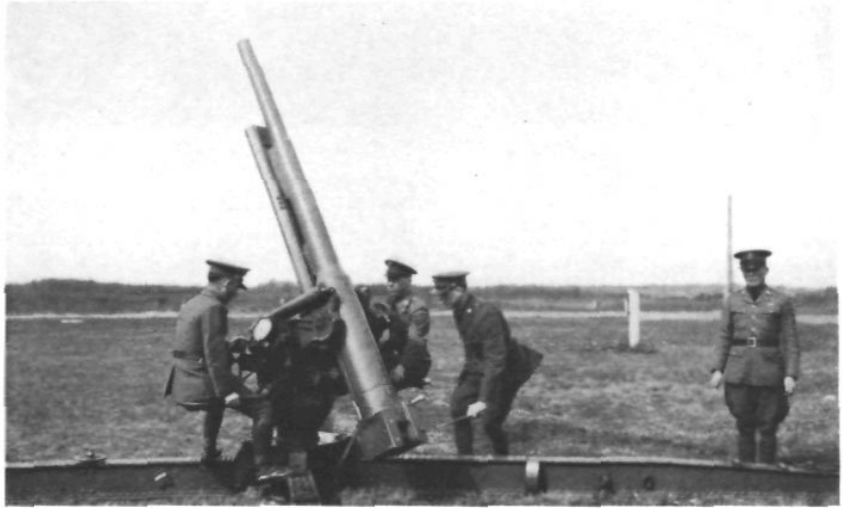


FIG. 2. FIRING AT MAXIMUM ELEVATION—80°

FIG. 3. FIRING WITH WHEELS REMOVED—ALL-AROUND TRAVERSE

position in one minute, and in the second firing position for (360° traverse) from the traveling position in four minutes.

It is believed that such a gun carriage fully meets the requirements which were outlined at the beginning of this article. The weight of the gun and carriage in the firing position is 5,800 lbs., or nearly twice that of the low velocity 75 mm. gun carriage of the World War type. However, assuming a 4″ penetration of the tires into the ground, the area of the tires in contact with the ground is 832 square inches as compared with 194.6 square inches for the French 75 mm. Field Gun, M1897, equipped with steel tires, and the ground pressure is 6.9 lbs. per square inch as compared to 13.7 lbs. per square inch for the French 75 mm. It will thus be seen that the new carriage will undoubtedly possess greater cross-country mobility than the lighter carriage. This low weight for a high velocity all-around fire carriage with cross-leveling features, dual balloon tires and spring suspension, is made possible by taking advantage of steels of high physical qualities, of the new welding process which has been developed at Watertown Arsenal, and by making parts of the carriage, where possible, of strong aluminum alloys having one-third the weight of steel. This carriage is equipped with the anti-aircraft type of elevating and traversing mechanisms, employing roller bearings thruout. All backlash

is eliminated making it possible to lay the gun with an accuracy of ½ mil on either elevation or azimuth.

**Fire Control for Artillery of the New Type.** The new gun carriage which has been described above is being fitted with fire control equipment in order that the above ideas may be tested. When more complicated fire control instruments are mentioned for Field Artillery, the questions of cost and weight are always raised. Both of these become factors of little importance if an increase in the percentage of hits can be realized by adding additional fire control instruments to the battery. For example, let us assume that the fire control instruments of the type to be described cost $20,000 per battery. This represents the cost of 800 rounds of 75 mm. ammunition at $25 per round. If a battery fires 200 rounds per gun using inaccurate data, it has wasted the price of proper fire control.

The Anti-Aircraft Service has already found that by changing to the new type of fire control and using mechanical methods, the percentage of hits on aerial targets can be more than doubled for the shorter ranges and the increases at the longer ranges have been even greater. If the accuracy of fire of Field Artillery

FIG. 4. TEST FIRING AT ABERDEEN

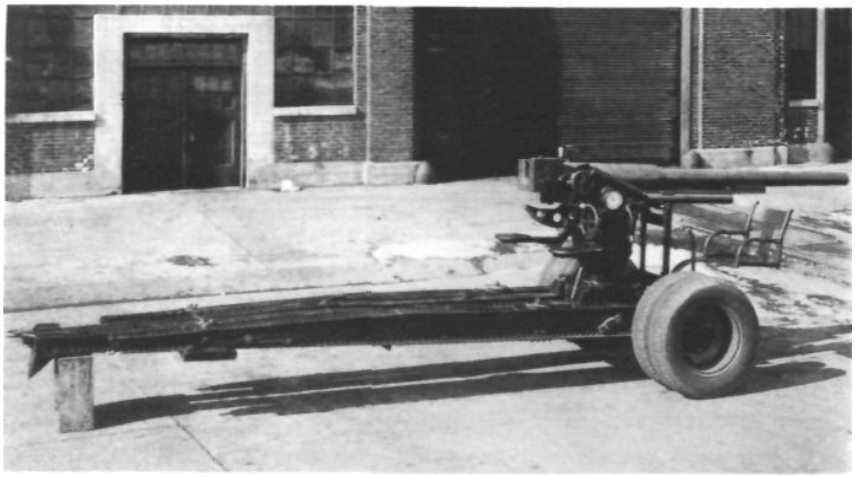


FIG. 5. TRAVELLING POSITION

against moving targets can be improved by new fire control methods, the instruments can be quickly paid for by the savings in ammunition. The same line of reasoning may be followed as to weight, assuming the weight of a complete set of battery fire control instruments of the new type at 1,500 lbs. This represents the equivalent of about 75 rounds of 75 mm. ammunition. If ammunition can be saved by increasing the accuracy of fire, then it is better to transport fire control instruments than ammunition. In other words, the slogan in peace or war should be "Buy Fire Control to Save Ammunition."

The fire control equipment which is being furnished for the new type of gun carriage will, for the purpose of this discussion, be divided into those instruments which are carried on each gun carriage, which will be designated as "On carriage fire control instruments," and the remaining instruments required for the battery will be designated as "Off carriage fire control instruments."

**On Carriage Fire Control.** A panoramic sight and elevation quadrant have been provided for the gun and carriage so that the present Field Artillery fire control methods can be used. The mountings for both the panoramic sight and quadrant have, however, been simplified since the trunnions can be cross-leveled before firing starts. Therefore, the standard mounting for the panoramic sight can be greatly simplified since the mechanism

required for correcting the "out of level" condition of the gun trunnions can be eliminated. The cross-leveling features usually required for the elevating quadrant can also be eliminated.

In order to permit the mechanical method of fire control to be used with battery, two additional instruments are required on each gun carriage. These instruments are an azimuth receiver geared to the traversing mechanism and an elevation receiver, which is geared to the elevating mechanism of the gun carriage. They should be located so that the azimuth and elevation personnel can watch the dials conveniently when maneuvering the elevating and traversing handwheels. Each receiver has two sets of pointers. One set of pointers is driven from the central station director electrically and keeps step with the data computed by the director continuously and without loss of time. The other set of pointers is geared, e.g., to the elevating mechanism of the gun carriage. Thus by matching pointers the gunner can keep the gun set in elevation in accordance with the readings continuously being sent from the central station instrument. Also by using these receivers telephones to

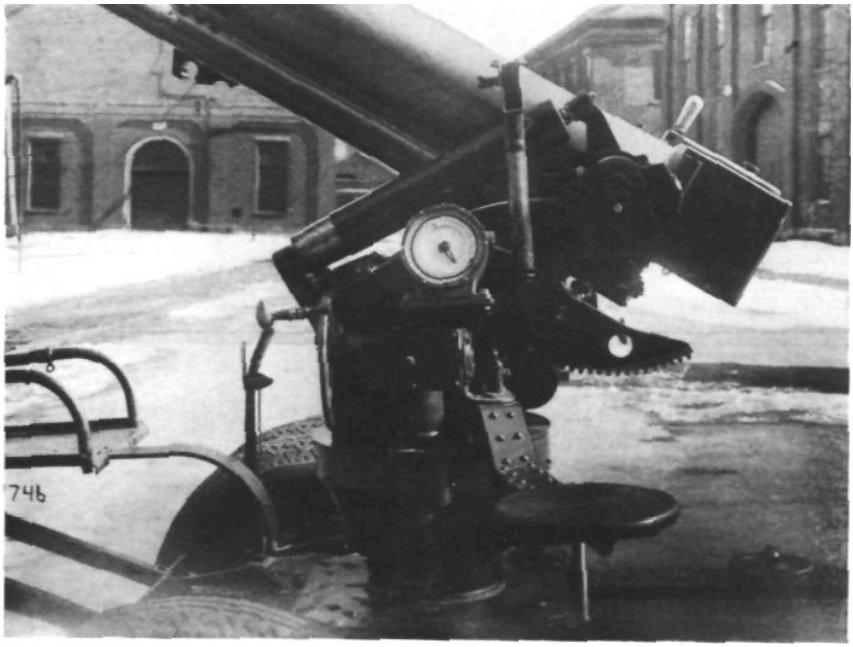



FIG. 6. FIRING DATA RECEIVER WITH ELECTRICALLY DRIVEN POINTER

the guns can be dispensed with, as the former can be used to transmit to the guns, if desired, not only Case III firing data, but also deflections and ranges. These receivers are relatively light and compact as will be seen from the photograph (Fig. 2), which shows the direct current type of data transmission system.

When the data transmission system was first introduced in the Anti-Aircraft Service, officers were skeptical as to whether this equipment would be sufficiently rugged for field service. Tests have shown that the electrical data transmission system is more reliable than the field telephone sets which were formerly used to transmit the firing data to the guns.

**Off Carriage Fire Control.** In addition to the present battery fire control instruments, there should be a mechanical data computer. An instrument of this type has recently been issued by the Ordnance Department to the Field Artillery Board for test. In the German Army every battery is now equipped with such a mechanical computer which is carried as part of the battery equipment. It furnishes corrected ranges, angles of site and deflections, and automatically corrects for the velocity and direction of the wind, muzzle velocity, density of atmosphere at different altitudes and heights. By changing one platen which has several cam slots cut in it, the machine can be used for different weights of projectiles and guns of different calibers. The instrument is universal in character and can be issued to any battery, it being only necessary to provide the proper platens. The machine, in solving Field Artillery map problems will reproduce a range table with an accuracy of plus or minus 10 yards. It is so arranged that the individual guns of a battery can be calibrated and the muzzle velocity correction for each gun set off on the instrument. The corrected data for each gun is automatically given when the muzzle velocity correction lever is changed for the setting of that gun. The calculator also furnishes data referring to the actual position of each gun of the battery, the position of which is indicated on the map. The device is small and compact, being only about 40 inches long. The device eliminates all computing in the solution of firing data problems. Furthermore, soldiers can be taught to operate it in a few hours.

The battery fire control equipment required for dealing with high-speed moving vehicles and airplanes would consist of a range and height finder of three or four meters base and another central station computing machine (hereafter called a director), together with an electrical data transmission system for hooking in with the elevating, azimuth and fuze receivers on the gun carriages.

**Range and Height Finder.** The range and height finder is used for measuring the range of ground targets which can be seen and the

FIG. 7. PREPARING TO REMOVE WHEELS

altitudes of aerial targets. Tests with instruments of this type conducted by the anti-aircraft artillery have shown that the stereoscopic type of instrument is superior to the coincident type. The stereoscopic type of range and height finder is a very valuable instrument for artillery since the operator can very accurately call overs and shorts when the bursts can be seen. For anti-aircraft fire the instrument is the only method of making corrections based on observation unless a flank observer connected to the battery by telephone can be used. The one-meter base range finder assigned to the Field Artillery does not possess sufficient accuracy for long range firing and of course could not be used for measuring the altitude of an airplane. The accuracy of all types of monostatic range and height finders varies directly with the length of base. Thus a four-meter range and height finder would have four times the accuracy of a one-meter instrument.

**Central Station Director.** The director is the instrument which computes automatically the firing data required for firing at rapidly moving targets. The anti-aircraft director automatically and continuously computes the ground speed of the target, angle of approach and finds the unknown future range and time of flight corresponding to the future position of the target. In addition, it adds algebraically corrections for drift, muzzle velocity, direction and velocity of the wind. The input of the instrument is the altitude, the present azimuth and angular height of the target. The output of

FIG. 8. WHEELS REMOVED—GOING INTO ACTION FOR ALL-AROUND FIRE

the instrument is the azimuth, quadrant elevation and fuze setting corresponding to the future position of the target. Transmitters are attached to the three output shafts of the director so that these values can be continuously sent to the elevation and azimuth receivers on the gun carriages and to the receivers on the fuze setters.

The Vickers type of the anti-aircraft director with modifications would be a suitable instrument for use of the Field Artillery. A 30-volt storage battery would be required for supplying the current necessary for the electrical data transmission system.

During the war the firing data for anti-aircraft artillery was telephoned to the guns. This introduced a dead time of 8 to 10 seconds into the firing data and made it impossible for the battery to secure a large percentage of hits upon aerial targets. The elimination of this dead time has contributed greatly to the success of the post-war anti-aircraft materiel.

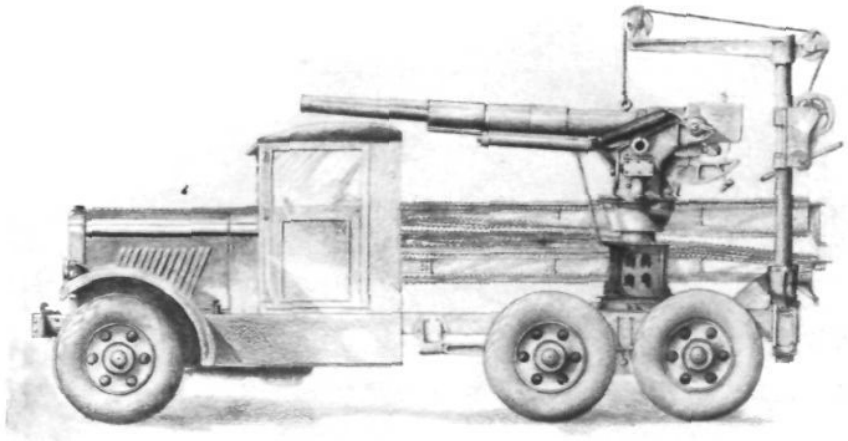


FIG. 9. ARRANGEMENT FOR CARRYING THE GUN ON A SIX-WHEEL TRUCK

While the director was designed solely as an anti-aircraft fire control instrument, it could be modified and used to compute Case III firing data for a rapidly moving ground target, such as a tank, taking range measured by the range and height finder as an argument instead of altitude. If a Field Artillery director of this type were developed, any problem involving visible targets on the ground or in the air could be solved. One of the great advantages which should not be overlooked is the fact that men can be trained in a few days to use successfully these automatic instruments which, while very complicated internally, are very simple to operate.

One additional instrument would be required to complete the fire control equipment of our battery;—a fuze setting machine. A fuse setter required for this type of fire control must be equipped with a receiver similar to those placed on the gun carriage. The receiver is geared to the fuze setter so that the operators of the latter can continuously keep in step with the fuze readings being transmitted electrically from the director. Such a fuze setter has already been developed for the Anti-Aircraft Service and it is known as a Continuous Fuze Setter M1. One of these fuze setters has been tested by the Field Artillery Board, but such a fuze setter has little advantage over the bracket fuze setter unless it is to be used in connection with the mechanical method of fire control, in which electrical data transmission

devices are included. In the case of the latest type of the anti-aircraft carriage (3″ A. A. Mount, M2) the fuze setter is mounted on the carriage. On account of lack of room, in the case of the 75 mm. universal field gun carriage, brackets are provided on all four outriggers so that the fuze setter can be attached to the outrigger most convenient to the breach. The fuze setter should be as near the breech as possible so that the shell can be fired as soon as possible after it has been removed from the setter. In the Anti-Aircraft Service, the time required to remove the fuze from the setter, insert the round in the gun, and fire, is one second. This second is allowed for and set into the director. The rate of fire of the 3-inch A. A. Mount, M2, averages 25 rounds per minute. The rate of fire of the new 75 mm. gun on the universal type of carriage illustrated above should be greater as the ammunition is lighter.

**Prime Movers for Division Artillery.** Many officers think of automotive vehicles in terms of the type of trucks and tractors which were used in France in 1918. This is not strange since few modern military automotive vehicles have since reached the Service.

The great strides, which are being made in commercial motor vehicles are everywhere apparent. Fleets of high-speed

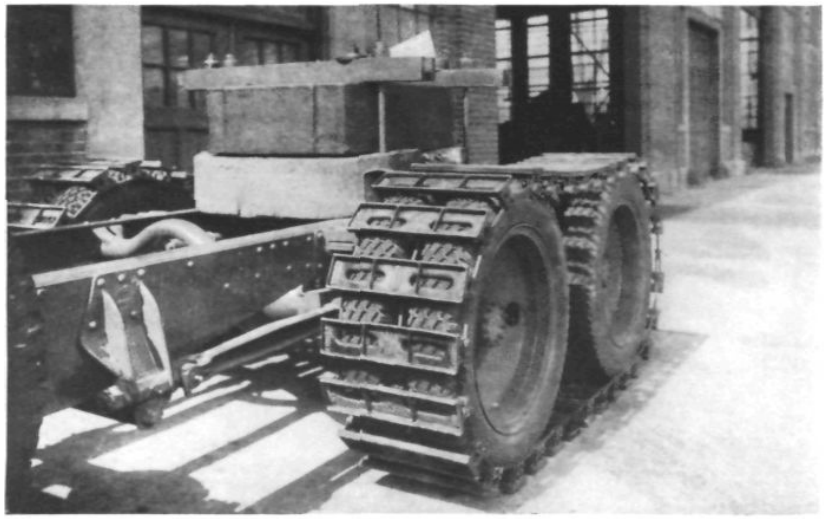


FIG. 10. LIGHT STEEL TRACK MADE AT WATERTOWN ARSENAL FOR 6-WHEEL TRUCK

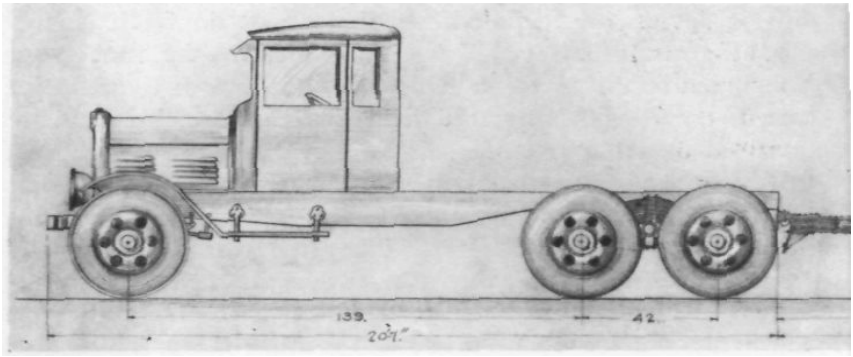


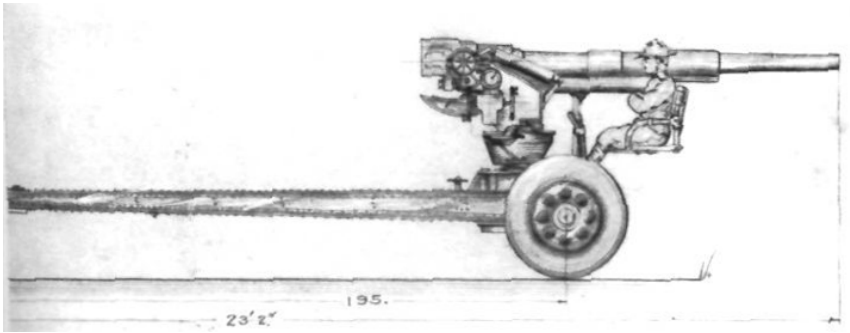

FIG. 11. 75 MM. GUN ON T3 MOUNT BEING TOWED

trucks and buses run daily between cities separated by great distances. Such vehicles carry many tons of pay load, and with their modern powerful engines, hydraulic brakes and balloon tires, can travel at speeds which make it difficult for the lightweight so-called pleasure automobile to duplicate. In short, all around us we see a new order of things and realize that at least the greater part of the artillery must be motorized if we are to be present with our artillery in future battles.

Strangely enough this country, which is the leader, far in advance of all other countries in automotive development, trails in the mortorization of artillery. The Italians have almost completely motorized their artillery with the famous Pavesi wheel tractor. In France where gasoline is a strategic material, great efforts are being made to build artillery prime movers which can use a gas generated from wood on the vehicle, while the English stand as leaders in this mortorization race.

The last named country, several years ago, found after extensive tests that the best all-around prime mover for division artillery was the 6-wheel truck. By subsidizing manufacturers, they forced the production of 6-wheel trucks of suitable specifications for military use. Hundreds of these vehicles are now in actual use in the British Army.

Fortunately, in this country where Government subsidies are impossible, there has been a commercial development of 6-wheel trucks, which started on the West Coast, and has gradually traveled eastward. The use of this type of vehicle has increased yearly until now many of the large manufacturers of




BY MODERN TYPE OF SIX-WHEEL TRUCK

commercial trucks sell 6-wheelers of excellent design of from 3 to 25 tons capacity.

The 6-wheeler is especially adapted as a prime mover for artillery because the weight is supported on three axles, the two rear axles being the driven axles. By using dual tires on the wheels a very large contact area of the tires with the ground can be obtained. This means a small ground pressure per square inch. Hence, the truck wheels will obtain good traction and can negotiate soft ground or sand. Furthermore, with the 6-wheel type of truck it is possible to use a light steel track between the rear wheels so that the ground pressure per square inch can be still further reduced. Such a track of very light weight made of welded alloy steels has been developed at Watertown Arsenal. Fig. 10 shows this track in place. It can be applied or removed in about five minutes. This track should only be used when passing over ground so soft that the vehicle would not otherwise be able to traverse it. Fig. 11 shows a 6-wheel truck of the size and type suitable for division artillery with the 75 mm. universal carriage being trailed behind the truck.

The new universal carriage is of such construction that it can be readily lifted aboard the truck discarding the wheel and axle assembly and removing the four outriggers which would also be carried on the truck. This arrangement is illustrated in Fig. 9. It has been computed that the mount could be put in a firing position from the truck or reverse under favorable conditions in five minutes. This arrangement reduces the road space by one-half as will be seen from the above diagrams. The lifting

A BATTERY OF DIVISION ARTILLERY IN ACTION AGAINST AIR TARGETS USING ELECTRICAL FIRE CONTROL SYSTEM

gear for placing the gun mount on or off the truck would be carried on the latter. The weight of this lifting gear would be less than the weight of the discarded wheels and axles.

**Division Howitzer.** Fortunately, the new 105 mm howitzers which gives a maximum range of 12,000 yards for a muzzle velocity of 1,550 ft. seconds can be mounted on the 75 mm. universal carriage which has been described. The howitzer so mounted can fire through 360° traverse and at a maximum elevation of 80°.

In conclusion, the division artillery in the next war will be entirely different from that used in the last war. It must be designed and built with the idea of being capable of attacking swiftly moving targets on the ground or in the air. The gun and carriage cannot do this alone. It must be supported by mechanical and electrical fire control, which will compute, instantaneously, accurate data for moving targets in the air or on the ground. The artillery must be capable of being drawn by high speed trucks, which must possess cross-country mobility.

The situation in regard to motorization and mechanization is admirably summarized in the report of the Chief of Staff for 1929 in which he states as follows:

"We must recognize that we are living in a machine age, and, in the interest of national defense, the Army must act accordingly. In the commercial world the machine has largely replaced manpower; so, in the Army we must, to the fullest practicable degree, use machines in place of manpower in order that our manpower can occupy and 'hold' without terrific losses incident to modern fire power. Our country, of all the world, is best able to take advantage of machines.

"Any great nation which fails to provide for the utilization of mechanization to the utmost practicable degree must suffer the consequences of neglect in future war. Furthermore, failure to prepare to meet an attack by a mechanical force may result in defeat by troops organized and equipped as of to-day. We must adopt, manufacture, and use the various machines incident to mechanized forces of the best known models of to-day *provided they are sufficiently better than existing equipment to warrant the expenditure of funds*. In short, the Army must be a constantly functioning research laboratory.

# THE DEVELOPMENT OF ARTILLERY IN THE GREAT WAR

BY MAJOR-GENERAL A. G. L. McNAUGHTON, C.M.G., D.S.O., p.s.c., M.Sc., LL.D.*

ALL that is attempted in the following article is an outline of the development of artillery during the Great War, with particular reference to our own Canadian Corps, and marked with a few figures of guns employed and ammunition expended. If little is said about the infantry and the other arms of the Service, the reader will appreciate that this is not because undue importance is attached to the role played by the artillery; none realize better than the gunners themselves that they are not an independent arm, but that their task is to assist the infantry and that, in the last analysis, however well the way is prepared by the artillery and other arms, it is the infantry advance and their determination to apply the cold steel that captures ground and confirms success in battle.

The fire power now in the hands of the infantry themselves by reason of the modern magazine rifle and the machine gun, usually renders direct assault impracticable for the infantry alone, while the vast numbers of troops placed in the field in modern war results in there being no flanks round which to maneuvre. These conditions, together with the increased power of resistance conferred on the defender by field entrenchments and wire entanglements, soon brought the war in Europe into a stable condition, where the opposing armies faced one another along continuous lines from Switzerland to the English Channel, and where each attempt to break the deadlock and power of maneuvre resulted in prohibitive casualties to the attacker. The obvious solution of the difficulty lay in a preponderance of artillery sufficient to crush out the existence of a wide section of the enemy's system, entrenchments and defenders alike, thus creating a gap through which troops could be thrown to work around the

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exposed flanks. The establishments of artillery based on pre-war requirements were far from adequate to permit of the accomplishment of this result and, quite early, all belligerents set to work to remedy this defect in their organization.

In the British Field Army we had to begin with the following natures of armament—

| | Calibre | Weight of Shell | Range |
|---|---|---|---|
| Horse Artillery ..... | 3 ″ | 13 lbs. | 5,500 yards |
| Field Artillery ..... | 3.3″ | 18 " | 6,500 " |
| Field Howitzer ..... | 4.5″ | 35 " | 7,200 " |
| Heavy Artillery ..... | 5 ″ | 60 " | 10,000 " |
| Siege Artillery ..... | 6 ″ | 100/122 " | 6,000 " |

The allotment of artillery per division worked out at about 76 field guns and four 60-pdrs.; the whole Siege Train capable of taking the field consisted only of 4 batteries of old pattern 6-inch howitzers and an armoured train equipped with erratic 4.7″ and antiquatetd 6″ guns. The total number of guns of all natures with the British Expeditionary Force in the fall of 1914 was 504.

Some idea of the growth of the British artillery during the war may be realized from the fact that at the time of the Armistice the British guns in batteries on the Western Front numbered 6,406, of which 2,204 belonged to the heavy artillery.

The Canadian Corps was repeatedly supported by over 750 guns and howitzers, while in the last organized fighting in which we took part—the attack on Mont Houy and the capture of Valenciennes on November 1st, 1918—the advance of one infantry brigade alone (the 10th) was supported by 248 guns and howitzers.

Not only did the number of our guns increase, but the range and shell power were also markedly improved—

IMPROVEMENT OF EXISTING PIECES.

| Type | Range in Yards | | |
|---|---|---|---|
| | 1914 | 1918 | Future |
| 18-pdr. ..... | 6,500 | 9,500 | |
| 50-pdr. ..... | 10,000 | 15,000 | |
| 6″ Howitzer ..... | 6,000 | 9,500 | 12,500 |

NEW WEAPONS INTRODUCED.

| Type | Weight of Shell. Lbs. | Range | | Remarks |
|---|---|---|---|---|
| | | Yards | Miles | |
| 8 ″ How. . . . | 200 | 12,000 | 7 | Travelling carriage |
| 9.2″ " . . . | 290 | 13,000 | 7.5 | Pedestal mounting |
| 12 ″ " . . . | 750 | 14,000 | 8 | " and railway |
| 15 ″ " . . . | 1,400 | 10,500 | 6 | " (obsolete) |
| 6 ″ Gun . . . . | 100 | 19,000 | 11 | Travelling carriage |
| 9.2″ " . . . . | 380 | 23,000 | 13 | Railway |
| 12 ″ " . . . . | 850 | 30,000 | 17 | " |
| 14 ″ " . . . . | 1,586 | 34,000 | 20 | " |

NEW WEAPONS PROMISED.

| Type | Weight of Shell. Lbs. | Range | | Remarks |
|---|---|---|---|---|
| | | Yards | Miles | |
| 18″ How. . . . . | 2,500 | ? | ? | Railway |
| ? Gun . . . . . | . . . . | | 75/100 | Fixed Emplacement |
| 8″ Gun . . . . . | . . . . | 40/50,000 | 23/28 | Railway |

Remarkable as these improvements were, the German gun designers had an initial lead which we were never able to overtake, and at the end of the war their weapons still outranged ours on the average gun for gun by nearly 30 per cent.

COMPARISON OF SOME GERMAN AND BRITISH GUNS.

| German | | British | | Remarks |
|---|---|---|---|---|
| Type | Yards Range | Type | Yards Range | |
| 10 cm. How . . | 11,000 | 4.5 How. | 7,200 | |
| 15 cm. Gun . . | 25,000 | 6″ Gun | 19,000 | Medium Howitzers of |
| 35.5 cm. . . . . | 68,000 | 14″ Gun | 34,000 | both armies |
| 77 mm. . . . . | 11,700 | 18-pdr. | 9,500 | approximately same. |
| 15 cm. H. . . . . | 9,600 | 6″ How. | 9,500 | |
| 21 cm. H. . . . . | 11,000 | 8″ How. | 12,000 | Advantage with British |

At the beginning, while our heaviest piece in the field was the 6″, the Germans had the 17″, and those who were in front of Ypres in April, 1915, will remember what it felt like to be shot at by every calibre, up to and including the 17″ with nothing to reply with, except a few field guns, and how exasperating it was to have German batteries come into action in full view and not be able to reach them, while their shells were exploding in and around our own battery positions. Then, too, in the matter of ammunition, the German had the lead. While we were under limitations of three rounds per gun per day for our field pieces, he

appeared to have plenty of reserve stocks and he certainly used them.

In those early days the artillery situation was not such as to inspire confidence in the minds of our infantry; picture to yourself the case of an infantry officer pointing out to a gunner the location of a nest of German machine guns which are worrying the men in the line. The gunner admits that it is a good target and that he would like to engage, but—"No ammunition." The retort of the infantryman was likely to be "What are you doing in the Great War anyway?" and the result, if the gunner was a bit touchy, was to impair and discourage liaison.

As the war went on, we got more and more ammunition, but we suffered considerably from lack of standardization. In the early summer of 1915, we had four different types of shrapnel in our limbers at the same time, with a variation of range between them of anything up to 400 yards. In 1916 in the 4.5 howitzers, we had three types of propellant in use simultaneously—Cordite, Ballistite and N.C.T.—all with different temperature and moisture coefficients, and all giving results varying in a most obscure way with the wear of the howitzer. Charges originally shipped in lots of similar manufacture got mixed up on the Lines of Communication; shell varied in weight; driving bands were of many varieties; the battery officers had in any event to make corrections for—

Temperature of air and charge.
Barometer.
Velocity and direction of wind.
Wear of gun.
Type of shell and fuze.

When the already difficult task was further complicated by lack of standardization in propellant, driving band and shell, the task of exact shooting became almost impossible, and by 1918 the lack of standardization was recognized as one of the serious limiting factors in the tactical employment of artillery.

In the event of another war these facts will have to be faced by those responsible for the manufacture of munitions; in that unfortunate eventuality due attention will have to be given to the necessity for a more thorough standardization than was possible

in the last war. Those of us who were in the field never quite realized the enormous difficulties under which the manufacturers of munition laboured, and what a wonderful achievement lies to their credit; but had we had closer touch with them perhaps some of our difficulties would have been earlier recognized and cleared away.

As the number of guns available began to increase the existing artillery units had to be expanded and new ones raised. Technical skill had to be developed and previous lessons and teachings modified to suit the changing conditions. The field and horse gunners, accustomed to fighting under circumstances which enabled them to observe every round, had to cease from scoffing at corrections for temperature, barometer, etc., and the heavy artillery, used to the utmost deliberation, had to learn speed. Accuracy of fire on unseen targets, and the ability to shoot close over the heads of our own infantry had to be acquired, and an organization built up which could effectively handle large masses of artillery.

At the Somme in 1916, we had any quantity of guns and ammunition, but many of our battery officers and higher commanders were inexperienced; they could not be otherwise; our artillery intelligence organization was in its infancy; the methods of cooperation between aircraft and the military command was rudimentary; the type of shell was in many instances unsuitable for the task to be performed (those who were there will recollect their disheartening task of endeavouring to cut wire with field gun shrapnel). Although, as Ludendorf admits, we did considerable harm to the Germans, the results indicated that there was not that happy combination in the employment of the artillery in support of the other arms which leads to easy success in battle. The lessons were invaluable, but the cost in life was inevitably great. It was largely because the British General Staff read these lessons correctly and had the courage of their convictions to effect the necessary reorganization, that, later we were able to beat the Germans despite the fact that in the technical matters of guns and ammunition they still maintained their lead.

Put shortly, the situation in 1917 and onward is, that the Germans

had the advantage in quality of artillery material; we in quantity, organization and method of tactical employment. General Byng, the commander of the Canadian Corps, was one of the first to grasp the significance of the lessons of the Somme and, with Major-General Sir Edward Morrison, set about perfecting our artillery organization. The improvement was continued when Sir Arthur Currie succeeded General Byng in the command; and so it came about that by 1917 the organization of the Canadian Corps Artillery and its ancillary intelligence and other services had reached an advanced state, and that our lead over similar organizations was maintained to the end of the war. The credit of this is largely due to our Corps Commander, who, in developing his policy of giving his infantry the maximum of support, was invariably sympathetic in his attitude towards the Canadian gunners and gave the necessary means and encouragement to surmount the difficulties which from time to time faced us; and not only that, he developed and put into practice a very thorough system of cooperation between the artillery and infantry; it was always the object of the Canadian Corps to exploit gun power to the limit for the purpose of saving the lives of our infantry.

In a previous paragraph it is indicated that one of the greatest advantages we had over the Germans was in organization; this will be realized from the fact that the enemy artillery was invariably organized and fought on a divisional front; as a consequence, they experienced great difficulty in bringing to bear, at any given time or place, an adequate volume of fire. So, too, the enemy's artillery intelligence was collected and coordinated on a divisional front and they experienced difficulty in passing this information quickly to adjacent formations, and while their intelligence service undoubtedly acquired a great mass of valuable data, there did not appear to be a suitable chain of artillery command through which its value could be fully exploited. During the battle we, on the other hand, organized and fought as a corps, with the result that the whole force of our artillery within range was immediately available to support any sector and the whole of our intelligence system was centred on those who had the means at their disposal to take immediate and effective action.

Artillery intelligence is required firstly, for immediate action,

and secondly, for compilation, study and deduction with a view to subsequent action. In the following paragraphs the principal sources of artillery intelligence are dealt with and the methods of practical application employed in 1918 are explained.

(a) *Aeroplanes*. From the advantageous position of the aeroplane, the observer is able to locate the position of conspicuous things, like a flash or a body of troops or transport, with a considerable degree of accuracy. This information is embodied in a zone call sent out by wireless and may be picked up directly by the batteries and acted on at once. By means of close reconnaissance it is often possible to detect new battery positions, tracks, effect of shell fire, etc. The information so obtained is reported either by a message dropped at Corps Heavy Artillery or by phone when the plane returns to its aerodrome. Under Position War conditions fully 30 per cent of the counter-battery information is supplied by the R.A.F. and in more mobile operations this proportion is much increased. Since the aeroplane is in continual motion and always liable to interference from hostile aircraft and anti-aircraft fire, the observation is at best intermittent and the whole attention of the observer cannot always be given to his task.

(b) *Aeroplane Photographs* show the exact position of emplacement and to a skilled interpreter the appearance gives a good indication as to whether or not they are occupied. Tracks, routes of approach, signal routes, etc., can be plotted from them to assist in determining the enemy's vulnerable points. Camouflage can often be overcome through stereoscopic photos, through photos taken on special colour plates or by comparison of recent and old photos. Favourable weather is required before photos can be taken, and usually the prints cannot be interpreted and the information circulated under 6 to 24 hours.

(c) *Survey Sections* have two or more "posts" situated on commanding ground, equipped with the finest type of surveying instruments and interconnected by telephone with a central station. When one post locates a hostile battery firing, the bearing is reported to central station and the other post or posts put on approximately. Then telephone communication is cut off, and each post as it sees the flash corrects its bearing and presses

a key which lights a corresponding lamp at central station. When all lamps there light up together the operator may be fairly certain that all posts are on the same flash. Bearings are phoned in and plotted and the position determined with great precision (under favourable conditions to within 5 yards.) Flashes of other guns appear to the right and left in the graticule, and so an accurate count of the "number of guns firing" may be made. In addition to locating active hostile batteries, survey posts act like other "ground observers" with the added advantage that cross-bearings can be obtained on anything visible from two or more posts, and thus an accurate location secured. For satisfactory counter-battery work, survey sections require a base of 6,000-10,000 yards and a minimum of three posts. Survey sections should be able to come into action within a few hours of the capture of commanding ground, using wireless as a temporary expedient until telephone communication is established.

(d) *Sound Ranging Sections* consist of a headquarters connected by electric cable to three or more microphone stations distributed along the front about 1½ miles from the line; in addition, a listening post is located well forward of these. The listener, on hearing the report of an enemy gun, presses a key which completes an electric circuit and sets in motion a recording apparatus at the headquarters, on which the sound as it reaches each microphone in turn is recorded. From the time intervals between microphones the location of the source can be calculated. Similarly, when the shell bursts, the sound waves sent out ultimately reach the microphone and are recorded. Under favourable conditions a record can be taken and the calculations made and reported within three minutes and with an accuracy of between 25 and 100 yards. Adverse winds check and dissipate the sound wave, and changes of temperature and barometric pressure vary the velocity with which it travels; also, the shape of the ground and the various strata of the atmosphere cause reflections and distortion which cannot accurately be allowed for and which reduce the precision of the "locations." From the records the exact time of flight is known, and, as the location of the gun and of the shell-burst have been determined, the range is known; hence, reference to range table will give "calibre" and

"nature of piece." Further, each piece has a characteristic wave shape from which a skilled sound ranger will at once recognize it; but during a heavy bombardment this source of information fails, for the microphones are continually recording and it is not possible to isolate the waves of any particular piece.

With howitzers the muzzle velocity is less than that of sound, so the shell is always behind the sound wave, but with guns there is a complication due to the fact that the shell is traveling faster than the sound of the gun and of the noises made in flight. As the shell loses velocity, it ultimately drops to that of sound and below, and the accumulated noises which it has been making pass on ahead of it, thus producing the "*Onde de Choc,*" the first part of the familiar double report heard when in front of a gun. The second report is the true gun wave and is the one on which calculations are based.

It takes from 36-48 hours for a Sound Ranging Section to change base and hence this method is of very limited usefulness in mobile operations.

(e) *Balloon Observation* can furnish useful information only under favourable conditions of light. The long range medium gun has driven the balloon so far back and the methods of attack by aircraft have been so perfected that it is questionable whether the balloon is worth retaining. Balloons can give general information, such as area shelled, groups of active batteries, train movement, etc. They can locate the closer targets and range on them under suitable condtions.

(f) *Ground Observers* include the "F.O.O's" of batteries and the special intelligence posts provided by the other arms. They are subject to the limitation that observation is only a single line and while the direction of the target can be given with fair accuracy, location is largely a matter of estimation. From these posts comes the mass of general tactical information which, when co-ordinated with the more exact intelligence derived from the air, survey sections, etc., forms the basis for the immediate counter-battery and other artillery action required.

(g) *Liaison Officers*. Artillery officers are maintained at the H.Q. of the infantry brigades for the purpose of keeping the infantry informed of the disposition and possibilities of the artillery

covering them. They are responsible for collecting and transmitting to their commanders all information regarding the plans or intentions and progress of our own troops, together with any intelligence of the enemy derived through infantry sources.

In the case of hostile shelling they should report at once:—

(1) Area shelled. Time and intensity of fire.
(2) Nature and size of projectiles.
(3) Direction from which shells are coming.
(4) Time when fire ceases.

This information is of great assistance in locating the hostile batteries engaged so that neutralizing fire may be opened. An artillery officer is detailed to R.A.F. Squadron H.Q., to act as technical assistant to the squadron commander and to represent the Counter-Battery Staff Officer. This officer is responsible for investigating any cases of failure in shoots with R.A.F. observation and for promoting cooperation generally.

(h) *Officers' Patrols*. There is only one sure way of obtaining information in battle and that is to detail special personnel whose sole business is to collect and transmit it. This is particularly the case in mobile operations when the routine of stationary war breaks down. Under these conditions it is essential that artillery commanders know the progress of the infantry from moment to moment and it has been found by experience that the only satisfactory way to obtain this information is by officers' patrols, either mounted or dismounted, operating in definite sectors and in touch with prearranged report centres from which the information is forwarded by wireless, telephone or despatch-rider according to circumstances. These patrols give advance information of the fight from which the future action required from the artillery may often be predicted and appropriate arrangements made.

(i) *Secret Agents and Repatries* often give valuable information concerning supply dumps and other centres of activity, the presence of reinforcing artillery in back areas, reliefs, enemy intentions, etc. Sometimes locations of gun positions are given, but this information is usually vague. On the whole, intelligence derived from these sources takes too long to get through

and concerns the area too far in the rear to be of much immediate use to artillery commanders.

(j) *Captured Documents and Prisoners' Statements* usually deal with what is past but are of use in checking up previous deductions and arriving at an estimate of the probable accuracy of future forecasts.

(k) *Listening Sets*. Police arrangements are usually so perfect that little of value is obtained; most often the information gleaned is confined to indications of a change of formations.

(l) *Intercepted Wireless*. Wireless Compass Stations can locate with fair accuracy any sending station whether in the air or on the ground. The intercepted message may give some information of tactical value and a study of the wireless traffic between located stations gives some clue to the hostile dispositions. Track charts of aeroplanes using wireless give indications of the enemy's artillery policy. Wireless camouflage has of course to be reckoned with.

In order to make the intelligence derived from these sources immediately available to the artillery very elaborate communications are required. In fact, the whole system evolved in the Canadian Corps was only possible because our Signal Corps was so thoroughly efficient.

In handling artillery in the field the first consideration is that its fire must do the utmost possible to assist the infantry to get forward. Exact intelligence and a careful study of the enemy's dispositions enable the artillery commander to form his plan with this end in view. He must foresee just which factors of the enemy's defense organization will be dangerous and when; hostile artillery, machine guns, trenches, wire, mortars, enemy reserves, etc., all must be given attention at the proper time. Wherever intelligence is indefinite, inaccuracy must be made up by volume of fire. In practice, the various conditions were generally met as follows:

Initially, and during the advance, the whole of the field artillery and a part of the heavy were on barrage work, carrying out a plan issued by the G.O.C., R.A. of the Corps and coordinated with flanking Corps by the Army.

The inner fringe of the barrage was laid in front of the infantry

and throughout the attack rolled forward according to the prearranged plan. It usually consisted of 18-pdr. shrapnel fired directly over the heads of our troops and in some of our operations reached a density of one 18-pdr. per nine yards of front, firing four rounds per minute. The accuracy demanded from our field batteries will be appreciated when it is realized that they were called on to burst their shell so that the mean point of impact of their shrapnel bullets should be 200 yards in front of our advancing infantry, the range being anything from 1,500-4,500 or more yards. The 4.5 field howitzers firing H.E. were employed on machine gun nests, strong points, etc., in rear of the 18-pdrs. The 6″ howitzers on similar targets still further in rear.

The idea of the barrage is to tie the enemy to the ground, to inflict casualties and to demoralize him and prevent his using his rifles, machine guns, trench mortars, etc., and to screen the advance of our infantry by a wall of bursting shell, and smoke and dust.

The heavy artillery not scheduled for the barrage work directly under the intelligence centre at the heavy artillery headquarters engaged the enemy's artillery, exploited targets of opportunity, harassed the enemy's line of retreat, his reserve troops, his railheads where reinforcements might be arriving, and his aerodromes.

As the attack progressed, and the end of the prearranged barrage was reached a portion of the field artillery reverted to the control of the divisions and moved forward to work directly with the attacking infantry. The remainder came into reserve. The heavy artillery which had been employed in the barrage moved forward to be in position to deal with the enemy's artillery as soon as it again came into action. The artillery initially on counter-battery work and sited well forward, became available as a reserve of fire power to be turned on any threatened sector as required.

It must be remembered that the whole method of employment of artillery underwent continuous development and we had had a succession of limiting factors to contend with. At Vimy in April, 1917, for instance, it was observation of fire and intelligence; at Hill 70 in August of the same year—life of guns; at

Passchendaele, in November—wear and tear on artillery personnel; at Amiens, in August, 1918—available positions for deployment; and during the later phases of the advance—transportation from railhead to guns. Throughout, as our artillery intelligence system was perfected, the need for increased accuracy was felt.

The policy of our Corps Commander was never to employ men where shells would do the work; the motto of the Canadian artillery throughout was to shoot the "ultimate round," and how well our gunners achieved this task may be seen from the figures of ammunition expenditure for some of our major operations.

| | Days | Guns | | | Ammunition | | |
|---|---|---|---|---|---|---|---|
| | | Field | Heavy | Total | Thousand Rounds | Tons | Tons/day |
| Vimy 1-8 Apr. | 8 | . . | . . | . . | 553 | 13,005 | 1,625 |
| Vimy 9 Apr. | 1 | 618 | 238 | 856 | 212 | 4,299 | 4,299 |
| Vimy 9-14 Apr. | 6 | . . | . . | . . | 540 | 11,337 | 1,889 |
| Hill 70 | 11 | 275 | 158 | 433 | 665 | 15,623 | 1,420 |
| Passchendaele | 30 | 360 | 220 | 580 | 1,453 | 40,908 | 1,370 |
| Amiens | 16 | 408 | 236 | 644 | 409 | . . . . | . . . . |
| Arras, 1916 | 6 | 504 | 270 | 774 | 300 | . . . . | . . . . |
| Drocourt-Queant | 27 | 528 | 234 | 762 | 786 | . . . . | . . . . |
| Canal du Nord | 12 | 522 | 262 | 784 | 1,067 | . . . . | . . . . |
| Cambrai | 23 | 334 | 262 | 596 | 519 | . . . . | . . . . |
| Valenciennes to Mons | 12 | 312 | 174 | 486 | 215 | . . . . | . . . . |
| Amiens to Mons | 100 | . . | . . | . . | 3,296 | 73,100 | 731 |

The significance of an ammunition expenditure of 73,100 cons in the Hundred Days' operations from Amiens to Mons is difficult to realize, and in order to help the reader to gain some coprehension of the relations of the artillery to the other arms and to the results achieved, the following cold figures concerning the Last Hunrded Days of the operations of the Canadian Corps in France and Belgium are set down:

| | | |
|---|---|---|
| Maximum number of guns | 784 | |
| Divisions, Canadian | 4 | British attached on the average—1. |
| Average total strength of Corps | 105,000 | |
| Guns per 1,000 troops | 7.5 | |
| Duration of operations | 100 | days (includes time spent in marching). |

| | | |
|---|---|---|
| Ammunition expenditure, rds. | 3,296,000 | |
| Ammunition expenditure, rds. per day | 32,960 | |
| Ammunition expenditure, rds. per day per 1,000 troops (including reserves) | 313 | |
| Average ammunition expenditure, rds. per gun per day | 42 | |
| Battle casualties | 45,830 | |
| Enemy killed and wounded | Unknown | |
| Prisoners captured | 31,537 | |
| Guns captured | 623 | |
| Machine guns captured | 2,842 | |
| Trench mortars captured | 336 | |
| Territory freed in square miles | 500 | |
| Villages freed | 228 | |
| German divisions met and defeated | 47 | |
| Other enemy divisions partially engaged | 21 | |
| Casualties per German division defeated | 975 | No allowance made for German divs. partially engaged. |
| Total battle advance | 86 | miles. |

No Canadian need fear a comparison of these figures with the corresponding results obtained by any similar organization, allied or enemy, for I know of no organization in the history of the war which was able to produce such a high ratio in shell to troops, nor any in which the price paid for victory was lower in personnel.

This enormous ammunition expenditure by the Canadian Corps and the satisfactory results achieved were only possible because our leaders arranged their plans of attack in such a way that the maximum artillery support could be developed in the intimate assistance of our assaulting infantry.

From an artillery point of view one of the most interesting

operations of the Canadian Corps was the attack carried out on the morning of November 1, 1918, by the 10th Infantry Brigade against Mont Houy, the key to Valenciennes. The 10th Brigade advanced with its left flank on the Canal de l'Escaut, and its right covered by the advance of the XXII Corps. On a front of about 2,000 yards the depth of penetration was some 4,000 yards, taking 190 minutes, including pauses. As the initial forming-up line was on a slight salient the direction of the advance was practically parallel to our own front. The attack was supported by eight brigades of field artillery and six brigades of heavy artillery, or roughly 144 18-pdrs., 48 4.5 howitzers, and 104 heavy guns and howizters. Some 80 machine guns were also employed.

The ammunition expenditure was as follows:

| | | | | |
|---|---|---|---|---|
| Field..... | 56,200 | rds. | 620 | tons. |
| Heavy ..... | 31,500 | " | 1,520 | " |
| Total ..... | 87,700 | | 2,140 | tons |

This is approximately 1 ton per yard of front, or 1½ tons per infantry soldier employed. This was the most intense barrage ever employed in support of any of the operations of the Canadian Corps. All objectives were taken on time.

| | | | | |
|---|---|---|---|---|
| Enemy killed ..... | 800 | Our | killed ..... | 60 |
| Wounded prisoners..... | 75 | " | wounded..... | 380 |
| Unwounded prisoners.... | 1,379 | " | missing ..... | 61 |
| | 2,254 | | | 501 |

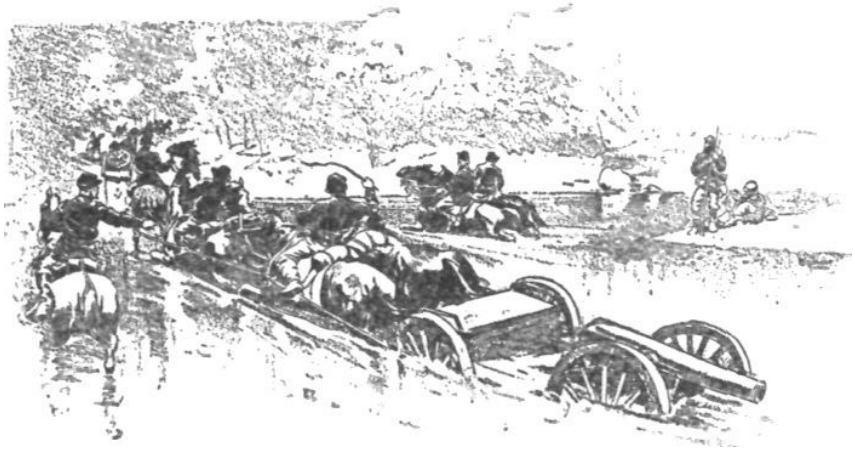
The capture of Valenciennes has been dealt with at some length because that operation is a type of what we would have tried to do in the campaign of 1919 had we had to fight.

The comparative expenditure may be judged from further illustrations. At Waterloo in 1815 the expenditure was 9,000 rounds, having a total weight of 37 tons; compare this with the average *daily* expenditure of the Canadian Corps at Passchendaele,

48,500 rounds, weighing 1,370 tons. In the South African War the expenditure was 273,000 rounds, weighing 2,800 tons; not much in excess of our Valenciennes operation, or equal to about two average days of the Passchendaele fighting.

The foregoing applies to the artillery, and many British batteries, field, heavy and siege, and some Australian and South African had helped us from time to time; but I wish to add a special word about our own Canadian gunners. Our people took naturally to gunnery; our battery commanders, section officers, n.c.o's and gunners developed extraordinary skill, efficiency and dependability, and if in support of our infantry there was ever a particularly difficult or dangerous task to be performed, a Canadian battery was called on to do it.

Only on one occasion were any guns of the Canadian Corps in German hands. This happened in Sanctuary Wood in 1916 when two of our forward guns were taken after they had expended all their ammunition at close range into the German attack. These guns were recovered in the subsequent fighting. I mention this as a tribute to the work of the infantry and as a reason for the confidence our gunners had when Canadian infantry were in front of them.



FORDING THE MATTAPONY—COLD HARBON OPERATIONS

# THE WHAT, WHERE, WHEN, HOW, AND WHY OF THE R. O. T. C.*

BY MAJOR T. J. J. CHRISTIAN, P.M.S.&T.

A TRAVELER in ancient Sparta once enquired of the king: "Where are your walls of defense?" The king took his visitor to the drill fields outside the city and, pointing to the ranks of trained and disciplined young men, replied, "These are the walls of Sparta—every man a brick!"

And so today, a nation's insurance consists of its able-bodied citizens to provide for the common defense; like those of Sparta, the walls of this country are our young men who become the military structure. The key-stones of this human wall will not endure the erosions of time without replacement material of a finished product. The officer replacements are furnished by the R.O.T.C. Units.

Like the traveler of Sparta, some few of our people do not seem to fully understand the walls of defense protecting the United States in case of emergency. The question is asked "What is the R.O.T.C. and how is it related to our National Defense?" It is my purpose to briefly answer that question, with a resume of the What, Where, When, How and Why of the Reserve Officers' Training Corps.

The National Defense Act, approved by President Wilson in 1916, and as amended in 1920, embodies the Anglo-Saxon tradition of a small regular army, with main reliance placed on a hastily mobilized citizen army, officered by a trained cadre of commissioned personnel. The Act provides for three components: Regular Army, National Guard and Organized Reserves, with a relative strength ratio of one, two, three, respectively. The regular establishment composes only one-sixth of the defense plan, while the ratio of Regular to Reserve Officer is approximately one to nine. The civilian component of the Officers' Reserve Corps is mainly a frame-work of approximately 110,000 Reserve Officers, organized in time of peace to mobilize, administer, train and lead an emergency force in case of war.

The R.O.T.C.—Reserve Officers' Training Corps—has the

*Radio Broadcast, WBBM, Chicago, Illinois, January 27, 1930.

primary object of providing systematic military training at civil educational institutions for the purpose of qualifying selected students for appointment as reserve officers in the forces of the United States. As a reservoir of technically skilled and thoroughly trained junior officers providing an annual replacement flow to the Organized Reserve units, the R.O.T.C. at once becomes a far-sighted factor and vital agency in making effective the plan for National Defense.

Unfortunately, the supply of the manufacturing plant does not meet the yearly demand of the consumer. The three hundred and twenty-four R.O.T.C. Units located throughout the nine Corps Areas, with a total enrollment of approximately 117,000 students—embryo officers—are providing an increasing annual output of commissioned officers—an average of 5,000 new second lieutenants per year—yet the number of vacancies in the Officers' Reserve Corps is necessarily increasing in the ranks of World War veterans as time lengthens from the Great War. At the Armistice, over 200,000 officers had been commissioned in the Army of the United States, an officers' corps of twice the size of our enlisted regular army in 1917. In the Field Artillery branch upon our entry into the war but 372 officers of more than one year's experience were in the Regular Army, yet it was necessary to expand quickly this meagre quota during the war to almost 25,000 Field Artillery officers.

The proper time to train an officer is certainly not after the outbreak of war. In no profession are mistakes so costly as in war, for on the battlefield the mistake of the unprepared leader is paid for in the lives of his men. Furthermore, the wearing of a Sam Browne belt does not, by magic, make an experienced, trained officer, for there is no royal road to such knowledge in the complex modern military science. In the grim business of war, perhaps enlisted men can be "machine-made," but their leaders must be "hand-made." The Bryanesque fallacy that in the event of an emergency, one million men would spring to arms overnight, was aptly answered by Colonel Roosevelt "that if one million men *did* spring to arms overnight, they would not know which end of the arm to spring to."

The R.O.T.C. movement in our colleges and universities has

a dual objective, as viewed not only from the standpoint of war, but from the aspect of peace. The joint undertakings of the government and the educational institutions embrace the educational aim of adding to the scholastic resources of the schools and colleges to give the student a training which will be valuable to him in his industrial or professional career as it would be should the nation call upon him to act as a leader in its defensive forces.

There is a prevalent opinion that the students' military training is merely a matter of drill—squads right and left—brass bands and precise parades, so the fact may be overlooked that military science since the World War has become more of a "head" than a "foot" drill. The president of a large midwestern university recently stated that "the mathematics of the Field Artillery units is as valuable as that taught in any other branch of the university; topography, military law, military history, organization, administration and other academic subjects improve the student's mind no matter where they take them."

Military instruction as a recognized part of the colleges' curricula is not a new thing in the United States. It has been in operation at the "Land-grant" State colleges and universities since the Morrill Act of 1862. This training which is required for the first two years in the sixty-nine Land-grant institutions constituted an immense asset to the United States in the late war. Cornell University alone furnished over 3,000 officers, including one major-general, who had been training prior to the war. Yale University, where the military enrollment is voluntary, furnished over 1,000 Field Artillery officers. Since the World War, with the impetus of scientific inventions and rapid strides in modern mechanization, military science has become more interwoven, academically, with many fields of education with useful values as by-products in peaceful pursuits and civil vocations. Its objective is closely allied with the general purpose of education—to produce a graduate who is better equipped to meet the complexities of modern life. As an integral "part of" rather than an extra-curricula activity "apart from" the university, it is helping to produce better and more useful American citizens, physically, mentally and morally.

One of the principal objectives in the training of an officer is

naturally to develop leadership—command of men. The qualities of leadership, such as character, force, initiative, discipline, executive ability, knowledge, common sense and loyalty are attributes which apply equally as well in peace as in war. As a concrete evidence of the value of this four-year course of training, it is mentioned, as a matter of interest, that graduates of the Military Department of the University of Chicago are able to obtain positions with large business organizations in the city based on the recommendation of their qualifications in military training. The business executives want efficient leaders. Chicago is one of the largest R.O.T.C. centers. Over 5,000 students are enrolled in the junior units, and many of these high school graduates carry through the courses in the senior units, where they are awarded commensurate credit for their basic training toward a commission in the Officers' Reserve Corps.

The University of Chicago maintains a Field Artillery and a Medical Unit. Enrollment is on an entirely voluntary basis, but has been increasing yearly in total registration and commissioned output. During the last two years, called the Advanced Course, the student received approximately $100 annually from the government, a tailor-made uniform, and attends a six-week summer camp at government expense. The military courses are coordinate with other academic courses, receiving equal credits, and maintaining the same high standards in quality of work. The University of Chicago authorities and student body give genuine support and cordial cooperation to its Military Department. Many civic and patriotic organizations have interested themselves in the Chicago unit. The Chicago Chapter of the Daughters of the American Revolution very generously award three medals each year to outstanding students of the Field Artillery unit, which greatly stimulates excellence in performance of the military work. This year over forty graduates of the University of Chicago will receive reserve commissions from the President of the United States simultaneously with the award of degrees from the president of the university.

These officer graduates constitute not only potential assets to our country in the unhappy event of war, but their thorough military training also adds kinetic energy to better citizenship and the pursuit of peace.

# PRESENT ORGANIZATION OF THE FIELD ARTILLERY

The following table shows the number of battalions and batteries of each type of Field Artillery which will constitute the peacetime organization of the Regular Army Field Artillery when the present reorganization is completed:

| Regiment | No. of Bns 37 | No. of Btries 90 | 75 MM HD 46 | 75 MM Mtz 17 | Pk 4 | 2.95″ Pk 7 | 155 How 14 | 155 Gun 1 | 240 How 1 |
|---|---|---|---|---|---|---|---|---|---|
| 1st FA ..... | 2 | 6 | 3 | 3 | | | | | |
| 2d FA† ..... | 1 | 3 | | | 3 | | | | |
| 3d FA ..... | 2 | 5 | 5 | | | | | | |
| 4th FA ..... | 1 | 2 | | | 1 | 1 | | | |
| 5th FA ..... | 2 | 4 | | | | | 2 | 1 | 1 |
| 6th FA ..... | 2 | 4 | 2 | 2 | | | | | |
| 7th FA ..... | 2 | 6 | 6 | | | | | | |
| 8th FA* ..... | 2 | 6 | | 6 | | | | | |
| 9th FA ..... | 1 | 2 | | | | | 2 | | |
| 10th FA ..... | 2 | 4 | 4 | | | | | | |
| 11th FA* ..... | 2 | 4 | | | | | 4 | | |
| 12th FA ..... | 2 | 4 | 4 | | | | | | |
| 13th FA* ..... | 2 | 6 | | 6 | | | | | |
| 15th FA ..... | 1 | 2 | 2 | | | | | | |
| 16th FA ..... | 2 | 5 | 5 | | | | | | |
| 17th FA ..... | 3 | 6 | | | | | 6 | | |
| 18th FA ..... | 2 | 6 | 6 | | | | | | |
| 24th FA (PS)‡ ..... | 2 | 6 | | | | 6 | | | |
| 76th FA ..... | 2 | 4 | 4 | | | | | | |
| 82nd FA (Horse) ... | 1 | 3 | 3 | | | | | | |
| 83d FA ..... | 1 | 2 | 2 | | | | | | |

*Hawaiian Dept.
†Panama Canal Dept.
‡Philippine Dept.

# PRESENT ORGANIZATION OF THE FIELD ARTILLERY

## FIELD ARTILLERY ORGANIZATIONS AND STATIONS
April 4, 1930

| *Corps Area* | *Stations* | *Organizations* | *Changes about May* 1, 1930 |
|---|---|---|---|
| I | Ft. Ethan Allen, Vt. | *7th FA less 2d Bn | All units become active. |
| II | Madison Barracks, N. Y. | *2d Bn 7th FA | All units become active. |
| III | Ft. Hoyle, Md. | 1st FA Brig Hq | |
| | | *6th FA 75G mixed | |
| | | 1st Am Train | Becomes inactive. |
| | Ft. Myer, Va. | 1st Bn 16th FA | |
| IV | Ft. Bragg, N. C. | 13th FA Brig Hq | |
| | | 13th Am Train | Becomes inactive. |
| | | Btry A, 1st Obsn Bn | |
| | | 5th FA less 3d Bn 155G & 240H | Regtl Hq & Hq Btry reduced and Serv Btry & Band become inactive. 1st Bn rearmed with 155H. 2d Bn to have 1 Btry 155G & 1 Btry 240H. |
| | | *17th FA less 3d Bn 155H | Band becomes active.<br>See VII C.A. |
| | | *2d Bn 16th FA | |
| | Ft. Benning, Ga. | 1st Bn 63d FA | One Btry becomes inactive. |
| V | Ft. Benj. Harrison, Ind. | *1st Bn 3d FA | All units become active. |
| VI | Ft. Sheridan, Ill. | *3d FA less 1st Bn | Regtl Hq & Serv Btry less Band becomes inactive. |
| VII | Ft. Des Moines, Ia. | *2d Bn 18th FA less Btry 'D' | All units become active. |
| | Ft. Leavenworth, Kan. | | 3d Bn 17th FA 155H becomes active. |
| | Ft. Riley, Kan. | Btry 'D' 18th FA | |
| | Ft. Robinson, Neb. | *2d Bn 4th FA 2.95″ & 75H Pk | |
| | | Band 76th FA | |
| VIII | Ft. Bliss, Tex. | 1st Bn 82d FA | |
| | Ft. Sam Houston, Tex. | 2d FA Brig Hq | |
| | | *12th FA | |
| | | *2d Bn 15th FA | |
| | | 2d Am Train | Becomes inactive. |
| | Ft. Sill, Okla. | 1st FA 75G mixed Sch Regt | |
| | | 1st Bn 18th FA | |
| | | 3d Am Train | |
| | | F. A. S. Detachment | |
| | Ft. Francis E. Warren, Wyo. | *76th FA less Band & 2d Bn | |
| IX | Ft. Lewis, Wash. | 3d FA Brig Hq | Reduced |
| | | *10th FA | |
| | | | 1st Bn 9th FA: 155H becomes active. |
| | Presidio of Monterey, Calif. | *2d Bn 76th FA | |
| | Hawaiian Department. | 11th FA Brig Hq | |
| | | 8th FA 75G Mtz | |
| | | 11th FA 155H | 3d Bn becomes inactive. |
| | | 13th FA 75G Mtz | |
| | | 11th Am Train | |
| | Panama Canal Department. | 1st Bn 2d FA 75G Portee | Becomes pack 75mm how. |
| | Philippine Department. | 24th FA 2.95″ Pk (P. S.) | |

*Has inactive or partially inactive units.

# "A CANDIDATE FOR CORPORALCY."

(Dedicated to the Tractor Driver)

*By* C. J. SCHORK, SERGT., 8TH F. A.

When I was a Private I served a term,
With a "Top-Kick" who was very stern;
With a heart so free and a will so strong,
On KOLE KOLE PASS with the wind along,
I drove a tractor so carefullee,
He made me a candidate for Corporalcy!

As a tractor driver I made such a mark,
I had 'er down so's I could make 'er bark;
And with all the perils to gun and crew,
I always handled 'er and guided thru',
I always handled 'er so manfullee,
I'm the proud candidate for Corporalcy!

I learned so well the signals and rules,
And I never lost any tractor tools;
Tho' oft I'd appear in a greasy suit,
With mud and dust upon my "snoot",
I did my duty and the "Top" liked me,
He helped me to get my Corporalcy!

Now drivers who cherish ambitious schemes,
Though now you may be but drivers in dreams;
Look well to the driving you may chance to do,
And do it with a hand that is firm and true,
But whatever you do, do it faithfullee,
And you may aspire to a Corporalcy!

# THE FIELD ARTILLERY BOARD

THE report of progress of tests of armaments and equipment for the quarter ending March 31, 1930, has been completed by the Field Artillery Board, Fort Bragg, N. C. The report covers the tests of thirty-five items of Ordnance, Engineers, Quartermaster, Signal and Chemical Warfare equipment. The following is a brief summary of the status of the various tests.

CHEMICAL WARFARE EQUIPMENT

**Gas Masks for Horses.** This test has been completed and a report has been forwarded to the office of the Chief of Field Artillery. The masks were issued to the 2d Battalion, 16th F. A., and during the period from September 11, 1928, to November 1, 1929, were used thirty times. The average time the masks were on horses at each wearing was two hours and the maximum time at any one wearing was four hours. The following conclusions were made as a result of the test:

a. The masks did not produce chafing about the animals' heads.
b. After the men and animals became accustomed to the mask, the average time to remove it from its carrier and adjust it to the animal's head was two and one-half minutes.
c. As regards the endurance of the horse when wearing a mask, the following points were noted: There was no appreciable effect on the endurance of the horse while walking. At a trot, however, some animals had trouble breathing and became very warm, and all animals coughed after marching a short distance. Weather temperature made no apprciable difference in breathing through masks, but on a humid or wet day the masks appeared to be harder to breathe through.
d. The bit or bridle did not interfere with the fit of the mask or its adjustment to the horse's head.
e. All animals resisted being masked more than they resisted being bridled.
f. Most of the animals became accustomed to being masked.
g. Under all conditions of weather and temperature there was some foam and saliva in the masks when taken off, but not enough to cause the animals any discomfort.

h. In general, the head straps of the masks were too short for heavy, large horses, and the leather over the muzzle of the mask was of poor grade and tore easily; these defects can be remedied. One mouth piece was badly chewed by a remount in approximately one and one-half hours.

The Board recommended that if these gas masks gave the required degree of protection against smoke and toxic gases that certain minor improvements be made and that they be adopted as standard.

**Gas Boots for Horses** are being tested by the 2d Battalion, 16th F. A. This test will probably be completed by June 30, 1930.

ENGINEER EQUIPMENT

**Canvas Cases for 18″×24″ Drawing Board and for the Johnson Movement Extension Leg Tripod.** These cases were issued to Battery "D," 16th F. A., and from April 1, 1928, to November 1, 1929, were carried in the battery reel, the board in the plotting board case of the reel and the tripod in the rear chest. During the test rivets on the tripod case came loose and the battery mechanics made a long strap for slinging the tripod over a man's shoulder for transportation on horseback or afoot. The drawing board case had no handle so the battery mechanics made one. The canvas webbing on the bottom of the tripod and board cases became considerable worn in places. The Feld Artillery Board found both cases satisfactory as modified and recommended that ten of each be issued for service tests.

ORDNANCE EQUIPMENT

**Caisson, 75 mm. M-1918.** Two caissons (one made by Rock Island Arsenal and one by Post Ordnance Office, Fort Bragg) were modified to carry Mark IV shell. These caissons are now being tested. Both appear satisfactory. Probable date of completion of test is May 1, 1930.

**Limbers, 105 mm. Type T2.** Four of these limbers were under test. Test has been completed and report is now being written.

**Sub-Caliber Outfits.** This test was conducted by the 2d Battalion, 16th F. A. The outfit consisted of a 30 caliber sub-caliber rifle mounted on a 75 mm. gun tube, a 45 caliber sub-caliber

pistol barrel mounted in a 75 mm. cartridge case and a Colby sub-caliber outfit consisting of miniature field pieces mounted on machine gun tripods, steel targets and Kraf rifles. As regards sub-caliber outfits the Field Artillery Board recommended that 37 mm. sub-caliber equipment be considered as primary subcaliber armament for Field Artillery. However, for use on restricted ranges and in galleries the Board recommended that the Ordnance devise a mechanism for mounting the caliber 30 rifle above the tube and in front of the shield on the 75 mm. gun and 155 mm. howitzer.

**Propelling Charge for 155 mm. Howitzer, M-1918.** This is a test of a special quick powder for the lower zones of the 155 mm. Howitzer. The Board is testing probable errors of this powder as compared to the present powder. Probable date of completon indefinite; awaiting ammunition.

**Artillery Theodolite "Wild."** Test being continued by 5th F. A.

**Tractor Caterpillar "60."** Test completed. Report being written.

**Field Glasses.** Fourteen pairs of glasses were received, two each of Zeiss Deltrentis, 8-power; Zeiss Delactis, 8-power; Zeiss Silvamar, 6-power; Moeller Teurix 6-power; Mirakel, 7-power; and Mirakel 5-power. They are all now under test to determine suitability as items of equipment. Probable date of completion November 31, 1930.

**Tool Equipment for 5- and 10- Ton Tractors.** A model tool roll has been made up by the Ordnance Department and is now being tested by the 17th F. A. Probable date of completion May 30, 1930.

**Carts, Cargo.** The Ordnance Department has constructed four types of cargo carts, T, T4, T5 and T*6*. These carts have not yet been received for test. When received they will be tested with a view to using them in place of caissons and limbers for 75 mm. guns, 105 mm. and 155 mm. Howitzer matériel. They will also be tested with a view to using them in place of the battery wagon and store limber wagon.

**Battery Reel, M-1917.** The Ordnance Department remodeled one of these reels in accordance with previous recommendations of the Field Artillery Board. The reel was found defective in

certain respects and was modified by the Post Ordnance Officer and was tested by the 2d Battalion, 16th F. A. This reel cart, as modified, has been found defective as to balance and is being further modified by the Post Ordnance Officer. Test completed and report now being written.

**Jack Beams for 155 mm. Gun.** Test completed. Report not yet written.

**Spongehead for 155 mm. Gun, M-1920E.** This item was tested by Battery "A," 5th F. A., from February to August, 1929, and the Post Ordnance Shop until January, 1930. The Board recommended it as a satisfactory substitute for the present spongehead for 155 mm. matériel. The cost of the present issue spongehead assembly is approximately $23.00, whereas the cost of the experimental head in lots of 100 is about $8.20. The two heads are reported to be of practically equal serviceability.

**Ammunition, 155 mm. Howitzer, 1920, T2, E2.** Shipping order received for 200 rounds of shell and charges. The Howitzer has not yet been received. The test will determine suitability of Howitzer and ammunition. Probable date of completion dependent on receipt of Howitzer.

**Reel Cart Type RL-23.** Now being tested by horsedrawn and motorized artillery. Probable date of completion December 31, 1930.

**Wheeled Machine Gun Mount M1.** Test awaiting receipt of matériel. Probable date of completion September 30, 1930.

**Towing Cables, T-3, for 240 Howitzer Materiel,** is now under test.

QUARTERMASTER EQUIPMENT

**Carts, Water.** Three water carts on Ordnance running gear are now under test. Test about completed.

**Desks, Field, Regimental and Company.** These desks were tested by the 2d Battalion, 5th F. A., September 12, 1928, to November 1, 1929. The Board recommended that the Company record chest and field desk be considered satisfactory for Field Artillery use. The regimental field desk was not considered satisfactory because it can not carry the Corona No. 4 typewriter and the construction of the interior partitions is too fragile. The Field

Artillery Board recommended that a new regimental field desk be designed which will carry the Corona No. 4 or other issue portable typewriter.

**Wagon, Spring, Light.** The pilot model of light spring wagon is under test by the 2d Battalion, 16th F. A. This wagon is designed to take the place of the present mountain wagon. Test completed. Report not yet written.

**Officer's Field Saddles.** Under test by Members of Field Artillery Board and 2d Battalion, 16th F. A. Probable date of completion June 30, 1930.

**Trench Coats, Experimental.** Under test by troops and members of Field Artillery Board. Probable date of completion June 30, 1930.

**Modified McClellan Saddles.** Test completed and report now being written.

**Web Horse Equipment.** Now under test by 2d Battalion, 16th F. A. Probable date of completion, November 30, 1930.

**Rubber Horseshoe Material.** Test completed. Report now being written.

**Radio and Command Post.** Now under test in 2d Battalion, 16th F. A. Probable date of completion December 31, 1930.

**Trucks, Indiana, Coleman, 3-ton, G. M. C. Coleman.** Test under way and will probably be completed by June 30, 1930.

SIGNAL EQUIPMENT

**Wire, 7-Strand (Experimental).** Extended service test being conducted. Probable date of completion May 1, 1931.

**Improved Monocord Switchboard.** Issued to organizations as follows from February 21, 1929 to February 20, 1930:

| | | |
|---|---|---|
| 5th F. A. | 1-12 line | 1-6 line |
| 2d Bn. 16th F. A. | 1-12 line | 1-6 line |
| 17th F. A. | 1-12 line | 1-6 line |

and tested in all garrison and field work including march to Camp Jackson, S. C., and return (340 miles), and maneuvres at Camp Jackson and Fort Bragg.

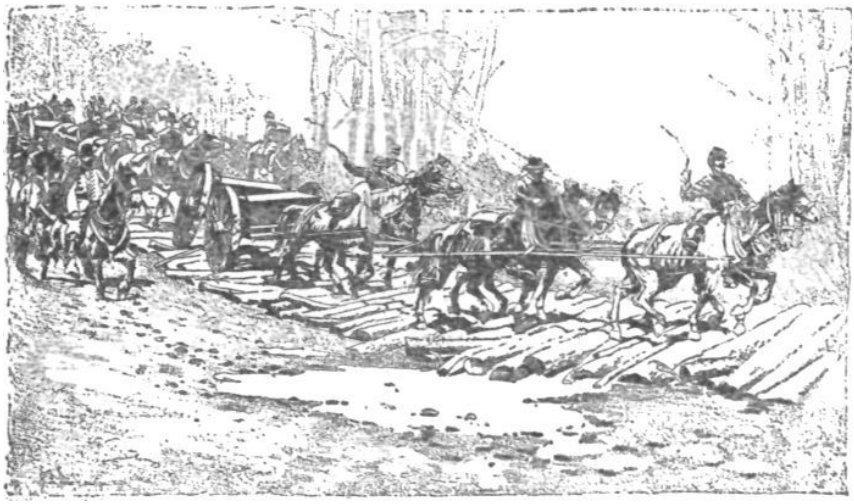
The Field Artillery Board recommended that the improved

6-line monocord switchboard with certain improvements be adopted in place of the type B. D-9 switchboard, and that the improved 12-line monocord switchboard with certain improvements be adopted in place of the Types B. D-10 and B. D-11 monocord switchboard in view of the fact that the modified switchboards are more compact, more easy to install, can be operated with greater speed due to simplicity of controls and to self-contained operator's set, contain self-contained light for night illumination of switchboards and night alarm.

**Experimental Wire Cart (Pintle Type).** Awaiting receipt of matériel. Probable date of completion June 30, 1931.

**Electricians Knife**
**Breast Reel, Type RL-21**
**Tool Equipment, Type TE-30**

These tests have been completed and reports written. The reports however have not yet been received by the the Chief of Field Artillery.



SHERMAN'S MARCH FROM SAVANNAH TO FAYETTEVILLE

# NATIONAL GUARD NOTES

### Battery Training Schedules

IT is believed that the forms for battery training schedules adopted by the 1st Battalion, 123rd Field Artillery, Illinois National Guard, on suggestion of Captain John F. Roehm, Field Artillery, the Regular Army instructor on duty with this organization, will be of interest to Field Artillery officers of the National Guard. Similar forms for unit training schedules are used at the Field Artillery School, and after six months' trial in the 1st Battalion, 123rd Field Artillery, it has been found that they can be applied to National Guard units with excellent results.

The following is a brief explanation of the method of using the master schedule and monthly schedule shown on pages 286 and 287:

The regimental program prescribes the objectives, methods of training, etc. The battalion program is made in such detail as to insure a thorough understanding by the battery commanders of the goal to be reached at the end of each phase. The master schedule of the batteries then comes into use. Each battery, because of its turnover and other circumstances, has a different problem; each has some subject in which it excels and some in which it is weak. The form for battery master schedules contains all subjects in which a National Guard battery may receive training at any time. It lists the text references, etc. It might appear that an organization may attempt to cover too many subjects; this is not the case, for the Battalion Commander must approve the master schedule. The Battery Commander, after careful analysis of his battery's training status, lists the number of hours he is to give to those subjects which he elects to cover. He does this after computing the number of purely training hours available during the period covered by the master schedule. One battery may feel that it requires four hours of interior guard instruction and sixteen of service of the piece, while another requires only two hours of interior guard, etc. If the Battalion Commander does not like the battery master schedule,

## MASTER TRAINING SCHEDULE (For a 155 mm. Howitzer Battery)

BATTERY—, —F. A. FROM JANUARY 1, 1930 TO JUNE 30, 1930 *Numbers of Hours*, 33

| *No.* | *Subject* | *Text References* | *Drivers (Hours)* | | *Cannoneers (Hours)* | | *Specialists (Hours)* | | *Remarks* |
|---|---|---|---|---|---|---|---|---|---|
| 1. | Physical Training | M. P. T. W. D. 1914, T. R. 115-5 | | 1 | | 1 | | 1 | |
| 2. | Care and Maintenance of Equipment | T. R. 50-90 NCO Manual 1917 (F. A.) | | | | | | | |
| 3. | Ceremonies, Guard Mounting, Etc. | T. R. 430-80; T. R. 420-20 T. R. 135-5; F. A. D. R. 1916 | | 1½ | | 1½ | | 1½ | |
| 4. | Dismounted Drill | T. R. 50-15; F. A. D. R. 1916 | | 5½ | | 5½ | | 5½ | Includes inspection in ranks: 15 min. at beginning of each drill. |
| 5. | Customs and Courtesies | T. R. 50-15; W. D. Doc. 864 | | 1 | | 1 | | 1 | |
| 6. | Laws of the Army | M. C. M.;—N. G. R. | | 1 | | 1 | | 1 | |
| 7. | First Aid and Military Hygiene | T. R. 112-5; T. R. 113-5; A. R. 850-125 | | 1 | | 1 | | 1 | |
| 8. | Interior Guard Duty | T. R. 135-15; M. B. T. (N. G.) | | 3 | | 3 | | 3 | |
| 9. | Service of the Piece | T. R. 430-65 | | | | 12 | | | |
| 10. | Service Practice—The Firing Battery | T. R. 430-70; T. R. 430-85 | | | | 2 | | | Only "The Firing Battery" during Armory year. |
| 11. | The Tractor Driver | T. R. 430-76 | | 8 | | | | | |
| 12. | Description, Care of Motor Vehicles | Tech. R. 1330-A Tech. R. 1430-A | | | | | | | |
| 13. | Maneuvers Limbered | T. R. 430-80 | | 3 | | 1½ | | | |
| 14. | Field Artillery Materiel (155 How.) | Ord. Doc. 2017 | | | | | | 6 | Instrument detail only. |
| 15. | Fire Control Instruments | T. R. 310-20 | | | | | | 4 | |
| 16. | Preparation of Fire | T. R. 430-85; F. A. S. Notes | | | | | 10 | | Signal detail only. |
| 17. | Signal Communications | T. R. 75-10; T. R. 160-5; T.R. 165-5; T. R. 160-6; T. R. 162-5 | | | | | | 2½ | |
| 18. | Reconnaissance and Occupation of Position. | T. R. 430-155; F. A. S. Notes | | | | | | 3 | |
| 19. | Map Reading | T. R. 190-5; T. R. 190-10 | | | | | | | |
| 20. | Manual of Pistol, Sighting, Aiming, Etc. | T. R. 320-15 | | 1½ | | 1½ | | 1½ | |
| | | T. R. 50-55; T. R. 150-20 | *2 | 2 | *3 | 2 | *2 | 2 | *Men to fire record byroster. |
| 21. | Pistol Marksmanship | T. R. 150-20 | * | | * | | * | | |
| 22. | Machine Gun—Instruction, Marksmanship | T. R. 150-35; Tech. R. 1400-30C | † | | † | | † | | |
| 23. | Recruit Instruction | M. B. Pamphlet 1925 | ‡ | | ‡ | | ‡ | | |
| 24. | Gunners Examination | T. R. 430-175 | | | | | | | |
| 25. | Defense Against Chemicals | T. R. 155-5 | | | | | | | |
| 26. | Riot Duty—Laws Governing | Treatise on Riot Duty M. B. 1920 | | | | | | | |
| 27. | Riot Duty—Performance | Treatise on Riot Duty M. B. 1920 | | | | | | | |
| 28. | Non-Commissioned Offices' School | | * | | * | | * | | |
| 29. | Battery Inspections | | * | | * | | * | | |
| | **TOTAL HOURS** | | | 33 | | 33 | | 33 | |

* Concurrent with other instruction ; not included in total. † For recruits only; not included in total.

## MONTHLY TRAINING SCHEDULE (*for 155MM. Howitzer Battery*)

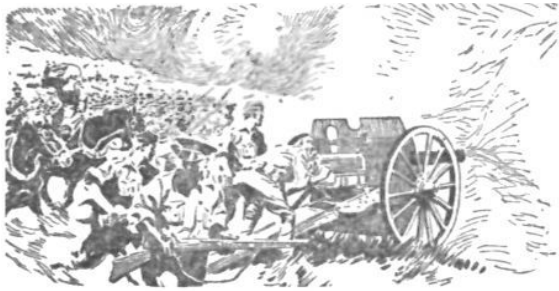
BATTERY—, — FIELD ARTILLERY

*From January* 1, 1930, *to January* 31, 1930.

| *Date* | *Hour* | *Place* | *Who Attends* | *Subject* | *Text and Paragraph* | *In Charge* | *Remarks* |
|---|---|---|---|---|---|---|---|
| Jan. 5 | 7:30- 45 | Floor | All | Inspection in ranks—Dism't'd Drill | TR 50-15 pp. 22-26 inc. | Capt. Risborg | Close check on insignia. |
| | 7:45-9:00 | Floor | Cannoneers | Service of the Piece | TR 430-65 pp. 20-25 inc. | Lt. Strader | Dummy Projectile will be used. |
| | 7:45-9:00 | Garage | Drivers | Descr. & Care of Tractors | Tech R 1330-A ignition carburetion | Lt. Andren and Motor Sgt. | |
| | 7:45-9:00 | N. E. Floor | Instrument | BC Telescope | TR 310-20 | Lt. Scott | Set up—descr. and care. |
| | 7:45-9:00 | S. E. Floor | Signal | Descr. of EE. Tel. | F. A. School Notes | Capt. Risborg | |
| | | | | | | Lt. Scott | Circuits—descr. of parts. |
| | | | | | | | Clerk and Sply. Sgt. may fall out after dismtd. drill. |
| Jan. 12 | | | | | | | |
| Jan. 19 | | | | | | | |
| Jan. 26 | | | | | | | |

he calls his Battery Commander in consultation and has him give reasons for his allotment of hours.

The monthly schedule is made from the battery master schedule bearing in mind the objective for a particular phase. At the end of each period listed on the monthly schedule, the hours devoted to the various subjects are checked against the master schedule and a balance written on the latter. This insures that the program is fully covered during the period. It avoids following the path of least resistance, which is to make the drill correspond to the subjects in which the instructors are best versed. It is believed that a battery schedule, made monthly, prior to the last drill of the preceding month and based on a well planned battery master schedule—one which lists the name of the instructor and the paragraphs to be covered in TR—will correct the tendency to use a slip-shod schedule which would result in lack of uniform training. No officer is enthusiastic about instructing in some subject in which he is not prepared.



# ARTILLERY AMMUNITION

## GENERAL DEVELOPMENT OF THE PAST AND PRESENT

**BY T. J. SMITH,* BY COURTESY OF "ARMY ORDNANCE"**

THE development of artillery ammunition has extended over a period of about seven hundred years. This period may be considered to have begun at about the time that weapons or cannons, utilizing the pressure of gases resulting from the rapid combustion or explosion of some substance to expel a missile or projectile, were first brought into use.

Ammunition, or projectiles, if such they may be called, for the first guns were the same as those used in the ballista, catapult or other similar devices of ancient warfare. The development of missiles or ammunition for these weapons goes back to remote antiquity. Compare the development of this item, if such be possible, with any other definite item that has been under almost constant development for such a length of time!

The contribution to this development by our own country was practically negligible until after the period beginning about 1850. Prior to that time, practically all improvements in ammunition used in this country came from abroad. Since that time, however, the improvements in ammunition directly attributable to development in this country, have consistently increased both in numbers and importance.

An examination of some of the ammunition in use in this country just prior to and even during the American Civil War, shows little improvement over that in use a few centuries earlier. There were improvements, of course, but those made after the period beginning about 1850 were rapid and outstanding. There have been improvements made, even since as late as 1890, which at that time seemed impossible.

The history of the development of artillery ammunition from its beginning until about 1850 is not really a history of the development of the ammunition itself, but is simply a history of the development of the craftsman's ability to cast or forge objects

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and to fabricate more complicated designs as to shape. In the evolution of artillery ammunition it will be noted that the more important changes and improvements have been concurrent with the many rapid developments that have taken place in practically every phase of the chemical and mechanical industries. During the World War, and most likely as has been the case in all wars of any magnitude, the industries of the nations involved were greatly stimulated by the demands for increased production of ammunition. There were thus evolved improved facilities and methods of production, as well as new sources of supply of raw materials, all of which have had a direct influence on the final completed round of ammunition.

Many improvements affecting ammunition design were proposed and their merits were realized many years, and in some cases centuries, before it was practical to utilize them. This has been due to the fact that in many instances the manufacturing arts necessary to accomplish these improvements in design were at that particular time either non-existent, or in a very primitive state of development. The change from the smoothbore to the rifled cannon brought about radical changes in ammunition design. The advantages to be gained by rifling were discovered apparently by accident about 1520. Although numerous schemes were tried in an endeavor to utilize its advantages, these apparently met with little success until about 1860. It was about this time that the principle of the progressive combustion of powder was discovered. Marked changes in cannon construction are also noted at about this period. There were many early attempts to produce a smokeless powder. Extensive experiments with this object in view were conducted in France before the American Revolutionary War. These experiments were carried out in an endeavor to reduce the smoke from the combustion of black powder. The achievement was not accomplished until a century later and then along lines entirely different from those attempted in the earlier period.

The development of ammunition requires in many instances the development of facilities for its manufacture. Regardless of how promising a design may appear, or of how excellent the results may be that are obtained when ammunition is made and

tested in small quantities during times of peace—the final round will be considered entirely satisfactory only if it is capable of being rapidly produced with the least skilled labor in the large quantities required in time of an emergency. Quantity production, on such a scale as to justify a proper conclusion on this basis in time of peace, is admitted to be practically impossible of realization. The requirement therefore necessitates as the ideal not only the fewest number of types consistent with tactical needs, but also simplicity in design of each type wherever possible.

While ammunition is being developed, consideration must not only be given to its use to meet tactical requirements and the ability to have it manufactured in quantity by established methods, but also there must be studied and tried new methods of manufacture developed in commercial industries. These methods of manufacture must be considered with a view to their adaptation to the manufacture of ammunition.

The experiences of the various nations engaged in the World War brought out as never before the vital necessity of substitutes for critical and strategical raw materials used in the development and production of artillery ammunition. It is not to be expected that a substitute will be the equal of the article or item which it is intended to replace. Substitutes may, however, play an imporant part in enabling the ammunition production and supply program to be carried out with the best munitions obtainable under critical circumstances.

During the World War, practically all countries engaged therein were forced to use substitutes for some of the components used in the complete round of ammunition. Substitute explosives were developed by all countries, including the United States. Germany developed a substitute consisting mainly of zinc to replace copper in the rotating bands of projectiles. Germany and France developed semi-steel shell. This substitute for forged steel shell was also taken up in this country, partly due to a supposedly threatening shortage of steel as well as to the desire to utilize the production capacity of the large number of foundries. While only a few of the substitutes have been briefly referred to, the records show that they were many and varied in all countries engaged in the World War. Their importance is

such that in the design and development of artillery ammunition they must receive careful consideration. Provision for their use must be made accordingly in order that they may be readily available should circumstances necessitate.

In an emergency it is not to be unexpected that the most carefully worked out peace-time plans of development will be upset by changes in requirements necessitated by special and peculiar circumstances that previously could not be foreseen. The reversal in the proportion of shrapnel and shell used, and the importance placed on the super-quick action of the point-detonating fuze of the high explosive shell during the World War, completely changed certain previous lines of development in this and other countries.

To meet new conditions the demand for entirely new types of ammunition not previously considered often requires a new line of development. In the World War the introduction of the use of chemical ammunition required the designing, developing, and production of such ammunition in a minimum time in order to meet an unforeseen condition.

During the World War the demands for ammunition to give greater range, greater accuracy and greater efficiency, in practically all calibers, resulted in innumerable designs and experiments to accomplish these results. The shapes of projectiles were modified—the bands were modified—changes were made in the ignition, detonating, loading and propelling systems, all to meet the requirements demanded by the users. A few important changes only are referred to in this article.

The question of greater range will always remain an item of prime importance. To meet this requirement, extensive developments have been, and still are being, made to collect and have available all data bearing on the design of projectiles to give the best results. Projectiles are now being designed and manufactured of the best shape to give long range and accuracy consistent with the requirement that they be capable of being produced in quantity by our arsenals and commercial manufacturers in case of an emergency.

Rapid strides and developments have been made in the past few years in the manufacture of steel tubing in this country.

Shell made from drawn steel tubing have been tested and found satisfactory. This process is still under investigation with a view toward collecting all necessary data for its use, should it be desired or should circumstances so require it.

There have been marked improvements in welding and welding methods. Many of these methods have been adopted by commercial manufacturers. Investigations are being made to determine the possibilities of their use in connection with the manufacture of ammunition and ammunition components.

The art of drawing metals, especially steel, has steadily progressed. The use of drawn steel as applicable to the manufacture of projectiles has been investigated and is being studied. The old pierce-and-drawn method of making forgings, although improved, still appears to hold its own, but other methods showing promise must be investigated.

Efforts to improve the fragmentation of high explosive shell, especially for antiaircraft use, resulted in the development of a segmental shell. So far, sufficient improvement to justify the additional difficulties in manufacture has not been obtained. It is interesting to note that similar segmental shell were introduced in 1858 and were used extensively by the Germans during the Franco-Prussian War. They were later superseded by shrapnel.

New uses are being made of old material—new materials are being brought into use. Remarkable advances have been made in the machine tool industry, whereby a very great variety of operations may be more economically, more quickly, and more accurately performed. In connection with the experimental and development problems on ammunition pertaining to production, it is important that the arsenals be supplied with the latest types of equipment if they are to keep abreast of the times and are to secure the advantages of our national industrial progress.

The development of artillery ammunition must be followed in every country. Any great advance or discovery in the chemical or mechanical sciences and industries may change the problem entirely. The progress and advancement made in the fixation of nitrogen and the oxidation of ammonia have had a direct influence not only on certain commercial industries, but have also

radically changed the nitrogen problem in its relation to munitions.

In the development of ammunition and its components, one of the very important problems and probably one of the most difficult has been the obtaining of satisfactory fuzes. During the past several years a great deal of experimental and development work has been carried on in an endeavor to obtain a satisfactory point detonating fuze for field artillery ammunition. (The French fuzing system adopted by the United States during the World War has never been considered satisfactory.) With the rigid requirements that the designers were endeavoring to meet, the problem was indeed baffling and at times discouraging. There has been designed and developed a fuze which it is believed will be entirely satisfactory. Tests have given the most promising results. Small lots of ammunition for various calibers of guns are under manufacture. This ammunition will be fitted with the new fuze and will be issued to the using services for test and approval.

While the fuze problem has been difficult with ammunition for field weapons, the situation has been none the less simplified by the requirement of fuzes for antiaircraft weapons. Due to changes in barometric pressure, powder-train time fuzes give erratic results when, fired at long settings and high elevations. To overcome these difficulties a mechanical time fuze has been adopted. A small unit has been set up at the Frankford Arsenal and is now in limited production. The results of tests so far made with this mechanical fuze have been encouraging and it is believed that a satisfactory solution to his problem will be obtained. Immediately after the World War there was appointed by the War Department a board of officers known as the Westervelt, or Caliber Board, to make a study of armament, calibers and types kinds and proportion of ammunition, etc., to be assigned to a field army.

The recommendations of the board were approved, and at various times have been published or referred to in service papers and periodicals. It is desired to review briefly some of the more important recommendations of that board pertaining to ammunition

and to give, in general, the present status of development of certain ammunition items.

*Board:* "The general laws governing the design of projectiles for maximum ballistic efficiency have not been formulated and there is insufficient data on which to proceed."

Since the board's report, for nearly ten years, there have been employed at the Picatinny Arsenal a technical designing organization and at the Aberdeen Proving Ground a ballistic section. These organizations have studied and designed ammunition, calculated data and formulas, and conducted practical experiments in an endeavor to collect and obtain such data as that referred to in the board's report as being insufficient. Their work continues and is of inestimable value to the Ordnance Department.

*Board:* "Development of a mechanical fuze should be actively prosecuted."

A mechanical fuze has been standardized and small production is now being obtained at one of the arsenals.

*Board:* "It is desired to emphasize the necessity for making fuzes for high explosive shell, bore-safe."

This principle has been followed consistently in all fuze developments and the new fuzes will be bore-safe.

*Board:* "It is especially desirable to reduce the types of fuzes issued to any single organization."

It is expected that one type only of the new fuze will be necessary for a single organization.

*Board:* "It is considered fundamental that all guns be furnished with types of projectiles which will give the maximum range—that all howitzers, except the 105-mm., be furnished with a type of shell to carry the maximum bursting charge."

Insofar as practicable, all new ammunition has been designed to be in accordance with this recommendation.

*Board:* "It is desired to point out defects in nitrocellulose powder. This powder takes up moisture from a damp atmosphere and deteriorates in its ballistic qualities."

Flashless, non-hygroscopic powder has been developed for a number of weapons. Experiments and developments are being continued on powder for other calibers.

For each of the types of weapons recommended by the board there was specified the weight limit and type of projectile, the kind of fuze, and certain characteristics of the powder.

The following weapons developed since the war in accordance with the board's recommendation have been standardized: 37-mm. infantry mortar; 75-mm. pack howitzer; 75-mm. Mk. I gun; 105-mm. howitzer; 240-mm. howitzer; 3-inch antiaircraft gun (mobile); 3-inch antiaircraft gun (fixed); 105-mm. antiaircraft gun; 14-inch railway gun; 16-inch howitzer; 16-inch gun on barbette carriage.

The following ammunition has been developed and standardized since the World War: 975-lb. armor-piercing projectile for 12-inch gun; 1560-lb. armor-piercing projectile for 14-inch gun; 2340-lb. armor-piercing projectile for 16-inch gun; Mark X base-detonating fuze for major caliber armor-piercing projectiles; mechanical fuze for antiaircraft artillery; fuze for 75-mm. infantry mortar; substitute explosive for TNT.

Projectiles and fuzes have been designed and the projectiles tested for the 37-mm. Infantry gun. Changes in requirements have necessitated additional designs. Tests are now being made to see if these new requirements can be met. A new projectile with supersensitive fuze for the 37-mm. antiaircraft gun has been designed and tested. Projectiles and fuzes are being manufactured for service tests. A change in requirements has necessitated a recent new design of projectile for the 75-mm. Infantry mortar. Firings are being conducted with encouraging results.

The 75-mm. field gun and 75-mm. pack howitzer will use the same shell. The design of shell has been held up pending the final design of fuze. Fuzes are now being manufactured for service test. The design of shell is being carried to completion.

Projectiles for the 105-mm. howitzer have been designed and tested. Fuzes are being manufactured for service test.

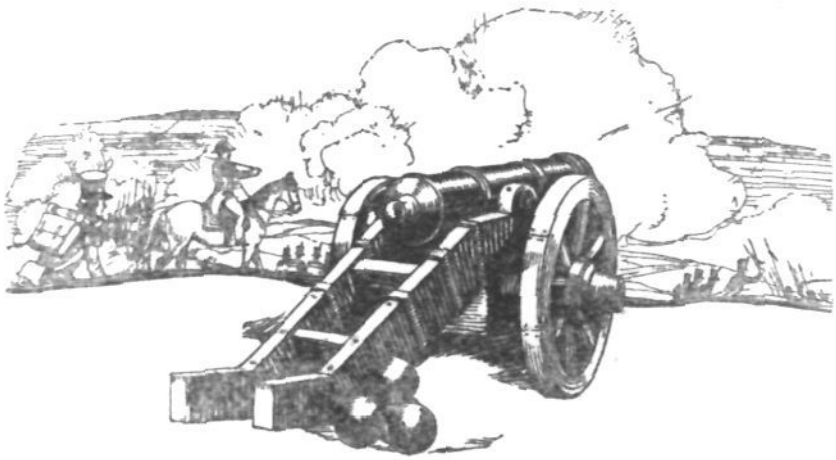
It is expected that the fuzes being designed will be suitable for field weapons including the 240-mm. howitzer.

Projectiles for 3-inch antiaircraft guns have been standardized Mechanical fuzes are being manufactured.

Projectiles for 105-mm. antiaircraft gun have been designed

and tested. The mechanical fuze will be tested with this projectile.

FNH powder has been standardized for the 75-mm. gun, M1897. NH powder has been standardized for the 155-mm. gun. Satisfactory FNH powder has been developed for the 2.95-inch mountain gun, 75-mm. pack howitzer, and the 105-mm. howitzer. Improved powders are being manufactured for service test for the 37-mm. Infantry gun, 37-mm. antiaircraft gun and the 75-mm. Infantry mortar. Improved powders have been developed for the 75-mm. M1 Gun and the 3-inch antiaircraft guns. In an endeavor to solve the many complex problems in connection with the design and development of artillery ammunition, there has been built up a technical organization whose activities are centered on this work. This organization, while relatively small, has carried a burden that has not been light. Progress that has been made to date indicates that most of the difficult problems in connection with the ammunition development program as laid down will be solved. Some of the problems, however, have not been solved—new problems are continually arising. If progress is to continue, experimentation and development must continue to play a most vital part in the program.



# AN EXPERIMENTAL BREECHING FOR THE PHILLIPS PACK SADDLE, ARTILLERY-CARGO TYPE

BY CAPTAIN JOHN W. RUSSEY, 4TH F. A. BN.

THE background for the following observations is the 500-mile march made by Battery "B," 4th Field Artillery, to test the comparative usefulness of the Phillips Pack Saddl and the Aparajo in transporting the new 75 mm. howitzer.

The six loads in which the pack howitzer is transported vary in weight from 228.5 to 256.5 pounds, exclusive of pack saddle or aparajo equipment. Practically all the material except the wheels ride as top loads, the most difficult problem in pack transportation.

The Phillips Pack Saddle is made in three types: the Pony, the Cavalry, and the Artillery-Cargo. The service given the last named type differs greatly from that given the Cavalry type. The breeching on all three types of saddle is in principle, however, the same. The Pony type is not considerd in this discussion since it has not been observed by the writer.

The Cavalry type saddle is for use in transporting loads not over 205 pounds in weight, the saddle included. The horse is normally used under this saddle, although mules may be used. The light weight makes it possible to maneuver at the trot and gallop in addition to the walk, and the breeching as designed for the Phillips Pack Saddle is especially suited for this. The loads transported, as, for instance, the machine gun load (Fig. 1), ride in general close to the saddle and on the sides. The saddle has little inclination to displace itself forward or backward on the animal's back. The breeching allows full movement of the hind quarters at the trot and gallop, and its action is sufficient to prevent the saddle from slipping forward.

On the other hand, the weight of the artillery loads being as high as 340.5 pounds with the saddle included, the maneuvering gait is limited to the walk except that on rate occasions the trot may be employed for short distances. The gallop is never used. The mule is employed under this type load.

There are three main factors which cause artillery loads to slip forward. First, the narrow-chested, wedge-shaped conformation of the mule in general. It is believed that this accounts for the fact that in all cases of slipping saddles observed the movement was forward. The saddles were never observed to slip backward, either on going continuously up grade for two hours or on climbing the steepest hills or mountain trails. Although the saddles were equipped with breast straps, on no occasion were they displaced to the rear so that the breast straps came into play. (The breast straps were removed the latter half of the test).

Second, the top load, riding high on the animal's back, is whipped about quite a bit by the walking movement of the animal under it. A great amount of rocking is transmitted to the saddle, tending to make it work forward.

And finally, going down grade for any length of time or descending steep inclines will usually cause the saddle to slide forward.

Of course, all three of these factors usually operate at the same time to displace a saddle, the result of which will be the raw withers of the pack animal. In other words, the breeching is called upon to function much more in the case of the Artillery load than in the case of the Cavalry load, and it may be inferred that although the action of the breeching on the Cavalry load may be sufficient to hold the saddle in place, this same action may not be sufficient to prevent the saddle from slipping forward in the case of the Artillery load.

In fact, it was found that the breeching of the Phillips Saddle, as furnished for the test march referred to, was not entirely satisfactory, so that the continual experiments in adjustment and design for some more adequate arrangement or type of breeching were made during the march. Certain improvements have been made on the breeching furnished with the latest model of the Phillips Saddle. But the principle of the breeching remains the same, and it is the opinion of the writer that the mechanical principle upon which the breeching is designed is unsound for artillery purposes.

The Cavalry type saddle with breeching adjusted is represented

by Figure 1, showing a typical Cavalry load. The breeching is made up of a croup piece; two four-inch rings, one at each end of the croup piece; two stays, one leading down from each four-inch ring and joining the forward ends of the breeching body at right angles. The breeching body is held in place by two "lead up" straps, one on each side of the buttocks, and joined to the croup piece. The croup piece is attached in turn to the upper rear edge of the saddle by two "hold up" straps. Two "holding" straps join the stays to the lower rear edge of the saddle. These last named straps transmit any movement of the saddle to the working parts of the breeching.

A more or less constant point of support to keep the saddle from going forward is the croup, upon which the croup piece bears. However, this support is transmitted to the saddle through lines of force approximately at right angles to one another, as can be seen by the position of the croup piece and stay in respect to that of the holding strap in Fig. 1. Should the force exerted to move the saddle forward be very pronounced, the angle between the holding strap and the croup piece will tend to become a straight angle. If the summit of the croup piece stays in position on the animal's croup its lower ends at the four-inch rings will swing forward in an attempt to line up with the holding straps, causing the stays to buckle and the breeching to give. If the summit of the croup piece does not stay in place the entire croup piece slips forward over the point of the animal's croup and the breeching body slips upward under the tail of the mule. A combination of the two conditions may prevail.

The Artillery type saddle with the breeching adjusted is represented in Figure 2, showing the bottom sleigh and recoil mechanism load of the 75 mm. howitzer matériel. It can be seen that the stay has been shortened at the upper end and that it is connected to the 4-inch ring by a leather loop, more in line with the holding strap, superimposed upon the stay. This alteration was made in order to overcome the tendency of the stay to buckle just below the 4-inch ring, to reduce the angle at which the holding strap acts on the croup piece, and to raise the breeching body to a more desirable position, nearer to the point of the

buttocks. The point of attachment of the holding strap to the saddle has also been raised several inches, thus decreasing the leverage of the holding strap on the saddle. This decreases the rocking motion given to the saddle by the action of the walking mule's quarters on the breeching body when the latter is brought into play.

The breeching body can also be raised to a more desirable position by raising its point of attachment on the stay as shown in Figure 3. In this figure the stay is seen to be buckled just under the 4-inch ring. The point of attachment of the holding strap to the saddle remains unaltered, as this particular saddle has a vertical length 3 inches shorter than the saddle shown in Figure 2, and the change therefore not necessary.

The latest type breechings have metal reinforced stays to eliminate buckling. But the lines of force acting to hold the saddle in place are still approximately perpendicular to one another, and the breeching body horizontal and about 6 to 8 inches below the point of the buttocks. It is believed that these two features will have to be changed before a satisfactory breeching is developed for artillery loads. When sufficient force is applied to the breeching through the holding straps, the breeching will not retain its adjusted shape nor remain in its adjusted position. It will give and allow the saddle to go forward.

The aparajo uses the crupper, corresponding to the breeching of the Phillips pack, but very unlike it, to keep the load from going forward. (See Figure 4.) The point of support of the crupper is above the point of the buttocks just under the dock. The crupper when under strain bears against the dock by which it is partly held in place and frequently makes severe cuts on the under side of the animal's tail. This is the serious objection to the crupper. As far as holding the aparajo in place it functions satisfactorily. As can be seen by Figure 4 there is only one line of force in operation in the crupper to hold the aparajo in place, that from just above the point of the buttocks to a point about four inches above the bottom of the crupper where the crupper joins the aparajo. That part of the crupper above this line is buckled and does not act on the aparajo. That

part under this line is so much added weight. An inspection of any section of broken-in aparajos will show the above to be true.

Therefore, to combine the best features of the Phillips breeching and the crupper, a breeching of the sling type as shown in Figure 5 was developed. The breeching body was altered by inserting an aparajo dock piece at its center. The stays were discarded. Both the breeching body and the croup piece were joined directly to the 4-inch rings, which in turn were connected with the holding straps. Thus the holding strap and the breeching body formed a straight line from the ring of the lower rear edge of the saddle to the buttocks of the mule just below the dock. The croup piece made an angle of about 20 degrees with the breeching body at the 4-inch ring, the lead up straps being materially shortened to hold the breeching body, as altered, in place.

The croup piece was adjusted so that a light pull was exerted on it when the animal was standing on level ground. Thus any ordinary pull of the saddle transmitted through the holding strap is first taken up by the croup piece. As the pull is increased the breeching body comes into play and the pressure distributed between the croup and the buttocks, a sort of sling being formed around these two parts of the animal. Where in the crupper of the aparajo, all of the pressure was on the buttocks just under the dock and frequently so great that the crupper-dock was forced upward against the tail and cut deep into it, in the sling design a good portion of this pressure is borne by the croup which is by shape well fitted to stand it without injury. From the limited use given the design, it appears that enough of the pressure is taken up by the croup to insure against the excessive and injurious pressure at the buttocks and dock. And the type is as efficient in holding the saddle in place as the crupper.

The mule on which this sling type breeching was tried on the march was the tube mule of the second section, "Mabel." This mule's conformation is shown by Figure 5. The forward pitch of her back is easily seen. The tube load, due to its great length and to the height at which it is carried above the saddle, is difficult. This, added to the mule's conformation, resulted in the most troublesome load unit, as far as the saddle's slipping

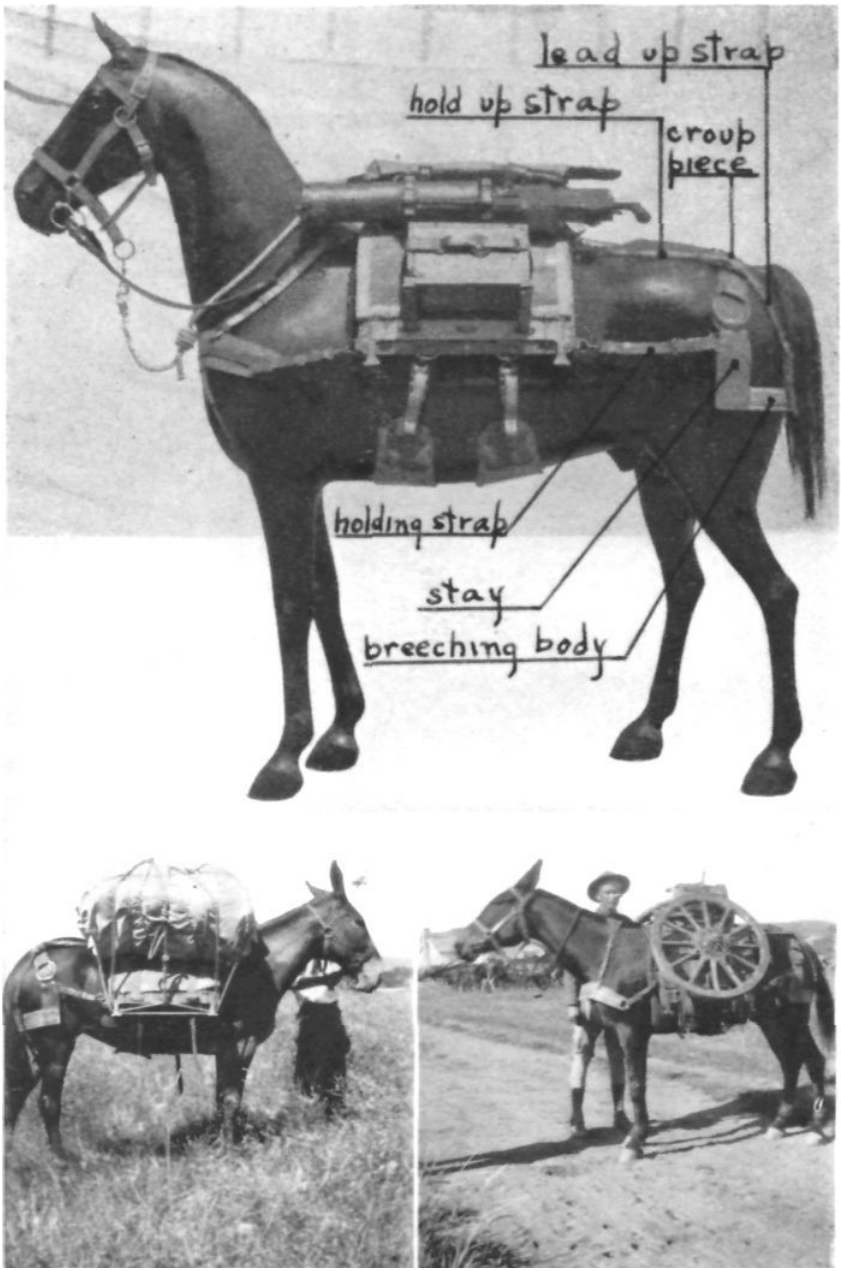



FIG. 1. (ABOVE): THE PHILLIPS PACK SADDLE, CAVALRY TYPE BELOW (LEFT): CARGO LOAD: (RIGHT) BREECH AND WHEELS LOAD—THE HEAVIEST LOAD—340.5 LBS.

forward on the animal's withers was concerned. It was only after every other adjustment possible was made with little or no result that such a radical departure from the original design of breeching was made, and this more as a matter of last resort, for the injuries incident to the crupper were feared in any design that incorporated the crupper dock.

FIG. 4. DOWN THE TRAIL FROM HARNEY PEAK.
NOTE ACTION OF CRUPPER ON APARAJO

But as soon as the sling type was employed on this unit, for the first time the forward movement of the saddle was under control and the animal's withers immediately began to heal. She finished the test with only a slight abrasion on one wither, caused by the mohair pads slipping on the last night's march. Neither her tail nor buttocks were damaged in the least. This alteration was made at Custer, S. D., and tested from there to Fort Robinson, Nebr., a distance of 110 miles marched in six consecutive days.

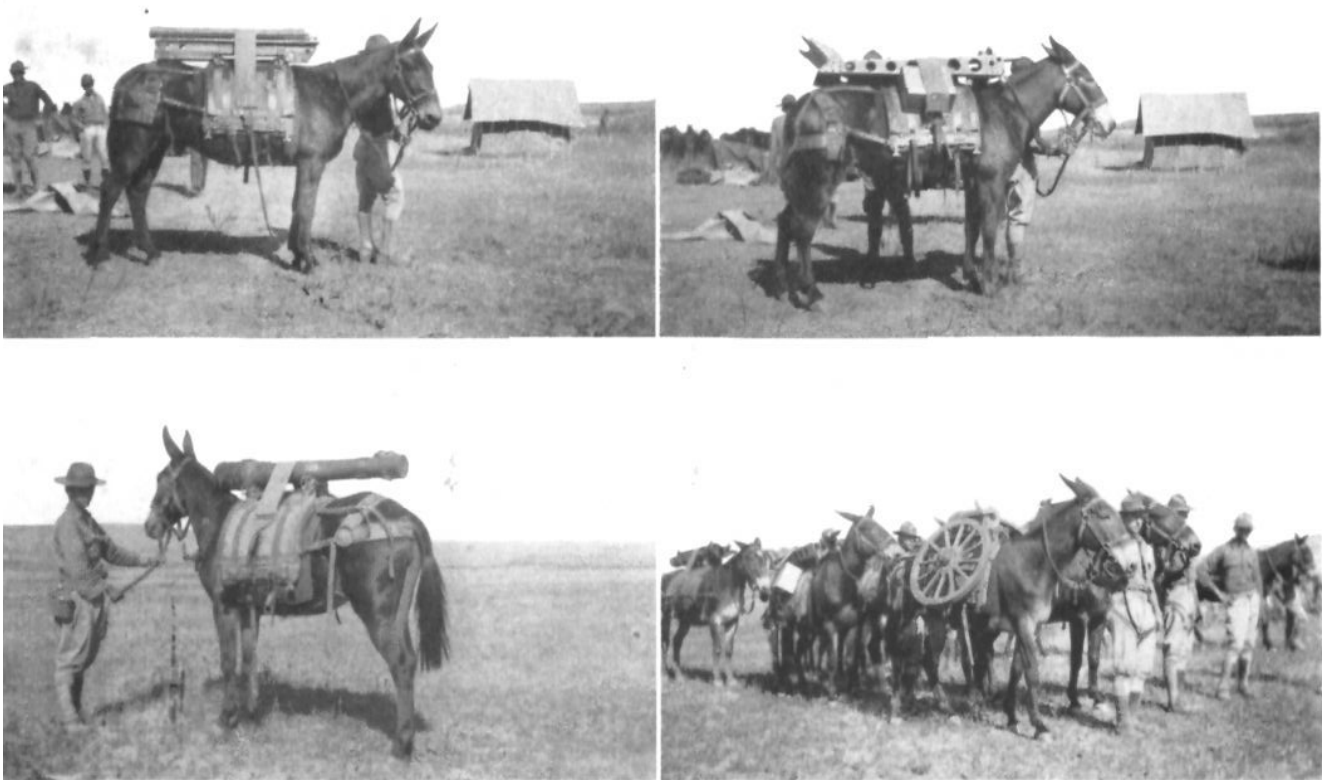


FIG. 2. (UPPER LEFT): BOTTOM SLEIGH AND RECOIL MECHANISM. FIG. 3. (UPPER RIGHT): REAR TRAIL LOAD
FIG. 5. (LOWER LEFT): 75 MM. TUBE LOAD, SHOWING EXPERIMENTAL SLING TYPE BREECHING OR CRUPPER
FIG. 6. (LOWER RIGHT): THE 6-MULE GUN SECTION WITH 75 MM. PACK HOWITZER

The croup piece was fitted to this mule and made secure to the 4-inch ring without means of adjustment. If this type breeching were made to outfit a number of animals, there should be adjustable attachments between the croup piece and the 4-inch rings also so that the proper length of the croup piece and the proper pressure of that piece could be obtained by fitting the breeching to the individual mule.

It is realized that the design of breeching is a wide departure from the regular Phillips breeching but it is thought that the principle of direct lines of force is correct, and that the type has possibilities. Of course the model should be tried on various mules and loads over a period of time to find out whether it is really any good or not. and so is offered for what it is worth.

BATTERY B, 4TH F.A., PLACE A PIECE ON TOP OF HARNEY PEAK, THE HIGHEST POINT BETWEEN THE ROCKY MOUNTAINS AND THE ATLANTIC COAST

*Mamma has only one pair of hands, Lieutenant!*

# WAR BUGS

## *BEING A WORM'S-EYE VIEW OF THE WAR TO END WAR*

**BY CHARLES MacARTHUR**

Formerly Private Second Class, Battery F, 149th F.A., 42nd (Rainbow) Division, A.E.F.
Pictures by RAYMOND SISLEY, Formerly of Battery C, 149th F. A.

**By courtesy of Liberty Magazine**

### DRIPPING DEATH IN THE ARGONNE

Into the Valley of Death charged Battery F, 149th Field Artillery, blond, American, salary thirty dollars a month. The Argonne was a boiler factory. Shells screamed in and out and up and down. Hardly the place for nervous people.

In the red hot blizzard we cut cross lots and took position in a field near Nantillois—an elegant maneuver, executed in broad daylight, right under the enemy guns.

The Katzenjammer Kids saw us coming and made it very, very hard for everybody. The mushy field bubbled like a bowl of porridge as big shells, little shells, and medium sized shells kissed the mud and whistled through our whiskers.

*Obviously, as a Captain, he had gone completely nuts. We had seen it coming for a long time*

We could see right off that the Argonne wasn't going to be any fun at all.

Some of the shells came from captured French 75s, which seemed a little unfair. There must be a law somewhere about shooting off other people's guns. Moreover, they were tossing a brand new kind of shell that bounced three times before exploding, like a skipping stone.

Several of the boys were knocked cold cracking their chins against the ground at every bounce.

Somehow the guns were lined up. Immediately we flattened out and dug with teeth, fingers, and toes. It wasn't safe to wiggle your ears. Don McGinnis stopped one in the arm, and had to play squat tag all the way back to the first-aid station to avoid getting eight more in the neck. He got no help from us. We were too busy digging—next stop, China.

Shovels, behave! The silver lining to this dark cloud was that the field was pocked with large shell craters, convertible to fairly safe flops in which only a direct hit could kill. And nobody ever worried about direct hits. They were too complete.

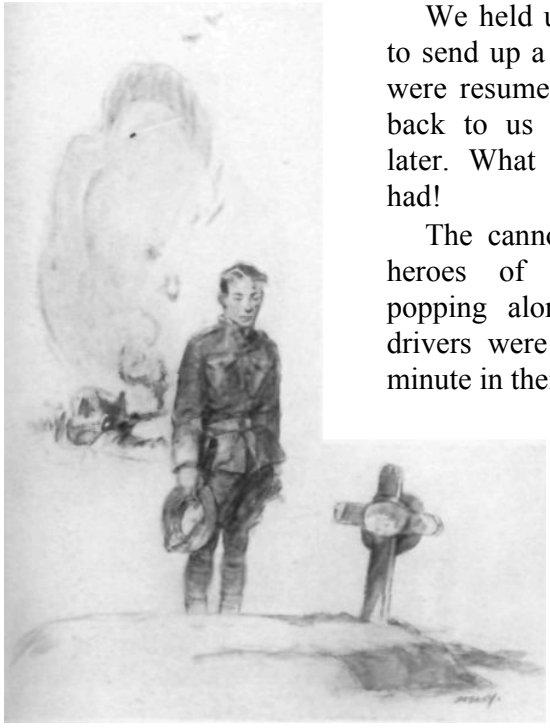
Captain Stone finished his firing data. We settled down to willful, premeditated murder. The Germans came back with new Niagaras of high explosive. Apparently somebody told them that if they hit us they would get a round of cigars. Under the rain of iron the second gun crew began to sing "Brighten the Corner Where You Are," with appropriate (if slightly rude) interpolations.

We had a new lieutenant. We got him at Chateau-Thierry—like the nosebleed. He was a sensitive man, and when all the pop corn began to come in, he developed galloping symptoms of St. Vitus' dance. A stray shell parted his hair as he dove into an honest private's flop trench, and when he discovered that he was still in one piece, he remembered he had sprained his ankle on the hike from Montfaucon and began to groan loudly. Nobody paid any attention. He spoke as follows:

"Could a couple of you fellows give me a lift over to the first-aid station?"

Well, there was nothing to do about that. There is a law about shooting officers. In the midst of serving his gun, Karl Nahowski remarked mildly, "Mama has only one pair of hands, lieutenant."

Mr. Lieutenant took the hint and hobbled painfully off, performing bewildering cartwheels, double somersaults, and sitfalls as the shells hammered at his heels.



We held up the war long enough to send up a barrage of boos, which were resumed when he was handed back to us at Brest some months later. What a boat ride that baby had!

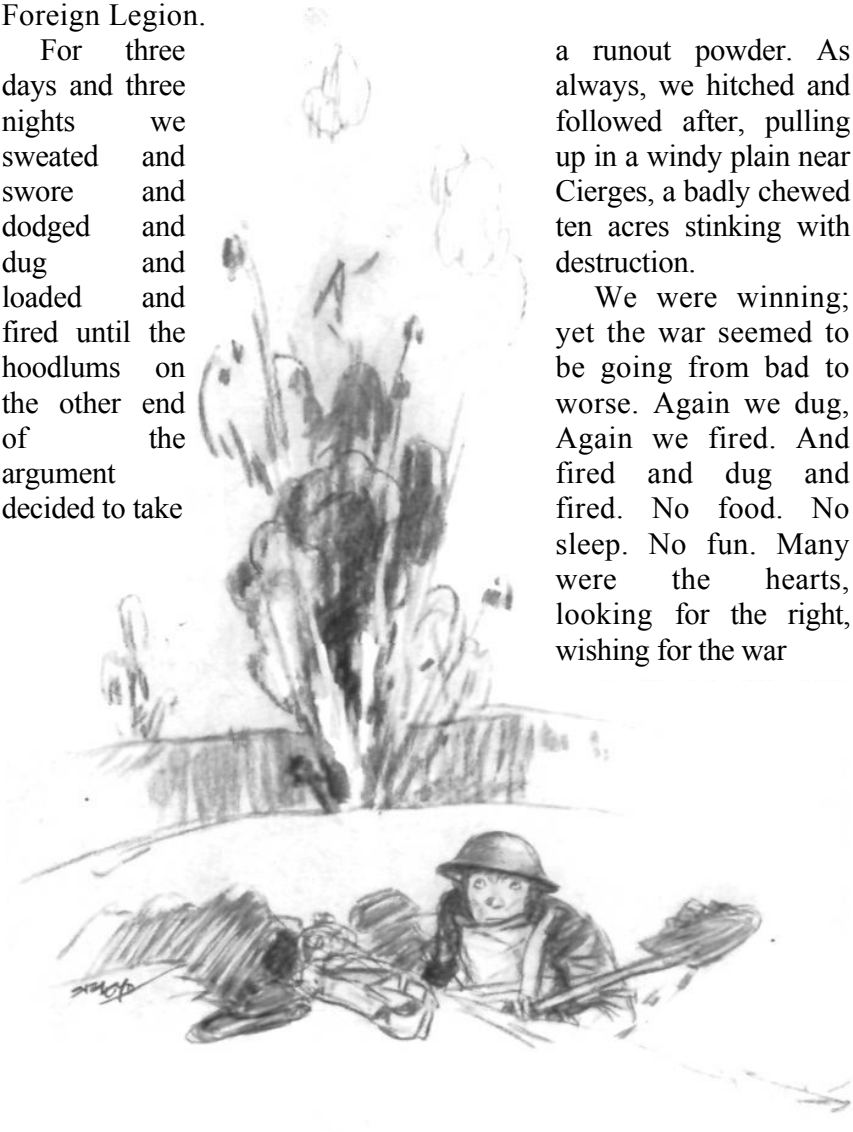
The cannoneers weren't the only heroes of Nantillois. Hell was popping along the roads, and the drivers were living from minute to minute in their saddles.

The parade was in charge of Corporal Bill Young-man, who had an uncanny instinct for outguessing the German guns. Time and again he turned the column at a gallop just as a flock of heavies

slapped the road ahead. Bill was an ardent American and loved his job. Day and night he carried four automatics, three trench knives, a Chauchat or two, and a peck of hand grenades in the hope of some day meeting the Prussian Guard. We called him the Foreign Legion.

For three days and three nights we sweated and swore and dodged and dug and loaded and fired until the hoodlums on the other end of the argument decided to take a runout powder. As always, we hitched and followed after, pulling up in a windy plain near Cierges, a badly chewed ten acres stinking with destruction.

We were winning; yet the war seemed to be going from bad to worse. Again we dug, Again we fired. And fired and dug and fired. No food. No sleep. No fun. Many were the hearts, looking for the right, wishing for the war



*We were too busy digging—next stop, China, Shovels behave!*

to cease. Home never seemed so far away and so long ago. Contrary to the happy proverb, the darkest hour usually is before a catastrophe. The night we landed at Cierges the wind died down and the guns had to be relaid. Walter Birkland volunteered to lay the second gun—a job for two men; but Walter didn't want to wake anybody up. And a shell got him, of course.

He kneeled over the trail and very quietly said he was hit. We had a weakness for Walter. There was an instant cross country run for the first aid station. A half dressed doctor was dragged to the guns. In the time that it took him to get there Walter had figured out his chances and arrived at conclusions.

He grinned and said: "Don't kid me, doc. It's curtains."

The doctor hestitated. He wasn't a bad guy and hated to break the news. Finally he said: "Yes, my boy. You're dying."

Walter thought it over.

"Well," he said, "I'm not afraid. Nobody's ever done my work."—In war, the life of every man is often dependent on the hard work of everybody else.—We tried to carry him back to the first aid station. He wouldn't let us.

"It won't do any good," he said, "and you're bushed as it is. Just help me back in the field a way. I'll be all right."

We carried him back of the guns and laid him down. The pain was unbearable. The doctor did his best with injections. They didn't work. Walter lay and sweated it out. Once he asked us to hurry it up. When we wouldn't he dictated a message to his parents, then asked to be alone.

A barrage was ordered. We sent it over, looking back between shots at the still shape in the moonlight. Now and then Paul Johnson went away and came back. In an hour he signaled that it was over. We worked the guns as fast as they would shoot and hoped hard that we were killing.

Walter's death shot our morale to pieces. He was such a swell guy. The next morning we got the supply wagon up and took him back to the echelon for a decent funeral. Jack Walsh made a coffin out of some ammunition boxes and we dug him a grave.

When the earth went in, the little Greek began to bawl, and opened the box to add a can of corn willie and a pinch of coffee.

The gesture was so frantic and sincere, we forgave him all his trespasses on the spot.

Walter's name was hammered on a mess kit top and nailed to a cross.

A second time we left him, and pushed on to Fleville in pursuit of the Flying Dutchmen.

Thank God, our own infantry finally were ahead of us. That was more like it. Whatever was in the cards from now on could go under the head of Unavoidable Hard Luck.

Positions were picked in a flat valley along the Aire, a deep and narrow river choked with French, American, and miscellaneous dead. Willow trees trailed their pretty fingers in the black rush of water. Here and there a body clung to the branches. Over the river a thousand yawning dead—a great pity, everything considered. Yet there, but for the grace of God, would lie all of us—the grace of God, and New York's rusty bayonets dead ahead.

Those New York babies went right to work. Before we had a chance to dig in, they were tearing through St. Georges, just over the hill. They asked for a barrage and we threw them a honey—up twenty-five and up twenty-five and run, you lousy Germans! It was like old times. We began to feel sorry for the poor Krauts. They shouldn't have to run like that on top of a heavy breakfast. It's bad for the stomach. Well, they were finally getting a rough idea of what war was like. A lot of them would be ready to quit the army and take in washing before long.

Ranges went up and up. We spun the dials an extra fifty meters to catch the colonels, generals, and society leaders, who naturally would have a head start. What runners! On a mud track, too.

At the limit of our range we ceased fire. Number One men swabbed out the steaming bores and remarked that if President Wilson wanted us to beat up any more Dutch athletes he would have to send us some hairbrushes. When, all of a sudden—

Captain Stone burned out of the telephone central, blowing his tin whistle.

"Seventeen degrees and ten minutes! Snap into it!"

We stood for a second, unable to believe our ears. The last elevation had been nearly 8,000 meters. And there was the skipper bawling a range that meant the Germans were a couple of city blocks away. Obviously, as a captain he had gone completely nuts. We had seen it coming for a long while.

*"Fire!* You so-and-sos! The Captain was jumping up and down like a monkey on a stick. "Colonel Reilly says the doughboys are in desperate need of our help!"

There were just ten shells in each gun pit. Half of them went bye-bye in the first frenzied minute. The range decreased in alarming kangaroo jumps. Only five shells to go. We slung them over, praying that the Germans would die of sunstroke or that God would do something about the Ordnance Department. He did.

Around the hill in back of the guns, on cue, rattled the first section caisson, hauled by six of the lousiest slobs in the animal kingdom. A more discouraged, seedier set of horses never lived, full of pneumonia germs and black thoughts toward the war, the world, and all mankind. As they plodded around the bend, a Comanche yell went up from the firing battery. The last shell was gone, the ranges were coming down, down. In another ten minutes the Germans would be in our laps.

The drivers somehow got the idea. Standing in their stirrups, they began banging their teams' bony bustles with steel helmets. Ten minutes before the horses would have laughed heartily at such treatment. Chances are that they would have sat down in their traces and made faces at the corporal. Now they seemed to get the idea, too.

While four decreasing ranges were rattled off with no back talk from us, they reared in their harness, shook their heads a couple of times, and began to pound across the field—hoofs flying, mouths open and dripping suds. And they were such bags of bones, any respectable merry-go-round would have turned them down.

The second caisson made the turn as if it had been banked on two wheels. The third, the fourth appeared the drivers hanging over their horses' necks, whispering words of love while they socked savagely at skinny rumps. The first section reached the

guns. The cannoneers broke the caisson and unloaded on the run. Shells were fused and fired in a beautifully controlled frenzy.

The second caisson galloped up. A bucket brigade was formed and shells were thrown to gunners like basketballs. Miraculously, ranges took a jump. It was time. We were firing at spitting distance, nearly. The last shell went just as the third caisson came up. We jammed the new ammunition into hot bores without waiting to grease.

Up twenty-five. Praise God from Whom All Blessings Flow! Up fifty. Who said those Dutch dough heads could fight? Up a hundred! Get with 'em, New York! Run them bowlegged. A hundred more. Cut a Rainbow in their pants. Another hundred. The war's over.

The trembling, bowlegged horses sagged away. We slammed some more iron at increasing ranges. At last 7,000, with the guns sweating paint and burning up the air. Cease fire—this time no kidding.

It was a great day for the doughboys. They had been surprised in front of their objective by forces ten times their strength, and spent a hot hour stabbing and getting stabbed, and winning washtubs full of crosses and Medals of Honor.

Such little parties—as the Colonel called them—weren't funny any more, especially for the doughboys. All of them had been sleeping in the rain for weeks, a single soaking blanket between them and the cold October slop. They were less than 60 per cent effective on the morning of St. Georges—full of dysentery, pneumonia, and fight. When this was called to General Summerall's attention by Alabama's scrappy Colonel, His Nibs took another chew of tobacco and ordered the doughboys to take the town or come back 100 per cent dead.

General Hindenburg laid off the hand to hand stuff and began fooling around with airplanes and gas, besides the usual shelling. By day a searching, nerve-racking fire—and good-by to all who didn't pull in their ears. Gas galore, drifting across the valley in ugly green wisps. One good sniff and *fini guerre*.

By night the bombs. German planes crawled over the dark sky unhindered, like lazy, fat lice. Battle of machine guns, bark

of antiaircraft, went for nothing. On they crept, black against dark blue. Beneath them a flash and a roar, a flash and a roar. Nothing is so demoralizing, especially when one's flashes are the targets.

The more bombs they dropped, the deeper we dug, until our positions were as strong as Verdun. Even though our guns stuck out like sore thumbs and the Germans sent handsome Christmas presents into the very pits, we remained safe and sound and extremely hard to kill. One of the men had a six inch shell—about fifty pounds of high explosive—sail between his ankles as he slept. It was a dud and he escaped with a sprained foot, a wise Providence intending that he should survive the war and become known as the greatest liar in America.

With each passing day the Heinies got meaner and meaner. Every time we bundled out to breakfast they gave us everything they had—which was about ten shells apiece. Again and again the camouflage over the guns was torn to shreds. Several times direct hits landed smack in the ammunition, blowing it to hell and gone. Colonel Reilly (God bless him and make him president of the War College) long ago had drilled it into us to keep fuses and shells separate, so these explosions were comparatively harmless. Another apple for Teacher: the uncomfortable tin hats he made us wear day and night saved many lives during this spell, which pretty well cleans up this Colonel business.

You would think the Germans would get sick of picking on one battery—and you would have another think coming. Several times they got up on the wrong side of the bed and acted so rough that Captain Stone made us abandon the guns. His motives were the best, but it only made matters more difficult when a barrage was ordered and we had to shinny through shellbursts back to the pits.

On October 16 some mathematical giant on the German side got us figured out to the sixteenth of an inch, and a barrage of 77's nearly put us out of business. For a while shells literally were bouncing off the guns. Ross Cline, Wilbur Wood, and Joe Yacullo were hit in the first ten seconds; Harold Sutton a minute after; and Frenchy Monast a few seconds later. It was lucky we weren't firing or the entire battery would have been hash.

The gun pits looked like sand forts after somebody had stepped on them.

We wiggled out of the flops and got the wounded to a first aid station. Sutton was cranky and couldn't be handled until he was allowed to crawl back through the barrage and recover certain buttons from his best blouse. He had been shining them ever since we left the States.

Monast had hardly reached the first aid station before unbecoming guffaws arose from his gun section. The poor guy's arm was nearly torn off and he deserved more sympathy. But cause for rejoicing lay in the fact that, rummaging through Monast's effects, Johnny Foster had uncovered a regular pantry—at least ten cans of jam, several packages of cookies, candy, cigars, and a litter of chewing gum. It became painfully evident that our hero had been holding out on the Y. M. C. A. supplies, of which he was in charge.

A bitter fight, nearly as disastrous as enemy shells, at once developed between the gun crews for possession of these dainties. The third gun crew held that the cache belonged to them by right of discovery, while the other crews demanded a *pro rata* split. Thereafter Frenchy's regrettable injuries seemed slightly retributive. For five days we had been smoking grass, with four full cartons of Camels in that burglar's musette bag.

Having scored on the battery, the Germans went in for some good, clean fun with a forty-two centimeter gun, the kind we had always read about and had never seen—and never want to see again. Every afternoon all the Heinies who had been very good for the previous week were allowed to shoot it off. And every afternoon we prayed fervently that the Germans would fry in hell for their practical jokes.

From far away—thirty kilometers at least—came a dull boom, as if a comet had struck the other side of the world. Next the growing rumble of an elevated train, rushing into a roar. Into the flops, boys, and may God have mercy on your souls!

The prospect was no worse than a runaway engine bearing down on an orphan asylum; and yet, as the air split before the shrieking tons of iron and the roar massaged our spines like a nutmeg grater, some instinct sent the shoulder blades together

with a bang and the most dauntless heroes rolled up like armadillos.

The first boilerful of death habitually took a final turn with a squeal that unbuttoned every vertebræ on the front. A terrific crash; a great black whirl of earth and iron; a rain of clods and steel. Five hundred meters away the shock was sufficient to knock the guns out of alignment and throw the crews on their faces—if they hadn't been on their faces from the first. Every eardrum caved in from concussion. It was enough to make a fellow as nervous as a witch.

We never got used to the feeling. Just as we thought we were hardened to it, along would come another aerial locomotive on the loose. Once more spines stretched like rubber bands. *Bang!* and a block of black smoke. That was Fleville. Up went the First Baptist church, ever so slowly, and chinned itself twice on nothing. Very impressively it descended, steeple first, a lesson to all good Baptists.

Quite often hits were made a stone's throw from the position. We ducked like loons while an acre of land went up and rattled down on our curly heads. A dozen times a chunk of scrap iron weighing 200 pounds crashed into the gun pits like a live bull.

"Well," said Cush Pryor, peeking from the bowels of the earth on one of these occasions, "that's the first time I knew them Germans used battleships for fragments."

There was a definite cadence to this monkey business and a full five minutes after every shot in which to see the damage. Always a smoking crater twenty feet deep, forty feet across. Each new hole was a powerful argument for the Monroe Doctrine. Let Europe mind its own business and we'll mind ours. America for Americans. No Entangling Alliances, and Three Cheers for Bryan.

One of our lieutenants (who shall be nameless because he tried to be a swell guy) heard one of these choochoo trains coming while he was telling funny traveling men's stories and punishing a mess kit full of beans. In the middle of a big laugh the ugly crescendo began.

Incidentally, the most interesting feature about a forty-two centimeter shell is its intimately personal touch. With 9,000

people around, you *know* it's for papa. The lieutenant's face slowly froze.

Automatically he began working backward, crab style, his eyes glaring at the invisible monster in the sky. We yelled that he was heading for the river, but he didn't hear or care. His face was so green, so sorry for everything he had done in this world, so unsure God would forgive him in the next. Still holding his mess kit at alert, he backed right into the Aire, disappearing in a cloud of bubbles and beans. We fished him out with a rammer staff, laughing like fools and keeping the pole away from him until he was half drowned. Before he got it he had to salute twelve times.

A battery of National Army artillery pulled into the field to our left. Immediately we were inspired to show the kids what real soldiers with whiskers could do. The next time the Fritzies shelled us, we stood up in the pits and faded them, shot for shot. There was no reason for this show of heroism; every reason for abandoning position. Shells were raining in like confetti. Captain Stone was yelling to beat it for the river, especially as we were firing at barbed wire and any other time would do. But that damned National Army battery was looking.

For half an hour we kept the home fires burning. The Germans turned two batteries on us and a hail of shells ripped through the camouflage and bounced off the wheels. It got so hot that we had to do belly flops and fire from the crouch. The National Army obliged with cheers, which endeared us to the draft at once. Those boys would be soldiers in time. Anybody could see that with half an eye.

The tough part of being a hero is that you can't quit, once you start. We were about to cease fire and run for it, when Johnny Foster had a rush of courage to the head and yelled: "Step right up, boys! Three shots for a nickel!" Which induced another round of applause and committed us to the worst half hour of the war, proving that Divisional Pride has Love of Country skinned a mile.

Lieutenant X, recovered from his wounds, rejoined the battery and decided to make the position God's Little Garden and the neatest little spot on the front. Every morning he wandered

among the gun pits, declaring National Cleanup Week. Old socks were to be burned; cigarette butts pulverized; blankets brushed; nasturtiums planted. The theory seemed to be that the Germans would peek through field glasses and set us down as innocent suburbanites.

All this was woman's work and we told the lieutenant so. We also told him to go away and not do that any more. At first we were very polite, and it wasn't until Lieutenant X got cross and bad tempered that we were in the least bit severe with him. Lieutenants are like children that way. They begin by talking back. The next thing you know they are out of hand and have to be sent to military school.

Rumors, rumors, rumors. The front was a *Keffeeklatsch*. Every soldier in the division had his own hot tip. Two American aviators had capturned the Kaiser and cut his ears off. Mr. Edison had invented a poison gas that would destroy every living thing within a radius of twenty miles. Hereafter we could fight the war with bean blowers.

Not all these popeyed rumors were so reassuring. For instance, the Kaiser was about to celebrate his birthday by destroying the entire American army with a new gas, better than Edison's. And so on and on.

The front settled down to periodic pot shots and bloodletting while both sides gathered strength. A lady came up from the Salvation Army and opened a bakery under fire. We examined a former sauerkraut factory and found a tub suitable for bathing. All of us were as lousy as goats and the leaky wooden barrel looked like a Turkish bath. Even this simple pleasure was resented by the Germans, who blew the place off the map, scattering sauerkraut for miles. The cranks!

So were we. Brick Bristol caught a Y. M. C. A. traveling man trading priceless chocolate to German prisoners for buttons and iron crosses. We hadn't had any chocolate since Monast bit the dust, and Brick knocked the secretary loose from his triangle and returned with his wares.

# THE CONDUCT OF WAR

**BY MARSHAL FERDINAND FOCH, AUTHOR OF "THE PRINCIPLES OF WAR"**
TRANSLATED BY CAPTAIN W. F. KERNAN, F. A. U. S. ARMY

## PART II

## EXECUTION OF THE PLAN OF WAR MANEUVRE

### CHAPTER VIII—THE MARCH TO THE SAAR

HAVING already demonstrated that the Second Army was protected in its concentration only by its distance from the enemy, let us now see what facilities for reconnaissance and above all what security was provided for it during its march.

On July 30th the Commander of the Second Army was instructed to cover the frontier from Saarbrucken to Bitche with the 5th and 6th Cavalry Divisions. It is clear that in the absence of any covering force worthy of the name an Advance Guard should have been assigned the mission of keeping the main body informed as to what is going on in the territory, about six marches in depth, which extends from the Rhine to the Saar. Inasmuch as this country is difficult to traverse with united masses it was particularly necessary to determine whether the defiles could be crossed before contact with the enemy was gained.

To this task Prince Frederick-Charles assigned the 5th and 6th Cavalry Divisions under the independent command of General von Rheinbaben, a total of fifty-six squadrons and one battery. These Divisions had not been organized in time of peace; they were absolutely unprepared to function as an independent Cavalry Corps. Moreover, the Prussian scheme of transportation had required the Cavalry regiments to be moved to the points selected for detraining of the several corps to which they originally belonged. Assembling these Cavalry regiments was attended by considerable difficulty.

The 6th Division was united around Spendlingen, but the 5th was separated into two masses beyond the Zone of Concentration, five regiments being in the vicinity of Bingen and Krenznach and four regiments a considerable distance to the south around Durckheim.

This Cavalry, which we find at the very beginning divided into three separate groups, was assigned missions in accordance with the same principles, or lack of principles, governing its original formation. Moltke divided it into four columns.

Supported by an Infantry division one day's march behind, this body of Cavalry, whose mission was to provide information and security, would, it was believed, make it possible for the main body to traverse a heavily wooded region without danger.

We have already pointed out the insufficiency of Moltke's system of security. Let us now consider the imperfections apparent in the employment of these fifty-six squadrons of Cavalry.

First of all, these squadrons were dispersed in different directions at intervals of fifty kilometers as the crow flies and absolutely without lateral communication. Moreover no reserve was provided. The wholly arbitrary event of detraining had been allowed to determine the allocation of troops to each route of advance. This mistake could easily have been avoided by organizing the Cavalry divisions before the outbreak of war and there is no doubt that Moltke would have done this had he believed the mission of reconnaissance and security assigned the Cavalry to be indispensable. But, as we shall see, although Moltke thought that reconnaissance was useful he believed he could get along without it.

We note here also the location of the Commander of the Cavalry Corps on the march; he remained with the left column where he could exercise no effective control over the columns to his right. This means that three distinct masses of Cavalry were advancing in the general direction of the Saar, not one Cavalry Corps. The dispositions taken permitted this Cavalry free and unhampered movement in the absence of the enemy, but fail absolutely to take into account what was to be done in the event of an engagement.

We are therefore justified in saying that the German Armies on the march to the Saar had in front of them nothing that could be appropriately designated as a corps of Cavalry or an Advance Guard.

In Murat's dispositions during the First Empire we have an excellent example of the correct method of handling such a

Cavalry Corps. For example, in the operations of Napoleon's armies during the first part of October, 1806, we observe a Cavalry Corps of three divisions (fifty-two squadrons according to the tables of organization of that period) employed on a mission very similar to that which Moltke assigned his Cavalry in 1870. Murat divided this corps into three columns which were advanced along three roads separated from each other by from six to ten kilometers. The distance covered by the scouting squadrons of each column guaranteed to the whole corps the possibility of concentration at will on any one of the three routes of advance. Moreover, Murat's squadrons were grouped into divisions according to weight of armament as follows:

One light division for scouting.

One division of dragoons for scouting and maneuver.

One division of cuirassiers as shock troops and therefore not to be employed as scouts.

After the events of 1812 and 1866 we have excellent reasons for abandoning as part of our permanent organization such Cavalry units as are difficult to feed, clumsy in maneuver and which generally arrive too late to be effective; nor should we ever consider the possibility of organizing such bodies in the event of war. We shall not have to consider the accomplishment of scouting missions over great distances such as those of the Palatinate of 1870. The troops composing a covering force today and the distance which ordinarily separate the covering force from that of the enemy are considerations which should ordinarily be given weight. For example, from Chateau-Salins to Nancy is twenty-seven kilometers. To employ a Cavalry Corps as a covering force to turn the flank of a hostile covering force would only lead to a lengthy and useless maneuver. On the other hand it is true today as it was in 1806 that a mass of independent Cavalry gives the advance guard or the covering force of an army a highly mobile reserve of great strength which may be used to reinforce a weakened line or to prepare a turning movement. Moreover, when after their initial engagement two opposing armies are again seeking contact, the necessary information regarding the enemy's situation can be obtained by that side which has a numerical superiority in Cavalry.

Such are the missions which must be assigned Cavalry masses at the outbreak of war. These masses, it must be remembered, have a flexibility peculiar to the Cavalry arm. In general the object sought should always be allowed to determine the particular mission upon which the Cavalry will be employed.

Under cover of his Cavalry Corps Moltke was about to undertake:

*First,* the concentration of the Second Army on the line Alzey-Gollheim-Grunstadt, this concentration to be carried out August 2nd.

*Second,* the advancing of this army's concentration beyond the zone fixed. The elements already detrained were to be displaced forward by road marches, those not yet detrained were to be moved by rail direct to their new detraining points.

The proposed march of the main body, protected by an advance guard of Cavalry improperly organized from the start, calls for some comment.

The truth is that the march of this Army would in no sense of the word be "informed" by this body of Cavalry, large as it was, unless, due to the absolute immobility of the enemy, no movement or activity whatsoever was reported in the area traversed. In other words the only information of value which it was possible to receive from a body of Cavalry so organized was negative information.

On the other hand if the French had launched even a partial offensive the German Cavalry, lacking means of resistance, would have been forced to retreat before it was able to gain any estimate of the importance of the enemy's attack. However, in this case (that of a partial offensive) the German Commander-in-Chief would have certainly expected that his *"alarm bell on the Saar"* was functioning. Otherwise, without any real reason, he might be led to countermand the order which he had given for the troops to cross the heavily wooded area of the Palatinate. Indeed he might, if his means of gaining information did not improve greatly, postpone indefinitely the forward movement of the German Army. However, what actually happened was that, without paying any attention to the need of proper reconnaissance,

the advance of the entire Second Army was begun on July 31st.

Let us suppose that the French had taken the offensive, and leaving one corps posted in observation in front of the German First Army, had advanced with their four other corps against the Second Army. They would have then encountered the enemy in the following situation during the first days of August:

III Corps debouching through Worrstadt, followed at some distance by the X Corps.

IV Corps debouching at Kaisers-Lautern thirty kilometers away and followed at the same distance by the Guard.

Such a situation would have been greatly to the advantage of the French. They would have been able to crumple three German Corps without encountering any obstacle to retard their advance. What must we say then of Moltke's statement quoted above: "Prince Frederick Charles would have at his disposal more than 194,000 infantry"? No doubt the Prince would have had this number of troops at his disposal in the sense that he would have had them under his command, but he could not have withdrawn them from the wooded area transversed by only two roads in time to oppose the enemy with united forces. And why not? Simply because of the lack of an adequate advance guard which, having given him due warning of the necessity for immediately uniting his forces, would have then, by its resistance, guaranteed to him the time—that is to say the opportunity—to complete this very necessary operation.

The security sought by this use of the Cavalry was faulty. The Prussian Army was in a very precarious situation. The precariousness was due to the fact that it would be impossible for the German forces to unite in the event of an attack. The same thing was true of the passage of the mountains of Bohemia in 1866, which was so different from Napoleon's passage of the Thuringian mountains in 1806. The latter was especially noteworthy with regard to the following points:

(1) The First Army Corps as Advance Guard was dispatched along a central route, preceded by one division of Light Cavalry and followed by the general Cavalry reserve.

(2) Three columns of two corps each followed along three

roads, one day's march behind the Advance Guard. The Advance Guard, having taken the pass and debouched into the plain beyond, protected the passage of each of the other corps to its right and left. When the whole Army had passed, the Advance Guard resumed operations continuing its mission of reconnaissance (having now all of the Cavalry ahead of it) and preparing carefully selected positions which, if the enemy had attacked would have enabled:

(1) The troops in the immediate vicinity to maintain and strengthen the positions selected for defense;

(2) Troops more distant to come up, to concentrate and to prepare the offensive maneuver which would result in victory;

(3) Under all conditions all his forces were to engage in one battle against the enemy.

The absolute immobility of the French in 1870 was sufficient to excuse, but not justify the imperfection of Moltke's dispositions. This is the utmost we can admit.

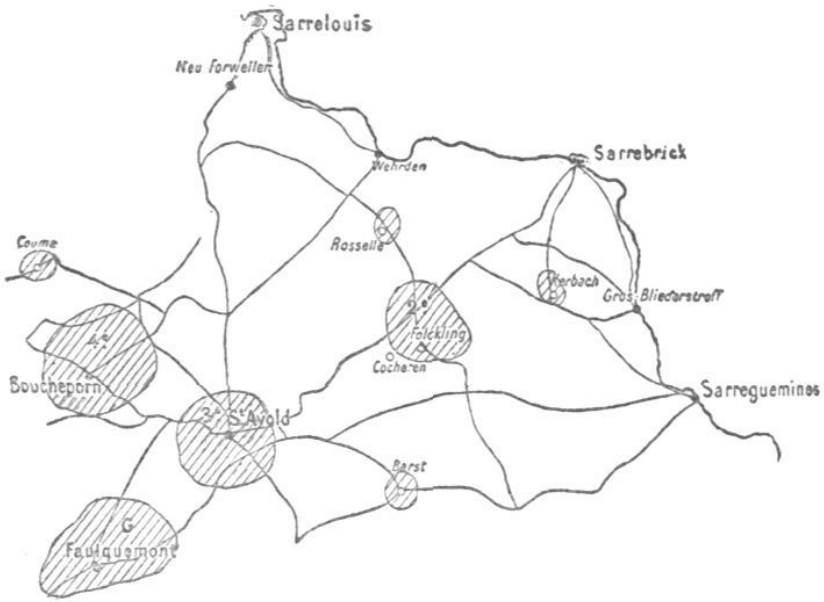
On July 31st the Emperor Napoleon III received the information that Steinmetz, commanding the VII and VIII Corps, was advancing southwards and that large German forces were concentrating at Mainz and Mannheim. At the same time the French Corps Commanders declared that they were not yet ready to commence an offensive. Consequently it was decided at French General Headquarters to adopt a middle course. Such a decision was futile in the extreme. A reconnaissance was determined upon in order to force the enemy to expose his strength. This operation was carried out by the following troops:

II Corps marching on Saarbrucken and supported:

*On the right* by a division of the V Corps debouching at Saarguemines on the right bank of the Saar.

*On the left* by a division of the III Corps operation against Wehrden, and further west by a demonstration of the IV Corps on Saarlouis.

Such were the dispositions which led up to the engagement at Saarbrucken on August 2nd. Initiated by the French forces enumerated above and commencing at ten o'clock in the morning, this action was over shortly after midday. The French masses encountered first two Prussian companies and next a Prussian




FRENCH DISPOSITIONS OF AUGUST 1ST

battalion (2nd Battalion of the 40th) and forced them to retreat with a loss of four officers and seventy-nine men.

This engagement at Saarbrucken has been ironically, but correctly designated as a battle of three divisions against three companies or a maneuver against an imaginary enemy.

We can, however, derive a lesson from these events: A weak detachment (The Prussian Battalion) even when attacked by very superior forces is neither surprised nor destroyed provided always that:

(1) It puts out outposts;

(2) It understands how to maneuver in retreat according to the principle governing the movements of advance guards, whose mission is not to gain a victory, but to prepare the battle for the main body.

We shall see, for example, how two days later the Douai Division, acting as advance guard of the Army of Alsace, was totally and unnecessarily destroyed at Wissembourg because, not understanding how to fulfill its mission as an organ of security, it permitted itself to be surprised.

The final result of the French operation of August 2d was nil.

How could it have been otherwise? The advancing French Army discovered nothing but empty space in front of it. The French were free to cross the Saar if they wished, but they neither desired to do so nor indeed were they in any condition to take advantage of this opportunity. If, on the other hand, the Germany Army had been encountered in great force the position of the French would have been a good deal like that of a man whose prayer for a rain storm is granted before he is prepared for it.

Once more we reiterate this principle: Reconnaissance should never be made merely for the purpose of reconnaissance. Reconnaissance is made to throw light on a projected operation, the means for which are already provided.

On August 5th the Army of Lorraine was placed under the command of Marshal Bazaine. That of Alsace was to be commanded by Marshal MacMahon. The Emperor took command of the Guard and of the Reserve. The whole command and responsibility for the functioning of the various corps was in the hands of the two marshals. There was no central command of the Army and no Army General Staff. This makeshift scheme of organization is characterized by the complete absence of all ideas regarding the functioning of the French Army as a whole. It does not correspond to anything remotely resembling a military plan. The armies were only on paper. They could never function as armies but merely as corps.

Let us now glance at the German situation and see what was being done during the time the French were making their dispositions. The explosion at Saarbrucken had been a very feeble one, but it still had an appreciable influence on the attitude of the Prussian troops nearest to the Saar. This was only natural. But at the same time the repercussion of this engagement was felt by the main body, particularly by the First Army. This was contrary to all principles and resulted from the lack of covering troops and from the general insufficiency of Moltke's system.

The engagement at Saarbrucken was begun by two companies who were occupying the country south of that town; these companies first defended the Winterberg, and then falling back, the Lowenberg, Saint-Arnaul, and the Repperstberg.

The companies in reserve hastened up from Saint-Johann. General Gneisenau arrived at 11:00 a. m. and immediately ordered up one battalion and four field pieces from Raschpfhul to Saint Johann in order that the sound of the cannon might call troops to his assistance. At noon after the French had thrown back the Prussians to the right bank of the Saar, the engagement was over except that a constant bombardment from one bank of the river to the other was kept up. At two o'clock Gneisenau ordered a retreat to Raschphful and then to Hilschbach where he called out the detachments of Volklingen, Dudweiler, Burbach and Malstadt as well as the reserve which was at Heusweiler. If the French attack had continued Gneisenau would have retreated to Guichenbach.

We note especially that since the French did not follow the retreating Germans, contact was lost during this very evening of August 2nd. When the Corps Commander at Wadern was informed of this he gave orders for August 3rd to General Gneisenau to regain contact by sending forward detachments to Saarbrucken, Dudweiler, Volklingen;

16th Division to march to Heusweiler;

15th Division and Corps Artillery to march to Lebach.

These orders were approved by the Commander of the First Army who issued the following orders to the VII Corps for the 3rd of August:

13th Division to Merzig.

14th Division to Brozdorf.

Thus the first Army on August 3rd was not on the line Losheim-Wadern in accordance with the orders issued by German General Headquarters, but along the front Merzig-Heusweiler, eight or ten kilometers from the frontier. This situation, dangerous as it was, was merely the necessary result of a chain of events brought about by the absence of an organized system of security.

In war the inexorable demands of circumstances require action. These demands can not be ignored. But the only action possible for the German Commander here was to organize a makeshift service of security out of the troops of the main body,

*i. e*. out of the same troops who later on would be required to take part in the decisive action of all forces.

The *inexorable need* here is to regain *contact:* the moment the enemy commenced operations he should have been followed and taken under observation. The more he threatened, the more he had to be watched.

Above all his advance must be *retarded*. The concentration, and after that the difficult march of the Second Army was threatened. It was necessary to be prepared to halt the enemy, and therefore the First Army had to advance.

"In the opinion of the Commander-in-Chief of the First Army the role of this army was to follow the enemy: *to cover the flank of the Second Army during its deployment by offensive operations. The thrust of the enemy must be borne by the First Army in order to facilitate the advance and deployment of the center of the three German armies*, and when the Second Army is unable to advance without giving battle, the First Army will give it all the assistance possible during the engagement."*

From the above we are able to gain an idea of what the Commander of the First Army thought should be done in the absence of a detachment specially organized to furnish security.

On the 2nd of August the Second Army carried out the movements ordered:

The III Corps reached Meishenim, Alsenz;

The IV Corps reached Kaiserslautern.

On the evening of the 3rd, Moltke, who had just learned of the combat at Saarbrucken, telegraphed from Mainz:

"In the event that the French take the offensive through Saarbrucken and Saarguemines, the III and IV Corps will remain in their present positions on the 3rd, the other corps will close up to within one-half day's march.

Otherwise; The III Corps is to move to Baumholder; the IV Corps to Landstuhl."

Both of these places are passages west of the heavily wooded region.

Here again we observe operations halted due to circumstances and to an unknown situation arising out of them.

This is the result of lack of security.

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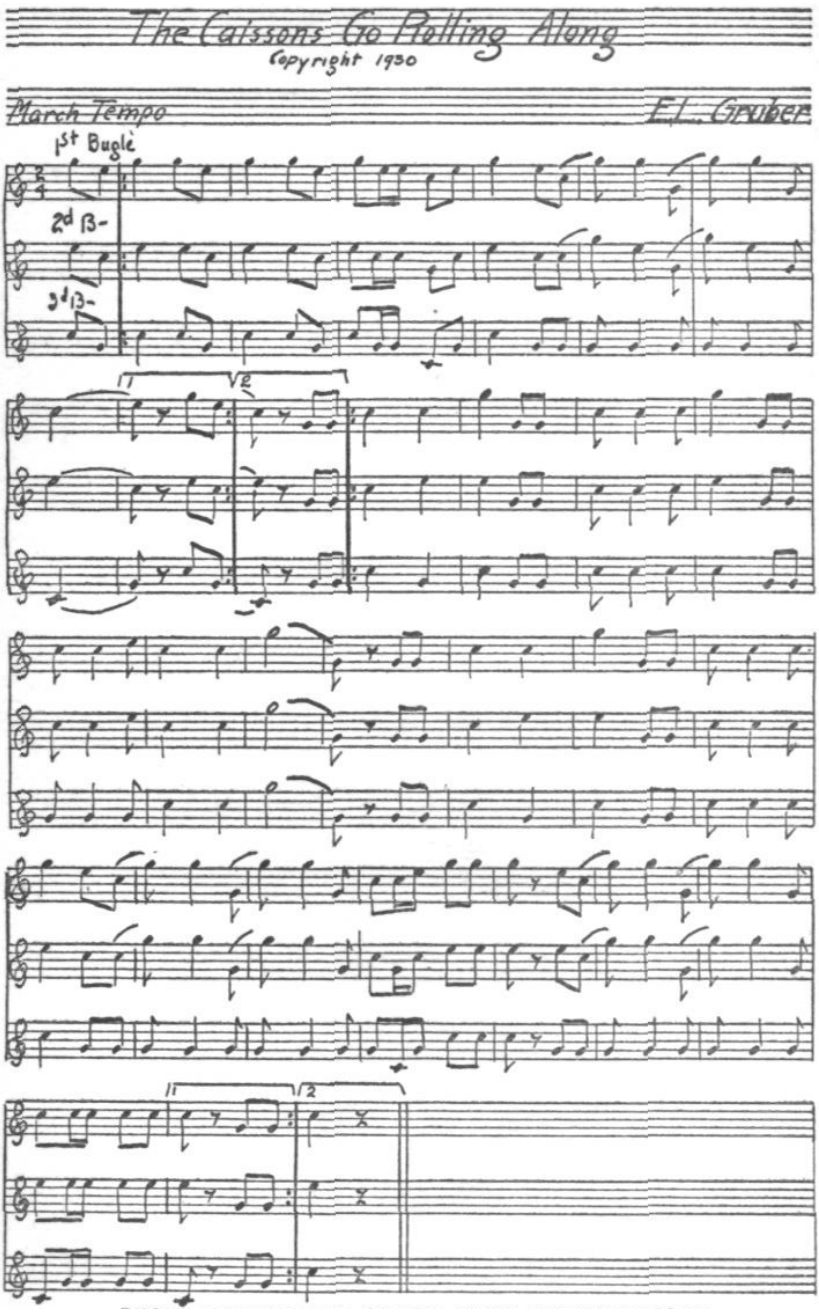
*Von Schell "OPERATIONS OF THE FIRST ARMY."




BUGLE ARRANGEMENT OF THE FIELD ARTILLERY SONG

# AMMUNITION EXPENDITURE BY THE FIRST FIELD ARTILLERY BRIGADE, A. E. F.

THE following table was contained in a memorandum from Captain Richard J. Eaton, Brigade Operations Officer, to Brigadier General Henry W. Butner, Brigade Commander, under date of February 27, 1919, and shows the expenditures of ammunition by the First Field Artillery Brigade from January 23, 1918 to November 11, 1918. The figures represent rounds actually fired; all expenditures by loss, fire, transfer to French units, etc., having been eliminated. It does not include the enormous quantity of ammunition consumed by attached artillery units, but only that fired by the 5th, 6th and 7th Field Artillery regiments. The table is published not only because it is a valuable historical record, but because it gives an indication of the problem of ammunition supply during active operations.

| DATE AND SECTOR | 75 mm. 6th & 7th F. A. 48 guns | 155 mm. 5th F. A. 24 guns |
|---|---|---|
| Jan. 23—Apr. 4, 1918—Ansauville Sector | | |
| Total number of rounds fired | 93,636 | 26,327 |
| Rounds fired per day (72 days) | 1,300.5 | 374.7 |
| Rounds fired per gun per day | 27.1 | 15.6 |
| Maximum daily expenditures: March 11 | 10,349 | 1,336 |
| Maximum daily expenditures: March 12 | 7,380 | 1,688 |
| April 25—July 8, 1918—Cantigny Sector | | |
| Total number of rounds fired | 566,536 | 91,647 |
| Rounds fired per day (74 days) | 7,760 | 1,238 |
| Rounds fired per gun per day | 161 | 77.4 |
| Maximum daily expenditures: May 28 | 33,313 | 4,192 |
| Maximum daily expenditures: May 29 | 29,932 | 2,916 |
| Maximum daily expenditures: June 6 | 27,223 | — — |
| July 18—July 24 Coeuvres Sector | | |
| Total number of rounds fired (approx) | 50,000 | 10,000 |
| Rounds fired per day (7 days) | 7,143 | 1,430 |
| Rounds fired per gun per day | 149 | 60 |
| Sept. 12—Sept. 13, 1918—Beaumont Sector | | |
| Total number of rounds fired | 28,400 | 7,100 |
| Rounds fired per day (2 days) | 14,200 | 3,550 |
| Rounds fired per gun per day | 300 | 148 |
| Oct. 4—Nov. 11, 1918—Meuse-Argonne | | |
| Total number of rounds fired | 345,448 | 46,626 |
| Rounds fired per day (37 days) | 9,336 | 1,260 |
| Rounds fired per gun per day | 194 | 52 |
| Maximum daily expenditures: Oct. 4 | 28,619 | 4,905 |
| Maximum daily expenditures: Oct. 10 | — — | 4,915 |
| Maximum daily expenditures: Oct. 14 | 32,329 | — — |

# FOREIGN MILITARY JOURNALS: A CURRENT RESUME

## Revue D'Artillerie, December, 1929

**"A Study on the Establishment of an Artillery Program,"** by General Maurin was written and submitted to the Ministry of War in September, 1915, before the adoption of any definite program of artillery development and manufacture.

In spite of the fact that a considerable period of time has elapsed since then, this study will still prove of interest to artillerymen.

**"Chemistry and War,"** by Charles Menu, Lieutenant-Colonel of Artillery, is a study of the many new applications of chemistry during the World War, the decisive part played by that science, and the results thereof upon our tasks of life, as well as upon the work of death.

After 1860, the discovery of mineral dyes derived from benzine, and of anilene dyes, gave rise to the chemical dye industry, in which France at the beginning played an important part. However, Germany soon took the lead in this industry and by crushing all competitors shortly acquired a virtual monopoly.

The effect of the Allied blockade in 1914 was to shut off Germany from her supply of Chile nitrates, the source of nitric acid, and from Spanish pyrites, the source of sulphuric avid. Even before 1915 the German government became aware of its inability to produce, and to supply its armies with sufficient quantities of explosives. The only course open to Germany was to substitute for explosives other substances, the supply of which was certain. The country turned to its chemical industry.

As early as November, 1914, and January, 1915, isolated instances were reported of the use by the Germans of hitherto unused chemicals in their shells, the gases from which, though they had an irritating and lachrimatory effect, resulted in no serious casualties.

The first decisive toxic effects were obtained by the Germans on April 22, 1915 on the Flanders front between Bixschoote and Langemarck, when a chlorine gas cloud, released on a front of

6 kilometers over a period of 10 to 15 minutes, killed about 5000 French. Having perfected their devices for releasing gas clouds, the Germans at the end of May repeated this type of attack at Loos, in Artois, on a front held by the British, of whom 1200 were left dead on the field. Again in May, 1915, reports were rife regarding German gas shells, similar in effect to those which had been reported in the preceding January.

However, it was not until July 16, 1915, that all doubt was dispelled regarding the use by the Germans of gas shells and the effect of such shells. The substances then used, though producing no serious organic disorders, reduced the physical capacity of the troops to a very marked degree. In this attack on the Chalade Woods in Argonne, 100,000 shells were fired, important ground gained, and 8000 prisoners captured.

This marked the real beginning of the "Chemical Battle," in which the German High Command hoped for decisive results, having become persuaded that its adversaries would find it impossible to use similar weapons.

The study covers in detail the development of the various toxic agents used by both the Allies and the Central powers, the devices used for laying down these chemicals upon the objectives, and the tactical and technical developments which occurred in this type of warfare.

Reviewing the course of events since 1914, the author looks into the future.

1914—Germany owns half of one of the richest iron beds in the world. It is certain that in war, no matter how great her needs, she will be able to supply the fields of battle with cannon and shells. She is certain of being able to support what we shall call the "Battle of Metals."

1919—Treaty of Versailles. Germany witnesses the destruction of practically all her artillery; on the other hand, she loses more than 75 per cent of her iron mineral resources, the Lorraine beds surrendered to France.

1927—Germany can only produce about 55 per cent of her requirements for the fabrication of steel.

In this situation, which seems grave indeed, what must be the thoughts of the Reich leaders? Let us imagine them.

Pursued by the memory of their recent anguish, they will dream of the immense consumption of steel required by war; they will seek means to avoid this consumption.

They will turn to their mining engineers and they will question them in order to learn if the German sub-soil does not contain resources which, unexploited in time of peace, might be capable of exploitation under war conditions.

They will ask their diplomats if they can be assured of unfailing imports from the outer world, with which to meet their needs, no matter what may happen.

They will ask their soldiers to find out the possibilities of the success against France of an immediate offensive which would win back for Germany the possession of the Lorraine iron beds.

If no definite affirmative answer should be given to these three questions, Germany would at once find herself obliged to foresee and prepare for another form of battle.

Will it again be the chemical form of battle?

Will it be another? Which?

The person who sees clearly in time and who, having seen, will be able to act with decision and speed, will win brilliant victories.

**"High Burst Ranging,"** by L. Hurault, Major of Artillery, is a discussion of an article on the same subject by Captain Perken, published in the Revue d'Artillery of April, 1929.

### Revue d'Artillerie, January, 1930

**"Operations of 75 mm. Unit—The Battalion in the Approach March,"** by E. Ricard, Brevet Major of Field Artillery, traces and discusses step by step the action of a battalion of field artillery engaged in this type of tactical maneuver. The execution of the various tasks by the staff and by the subordinate units of the battalion is explained in a clear and interesting manner by the author, several of whose articles relating to tactics and technique of the 75 mm. battalion have appeared in recent issues of the *Revue d'Artillerie*.

**"Artillery in the Offensive in Position Warfare,"** the first installment of a complete translation of Colonel Bruchmuller's work by Captain N. Aizier. The article, which will be continued in

succeeding issues of the *Revue d'Artillerie,* was reviewed in the October issue of that publication, and was referred to in the FIELD ARTILLERY JOURNAL, March-April, 1930.

Other articles appearing in this issue are: **"Sound ranging by Antiaircraft Artillery—The Measurement of Altitude by the Method of Cotangents,"** by F. Béliard, Lieutenant of Artillery; and

**"The Law of Errors in the Rational Theory of Errors in Observation,"** by General Estienne.

### Revue Militaire Francaise, January-February, 1930

**"The Nanking Government,"** an article by Colonel Doumenc, describes the Chinese situation.

During the last 15 years, the history of China has been one of confusion and civil wars. Above the noise of battle various groups of Chinese diplomats have tried to treat with the powers in the name of many short lived Chinese governments. Scarcely has one "Central Government" emerged from the sea of turmoil than it has sunk beneath the wave of a new revolution. Until recently, the powers have found no logical head of China with whom to treat in order to bring order out of chaos.

In 1928, the victory of the southern forces assured the supremacy of Nanking. In spite of many difficulties this government still exists and is slowly spreading its influence throughout China.

One of the chief problems confronting China is the reduction of the armed forces. This is a political as well as a financial problem. Of a total of 2,000,000 troops, scarcely 160,000 are under the orders of the central government. The rest make up the feudal forces of the various military chiefs, who thus have the power to oppose the will of the central government. Various efforts to reduce these armed forces have been unsuccessful due to the opposition of the military chiefs, and also because of the recent crisis on the Manchurian front.

The aims of the Chinese government have varied but little since the Versailles conference in 1919, where the Chinese delegates demanded:

(1) Complete deliverance from the foreign reign of exterritoriality.

(2) The right to fix its own customs duties.
(3) Withdrawal of foreign posts and troops.
(4) The suppression of foreign concessions.

To date, China has obtained from the powers only its official recognition and autonomy of customs.

Although the existing government has at least nominal control over the largest part of China, the situation is still precarious. Cause for civil war has not yet disappeared. The leading men of the Nanking government are unselfish and patriotic, but they are hindered in their efforts by the selfish ambitions of the military chiefs. The greatest danger, perhaps, which menaces the new government is communism, which threatens to plunge China into civil war. It is quite possible that the feudal chiefs will ally themselves with the communists in order to gain power.

**"Anti-aircraft Defense,"** by Lieutenant-Colonel Vauthier, is a discussion of the various theories advanced in France and other countries as solutions of the problem of defense against enemy aviation.

Most experts prefer a system of defense based on the use of pursuit planes, the system successfully used by the British in the summer of 1918. The retention of this system is at least justified by facts and experience.

One of the chief advocates of an opposing or offensive system is General Douhet of the Italian army, who believes that the only successful defense against enemy aviation is an aggressive offense with "battle planes." Today, the only offensive planes are bombers. These, however, have offensive strength against terrestrial forces and objects only; against enemy planes the bomber is helpless. A true offensive plane should be capable of attacking both ground and air forces. This type, called "battle planes" by General Douhet, would possess the following qualities: a speed of 200 kilometers per hour, a radius of action of 2,000 kilometers, an armament of one or two 37 mm. guns, from 16 to 20 machine guns (with the possibility of concentrating 8 or 10 in a given direction), a few tons of bombs for use against ground targets, and an armor covering vital parts of the plane. The principal mission of a fleet of such planes would be mastery of the air with the destruction of enemy aviation. Such a battle

fleet, if stronger than the enemy air force, would not need to confine its activities to surprise attacks. It could defeat the enemy air forces and then penetrate boldly into enemy territory.

Although Lieutenant-Colonel Vauthier does not entirely admit the feasibility of the "battle plane," he remarks that both the bombing and pursuit planes, with their increasing personnel and armaments, are developing toward the battle plane type.

**"Engagements near Hill 304 in May, 1916,"** by Captain Laxague, is a detailed description of a phase of the battle of Verdun. German offensive tactics during this period of their Verdun offensive are clearly described in a letter from General Petain to the Commanding General of the French Armies:

"The Germans have modified their tactics; instead of dispersing their fire on large fronts, they now concentrate it on narrow fronts which they shell in depth. They thus prepare narrow passage-ways which their infantry may follow without encountering either obstacles or men.

"We succeed now and then, it is true, in resisting enemy attacks by executing counter-preparations in front of all points of attack indicated by the enemy bombardment; but, as the hour of attack is unknown and as it is impossible to observe anything in the dust and smoke caused by the bombardment, we cannot always have at the desired moment the density of fire which would prevent the enemy from leaving his trenches. We cannot always prevent the enemy infantry from advancing in the pathway prepared by its artillery and from occupying a terrain where the defenders have been wiped out."

Captain Albord explains the causes of **"The Russian Defeat in Eastern Prussia."**

It is frequently stated, and with truth, that Russia in attacking rapidly in Eastern Prussia, in August, 1914, caused Germany to divide its strength and, thereby, to lose the battle of the Marne. In the joy of victory, the French excused the Russian defeat as an unavoidable sacrifice. Captain Albord admits that the Russian defeat was predestined not, because of the difficulty of the Russian mission, but because of the incapacity of the Russian army and its general staff.

The Russian army in 1914 had not progressed much since its

defeat in 1904. Its peace-time strength was 1,300,000 men, about one-quarter of its available yearly classes. As large units, it had 70 infantry divisions and 24 cavalry divisions. It possessed 7,000 artillery pieces. Reinforced by 35 divisions of infantry reserve, the war-time army contained 5,000,000 men.

The light artillery had batteries of light guns commanded by a Lieutenant-Colonel, assisted by two Captains. The horse batteries had six guns, and the heavy batteries four guns. There were not enough field pieces of 76 mm. caliber to arm all the batteries of the reserve divisions, some of whom had to use the old 89 mm. slow fire guns, which had poor sighting devices and were badly worn. The heavy artillery matériel was still under construction in French factories at the outbreak of war. However, the Russian artillerymen obtained good results from their matériel. They made good use of defilade, and used OP's at a distance from the batteries.

Unfortunately the Russian artillery was a technical arm. Every artillery officer who went to the War College lost his identity as an artilleryman, and, upon graduation, went to either an infantry or a cavalry unit. As a result, the high command, having no artillerymen, did not know how to maneuver masses of artillery or know how to concentrate artillery fire.

In time of peace, the Czar was commander-in-chief of the army. There was no permanent military chief who could expect to execute, in time of war, plans which he had drawn up in time of peace. In 1914, the Czar was convinced of the necessity of appointing a supreme commander other than himself. Forced by the opinion of the public and the army, he named Grand Duke Nicholas, a very capable and energetic soldier. This appointment was made in spite of the jealousy of the Minister of War and against the opposition of Raspoutin and the Czarina.

The Grand Duke was not in reality the supreme chief of the army. His authority was limited to general directions "on a large scale" to his army group commanders, who were in independent command of their respective fronts. The Grand Duke could intervene in the conduct of operations only by means of army reserves.

Russia, therefore, entered the war with an untrained army and a poorly organized command.

# FIELD ARTILLERY NOTES

## Battery F, 18th Field Artillery, to Return to Fort Snelling, Minnesota

The Secretary of War has directed that Battery F, 18th Field Artillery, which will be made wholly active at Fort Des Moines, Iowa, be returned to Fort Snelling, Minnesota, for permanent station after the completion of the summer training season of 1930.

## Fort Sill Horse Show

The eighth annual horse show of the Field Artillery School will take place on May 26, 27, 28 and 29, 1930. There will be thirty-eight classes and a large number of entries. Last year the Fort Sill horse show was a tremendous success as nearly 900 animals were entered in the various events which were reported in the July-August, 1929 issue of the FIELD ARTILLERY JOURNAL.

## Flash and Sound Ranging Activities of the Field Artillery

Recently the Field Artillery took over from the Coast Artillery the latter's activities in connection with land sound ranging. Henceforth the Coast Artillery will concentrate its efforts on sub-aqueous sound ranging, which has to do with the location of ships or other sound producing agencies which are not visible because of fogs, haze, smoke or other causes.

At present Battery "A," 1st Observation Battalion, is the only active flash and sound ranging battery in the Regular Army. It is used chiefly for experimental and instruction purposes and consists of 4 officers and 108 enlisted men, stationed at Fort Bragg, North Carolina. A detachment of the battery was recently at Fort Sill, Oklahoma, to demonstrate the installation and operation of the sound ranging equipment at the Field Artillery School.

In order to be prepared to expand our flash and sound ranging activities promptly in case of war, the Field Artillery is organizing six additional Observation Battalions in the Organized Reserves as follows:

| | | | | |
|---|---|---|---|---|
| 314th | Observation | Battalion, | F. A. | in 1st Corps Area |
| 315th | " | " | " | in 1st Corps Area |
| 316th | " | " | " | in 4th Corps Area |
| 318th | " | " | " | in 6th Corps Area |
| 320th | " | " | " | in 6th Corps Area |
| 321st | " | " | " | in 9th Corps Area |

Selected Reserve Officers are being assigned to the Observation Battalions and given special instruction in flash and sound ranging. In addition, orders for the following prospective ROTC graduates of certain colleges which have Field Artillery units assigned to them have been requested, so that they may take a special two weeks' course of instruction in flash and sound ranging at Fort Bragg, North Carolina, beginning June 21, 1930:

VIRGINIA MILITARY INSTITUTE

| | |
|---|---|
| Blackwood, Herbert B., | Norfolk, Virginia |
| Fox, Paul D., | Richmond, Virginia |
| Haase, Charles H., | Richmond, Virginia |
| Gravatt, Basil E., | Bowling Green, Virginia |
| Spratley, Thomas C., | Surray Court House, Va. |
| Lewis, Robert F., | Philadelphia, Pa. |
| Lourey, Walter L., Jr., | Cohoes, New York |
| Kerlin, Henry C., | Roanoke, Virginia |
| Britt, Albert S., Jr., | Nashville, Tenn. |

ALABAMA POLYTECHNIC INSTITUTE

| | |
|---|---|
| Morris, Comer F., | Hokes Bluff, Alabama |
| Reed, James R., | Altoona, Alabama |
| Brittain, Courtland F., | Birmingham, Alabama |
| Barrineau, Thomas G., | Molino, Florida |

CORNELL UNIVERSITY

| | |
|---|---|
| Dickinson, Allan B., | Brooklyn, New York |
| Emeny, George, | Salem, Ohio |
| Gorthy, Willis C., | Buffalo, New York |
| Scott, Clarence E., | Cleveland, Ohio |
| Ketner, David C., | Corry, Pa. |
| Harwood, Landry, Jr., | Kansas City, Missouri |

OHIO STATE UNIVERSITY

| | |
|---|---|
| Hallock, Harry E., | Columbus, Ohio |
| Geyer, Gorwin T., | Columbus, Ohio |
| Willis, Ralph I., | Arcanum, Ohio |
| Gay, Hayward A., | Worthington Ohio |
| Wagner, Charles R., | Arcanum, Ohio |

## Motorization of Minnesota Field Artillery

Upon the recommendation of the Chief of the Militia Bureau, the Secretary of War has approved a project providing for the motorization of the 59th Field Artillery Brigade, Minnesota National Guard. This brigade is composed of authorized staff, administrative and service units, and the 125th and 151st Field Artillery Regiments.

It is estimated that the operating cost of the two motorized regiments of Field Artillery will be $276,540 per annum as compared with $361,970 for the present horse-drawn organization. The difference of $85,430 will accrue from the savings of caretakers and forage, animal replacements and other operating expenses.

## Colonel Carter New Artillery Commander

Colonel Arthur H. Carter, FA-Res., has recently been assigned as Commanding Officer of the 861st Field Artillery. Colonel Carter graduated from West Point in 1905 and served with various regular Field Artillery units until his promotion to Major of Ordnance in 1918. In July, 1918, he was promoted to Colonel of Field Artillery and was in charge of the organization of the Field Artillery Officers Training Schools, for which he received the distinguished Service Medal.

Colonel Carter left the regular service in 1919 and was commissioned Colonel, Field Artillery Reserve in August, 1919. In civilian life Colonel Carter is an executive of the firm of public accountants of Haskins and Sells.

## Governor of Missouri Commends National Guard

Governor Henry S. Caulfield of Missouri has commended the National Guard of that State for the prompt manner in which troops were mobilized and dispatched to the scene of the recent disturbance in the State Penitentiary at Jefferson City, Missouri. "This incident" said Governor Caulfield, "has shown in a fine way the efficiency of the Missouri National Guard." According to State Adjutant General A. V. Adams, the conduct of all the officers and men on duty in connection with the disturbance was excellent and the Guard as a whole has reason to be proud of the manner in which these units acquitted themselves.

The following units were on duty at the State Penitentiary on this occasion:

Headquarters Company, 70th Infantry Brigade.
Band Section, Service Battery, 128th Field Artillery.
Battery F, 128th Field Artillery.
Company M, 138th Infantry.

**New Uniforms for R. O. T. C. Units**

The senior units of the Reserve Officers' Training Corps which are maintained at various colleges and institutions throughout the United States will soon be provided with an improved uniform which has been approved by the Secretary of War. All of these uniforms, of 16 ounce olive drab melton, will be brand new, and are now being manufactured by the Quartermaster Corps from cloth which has been and is being purchased for this purpose. Effort is being made to effect complete delivery of these uniforms by September of 1930.

Advanced students who are Cadet Officers will wear Sam Browne belt, service cap, leather leggins, etc., and basic students will wear uniforms similar to those of enlisted men of the Army, with service or overseas caps. The uniform of each basic student, however, will differ materially from the enlisted men's uniform and from that of the advanced students, in that lapels of the coat will be faced with sky blue material.

Various colors were considered for these lapels, but the color chosen was believed to present the best appearance.

**90 More F.W.D. Trucks to be Purchased**

The Army has placed an order with the Four Wheel Drive Auto Company, Clintonville, Wisconsin for 90 more FWD's. These trucks, which are of the two-ton capacity, will be used for general army service in the United States and its possessions.

Features of these trucks will be radiator guards, window bars placed on outside of rear windows, plate glass throughout cab, auxiliary 1-2 gallon fuel tank, bumpers front and rear, folding starting crank, and a Godward gas generator which burns fuel oil like gasoline. This generator is an exhaust heated device placed between the carburetor and the intake manifold. Mixture

coming from the carburetor is changed into a dry gas by reducing the velocity of the gas by means of larger passages and provision for warming the gas on heated surfaces within the generator. Tests have shown that performance of engines running on fuel oil compares very favorably with those running on gasoline.

The FWD truck has been well-known in the army for fifteen years. Large fleets of FWD's operated on the Mexican Border, and 16,000 were purchased for service in the World War. Throughout these many years of service the Army has had ample time and opportunity to watch the performance of the FWD.

**Organization of New Oregon National Guard Battery**

Major General William G. Everson, Chief of the Militia Bureau, has authorized the organization of Battery D, 218th Field Artillery, Oregon National Guard, without increasing the State's allotment of personnel as the authorized strength of the National Guard is completely obligated.

The 218th Field Artillery is the 155 mm. Howitzer regiment of the 66th Field Artillery Brigade, 41st Infantry Division, of which Major General George Ared White has recently been appointed commanding general. He is also the Adjutant General of Oregon. Battery D will be organized at Portland as the fourth firing battery in the regiment, all units of which are at Portland.

The 218th Field Artillery was a 75 mm. tractor-drawn regiment assigned to General Headquarters Reserve until it was recently converted into a 155 mm. Howitzer regiment in accordance with the new tables of organization which add a regiment of that type to the Field Artillery Brigade.

**Officer of Ecuadorean Army Attached to 2nd Field Artillery**

The Secretary of War has authorized the attachment of Second Lieutenant José M. Plaza, Ecuadorian Army Reserves, to a unit of the 2nd Field Artillery Brigade at Fort Sam Houston, Texas, from March 16 to July 1, 1930.

**Federal Recognition of Rhode Island Brigadier General**

Brigadier General Herbert Reynolds Dean, Rhode Island National Guard, has been Federally recognized to date from

March 7, 1930. He will command the 68th Field Artillery Brigade, Rhode Island, Connecticut and Maine National Guard.

### Special Course of Instruction at Chemical Warfare School

The Secretary of War has directed that a special course of instruction for field officers be conducted at the Chemical Warfare School, Edgewood Arsenal, Maryland, from July 7 to August 1, 1930. The course is intended for field officers and senior captains who about that time are scheduled for relief from duty at the Army War College, the Coast Artillery School, National Guard, Reserve and Reserve Officers' Training Corps details and from duty in the War Department.

Quotas have been allotted to the arms and services as follows:

| | | | |
|---|---|---|---|
| Infantry | 20 | Air Corps | 2 |
| Cavalry | 8 | Signal Corps | 1 |
| Field Artillery | 8 | Quartermaster Corps | 2 |
| Coast Artillery | 8 | Ordnance | 1 |
| Engineers | 2 | Medical Corps | 2 |

### Pennsylvania Regiment has Remarkable Attendance Record

The headquarters of the 108th Field Artillery, Pennsylvania National Guard, located at Philadelphia, has issued a regimental order awarding the 100 per cent Drill Attendance Medal to 43 officers and enlisted men for the year 1929. Sixteen officers and enlisted men were awarded a bronze star for the second year of 100 per cent attendance at drill formations while fourteen received additional bronze star for the third year, and nine for the fourth year of perfect attendance. Six officers and non-commissioned officers, including the colonel of the regiment, received a silver star for five years while nine received an additional bronze star for perfect attendance six consecutive years.

The bronze stars are worn on the medal until the silver stat is earned, after which the bronze stars represent years in excess of five. This is a truly remarkable record and is evidence of the faithfulness and loyalty of the officers and men of the National Guard who are doing their bit week after week for National Defense.

# POLO

## ARMY POLO ASSOCIATION HANDICAPS

(Revised January 22, 1930 and Published by the U. S. Polo Association)

Abbott, Capt. O. B. ..... 0
Adams, Lt. H. P. ..... 0
Adams, Capt. John C. ..... 1
Adams, Lt. J. C. L. ..... 0
Adamson, Capt. H. ..... 0
Adler, Capt. E. E. ..... 0
Airan, Lt. Jesus ..... 0
Alderman, Lt. C. ..... 0
Alexander, Lt. H. M. ..... 0
Alexander, Maj. W. D. ..... 2
Allen, Capt. C. J. ..... 1
Allen, Capt. F. A. ..... 0
Allen, Capt. H. B. ..... 1
Allen, Capt., H. T., Jr. ..... 0
Allen, Capt R. R. ..... 0
Allen, Maj. T. de la M. ..... 3
Almquist, Capt. E. H. ..... 0
Aloe, Capt. R. C. ..... 0
Alverson, Capt. J. L. ..... 0
Amazeen, Lt. C. P. ..... 0
Amory, Maj. C. B. ..... 1
Anderson, Lt. H. ..... 0
Anderson, Maj. R. E. ..... 3
Andrews, Lt. E. L. ..... 0
Andrews, Maj. F. M. ..... 1
Applegate, Lt. E. C. ..... 0
Andrus, Capt. B. C. ..... 0
Argo, Capt. R. W. ..... 0
Arnold, Maj. A. V. ..... 2
Asensio, Lt. M. J. ..... 0
Atkinson, Capt. J. J. ..... 0
Atwell, Capt. R. N. ..... 0
Avera, Lt. W. B. ..... 0
Babcock, Col. C. S. ..... 0
Babcock, Lt. C. S., Jr. ..... 0
Babcock, Lt. D. S. ..... 1
Baehr, Maj. C. A. ..... 3
Bailey, Lt. G. W., Jr. ..... 0
Baird, Lt. A. R. ..... 1
Baird, Maj. H. W. ..... 1
Baker, Capt. H. E. ..... 0
Baker, Lt. H. D. ..... 3
Baker, Lt. J. K. ..... 2
Baldwin, Capt. R. O. ..... 0
Baldwin, Lt. T. A., Jr. ..... 0
Ballantyne, Capt. J. L. ..... 0
Barden, Lt. A. R. S. ..... 3
Barks, Lt. Louis ..... 0
Barnes, Lt. V. B. ..... 0
Barnes, Lt. W. H. ..... 0
Barnhart, Capt. F. H. ..... 2
Barrett, Lt. Chas. J., Jr. ..... 1
Barrows, Maj. F. N. ..... 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. ..... 2
Beasley, Capt. R. W. ..... 0
Beatty, Lt. G. S. ..... 0
Beaucond, Lt. C. ..... 2
Beck, Lt. D. A. ..... 0
Beeman, Capt. H. N. ..... 1
Beiderlinden, Lt. W. A. ..... 1
Bell, Lt. Clyde B. ..... 0
Bell, Col. Ola W. ..... 0
Bender, Capt. J. D. ..... 2
Bennett, Lt. C. W. ..... 0
Benney, Capt. J. F. ..... 1
Bennison, Lt. R. T. ..... 0
Benson, Lt. G. C. ..... 4
Berg, Lt. C. E. ..... 2
Berg, Capt. S. ..... 1
Berry, Lt. L. C. ..... 0
Bertholet, Capt. F. E. ..... 0
Besse, Capt. A. H. ..... 1
Betcher, Major A. J. ..... 0
Betts, Capt. E. C. ..... 2
Bevan, Capt. W. L. ..... 1
Beverly, Lt. G. H. ..... 2
Biddle, Lt. W. S. ..... 1
Bidwell, Lt. B. W. ..... 0
Biggs, Capt. L. W. ..... 0
Billingsley, Lt. E. A. ..... 0
Billigsley, Lt. J. D. ..... 0
Bing, Lt. R. C. ..... 2
Bird, Lt. J. F. ..... 0
Bixel, Lt. C. ..... 0
Black, Lt. F. H. ..... 1
Black, Lt. J. W. ..... 0
Black, Capt. P. G. ..... 0
Blakeney, Capt. C. C., Jr. ..... 0
Blakeney, Lt. C. G. ..... 1
Blatt, Capt. R. C. ..... 0

Bloomquist, Capt. G. F. ..... 0
Blue, Capt. J. W. ..... 2
Blunt, Maj. M. ..... 1
Boatner, Lt. Harry W. ..... 0
Boon, Capt. Stephen ..... 0
Boone, Maj. A. ..... 0
Booth, Lt. C. L. ..... 0
Booth, Lt. M. B. ..... 1
Born, Lt. C. F. ..... 0
Bosserman, Lt. R. B. ..... 1
Boucher, Capt. F. H. ..... 0
Boudinot, Capt. T. E. ..... 0
Bowley, Maj. F. W. ..... 2
Boye, Maj. F. W. ..... 0
Boyers, Capt. J. A. ..... 3
Boykin, Lt. J. G. ..... 1
Boyle, Capt. C. E. ..... 2
Bradford, Lt. D. E. ..... 0
Bradford, Capt. W. B. ..... 0
Bradley, Lt. J. S. ..... 1
Bradley, Lt. W. J. ..... 0
Brann, Lt. D. W. ..... 1
Brannan, Maj. F. M. ..... 0
Branson, Capt. H. L. ..... 1
Bratton, Lt. D. H. ..... 0
Bratton, Maj. R. S. ..... 0
Brendon, Lt. J. P. ..... 0
Brennan, Lt. T. J., Jr. ..... 0
Brewer, Maj. C. ..... 3
Brewster, Lt. M. W. ..... 0
Brian, Capt. A. R. ..... 0
Bridges, Capt. B. C. ..... 3
Bridgeman, Lt. R. H. ..... 0
Brill, Lt. Albert ..... 0
Brimmer, Lt. H. W. ..... 0
Briscoe, Maj. N. B. ..... 0
Brittingham, Lt. G. L. ..... 0
Broaddus, Lt. Kirk ..... 0
Broedlow, Lt. R. W. ..... 0
Bromley, Lt. C. V. ..... 1
Brooks, Capt. E. F. ..... 1
Brooks, Capt. E. H. ..... 0
Brophy, Lt. N. D. ..... 2
Browder, Lt. W. F. ..... 1
Brown, Capt. E. H. ..... 1
Brown, Maj. J. K. ..... 4
Brown, Lt. Col. Lewis, Jr. ..... 4
Brown, Lt. P. W. ..... 0
Brown, Maj. T. K. ..... 1
Browne, Lt. J. C. ..... 1
Brownell, Lt. J. R. ..... 0
Bruner, Lt. A. P. ..... 0
Bruner, Lt. G. E. ..... 1
Bruton, Lt. P. G. ..... 0
Buckland, Lt. D. P. ..... 1
Buckley, Capt. H. A. ..... 1
Buckley, Lt. M., Jr. ..... 1
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
Burgess, Capt. C. ..... 2
Burgess, Capt. D. ..... 2
Burgess, Lt. H. F. ..... 0
Burkhart, Lt. E. C. ..... 0
Burnett, Lt. E. M. ..... 0
Burnside, Lt. Walter ..... 0
Burress, Capt. 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. ..... 0
Camp, Capt. H. E. ..... 0
Campbell, Lt. W. P. ..... 0
Candee, Capt. R. C. ..... 0
Cannon, Capt. V. M. ..... 3
Caperton, Maj. J. N. ..... 2
Carleton, Lt. Don E. ..... 1
Carmouche, Lt. G. H. ..... 0
Carpenter, Lt. G. R. ..... 0
Carroll, Lt. J. V. ..... 0
Carson, Capt. M. ..... 1
Carter, Lt. L. D. ..... 0
Carter, Lt. P. D. ..... 1
Carter, Lt. R. A. ..... 0
Catalan, Lt. N. ..... 0
Causey, Lt. L. ..... 0
Cavanaugh, Lt. A. A. ..... 0
Cella, Lt. J. A. ..... 0
Chaffee, Lt. Col. A. R. ..... 2
Chamberlain, Lt. J. L. ..... 0
Chamberlin, Maj. H. D. ..... 4
Chandler, Maj. C. P. ..... 3
Chandler, Lt. R. E. ..... 0
Chaney, Maj. J. E. ..... 0
Chapin, Maj. F. K. ..... 1
Chapman, Lt. C. P. ..... 1

Cheshire, Capt. H. H. ..... 0
Cheves, Capt. G. X. ..... 2
Childs, Capt. F. M. ..... 0
Clark, Maj. C. L. ..... 2
Clark, Lt. J. M. ..... 1
Clark, Capt. S. F. ..... 1
Claussen, Lt. Geo. C. ..... 0
Clay, Lt. R. P., 2nd ..... 1
Claybrook, Lt. J. H., Jr. ..... 1
Clayton, Capt. Philip ..... 0
Clendenen, Lt. C. C. ..... 0
Clifford, Maj. C. L. ..... 2
Clover, Capt. George ..... 0
Cloverdale, Lt. G. B. ..... 0
Clyburn, Lt. J. W. ..... 3
Coe, Maj. R. L. ..... 1
Coiner, Capt. B. H. ..... 0
Cole, Capt. C. B. ..... 1
Cole, Capt. J. T. ..... 2
Collier, Lt. J. H. ..... 0
Collier, Capt. W. A. ..... 1
Collins, Lt. J. F. ..... 0
Collins, Maj. James L. ..... 2
Colwell, Capt. J. K. ..... 0
Comfort, Lt. F. ..... 1
Condon, Lt. R. ..... 0
Conlon, Lt. C. L. ..... 1
Connally, Lt. W. P. ..... 0
Connell, Lt. S. M. ..... 1
Conrad, Lt. G. B. ..... 0
Constant, Maj. S. V. ..... 0
Cook, Capt. J. G. ..... 0
Cooksey, Capt. R. W. ..... 1
Coombs, Lt. R. H. ..... 0
Corlett, Maj. C. H. ..... 0
Cornog, Lt. W. W. ..... 0
Corridon, Lt. J. H. ..... 2
Cort, Lt. Hugh ..... 2
Coughlin, Lt. W. L. ..... 0
Coulter, Capt. H. K. ..... 4
Coulter, Maj. J. B. ..... 1
Counihan, Lt. T. S. ..... 0
Covey, Lt. P. R. ..... 0
Cox, Capt. C. R. ..... 0
Cox, Lt. J. W., Jr. ..... 0
Craig, Capt. Charles ..... 0
Craig, Lt.-Col. D. F. ..... 1
Craig, Capt. R. E. ..... 2
Craig, Capt. W. H. ..... 3
Cramer, Capt. Charles ..... 0
Cramer, Capt. L. V. ..... 0
Crane, Capt. D. L. ..... 2
Crane, Capt. L. F. ..... 1
Craw, Lt. D. T. ..... 3
Crawford, Lt. H. ..... 1
Creed, Maj. R. L. ..... 2
Creel, Capt. B. M. ..... 0
Crehan, Lt. J. P. ..... 1
Crittenberger, Maj. W. D. ..... 1
Crockett, Capt. G. K. ..... 0
Crosby, Capt. R. H. ..... 1
Crowe, Lt. W. J. ..... 1
Cullinane, Capt. D. B. ..... 0
Cullins, Lt. H. ..... 3
Cullum, Maj. E. G. ..... 1
Culton, Lt. H. G. ..... 3
Cunningham, Capt. J. W. ..... 1
Curtis, Capt. C. S. ..... 0
Curtis, Capt. Ivan ..... 0
Curtis, Lt. R. W. ..... 0
Cutler, Lt. A. W. ..... 1
Daly, Capt. J. ..... 0
Daly, Lt. J. B. ..... 0
Daly, Maj. J. O. ..... 1
Danforth, Capt. G. L. ..... 0
Daniels, Capt. E. M. ..... 1
Darrell, Lt. R. H. ..... 0
Dasher, Lt. C. L. ..... 1
Davidson, Lt. J. A. ..... 0
Davies, Lt. T. H. ..... 0
Davis, Capt. C. E. ..... 4
Davis, Capt. J. F. ..... 1
Davis, Maj. Robert ..... 1
Davis, Capt. W. D. ..... 0
Davidson, Lt. H. W. ..... 0
Davison, Maj. P. R. ..... 1
Dawley, Maj. E. J. ..... 1
Dean, Lt. R. ..... 0
Dean, Capt. W. H. ..... 1
Dean, Lt. W F. ..... 0
DeBardeleben, Lt. D. ..... 1
De Graaf, Lt. G. ..... 1
Delaney, Lt. N. S. ..... 0
DeLangton, Capt. F. C. ..... 1
Delany, Lt. N. J. ..... 1
DeLong, Capt. J. C. ..... 1
Delorimer, Capt. A. ..... 0
Dencker, Lt. W. L. ..... 1
Derrick, Maj. J. D. ..... 0
Deepland, Capt. L. A. ..... 0
Devers, Maj. J. L. ..... 3
Devine, Lt. M. A. ..... 3
Dewey, Lt. F. O. ..... 1
Dewey, Lt. L. R. ..... 0
DeWitt, Maj. C. ..... 1
Diehl, Capt. J. W. R. ..... 0

Dierking, Capt. I. S. ..... 0
Disney, Lt. P. A. ..... 0
Dissinger, Capt. C. E. ..... 2
Doak, Maj. Sloan ..... 2
Doan, Lt. L. L. ..... 0
Dobyns, Capt. T. A. ..... 0
Dockler, Capt. J. ..... 0
Dodd, Lt. F. T. ..... 2
Dodd, Capt. Haywood S. ..... 0
Dodge, Capt. H. E. ..... 1
Donahue, Capt. J. H. ..... 0
Donaldson, Lt. T. Q., Jr. ..... 3
Donnovin, Lt. J. P. ..... 1
Doran, Capt. A. F. ..... 0
Dorst, Maj. J. A. ..... 1
Dosher, Capt. G. H. ..... 1
Douglas, Capt. J. S., Jr. ..... 0
Douglass, Lt. R. W. ..... 1
Downer, Maj. J. W. ..... 1
Doyle, Lt. E. J. ..... 0
Doyle, Lt. J. P. ..... 0
Drake, Lt. R. A. ..... 0
Drummond, Lt. W. H. ..... 1
Duff, Capt. R. E. ..... 0
Duffy, Lt. I. A. ..... 1
Dugan, Lt. A. D. ..... 0
Duke, Capt. J. T. ..... 0
Dukes, Capt. E. F. ..... 0
Dulaney, Lt. R. L. ..... 2
DuLong, Capt. ..... 0
Duncan, Lt. H. W. ..... 0
Dunckle, Cap. W. C. ..... 0
Dupuy, Capt. R. E. ..... 0
Eager, Maj. J. M. ..... 1
Earnest, Capt. H. L. ..... 1
Eckert, Lt. H. D. ..... 1
Eckert, Lt. J. P. ..... 1
Eddleman, Lt. C. D. ..... 0
Edmondson, Lt. E. M. ..... 1
Edmunds, Lt. J. B. ..... 0
Edmunds, Maj. K. B. ..... 0
Edwards, Lt. R. ..... 0
Edwards, Lt. S. ..... 0
Ehrhart, Lt. G. V. ..... 0
Elkins, Lt. J. W. ..... 1
Elkins, Lt. S. B. ..... 1
Elliott, Lt. H. G. ..... 1
Ellis, Maj. E. de T. ..... 1
Ellis, Capt. Murray ..... 0
Ellsworth, Lt. R. A. ..... 0
Elms, Lt. G. C. ..... 1
Elwood, Lt. Ernest A. ..... 1
Englehardt, Lt. E. C. ..... 0
Ennis, Lt. W. P., Jr. ..... 0
Erlenkotter, Maj. H. ..... 1
Erskine, Lt. David G. ..... 1
Ervin, Capt. R. G. ..... 2
Esterday, Maj. G. W. ..... 0
Estes, Maj. H. M. ..... 1
Eubank, Lt. E. L. ..... 1
Evans, Lt. J. P. ..... 1
Ewen, Capt. Lloyd C. ..... 0
Fain, Col, J. S. ..... 0
Fainter, Capt. F. F. ..... 0
Fake, Lt. C. W. ..... 0
Falck, Capt. W. A. ..... 1
Farmer, Lt. C. R. ..... 2
Faulkner, Col. A. O. ..... 0
Feagin, Lt. C. W. ..... 3
Featherstone, Capt. H. E. ..... 0
Febiger, Capt. P. C. ..... 1
Fellows, Capt. H. C. ..... 0
Ferrin, Capt. C. S. ..... 1
Fickett, Capt. E. M. ..... 0
Finley, Capt. Glenn S. ..... 2
Finley, Capt. J. R. ..... 0
Field, Lt. L. O. ..... 1
Fish, Lt. J. ..... 1
Fisher, Capt. R. K. ..... 1
Fisher, Lt. S. H. ..... 0
Fiske, Capt. N. E. ..... 2
Fitch, Lt. B. M. ..... 2
FitzGerald, Capt. H. J. ..... 1
Fleming, Maj. P. B. ..... 1
Fleming, Capt. P. C. ..... 3
Fletcher, Lt. L. S. ..... 0
Fletcher, Lt. W. T. ..... 0
Fooks, Lt. N. I. ..... 0
Forbes, Lt. W. R. ..... 0
Ford, Lt. W. W. ..... 0
Forster, Capt. H. W. ..... 0
Forsyth, Lt. A. E. ..... 2
Forsythe, Capt. J. D. ..... 1
Foster, Capt. Harry ..... 0
Foster, Lt. 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. ..... 0
Frakes, Capt. E. N. ..... 0
Frank, Maj. S. H. ..... 0
Franke, Maj. G. H. ..... 2
Franklin, Capt. E. A. ..... 1
Franklin, Maj. E. L. ..... 2
Fraser, Lt. F. G. ..... 0

Hastey, Capt. T. W. ..... 2
Hawley, Capt. D. C. ..... 0
Hayden, Lt. G. ..... 0
Haydon, Capt. P. S. ..... 1
Haynes, Lt. P. O. ..... 0
Hays, Capt. Geo. P. ..... 1
Hazelrigg, Lt. W. R. ..... 1
Hazeltine, Maj. C. B. ..... 0
Heacock, Lt. W. O. ..... 0
Healy, Lt. D. F., Jr. ..... 0
Healy, Capt. J. H. ..... 2
Heard, Maj. F. ..... 1
Heard, Maj. J. W. ..... 0
Hedekin, Lt. D. ..... 0
Heffner, Lt. P. T., Jr. ..... 1
Henning, Lt. F. A. ..... 2
Henry, Lt. C. E. ..... 0
Henry, Maj. W. R. ..... 0
Hensey, Lt. W. R. ..... 1
Herbert, Lt.-Col. W. D. ..... 0
Herendeen, Lt. E. ..... 1
Herman, Maj. H. ..... 1
Herron, Capt. Thos. ..... 2
Herr, Maj. Frederick ..... 1
Herr, Lt.-Col. J. K. ..... 3
Hershberger, Capt. F. C. ..... 0
Hershey, Capt. L. B. ..... 0
Hester, Lt. H. B. ..... 1
Hettinger, Capt. J. A. ..... 2
Hickman, Lt. G. W. ..... 1
Hicks, Maj. E. H. ..... 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. ..... 0
Hilton, Capt. S. C. ..... 0
Hinds, Lt. J. H. ..... 0
Hine, Lt. H. C. ..... 1
Hines, Lt. J. L. ..... 1
Hinrichs, Lt. J. H. ..... 0
Hinton, Lt. John ..... 0
Hodes, Lt. H. I. ..... 1
Hoffman, Lt. H. E. T. ..... 0
Hogan, Lt. E. L. ..... 1
Hoge, Maj. W. M., Jr. ..... 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
Holman, Lt. J. L. ..... 0
Holman, Maj. O. I. ..... 1
Holt, Capt. H. G. ..... 1
Holt, Capt. R. T. ..... 1
Holweger, Lt. C. P. ..... 0
Holzworth, Lt. B. A. ..... 0
Honeycutt, Lt. Col. F. W. ..... 1
Hood, Capt. J. D. ..... 2
Hood, Lt. R. B. ..... 0
Hopkins, Lt. E. O. ..... 0
Horger, Capt. C. A. ..... 2
Horton, Lt. J. B. ..... 3
Houghton, Capt. C. F. ..... 0
Houghton, Capt. W. ..... 2
Houston, Capt. L. V. ..... 0
Howard, Capt. A. H. ..... 0
Howard, Lt. J. G. ..... 0
Howarth, Lt. W. L. ..... 0
Howell, Maj. R. M. ..... 1
Howze, Lt. R. L., Jr. ..... 1
Hoyle, Lt. Col. R. E. de R. ..... 3
Hudgins, Capt P. H. ..... 1
Hudnett, Maj. Dean ..... 0
Hudson, Lt. G. B. ..... 1
Huff, Lt. R. P. ..... 0
Huggins, Lt. Wm. C. ..... 0
Hughes, Lt. C. E. ..... 1
Hume, Capt. J. V. ..... 0
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
Hutchings, Lt. R. B. ..... 0
Hutchinson, Lt. C. B. ..... 0
Huthsteiner, Capt. G. E. ..... 6
Hyatt, Maj. R. F. ..... 1
Ireland, Lt. R. E. ..... 2
Irving, Capt. J. H. ..... 1
Isaacson, Lt. H. S. ..... 0
Isker, Capt. R. A. ..... 0
Jacobs, Lt. B. R. ..... 3
Jacobs, Capt. F. S. ..... 1
Jacoby, Lt. L. E. ..... 2
Jadwin, Lt. C. C. ..... 3
James, Lt. B. M. ..... 0
Jay, Capt. H. D. ..... 2
Jedlicka, Lt. F. C. ..... 0
Jenkins, Maj. J. M., Jr. ..... 2
Jernigan, Lt. H. S. ..... 2
Jeter, Lt. J. R. ..... 0
Jett, Lt. R. S. ..... 2

Longfellow, Lt. N. ..... 0
Lord, Lt. J. B. ..... 0
Lord, Lt. R. B. ..... 0
Loutzenheiser, Lt. J. L. ..... 0
Lowe, Lt. R. G. ..... 0
Lubberman, Lt. H. A. ..... 0
Lucas, Maj. J. P. ..... 1
Luebbermann, Lt. B. F. ..... 0
Lueking, Capt. H. E. ..... 0
Lyman, Maj. C. B. ..... 2
MacDonald, Capt. J. C. ..... 0
MacDonald, Capt. R. ..... 0
MacKelvie, Capt. J. W. ..... 1
MacNabb, Capt. A. B. ..... 1
McAuliffe, Lt. A. C. ..... 0
McBride, Lt. D. G. ..... 0
McBride, Maj. H. L. ..... 1
McCann, Lt. J. H. ..... 0
McCarthy, Lt. L. J. ..... 0
McCarthy, Lt. W. D. ..... 1
McCartney, W. O. H. A. ..... 0
McCatty, Capt. K. ..... 0
McCauley, Lt. J. W. ..... 0
McChrystal, Capt. A. J. ..... 0
McChrystal, Lt. H. J. ..... 0
McClure, Capt. Mark ..... 4
McClure, Capt. R. A. ..... 2
McConeghy, Capt. J. K. ..... 0
McCormick, Lt. J. H. ..... 0
McCormick, Lt. R. C. ..... 0
McCoy, Maj. Gen. F. R. ..... 0
McCreary, Capt. M. L. ..... 1
McCreight, Capt. W. V. ..... 2
McDonald, Capt. John ..... 0
McDonald, Lt.-Col. R. B. ..... 1
McDonald, Lt. T. J. ..... 0
McDowell, Capt. J. V. ..... 1
McElroy, Lt. G. R. ..... 0
McFarland, Lt. C. N. ..... 3
McFarlen, Lt. P. ..... 0
McFayden, Lt. B. N. ..... 0
McGehee, Capt. Schaumburg ..... 0
McGinley, Lt. E. ..... 4
McGregor, Lt. T. ..... 0
McGuire, Lt. J. C. ..... 0
McGuire, Maj. E. C. ..... 0
McIntosh, Capt. A. E. ..... 0
McKee, Capt. J. L. ..... 2
McKnight, Lt. R. D. ..... 0
McLane, Maj. J. T. ..... 0
McLemore, Lt. E. H. ..... 0
McMahon, Capt. N. J. ..... 0
McMaster, Lt. R. K. ..... 0
McNair, Lt. W. D. ..... 1
McNaughton, Lt. K. P. ..... 0
Mabie, Lt. R. L. ..... 0
Mackall, Lt.-Col. S. T. ..... 2
Maddocks, Capt. R. T. ..... 1
Maddox, Lt. Halley G. ..... 1
Magruder, Lt. C. B. ..... 1
Magruder, Maj. M. ..... 0
Maher, Capt. G. H. ..... 0
Makinney, Lt. F. W. ..... 3
Mallan, Capt. D. H. ..... 0
Mallonee, Capt. R. C. ..... 2
Malone, Lt. P. B., Jr. ..... 1
Mandell, Maj. H. C. ..... 1
Manley, Capt. N. C. ..... 0
Manning, Lt. B. F. ..... 0
Manuel, Lt. T. B. ..... 1
Manzano, Lt. N. L. ..... 0
Maraist, Capt. R. V. ..... 1
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
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. J. J. ..... 1
Mauger, Lt. G. R. ..... 1
Maxwell, Capt. R. R. ..... 1
May, Lt. E. T. ..... 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
Merrick, Lt. R. J. ..... 0
Meskill, Warrant Officer R. J. ..... 1
Metcalf, Lt. F. A. ..... 2
Mewshaw, Lt. H. C. ..... 1
Meyer, Lt. T. E. ..... 0
Meyer, Maj. V. ..... 1

Price, Capt. T. E. ..... 1
Prickett, Maj. F. B. ..... 2
Proctor, Lt. G. ..... 2
Prouty, Lt. S. M. ..... 0
Purdie, Capt. K. S. ..... 0
Pyle, Lt. C. A. ..... 1
Quekemeyer, Lt. R. K. ..... 0
Quesenberry, Capt. M. H. ..... 0
Raguse, Lt. C. A. W. ..... 0
Ramey, Capt. R. ..... 0
Ranck, Lt. J. R. ..... 0
Rasbach, Lt. J. B. ..... 1
Rasor, Capt. W. I. ..... 2
Rathjen, Capt. H. F. ..... 0
Raymond, Lt. R. R. ..... 0
Read, Maj. B. Y. ..... 0
Read, Lt. G. W., Jr. ..... 3
Reardon, Lt. W. J. ..... 1
Redman, Capt. John W. ..... 0
Reed, Lt. C. H. ..... 2
Reed, Lt. H. D. ..... 2
Reed, Lt. James ..... 0
Rees, Lt. J. E. ..... 1
Regnier, Capt. E. A. ..... 0
Rehm, Lt. G. A. ..... 0
Reid, Lt. G. J. ..... 0
Reinberg, Capt. W. H. W. ..... 1
Reipe, Lt. J. H. ..... 0
Renshaw, Capt. S. B. ..... 0
Reynolds, Lt. A. S. ..... 2
Reynolds, Lt. Roy D. ..... 0
Rhinehardt, Maj. C. K. ..... 1
Rhodes, Lt. E. L. ..... 0
Rice, Capt. E. L. ..... 1
Rich, Lt. T. L. ..... 0
Richardson, Capt. H. O. ..... 0
Richmond, Maj. J. F. ..... 1
Ridge, Lt. P. A. ..... 1
Rieman, Capt. G. ..... 0
Riggs, Lt. B. L. ..... 0
Riggs, Lt. T. S. ..... 0
Ritchie, Lt. W. S. ..... 1
Robenson, Maj. J. A. ..... 2
Roberson, Lt. W. S. ..... 0
Roberts, Lt. F. A. ..... 1
Robinett, Lt. P. M. ..... 0
Robins, Maj. T. M. ..... 1
Robinson, Capt. H. W. ..... 0
Robinson, Capt. J. S. ..... 1
Robinson, Lt. T. ..... 2
Rodes, Capt. P. P. ..... 6
Rodwell, Capt. J. S. ..... 1
Roemer, Lt. L. E. ..... 0
Roemer, Capt. T. M. ..... 0
Rogers, Lt. G. B. ..... 1
Rogers, Capt. J. C. ..... 3
Rogers, Capt. R. W. ..... 0
Roper, Lt. H. M. ..... 0
Rose, Capt. H. 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
Russell, Capt. A. J. ..... 0
Russell, Capt. R. W. ..... 1
Ryan, Lt. J. L. ..... 0
Ryan, Capt. W. O. ..... 1
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. ..... 0
Sandlin, Capt. E. O. ..... 0
Sappington, Maj. W. F. ..... 0
Sargent, Lt. C. E. ..... 2
Sasse, Maj. R. I. ..... 2
Sawtelle, Lt. D. W. ..... 1
Scherer, Lt. H. F. ..... 0
Schjerven, Lt. Einar N. ..... 0
Schmidt, Capt. F. O. ..... 0
Schriver, Lt. A. J. J., Jr. ..... 0
Schucker, Capt. F. R. ..... 0
Schuyler, Capt. R. L. ..... 0
Schwab, Lt. J. A. ..... 0
Schwenck, Maj. J. C. R. ..... 1
Scott, Capt. D. M. ..... 3
Scott, Lt. J. D. ..... 2
Searby, Lt. E. W. ..... 0
Searight, Lt. H. F. ..... 0
Searle, Capt. A. C. ..... 1
Segundo, Lt. F. V. ..... 0
Selee, Lt. R. ..... 0
Sells, Lt. J. K. ..... 0
Selway, Lt. R. R., Jr. ..... 0
Sexton, Lt. Wm. T. ..... 0
Seymour, Capt. R. T. ..... 0
Shafer, Capt. L. A. ..... 3
Shaifer, Capt. E. F. ..... 1
Shannon, Capt. C. A. ..... 0
Sharp, Capt. F. D. ..... 3
Shaw, Capt. C. R. ..... 1

Shaw, Lt. V. F. ..... 0
Shea, Lt. A. F. ..... 3
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
Shelton, Capt. J. M. ..... 0
Shepard, Lt. L. ..... 0
Sherwood, Capt. P. H. ..... 2
Short, Capt. J. C. ..... 4
Shubert, Warrant Officer ..... 0
Simmonds, Lt. C. D. ..... 0
Simpson, Lt. J. R. ..... 1
Simpson, Maj. W. H. ..... 1
Skelton, Lt. W. G. ..... 0
Skerry, Capt. L. M. ..... 0
Slack, Lt. J. E. ..... 1
Slider, Lt. R. H. ..... 0
Slocum, Capt. L. H. ..... 1
Smith, Capt. A. C. ..... 1
Smith, Lt. C. A. ..... 2
Smith, Maj. C. C. ..... 5
Smith, Capt. G. I. ..... 2
Smith, Lt. G. S. ..... 1
Smith, Maj. H. J. M. ..... 2
Smith, Lt. J. ..... 0
Smith, Lt. John A. ..... 4
Smith, Lt. L. G. ..... 3
Snyder, Lt. C. E. ..... 1
Snyder, Lt. J. A. ..... 1
Sothern, Capt. R. J. ..... 0
Soule, Lt. R. H. ..... 0
Spettel, Lt. F. J. ..... 1
St. John, Capt. A. ..... 1
Stadler, Lt. J. H. ..... 2
Stafford, Capt. C. L. ..... 3
Stearley, Lt. R. F. ..... 2
Steiger, Capt. W. C. ..... 0
Sterling, Lt. J. M. ..... 0
Stevenson, Lt. H. W. ..... 0
Stevenson, Lt. W. G. ..... 0
Stewart, Lt. L. J. ..... 0
Stewart, Capt. S. G. ..... 1
Stillinger, Lt. O. H. ..... 0
Stober, Lt. M. F. ..... 0
Stockton, Lt. M. L. ..... 2
Stodter, Lt. J. H. ..... 0
Stratton, Lt. J. H. ..... 0
Strawn, Capt. C. C. ..... 0
Strickland, Lt. F. H. ..... 1
Strickler, Lt. D. G. ..... 0
Strohbehn, Lt. E. L. ..... 0
Strong, Lt. P. N. ..... 1
Strong, Maj. R. W. ..... 0
Stubblebine, Lt. A. N. ..... 0
Sturdevant, Maj. C. L. ..... 1
Sturman, Lt. J. F. ..... 0
Sugg, Lt. O. D. ..... 0
Sugrue, Lt. C. D. ..... 0
Sumner, Capt. E. M. ..... 0
Surles, Maj. A. D. ..... 2
Sutton, Lt. H. T. ..... 1
Sweet, Capt. J. B. ..... 0
Swift, Lt.-Col. Eben, Jr. ..... 1
Swift, Lt.-Col. I. P. ..... 3
Swing, Maj. J. M. ..... 3
Syme, Lt. L. D. ..... 0
Talbott, Maj. R., Jr. ..... 1
Tallent, Capt. R. E. ..... 0
Tansey, Lt. T. H. ..... 1
Tate, Lt. F. J. ..... 1
Tate, Capt. J. S. ..... 4
Taulbee, Maj. E. W. ..... 1
Taulbee, Col. J. F. ..... 2
Tayler, Lt. R. L. ..... 1
Taylor, Capt. J. B. ..... 1
Taylor, Maj. T. F. ..... 1
Taylor, Maj. V. V. ..... 1
Temple, Capt. H. H. ..... 0
Thayer, Capt. A. P. ..... 2
Thayer, Lt. B. G. ..... 2
Theis, Lt. H. J. ..... 0
Thomas, Maj. R. S. ..... 1
Thompson, Lt. Frank J. ..... 0
Thompson, Capt. G. D. ..... 1
Thompson, Maj. J. B. ..... 2
Thompson, Maj. J. M. ..... 1
Thomson, Lt. E. F. ..... 2
Thornburgh, Lt. T. T. ..... 1
Thornton, Lt. H. J. ..... 0
Thorp, Lt. C. A. ..... 0
Thorpe, Lt. G. C. ..... 0
Thorpe, Lt. W. ..... 0
Thummell, Maj. C. B. ..... 0
Tillson, Maj. J. C. F., Jr. ..... 0
Timberman, Lt. F. S. ..... 0
Timmins, Lt. J. W., Jr. ..... 1
Todd, Lt. W. N. ..... 0
Tombough, Lt. P. E. ..... 1
Tompkins, Lt.-Col. D. D. ..... 1
Tompkins, Capt. W. F. ..... 1
Toole, Capt. Leslie E. ..... 0
Torbett, Lt. O. C. ..... 1
Toy, Capt. C. R. ..... 0
Trapolino, Lt. T. F. ..... 0

Trapnell, Lt. T. J. ..... 1
Tent, Lt. J. F. ..... 0
Trew, Lt. F. G. ..... 0
Trudeau, Lt. A. G. ..... 0
Truscott, Capt. L. K. ..... 4
Truxes, Capt. A. H. ..... 2
Tully, Maj. J. M. ..... 2
Tuttle, Capt. W. B. ..... 0
Turnbull, Maj. S. J. ..... 1
Turner, Lt. F. T. ..... 0
Tyler, Lt.-Col. M. C. ..... 0
Unger, Capt. C. H. ..... 1
Upton, Capt. P. R. ..... 2
Van Auken, Capt. W. B. ..... 0
Vance, Lt. Lee C. ..... 0
Van Houten, Lt. J. G. ..... 1
Van Meter, Lt. S. W. ..... 1
Van Natta, Lt. T. F. ..... 0
Vanture, Lt. G. D. ..... 0
Van Wyck, Lt. H. ..... 2
Van Tuyl, Lt. H. E. ..... 0
Vincent, Lt. J. W. ..... 0
Vocke, Lt. L. ..... 1
Voight, Capt. T. E. ..... 3
Wahl, Capt. G. D. ..... 1
Wakefield, Lt. M. F. ..... 1
Waldron, Capt. N. E. ..... 1
Wales, Maj. V. W. B. ..... 0
Walker, Lt. H. E. ..... 0
Walker, Capt. I. G. ..... 1
Walker, Lt. J. H. ..... 1
Walker, Lt. S. P. ..... 0
Walker, Lt. W. A. ..... 0
Wall, Maj. J. F. ..... 1
Walsh, Capt. Overton ..... 1
Walsh, Maj. R. L. ..... 1
Ward, Lt. J. T. ..... 2
Washburn, Capt. J. H. ..... 1
Waters, Lt. W. C. ..... 0
Watkins, Capt. H. E. ..... 0
Watkins, Capt. J. G. ..... 0
Watson, Capt. H. L. ..... 0
Watson, J. A. ..... 1
Watters, Lt. W. E. ..... 0
Weaver, Maj. W. G. ..... 1
Wedemeyer, Lt. W. A. ..... 0
Weeks, Maj. H. J. ..... 2
Welch, Capt. G. B. ..... 0
Wells, Lt. J. B. ..... 0
Wells, Lt. L. F. ..... 0
Wesner, Lt. C. ..... 0
West, Lt. G. ..... 0
Westlund, Lt. C. W. ..... 1
Westphalinger, Lt. H. R. ..... 1
Wharton, Lt. S. F. ..... 0
Wheeler, Pvt. J. ..... 1
Whelan, Lt. J. A., Jr. ..... 0
Whelchel, Lt. W. W. ..... 0
Whisner, Capt. E. B. ..... 1
White, Lt. A. F. ..... 0
White, Lt. I. D. ..... 3
Whitehouse, Lt. B. M. ..... 0
Whitmore, Lt. C. S. ..... 1
Whittaker, Capt. F. L. ..... 1
Wickham, Capt. F. O. ..... 0
Wiener, Capt. Wm. M. ..... 0
Wilder, Capt. C. J. ..... 2
Wilkinson, Capt. C. A. ..... 6
Williams, Capt. A. W. ..... 0
Williams, Maj. C. F. ..... 1
Williams, Capt. E. A. ..... 1
Williams, Lt. E. T. ..... 2
Williams, Col. G. ..... 0
Williams, Lt. I. J. ..... 0
Williams, Lt. J. F. ..... 2
Williams, Lt. J. H. ..... 0
Wiliams, Capt. J. R. ..... 1
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
Wilson, Lt. Richard T. ..... 0
Wilson, Maj. A. H. ..... 4
Wilson, Capt. A. R. ..... 1
Wilson, Capt. Chas H. ..... 0
Wilson, Lt. G. H. ..... 0
Wilson, Lt. O. O. ..... 1
Winans, Maj.-Gen. E. B. ..... 0
Winfree, Lt.-Col. S. W. ..... 1
Wing, Capt. A. G. ..... 1
Wingfield, Lt. L. R. ..... 1
Winn, Lt. J. S., Jr ..... 1
Wipprecht, Capt. R. ..... 1
Wise, Capt. K. B. ..... 1
Withers, Lt. W. P. ..... 0
Wofford, Lt. J. W. ..... 3
Wogan, Maj. J. B. ..... 1
Wolfe, Capt. W. R. ..... 0
Wood, Capt. D. S. ..... 3
Wood, Lt. W. H. ..... 0

Woodruff, Capt. R. C. ..... 1
Woodward, Maj. W. R. ..... 1
Works, Lt. J. M. ..... 1
Wren, Lt. W. B. ..... 0
Wyman, Lt. W. G. ..... 0
Yale, Lt. Wesley W. ..... 0
Yancey, Lt. W. J. T. ..... 0
Yeager, Maj. E. ..... 0
Yeaton, Lt. I. D. ..... 1
Yeats, Lt. J. J. ..... 2
Yeo, Lt. S. ..... 1
Young, Lt. E. W. ..... 0
Young, Capt. M. L. ..... 1
Younger, Capt. J. W. ..... 0
Zeller, Lt. H. M. ..... 0