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RECORD OF AN OLD ARTILLERY ORGANIZATION.

BY MAJOR ALLISON OWEN.

For some reason Louisiana has always been singularly rich in artillery. During the Civil War the State furnished a surprisingly large number of batteries to the Confederate armies. At the opening of the Spanish-American War there were seven batteries of National Guard Artillery, and for several years following there were ten batteries in the city of New Orleans alone. Up to a year ago this city held five batteries in the service. Before the Washington Artillery was organized there were several batteries in New Orleans which drew their membership from the French or Spanish population, and it was to distinguish the new battery from these that it was first called the Native American Artillery. The exact day of its foundation is not known, but the newspapers of 1838 and 1839 occasionally refer to it or its captain, E. L. Tracy.

In 1841 the battery was attached to a body of American volunteer infantry known as the Washington Battalion, of which C. F. Hozey was Major and J. B. Walton was Adjutant. In 1843 Captain Henry Forno assumed command, Captain Tracy having been promoted to the command of the battalion. The following year three other companies were added and the battalion became the Washington Regiment, under Colonel Persifer F. Smith, who later became a Brigadier-General in the regular establishment. J. B. Walton was the Lieutenant-Colonel.

In 1845 the battery saw its first war service in General Zachary Taylor's army, leaving New Orleans on August 22nd for Corpus Christi, equipped with six 6-pounder bronze guns. After three months' duty the battery was relieved by artillery of the regular army. The following year volunteer infantry was called for and

the battery again responded, equipped on this occasion as infantry, and served as company A of the Washington Regiment, to the command of which Walton had been promoted. It embarked on May 9th, 1846, and served until July 21st, and was commanded by Captain Isaac F. Stockton. The details of these two tours of duty are lacking, as all records prior to 1860 were destroyed when the old armory was fired after the fall of New Orleans during the Civil War. The only note that remains is that it embarked for the front three days after receiving the call.

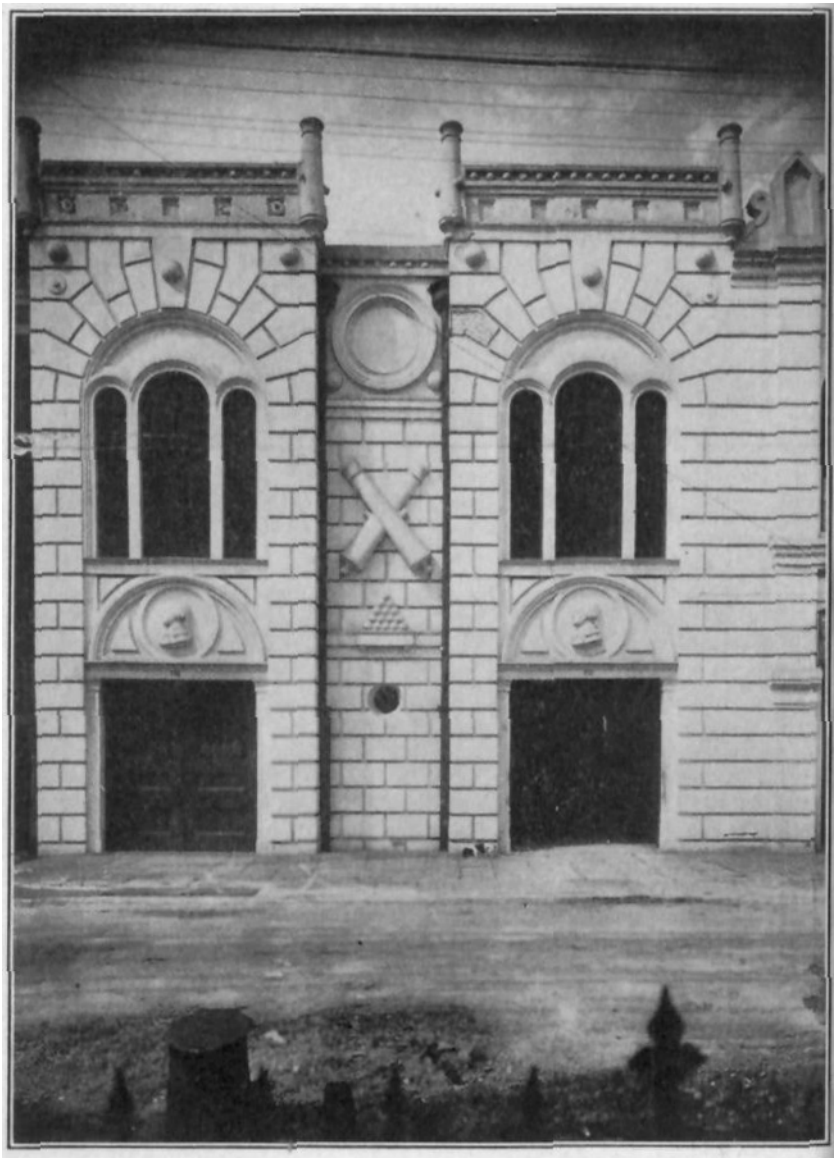
Shortly after the return from Mexico, the regiment fell to pieces; the battery adopted the regimental name, and has been known ever since as the Washington Artillery. The only relic of this period now preserved is the center of a red silk standard bearing a tiger head, the emblem of the command. The seal and the badge of the active corps are crossed cannon encircled by a belt upon which is inscribed the motto, "Try Us," and the name of the organization. When and why this motto and seal were adopted is not known. On account of the tiger-head emblem the command is sometimes confused with a regiment of Louisiana infantry which was known during the Civil War as "Wheat's Louisiana Tigers." There is no connection, however, between the two.

During the fifties, the city of New Orleans offered a site for an armory "as long as the Washington Artillery remains in possession of the city's cannon," and upon the election of Colonel Walton to the command of the battery the building was begun. It was completed in 1858, and the front wall still stands in Girod Street, an interesting example of early armory design. It was the work of a member of the command, William A. Freret, who later became supervising architect of the United States. While the command was absent during the Civil War the property was confiscated, and during reconstruction days was sold. The organization has never been compensated.

During the Civil War the organization had a long and interesting period of service, opening with the seizure of the United States Arsenal at Baton Rouge on January 10th, 1861. The rush to arms at this time is shown in the expansion of the battery into two batteries on January 28th, to be followed by further expansion into a battalion of four batteries March 3d. On Washington's birthday the Confederate Secretary of War, Judah P. Benjamin, on behalf of

the ladies of New Orleans, presented the battalion with an embroidered silk standard, and on May 13th the command volunteered "for the war," was accepted and mustered in on May 26th as part of the regular army of the Confederate States. The day after it was mustered in it entrained for Richmond, under the command of Major James B. Walton, with W. Miller Owen as Adjutant. The personnel was drawn from the best element of New Orleans, and many were socially and financially prominent. They brought their own equipment of nine guns to Virginia, the six guns used in Mexico with two 12-pound howitzers, and one 8-pounder rifle. The batteries were known as, First, Second, Third and Fourth Companies, and were commanded by Captain H. M. Isaacson, First Lieutenant C. C. Lewis, Captain M. Buck Miller, and Captain Benjamin Franklin Eshleman respectively. The battalion arrived in Richmond on June 4th, was supplied with horses and placed under

THE ADJUTANT.
A Typical Washington Artilleryman.



ARSENAL OF THE WASHINGTON ARTILLERY.
Built in 1858, Burned, confiscated, and sold in 1867.

the instruction of Lieutenants T. L. Rosser, James Dearing and J. J. Garnet, who were fresh from West Point, and who later rose to high rank in the Confederate Army.

Six weeks later, July 18th, the Third Company under Captain Miller with four 6-pounders, and three rifles of the First Company under Lieutenant C. W. Squires, drove Battery E, Third U. S. Field Artillery with two 10-pounder Parrott rifles, two 6-pounder howitzers, and two 6-pounders, together with a platoon of Battery G. Fifth U. S. Field Artillery with two 20-pounder Parrot rifles from the field at Blackburn's Ford, Bull Run. By a strange coincidence it was the present commanding officer of Battery E, Third Field Artillery, Captain Fred T. Austin, who made the Federal inspection under which the Washington Artillery mustered in under the Dick Bill in 1909.

In the battle of Bull Run, July 21, 1861, the positions of the batteries were as follows:

The Second Company under Lieutenant T. L. Rosser with four 12-pounder howitzers, at Union Mills Ford;

The Third Company, under Captain W. B. Miller with two 6-pounder smooth bores, at McLean's Ford;

A platoon of the Third Company under Lieutenant J. J. Garnet with one 6-pounder, smooth bore, and one 6-pounder rifle, at Blackburn's Ford.

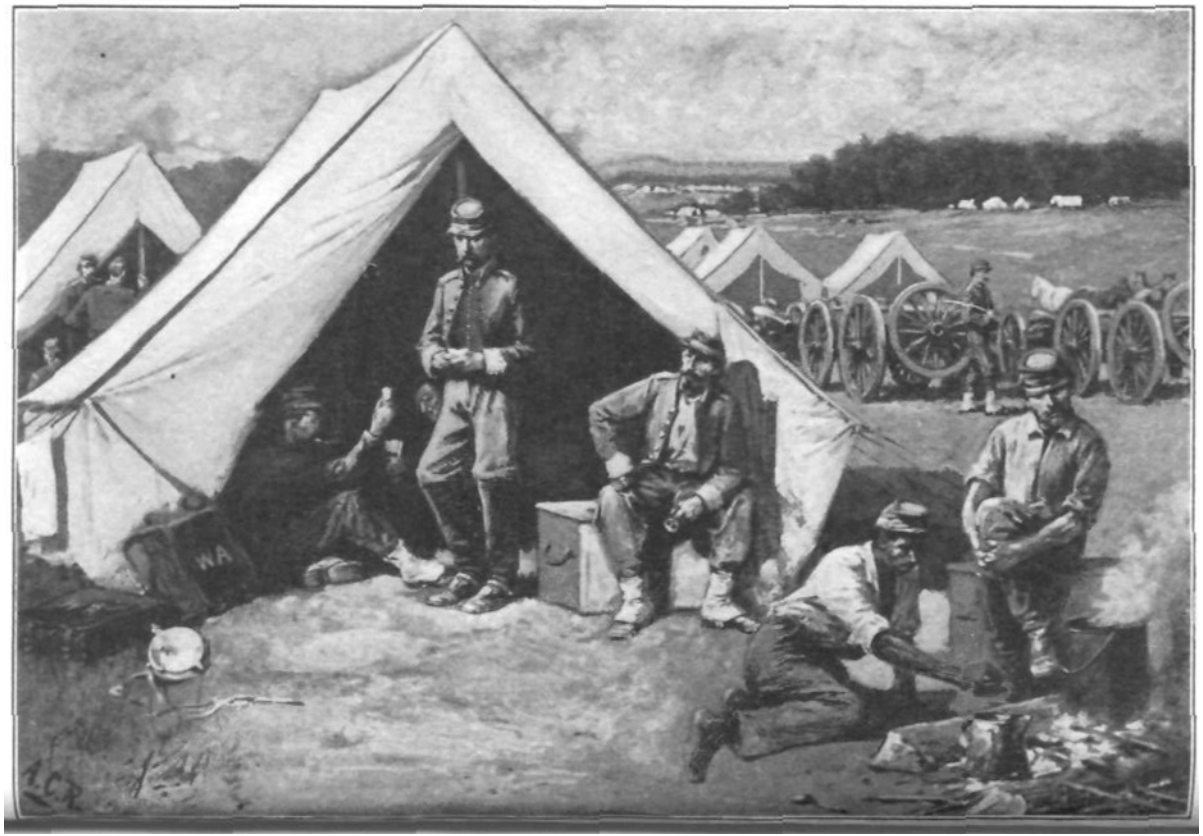
Three sections of the First Company under Captain C. W. Squires with three 6-pounder smooth bores, and a platoon of the First Company under Lieutenant J. B. Richardson with two 6-pounder rifles, at the Henry House.

The opposing batteries near the Henry House were those of Griffin and Ricketts. Eleven guns were captured, one disabled, one caisson exploded and Capt. Ricketts taken.

In January, 1862, $1,499.16 was subscribed by officers and men for the relief of fire-swept Charleston.

The Spring was spent in maneuvering on the peninsula, and on May 13th, the Third Company under Captain Miller with three 24-pounder howitzers, blocked the advance of Federal gunboats on the James River at Drewry's Bluff.

On May 31st the Battalion was not engaged, but while the battle of Seven Pines was being fought, Captain Buck Miller of the Third Company, carried off an abandoned battery of four Napoleons,



which, by a singlar coincidence, had been commanded by a Captain Miller in the Federal service. An ambulance of the Second Rhode Island Infantry was also taken and was used throughout the war for a headquarters wagon and was always referred to as "The Second Rhode Island."

On June 6th, the First Company under Captain Squires engaged in a two-hour artillery duel at New Bridge at Garnett's Farm on the Chicahominy, exploding a caisson, after which the opposing force withdrew.

On June 20th, Colonel Walton was appointed Longstreet's Chief of Artillery, and the Washington Artillery was assigned as the reserve artillery of Longstreet's Division.

After the departure of the Battalion from New Orleans, those members whose family or business affairs had not permitted their leaving, began the organization of a fifth and a sixth battery. The call of General Beauregard in February of 1862 for troops to serve in the Army of Tennessee, resulted in the consolidation of these two batteries into what was known as the Fifth Company, Washington Artillery. This battery was mustered in on March 6th under Captain W. I. Hodgson, with 156 men and two 6-pounder smooth bores, two 6-pounder rifles, and two 12-pounder howitzers. It entrained on March 8th for Grand Junction, where horses were supplied, and on the 27th marched to Corinth, Miss., where it was assigned to Anderson's Brigade, Ruggles Division. On April 6th and 7th it fought at Shiloh from five successive advanced positions, firing 738 rounds, losing 7 killed, 27 wounded and 28 horses killed; 3 caissons, a battery wagon and forge were abandoned for want of teams.

The battery under the command of Captain C. H. Slocomb played a conspicuous role in the capture of Mumsfordsville. Perryville, Knoxville, Murfreesboro and Jackson. It distinguished itself in the great battle of Chickamauga, and lost six guns on Missionary Ridge. It captured other guns and fought desperately in fight after fight throughout the Georgia campaign. After the siege of Atlanta, back they went to Nashville, spiked their four guns and ended their career in the siege of Spanish Fort in Mobile Bay.

The details of much of the service of this battery are difficult to obtain, as the papers of the Company were lost in the Tennessee campaign. In all, 418 men served in its ranks; 50 were killed and

over a hundred were wounded. It fought twenty-three battles and fifteen minor engagements, lost 143 horses, expended 5,906 rounds of ammunition and marched 3,285 miles.

At Beverly Ford near Rappahannock Station, on August 23, 1862, the First Company under Captain Squires, with four 3-inch rifles, and the Third Company under Captain Miller, with four 12-pounder Napoleons, were engaged in what was purely an artillery battle which lasted four hours and resulted in the repulse of the enemy. The losses were 10 killed, 13 wounded, and 22 horses killed; 756 rounds were fired.

In the second battle of Manassas on August 29th, the First Company under Captain Squires with three rifles, and the Third Company under Captain Miller with four Napoleons, together with twelve other guns of other batteries, were placed between the flanks of Jackson's and Longstreet's Corps, and fought for two hours, when the Third Company was sent to a new position on Longstreet's left. On the 30th, the Second Company under Capt. J. B. Richardson, occupied a position near the Chinn house with two 6-pounder bronze guns and two 12-pounder howitzers, and captured a battery of four Napoleons, fully horsed, which they manned and turned upon the retiring foe. The Fourth Company under Captain B. F. Eshleman with two 6-pounders and two 12-pounder howitzers, also occupied a position near the Chinn house and was hotly engaged. It later moved forward to the Conrad house and until 9 p. m. continued the action in the direction of Centerville. A platoon of the First Company under Lieutenant Edward Owen, was used on the 31st to "speed the parting guest." The casualties for the three days were one killed and nine wounded. No record is available of the loss of horses or the expenditure of ammunition.

In the battle of Antietam, or as it is called in the South, "Sharpsburg," the First Company, under Captain Squires, was posted on the ridge east of the town, on the right of the turnpike, with two 3-inch rifles and two 10-pounder Parrotts. On the right of the First Company was the Third Company, Captain Miller, with four 12-pounder Napoleons; across a ravine on the right, in an orchard in front of D. R. Jones' Division, the Second Company, under Captain Richardson, with two 12-pounder Napoleons and two 12-pounder howitzers. Still further to the right was the Fourth Company, Captain Eshleman,

with two 6-pounder bronze guns and two 12-pounder howitzers.

At a critical moment when the center of Lee's front was heavily pressed, the Third Company was in front of a corn field and orchard through which the enemy was advancing in force. Here one of its caissons was exploded, but the battery remained in position inflicting heavy loss until 4 p. m., when it was withdrawn to replenish ammunition. So depleted were the gun detachments that Longstreet's staff officers served as cannoneers, the general himself directing the fire.

The sectors of the First and Second companies included the Stone Bridge. At about noon the Fourth Company shifted its fire to a six-gun battery just going into action near the lower ford.

A. P. Hill reached the field at 2:30 p. m., and in the last phase of the fight on September 17th, the Washington Artillery was represented by ten guns drawn from all the batteries, and played an important role in checking and pushing back Burnside's Corps. The casualties were 13 killed, 51 wounded, and 2 missing. No record is available of the expenditure of ammunition but this must have been considerable as caissons were frequently refilled throughout the day or new ones sent to the guns.

At Fredericksburg, December 13, 1862, the First, Third, and Fourth Companies occupied redoubts on the crest of Marye's Hill, while the Second Company reported to General Pickett near Lee's Hill. This was the first occasion on which the Washington Artillery used earth works. The Fourth Company, Captain Eshleman, with two 12-pounder howitzers and two 12-pounder Napoleons, occupied the right. On the left of the Fourth Company came the Third Company, under Captain Miller, with two 12-pounder Napoleons. On the left of the Third was the First Company, Captain Squires, extending to the Plank road, with two 3-inch rifles and one 10-pounder Parrott, one of which under Lieutenant Galbraith being placed in the road. Incessant fire was maintained for five hours, and the guns were withdrawn at 5 p. m., the losses being 3 killed and 24 wounded. This was, like Gettysburg, one of the great panoramic battles where the whole field was in sight, and the effect of the fire at point blank ranges was easily observed. During the battle one of the Napoleons was taken from its redoubt and placed in the open to secure greater effect.

Some days after the battle a subscription was raised to relieve the destitute people of Fredericksburg and the battalion Washington Artillery contributed $1,391.00.

While Lee and Jackson were fighting Hooker in that astounding battle of Chancellorsville on May 3, 1863, a very important duty was assigned the Battalion which, with Barksdale's Mississippians and Hays's Louisianians, was sent back to retard Sedgwick in any effort to reach Hooker in time to aid him. Again the guns of the command occupied the crest of Marye's Hill with the 18th and 21st Mississippi in the sunken road. The First Company, under Squires, with two 3-inch rifles, occupied a position to the right of the Marye house. An ammunition chest under a tree still marks the spot. The Second Company, with four guns, under Richardson, was sent to Hamilton's Crossing on the extreme right. The Third Company with two 12-pounder Napoleons under Lieutenant Brown was posted near the plank-road. One gun under Lieutenant A. Hero accompanied General Hays to the left. One howitzer of the Second Company and one of the Fourth under Lieutenants Apps and DeRussy, occupied works to the left of the plank-road. These works are still plainly traceable. On the extreme left the Fourth Company placed two guns under Captain Joseph Norcom.

After a stubborn defence the weakness of the line was discovered during a flag of truce, and Marye's Hill was over-run. Each battery lost one gun except the First Company which lost two, the first guns lost by the battalion. Four men were killed, nine wounded, and three officers and 29 men were captured with their guns. The Second Company coming to the rescue could accomplish nothing, and sacrificed a gun before it would retire, making six guns lost in all, two 3-inch rifles, two 12-pounder howitzers, and two 12-pounder Napoleons. Sedgwick, however, failed to reach Hooker. The officers and men captured were taken to Washington, thence to Fort Delaware, and on the 20th were exchanged and reported for duty after an absence of just twenty days.

At Gettysburg, the battalion reached the field at 8 a. m. on the 2nd of July, and on the morning of the 3rd was placed on the left of the peach orchard under the command of Major B. F. Eshleman. The two signal guns for the great cannonade which preceded Pickett's charge were fired by the right platoon of the First Company under Lieutenant C. H. C. Brown, the right gun under

Sergeant W. T. Hardie, the second under Sergeant P. O. Fazende, each exploding a caisson of an opposing battery.

The First Company with two 12-pounder Napoleons, under Captain Squires, occupied the extreme right of all the Artillery, near the Emmitsburg Road at the Peach Orchard; the Second Company, with one 3-inch rifle, one 12-pounder Napoleon and one 12-pounder howitzer, under Captain Richardson, was placed on the left of the First Company. The Third Company under Captain Miller with three 12-pounder Napoleons, occupied a position on the left of the Second Company, and on their left was the Fourth Company under Captain Norcom, with two 12-pounder Napoleons. The First and Third Companies followed Pickett's charge to a point where they could enfilade the enemy's line until Pickett fell back and their ammunition was exhausted.

The losses were 3 killed, 26 wounded and 16 captured; 39 horses were killed. The expenditure of ammunition is not recorded but must have been heavy as the cannonade was continued until the chests were empty.

At Drewry's Bluff on May 16, 1864, Hagood's brigade and the First Company under Captain Edward Owen with four guns, were sent forward on the turnpike to a point near the outer line of works and there captured Captain Belger and his two 12-pounder Napoleons and Captain Ashby's (3rd N. Y. Artillery) three 20-pounder Parrotts. Colonel Eshleman, Adjutant Kurshedt and Sergeant Major Randolph manned one of the captured Parrott rifles to accelerate the retreating foe. The captured guns were presented on the field to the First Company in recognition of their splendid work. The Second Company under Richardson occupied Fort Stevens with four guns. The Third Company under Captain A. Hero with four guns was near the Saddler house to the right of Beauregard's headquarters. The Fourth Company under Captain Norcom occupied a position on the right flank near the R. & P. R. R., and beside three field-pieces manned four guns of position. The casualties were 9 killed and 21 wounded.

The command went into the trenches at Petersburg on June 18, 1864, and there remained until April 2, 1865, making the last stand at Fort Gregg under Lieutenant F. McElroy. During the retreat to Appomattox the Second Company under Captain Richardson served with the rear guard and was engaged up to 11 p. m. the night before the surrender.

One officer, Lieutenant C. H. C. Brown and nine men from the First and Fourth Companies served as an escort for President Davis and were present at his capture.

In all 808 men had served in the ranks of the Washington Artillery in Virginia and Tennessee of whom 139 were killed or died of wounds. Four hundred and twelve were present for duty at the end of the war, of whom 92 still survive.

The battalion had fought in sixty battles and a number of minor engagements, six of its officers were promoted out of the command, several rising to the rank of Major and Brigadier Generals.

As soon as a sufficient number of its members had returned to New Orleans after the surrender, two attempts were made to reorganize the Battalion, but the Federal Commander dispersed both meetings and Confederate military organizations were prohibited, so the Washington Artillery took on a civil and benevolent character to care for its impoverished members and their families and the families of the dead. In 1875 the embargo was removed and, at once, the command was armed and equipped at its own expense, purchasing a battery of 3-inch Parrott rifles from the Government.

Colonel Walton and the old officers again assumed command, but the reduced numbers formed but three batteries known as A. B. and C. successors to the Third, Fifth and First Companies, respectively.

In 1876 Colonel William Miller Owen, the Civil War Adjutant, was elected to command the Battalion, and in 1880 a monument was erected to the memory of the men in its ranks who gave their lives to their country. In 1881 Lieutenant-Colonel John B. Richardson was promoted to command, and the Battalion purchased its present arsenal.

In 1898 the Battalion volunteered for service in the Spanish-American War, and one battery commanded by Captain Fred Kornbeck, recruited from the entire command was accepted, but the war terminated before the Government could equip it for the field.

Following the Spanish War the Washington Artillery again expanded into five batteries, but upon the enactment of the Dick Bill, fearing that the interpretations to be placed upon its requirements might injure its *esprit de corps* or destroy its identity, the Battalion mustered out of the service, and existed at its own expense as an independent command until 1909, when it was demonstrated that

service under the Dick Bill would be beneficial. It was then mustered in and is now composed of three batteries conforming in all respects to the regulations and striving to perfect its training for any service it may be called upon to perform.

NEW ARSENAL ON ST. CHARLES STREET.

Purchased in 1880, running through the block from St. Charles to Carondelet Street, 360 feet by 90 feet.

During its years of peace service it has repeatedly done riot duty both in New Orleans and at various points in Louisiana. In 1912 it was called to conduct refugee camps for flood sufferers along the

Mississippi River located at Vicksburg, Baton Rouge, Milliken's Bend and other points.

During the days of interstate competitive drills the Washington Artillery under Capt. Eugene May took first prize at Dubuque in 1884, Mobile and Philadelphia in 1885, Galveston, 1886, and Austin, 1888. It took second place at New Orleans in 1885, and third place at New Orleans and Nashville in 1883.

The following works have been published upon its history:

"A Soldier's Story of the War," by Corporal Napier Bartlett, of the Third Company. Published in 1874.

"In Camp and Battle with the Washington Artillery," by Colonel William Miller Owen, 1885.

"Washington Artillery Souvenir," by Lieutenant-Colonel John B. Richardson; 1894.

"A Reminiscent Story of the Great Civil War," by Major H. H. Baker, of the Fourth Company; 1913.

All of the present officers have attended the Artillery Schools either at Fort Riley or Tobyhanna, and four have attended the school of Fire at Fort Sill and have been graduated.

THE CAMP OF INSTRUCTION FOR FIELD ARTILLERY AT TOBYHANNA, PA.

BY MAJOR CHARLES P. SUMMERALL, 3RD FIELD ARTILLERY.

The need of a range for field artillery target practice in the Eastern States has long been felt keenly by the regular batteries stationed in this section. Many localities have been tried, but all proved so inadequate, both as to ranges and safety, that the practice was of little value, and efforts to use them were discontinued. The practice of the regular batteries of the Fort Myer battalion, prior to its mobilization with the Maneuver Division at San Antonio in 1911, was held at a coast defense post, with targets that were located on the water. The deficiencies resulting from such restrictions were made apparent in the firing of the battalion at Leon Springs, Texas, that year, and it was realized that effective steps must be taken to overcome them.

In addition to the needs of the regular batteries, the development of the militia field artillery, and its increase in size and importance, emphasized the lack of any place where firing instruction could be given. In his report for 1912, the Chief of the Division of Militia Affairs said:

> While four-fifths of the State batteries are east of the Mississippi, and two-fifths of them are east of the Allegheny Mountains and north of Virginia, the United States owns but one field artillery target ground east of the Mississippi (Sparta, Wis.), and none at all east of the Allegheny Mountains.
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> The country in the east, where most of the militia batteries are located, being thickly settled, suitable ranges do not exist, conveniently located to the batteries, and hence, the great majority of these batteries can have only the most elementary firing, and as a rule they derive but little real instruction from it. Several target firing grounds centrally located for batteries of contiguous states should be secured by the Federal Government, just as small-arms ranges are now secured in each State with Federal funds, either by purchase or lease. It is absurd to think that the only arm of the service (field artillery) which has no action on the batlefield, except fire, can secure efficiency without thorough target practice, conducted under all sorts of conditions, and under the supervision of competent instructors.

At the date of this report, there were 18 militia and 3 regular batteries east of the Allegheny Mountains, extending from New Hampshire to Virginia, inclusive. Some of them had never had target practice, although they had been organized for several years. The number of militia batteries in this area has been increased to

23, and it is probable that a still greater increase will follow at an early date. When it is considered that the cost of the matériel alone of a 3-inch battery is about $80,000, it is appalling to think that the enormous investment for these batteries should largely be nullified by the lack of a suitable place to utilize them in the training of the personnel. It was to meet the above needs that a search was begun early in 1912, for a range. The place that fulfilled the greatest number of requirements was a large area of uninhabited country near Tobyhanna, Pennsylvania. It is situated on the extensive plateau of the Pocono Mountains, at an altitude of nearly 2300 feet.

A BATTERY GOING INTO POSITION, TOBYHANNA RANGE.

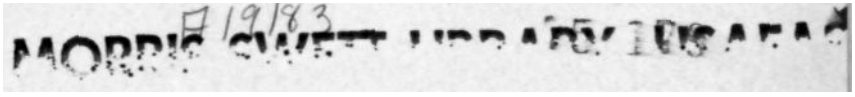
The climate is cool and invigorating, the water is abundant and of unusually good quality, and the conditions for health are all that could be desired. The country is covered with a dense second growth of trees and brush and the surface is rendered exceedingly rough by rocks and small holes. Maneuvering is slow and difficult, but there are sufficient roads and trails to afford convenient access to the firing points. A great variety of ranges can be found, and the absence of any inhabitants over an extensive area renders the practice unusually safe.

In order to try the range, the 2d Battalion, 3d Field Artillery, was sent there for practice after the Connecticut Maneuvers in 1912. The results were so satisfactory that it was decided to use the range again in 1913, and, in addition to the practice of the regular officers and batteries, a camp of instruction for militia batteries and a school for militia officers were organized. The camp was located near the station at Tobyhanna, where the Lackawanna Railroad afforded an excellent train service. The land was cleared and temporary buildings were constructed for kitchens, latrines, shower baths and stables. A well was driven and a water tank, a pumping plant and a system of water pipes were constructed to take an abundant supply of water to all parts of the camp. Kitchens, latrines, and showers were built in pairs, so that each regular battery should have a militia battery camped adjoining it and parallel to its tents. Militia batteries were expected to come with only the personnel and the camp equipage, and to use the horses and the matériel of the regular batteries in camp. A circular was sent to the batteries with the following information:

Batteries will detrain on a siding near the camp.
Wagons will meet the trains to haul all baggage.
The postoffice, depot and telegraph office are at Tobyhanna.
Camp cots or bed sacks should be brought for all men.
Extra covering will be found useful, as the nights are generally cold.

The regular battalion left Fort Myer June 2d and marched by way of Baltimore, crossing the Susquehanna River at Conowingo, Md. The route through Pennsylvania traversed one of the most fertile and attractive sections of the country. Sundays were spent in camp at Buck and Pen Argyl. At Bethlehem, Batteries D and E were detached and sent to Easton for a week. From there, Battery D returned to Gettysburg and Battery E proceeded to Tobyhanna. Battalion Headquarters and Battery F continued the march to Tobyhanna, where they arrived June 18th, having covered a distance of 260 miles.

The camp was in a very crude condition, but the men made such preparations as were possible for the militia batteries who were due to arrive three days later. It was not practicable to have the camp graded, and the first batteries found much to do before their grounds and company streets had any resemblance to the usual types. The men manifested a creditable zeal, and with a cheerful enthusiasm



that spoke well for their morale, they adapted themselves to the situation and were soon ready for the real work of the camp.

In accordance with the schedule prepared by the Division of Militia Affairs, batteries reported at the camp as follows:

Battery.	State.	Officers.	Enlisted Men.		Rounds of Ammunition.
A	New Jersey	5	88	From June 21 to June 30	300
A	Rhode Island	5	124	From June 21 to June 30	124
A	Connecticut	3	108	From July 21 to July 30	129
B	Pennsylvania	5	92	From July 21 to July 30	171
C	Pennsylvania	4	81	From July 20 to July 30	243
B	New Jersey	5	91	From Aug. 1 to Aug. 10	362
1st	Dist. of C.	4	86	From July 31 to Aug. 11	236

Three other batteries and a battalion headquarters, designated to attend in August, failed to come.

In all cases, the militia batteries were met at the trains and conducted to the camp, where meals for them were provided by the regular batteries with which they were paired, till the new messes could be established. A mess for all officers who attended the camp was conducted by a caterer.

Battery comanders took full charge of the instruction of the militia batteries paired with them. They followed the prescribed schedule, using all officers and men of their batteries required for the different classes of instruction. Especial assistance was rendered in messing, cooking and serving meals and in camp sanitation. During the firing, officers and noncommissioned officers of regular batteries exercised a close supervision over the duties of all officers and men of the militia batteries to prevent errors or irregularities that might have endangered the batteries or the range parties. Battery commanders also made the annual field inspection under Section 3, Militia Laws, of the batteries assigned to them.

As the stay of each set of batteries in the camp varied but little, the following program of instruction was followed in all cases, with only such modifications as were found to be necessary:

FIRST DAY, SATURDAY.

Arrival in camp; pitching tents and establishing messes.

SECOND DAY, SUNDAY.

Explanation of duties, routine and course of instruction; battery administration for officers; riding for recreation.

THIRD DAY, MONDAY.

Morning.

Drivers: Fitting harness; harness drill; driving by pair and by team.
Cannoneers: The cannoneer, the gun squad and the firing battery; methods to obtain speed with accuracy.
Special details: (Chiefs of 5th section, signal details and scouts.) Instruments, telephones and signalling; reconnaissance and transmission of messages.
Officers: Blackboard method of conduct of fire; sketching and smoke bomb practice.

Afternoon.

Drivers: The team hitched; the battery mounted.
Cannoneers: The firing battery.
Special details: Same as morning.
Officers: Same as morning.

Evening.

Officers: Map exercises in the employment of special details.

FOURTH DAY, TUESDAY.

Morning and Afternoon.

Drivers: Fitting harness; the battery mounted.
Cannoneers: The firing battery.
Special details: Same as third day.
Officers: Adjustment and use of B. C. telescope and use of ruler, telemeter and field glasses; preparation of firing data and smoke bomb practice.

Evening.

Officers: Same as third day.

FIFTH DAY, WEDNESDAY.

Morning.

Batteries: Reconnaissance, selection and occupation of positions, posting all elements, preparation of firing data and conduct of fire.

Afternoon.

Drivers: The battery mounted.

Officers and cannoneers: Simulated fire and sub-caliber practice, using fixed and moving instruction targets.

Special details: Same as third day.

Evening.

Officers: Probability of fire.

SIXTH DAY, THURSDAY.

One battery: Service practice.
Remaining batteries: Same as fifth day.

Evening.

Officers: Critique.

SEVENTH DAY, FRIDAY.

Same as sixth day, batteries alternating for service practice.

EIGHTH DAY, SATURDAY.

Same as seventh day.

NINTH DAY, SUNDAY.

Morning.

Officers: Administration and discipline.
Enlisted men: Care of matériel.

Afternoon.

Officers and enlisted men: Riding for recreation.

TENTH DAY, MONDAY.

Breaking camp and entraining.

The militia batteries furnished all guard details except the senior noncommissioned officers and the sentinels over the guard tents and the stores. An officer of the day and an officer of the guard were detailed from the militia batteries.

The new guard details were formed on the parade ground at 1:00 p. m., daily, for instruction by the adjutant. At the same time officers were instructed in the manuals of the saber and the pistol. Stable duties were performed by the militia batteries and officers attended stables for instruction in the treatment and care of horses. Batteries had the routine formations and were inspected at retreat. One-half the officers attended drills with their batteries and the other half attended the special instruction prescribed for officers.

All officers attended service practice of all batteries, except one regular officer with each battery not firing.

Calls for instruction were sounded as follows:

Drill Call	7:55 a. m.
Assembly	8:00 a. m.
Recall	11:30 a. m.
Drill Call	1:25 p. m.
Assembly	1:30 p. m.
Recall	3:30 p. m.
School Call for Officers	7:25 p. m.

BATTERY IN POSITION AT TOBYHANNA.

Three smoke bomb ranges were installed and a good drill ground was procured for the elementary work of the batteries.

The entire scheme of instruction led up to the service practice for which batteries brought varying quantities of ammunition. Precautions were taken to segregate and fire ammunition by lots, and all instruments were adjusted before firing, under the supervision of the regular officers. The range was operated by permanent details from battalion headquarters. Officers reported at the observing station and problems were assigned in rotation to each battery.

Sketches of the terrain and targets and observations of all shots were made by officers not firing and complete records were kept for the reports. Imediately after the day's practice, mimeograph copies of the records were made and distributed for the critique that evening. At the critiques, each officer first commented upon his own work and details not satisfactorily pointed out by him were discussed by others.

The best of feeling existed between the different organizations, and the departure of the militia batteries was generally preceded by a smoker to their regular comrades.

During a part of the time that Battery A of Rhode Island attended the camp, Brigadier General C. B. Abbott, Adjutant General of Rhode Island, and Major Charles T. Glines, of his staff, were present. The interest of General Abbott in the work and his earnest cooperation were helpful to all concerned. It is hoped that the Adjutants General of the States will find it possible to visit succeeding camps.

Major General C. B. Dougherty, commanding the Division of Pennsylvania Militia, was an active and sympathetic friend of the camp. He reviewed the provisional battalion composed of Batteries B and C of Pennsylvania and Battery A of Connecticut, and his presence at a number of the practices was encouraging to both regulars and militia.

The Division of Militia Affairs arranged for a school for officers from July 1 to July 15. Eighty-one officers from States east of the Mississippi River were authorized to attend. Of this number, fifty-three reported. It is worthy of note that twelve officers came from the State of Louisiana, including the Washington Artillery field and staff as well as battery officers. Circulars had been sent to all officers authorized to attend, as follows:

> As your name has been sent in as one of those who will attend the camp of instruction for militia field artillery officers to be held at Tobyhanna, Pa., from July 1 to 15th, the following information will be of interest to you:
>
> The camp will be established at Tobyhanna, Pa., on the D. L. & W. R. R. Tents will be provided and equipped with gold medal cots, water buckets and lanterns. Each officer will, therefore, need to bring with him his bedding roll and his field trunk or clothing roll, his service uniform (woolen or cotton), including overcoats, olive drab shirts (which will be worn in lieu of blouses on hot days), saddle cloth, saber and belt. blankets (2), canteen, spurs, field glass, watch, compass, note book, pad and pencils. A horse equipped with saddle, saddle blanket and bridle, will be furnished each officer, and orderlies will be provided to care for them.

Each officer should bring a serviceable slicker. He will also find a pair of rubber boots a great convenience.

A good mess will be established in the camp at which officers may get their meals at $1 per day. A small charge will be made for caring for tents.

In regard to previous preparation, officers should study the drill regulations and the hand book of 3-inch field artillery matériel.

They are requested to bring the two books above mentioned and the B. C. rulers, B. C. telescopes and sextant telemeters, belonging to their battery or battalion.

The student officers arrived on June 30th and July 1st. All were met at the trains and conducted to camp, where they were assigned, usually, two to a tent. For the purpose of instruction, they were divided into two classes and each class was subdivided into four sections. Mimeograph lists of the sections and schedules of instruction and copies of camp orders were furnished each officer.

The course was as follows:

1. Simulated fire with smoke bombs.
2. Preparation of firing data and the blackboard method of conduct of fire.
3. Use of special details and occupation of positions in map exercises.
4. Reconnaissance and occupation of positions and conduct of simulated fire, using a battery.
5. Sketching and range finding.
6. Adjustment and use of instruments.
7. Telephones and signalling.
8. Hippology.
9. Harness and draft.
10. Subsistence and supply.
11. Equitation.
12. Battery administration and camp sanitation.
13. Terrain exercises, with battalion headquarters and special details.
14. Battalion administration.
15. Service practice.

The instruction was conducted according to the following detailed schedule:

TUESDAY, JULY 1ST.

Report at camp.
Assignment to sections.
Explanation of course—7:30 p. m.
Lecture—Firing Regulations.

WEDNESDAY, JULY 2D.

Morning.

Class A.

Subject No. 1:
1st and 2d sects... 7:30– 9:30
3d and 4th sects.. 9:30–11:30
Subject No. 2:
1st and 2d sects.. 9:30–11:30
3d and 4th sects.. 7:30– 9:30

Class B.

Subject No. 6:
1st and 2d sects.. 7:30– 8:30
Subject No. 3:
1st and 2d sects.. 8:30–10:00
3d and 4th sects.. 10:00–11:30
Subject No. 5:
3d and 4th sects.. 7:30– 8:30
Subject No. 4:
3d and 4th sects.. 8:30–10:00
1st and 2d sects..10:00–11:30

Afternoon.

Subject No. 3:
1st and 2d sects.. 1:30– 2:30
3d and 4th sects.. 2:30– 3:30
Subject No. 4:
1st and 2d sects.. 2:30– 3:30
3d and 4th sects.. 1:30– 2:30
Subject No. 5:
1st and 2d sects.. 3:30– 4:30
Subject No. 6:
3d and 4th sects.. 3:30– 4:30

Subject No. 1:
1st and 2d sects.. 1:30– 3:00
2d and 3d sects.. 3:00– 4:30
Subject No. 2:
2d and 3d sects.. 1:30– 3:00
1st and 2d sects.. 3:00– 4:30

Evening.

Lecture—Probability of Fire—7:30.

THURSDAY, JULY 3D.

Morning and Afternoon.

Same as July 2d.

Same as July 2d.

Evening.

Lecture—Telephones and lines of information—7:30.

FRIDAY, JULY 4TH.

Ceremonies and athletic games.

SATURDAY, JULY 5TH.

Morning and Afternoon.

Same as Class B, July 2d and 3d.

Same as Class A, July 2d and 3d.

Evening.

Lecture—Employment of Field Artillery—7:30.

MONDAY, JULY 7TH.

Morning and Afternoon.

Same as July 5th, substituting subjects No. 7 for No. 6 and No. 9 for No. 5.

Evening.

Lecture—Topography—7:30.

TUESDAY, JULY 8TH.

Morning and Afternoon.

Service practice—8:00 a. m.

Evening.

Critique—7:30.

WEDNESDAY, JULY 9TH.

Morning and Afternoon.

Same as July 7th.

Evening.

Critique—7:30.

THURSDAY, JULY 10TH.

Morning and Afternoon.

Service practice—8:00 a. m.

Evening.

Critique—7:30.

FRIDAY, JULY 11TH.

Morning and Afternoon.

Same as July 7th, substituting subject No. 8 for No. 9 and subject No. 10 for No. 7.

Evening.

Critique—7:30.

SATURDAY, JULY 12TH.

Morning and Afternoon.

Service practice—8:00 a. m.

Evening.

Critique—7:30.

MONDAY, JULY 14TH.

Morning and Afternoon.

Same as July 7th.

Evening.

Critique—7:30.

TUESDAY, JULY 15TH.

Departure from camp.

JULY 6TH AND 13TH, SUNDAYS.

Morning.

Class A.	*Class B.*
Subject No. 12.....10:00–11:30	Subject No. 12..... 8:30–10:00
	Subject No. 11..... 10:00–11:30

Afternoon.

Riding for recreation.

HEADQUARTERS WASHINGTON ARTILLERY.

Morning.	*Afternoon.*
Subject No. 13..... 8:30–11:30	Subject No. 14..... 1:30–3:00

Calls were sounded as follows:

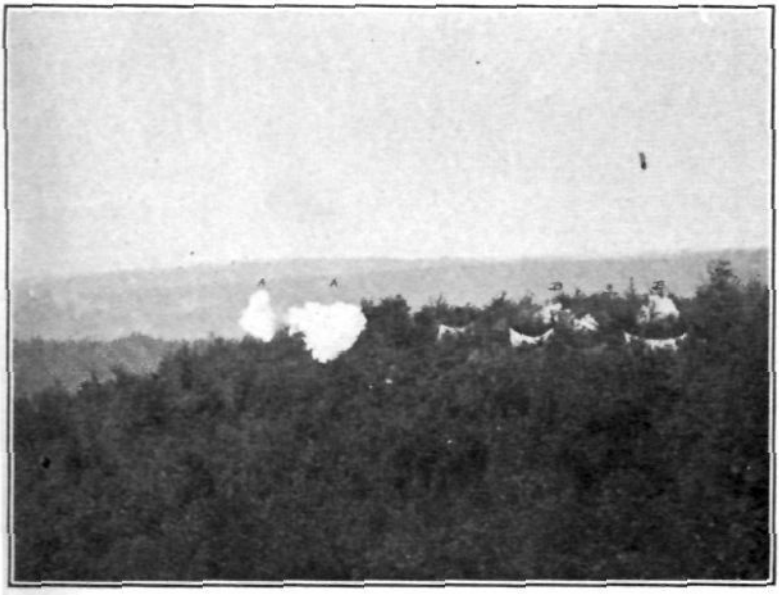
Mess Call	5:50 a. m.
School Call	7:25 a. m.
Assembly	7:30 a. m.
Recall	11:30 a. m.
Mess Call	12:00 m.
School Call	1:25 p. m.
Assembly	1:30 p. m.
Recall	4:40 p. m.
Mess Call	6:00 p. m.
School Call	7:25 p. m.
Assembly	7:30 p. m.

All officers took the same course, except the special exercises for the headquarters of the Washington Artillery. From the records of the instructors, officers were selected to conduct the fire in the service practice. Chiefs of platoon were detailed by roster. The practices and the critiques were conducted as already described for the militia batteries. Two hundred and thirty-one rounds of shrapnel were allowed for the school and the State of Rhode Island gave one hundred and ten rounds to the officers from that State. Nineteen problems were fired over a variety of ranges, and under favorable and unfavorable conditions of weather.

Student officers were detailed daily to attend the routine calls and duties of the regular batteries, and they were especially enjoined to familiarize themselves with the methods of operating the messes, caring for horses, and camp sanitation.

At the conclusion of the school, a study was made of the work of each officer, and gradings were given under the following headings:

1. Preparation of Firing Data.
2. Conduct of Fire.
3. Observation of Fire.
4. Occupation of Position with Battery.
5. Adjustments of Instruments.
6. Telephones and Signalling.
7. Sketching.
8. Range Finding.
9. Hippology.
10. Equitation.
11. Harness and Draft.
12. Battery Administration.
13. Aptitude.
14. Recommendation.



A SALVO OF HIGH EXPLOSIVE SHRAPNEL.

B. B. show percussion burst of the fuzes after the time bursts at A. A.

This record forms a fair basis for estimating an officer's efficiency and will be of great assistance in arranging into classes those who attend future camps.

During the intervals when no militia officers or batteries were present, details of regular field artillery officers on detached service reported for their annual service practice. As a preliminary to

shooting, all officers were practiced in subjects 1, 2 and 3 of the militia school course. The problems were then conducted as described for the militia batteries. At the same time, officers of the battalion fired a part of their service practice. In addition to the regular officers, a class of six officers of the Marine Corps attended for one week and conducted service practice. They gave evidence of skill and a high degree of aptitude, and their visit was one of the most pleasing features of the camp.

Battery D joined August 1st from Gettysburg, where it had remained for the College Student's encampment. It took no part in the militia officer's school or the instruction of the batteries, and its services were greatly missed.

The annual field inspection of the battalion by the Department Commander was made September 3d.

The Department Commander and nine of his staff officers took the three days' test ride from the camp during the last part of September.

The practice of the battalion extended through September.

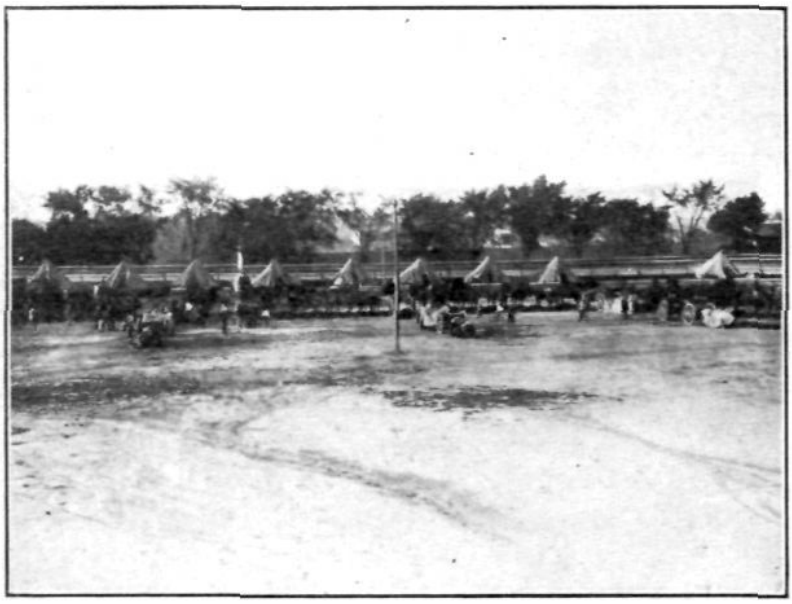
During the season, the camp was attended by the following troops:

Regular officers	34
Marine officers	6
Militia officers	72
Total officers	112
Enlisted men (Regular)	380
Enlisted men (Militia)	670
Total enlisted men	1050
Aggregate	1162

One hundred and ninety-nine problems were fired with an expenditure of 3374 rounds of ammunition. While the hours for work were long and the duties exacting, the health and morale of the command, both regulars and militia were excellent. During a large part of the encampment, the presence of the 15th Cavalry Band contributed to the pleasure not only of the camp but of the people who spent the summer in that section. The firing and the music attracted many visitors from the summer resorts and the camp was enlivened by their presence. On Saturday afternoons, polo

and baseball afforded healthful recreation and, when off duty, both officers and men enjoyed visits to the neighboring cities. Field day sports were arranged for July 4th and September 1st and they were largely attended by the neighboring communities. As a result, the most cordial relations were established with the people, who became interested in the service through their contact with the camp.

The battalion broke camp October 4th and began the return march to Fort Myer. A week was spent at Columbia, Pa., where many courtesies were extended to the command. With the exception of two

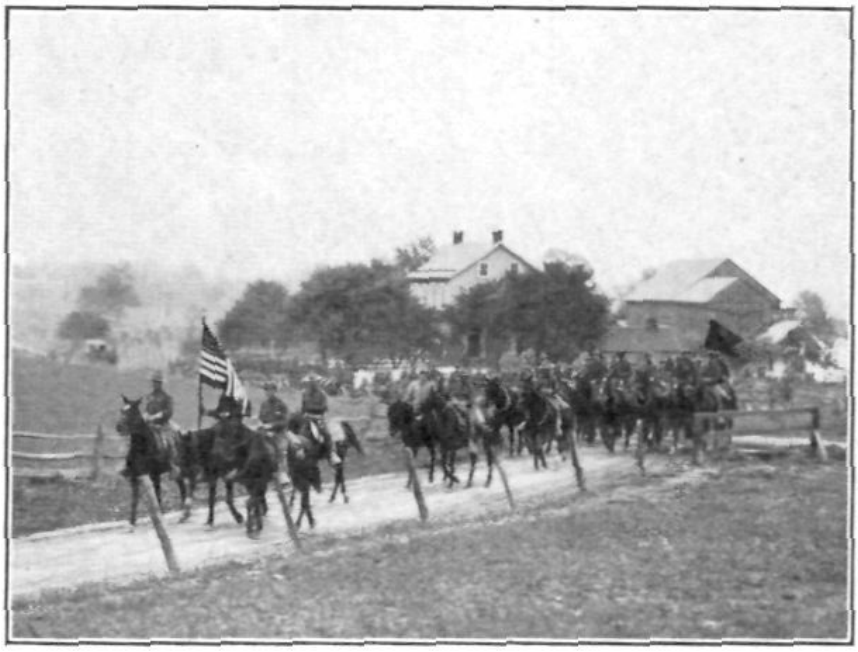


A CAMP DURING THE MARCH.

days in the valley of the Susquehanna, the marches were over good roads and the command reached Fort Myer October 24th, as originally planned.

The results of the summer's work demonstrated the value of the range to the field artillery, and it is believed that the batteries that attended the camp gained more in efficiency than they could have acquired by any other employment of the time. Arrangements have been completed for the continued use of the ground. Work will begin on the improvement of the camp, the construction of roads

and the clearing of ground for moving targets. Each year should see increased facilities and improved methods of instruction. If batteries are sent for ten-day periods, at least twenty-one militia batteries, in addition to the officers' school, could attend each summer. The saving of horse hire is a great economy to the batteries and the use of well-trained horses prevents waste of time in trying to handle green horses with unskilled men. Contact with other organizations at the camp has a great educational advantage over the habitual isolation of batteries in their practical training.



ON THE MARCH.

Ample opportunity is given every one to show his skill and to develop his full capacity and assistance is given where needed to overcome deficiencies.

The marches of the battalion from Fort Myer to Tobyhanna and return are of unusual interest. Several militia officers could conveniently be accommodated by the batteries and they would profit by contact with the troops as well as by the study of the methods practiced by the battalion in the field. Officers who might desire to make the march would be welcomed and arrangements could be

made for their presence during a part or all of the journey either way.

The need of more instructors was felt throughout the camp. Two inspector-instructors assigned to duty with the Organized Militia were present a part of the time. It is believed that inspector-instructors should accompany the batteries under them to the camp and that those from the States represented, should attend the officers' school.

THE FRENCH FIELD GUN

IN COMPARISON WITH THAT OF THE UNITED STATES, AND OTHER NOTES ON FIELD ARTILLERY.

The data for the following comparison are perhaps already well known, but, so far as the writer is aware, they are not conveniently available nor have they hitherto been verified by the personal observation of one of our officers:

PRINCIPAL DATA.

	French.	*United States.*
Weight of gun	860 lbs.	788 lbs. (Ml. 1905)
Caliber	2.952″	3″
Total length	102″ +	87.8″
Length of bore	94″ +	84″
Rifling:		
No. of grooves	24	24
Initial width of grooves	.2677″	.2927″
Final width of grooves	.1574″	.2927″
Depth of grooves	.01968″	.03″
Initial width of lands	.1181″	0.1″
Final width of lands	.2284″	0.1″
Twist, initial	1 in 25½	0 } Ml. 1905.
Twist, final	1 in 25½	1 in 25. } Ml. 1905.
Shrapnel:		
Weight, filled and fuzed	15.96 lbs.	15 lbs.
Weight, round complete	20.25 lbs.	18.75 lbs.
Muzzle velocity	1738 f. s.	1700 f. s.
Angle of departure, principal ranges:	Mils.	Mils.
2000 yards	43.8	52.4
3000 yards	75.6	92.4
4000 yards	113.	140.5
Terminal velocity, principal ranges:		
2000 yards	1181 f. s.	1038 f. s.
3000 yards	1003	906
4000 yards	892	837
Slope of fall, principal ranges:		
2000 yards	1 on 17.2	1 on 13.9
3000 yards	1 on 9.3	1 on 7.4
4000 yards	1 on 5.7	1 on 4.7
Base bursting charge:		
No. of balls	260	252
Weight of 1 ball	184 + grs.	167 grs.
Velocity imparted by bursting charge	328 f. s.	250 to 300 f. s.
Bursting charge intermingled with bullets:		
No. of balls	290	———
Weight of 1 ball	184 grs	———

Velocity imparted by bursting charge	262 f. s.*	———
Fuze	Combination time train spirally coiled on cylinder	Combination time train contained in superimposed rings
Maximum range of time train	6014 yds.	6500 yds.
High explosive shell:		
Weight filled and fuzed	11.6 lbs.	15 lbs.
Nature of bursting charge	Melinite	Explosive "D"
Weight of bursting charge	29.04 oz.	13.12 oz.
Fuze	Point delay action	Base
Gun carriage:		
Weight of carriage, complete	1630 lbs.	[1]1685 lbs.
Weight of gun and carriage, complete	2490 lbs.	2520 lbs.
Diameter of wheels	48″ +	56″ +
Width of track	59″ +	60″
Length of recoil	43″ to 49″	45″
Height of axis of gun	[2]37″	40.875″
Amount of traverse on carriage	104 mils.	140 mils.
Method of traverse	Slides on axle, center of motion end of trail	Around vertical trunnion
Limber:		
Weight without ammunition	946 + lbs.	1026 lbs.
Rounds carried	24	36
Weight ammunition	485 + lbs.	675 lbs.
Weight of gun, carriage, and limber, equipped and with ammunition	[3]3921 lbs.	[4]4212 lbs.
Free height, gun carriage	[5]15″	22″
Caisson:		
Weight without ammunition	1430 lbs.	1320 lbs.
Rounds carried	72	70
Weight of caisson and limber, equipped and with ammunition	[6]4700 lbs.	4440 lbs.
Position of rounds in caisson and in limber	Vertical	Horizontal
Total round in battery (4 guns, 12 caissons)	1248	1432
Rounds per gun	312	358
High explosive shell per battery	288	358

The above numerical data have been sought with great care and are considered reliable; wherever there has appeared to be a reasonable doubt an approximate note has been made. Bearing in mind the differences shown by the data, we may now proceed to discuss the principal features of those differences.

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* Stated.
[1] Includes 4 rounds ammunition.
[2] Approximate.
[3] 24 rounds.
[4] 40 rounds.
[5] Approximate.
[6] Includes 2 days rations for 16 men, 110 lbs. oats, etc.

The Shrapnel:

It will have been noticed that two shrapnel have been shown for the French matériel. It is believed that the shrapnel now being manufactured is a perfected model of that known as the "Robin" (bursting charge intermingled with the balls).

It seems somewhat strange to us, perhaps, that a bursting charge thus intermingled with the balls can be so arranged as to impart to the latter, on burst, an additional velocity of some 262 feet per second, without corresponding disadvantages. Evidently it would be interesting to know the details of construction of this shrapnel.

The general explanation usually given is as follows: Successive layers of powder, saltpeter, and bullets are put in the case, each set of layers being subjected to a pressure comparable to the stock of discharge before the next set is introduced. The flame from the fuze is so conveyed as to ignite the rear portion of this compressed mass. The claim is that the initial compression of the mass of powder, saltpeter, and balls and the manner of communicating the flame gives the additional velocity along the tangent to the trajectory without accompanying disadvantages. To what extent this claim may be justified the writer is not prepared to say. He can, however, state with certainty derived from personal observation, that the central tube for communicating the flame from the fuze to the bursting charge is pierced with holes for a distance of about 1½ inches from the end next the base; that the case does not break up on burst; and that there is a very considerable and dense volume of smoke given out on burst.

It is apparent that, unless it has very great disadvantages, this French shrapnel, containing 290 bullets, assuming that the claims for it are reasonably true, is very much superior to ours. The French consider this system to be effective and, especially as the French measure of the effectiveness of a shrapnel is more rigid than ours, it is believed that we should make experiments to determine the value of a shrapnel constructed along the lines which have been roughly outlined.

The French criterion for measuring the effect of shrapnel is so different from our own standard that it seems desirable to briefly sum up the principal differences.

The French consider that their 184 grain ball requires a striking velocity of 550 f. s. to enable it to put a man out of action.

In French experiments for determining the effective pattern of

their shrapnel, no hits are counted which do not pierce 1.6 inches of soft pine. As against these standards, we admit that a striking velocity of 400 f. s. (Document 1659—Revised July 1, 1911), is sufficient with our 167 grain bullet to disable a man. In our experiments (Report of Field Artillery Board on Firing conducted at Fort Riley, in October, 1906), we have admitted as effective those bullets which embedded themselves in, as well as those which pierced one inch of soft lumber. Referring again to the "Robin" shrapnel, the French admit, under their standards, that about one-third of its bullets are ineffective at all ranges. This proportion is exactly the same as that found under our standards for our shrapnel (Report of Field Artillery Board mentioned above).

So great a difference in standards as that just noted would seem to indicate either that the French are unnecessarily rigid or that we are too lax in our requirements. But since doubt may reasonably exist as to the value of the "Robin" system, it may be well to compare the French shrapnel with a base bursting charge with our own projectile.

Various ratios may be used in determining the relative value of two shrapnel. Assuming that in each case the balls are effective, one may show that the French shrapnel of the base charge type is superior to our own, or vice versa, according to the ratio adopted. The truth is that the estimation of the relative value of two shrapnel is very largely a matter of judgment.

The writer is of the opinion that the French shrapnel is superior to our own for the following reasons: The number of balls per shrapnel is greater; the weight of the individual ball is greater; the remaining velocity of the projectile is considerably greater at the principal shrapnel ranges; the velocity imparted on burst is greater and, consequent upon the greater weight of the individual ball, the greater velocity, and the flatness of the trajectory, the depth effectively covered by the French shrapnel is considerably greater than that covered by our own. The superiority thus obtained is accompanied by an increase in weight of one and one-half pounds per complete round. It is believed that this disadvantage is not sufficient to entirely counteract the superiority mentioned and on the whole the writer believes that, pound for pound, the French shrapnel is somewhat superior to our own.

High Explosive Shell:

There is a very noticeable tendency among French officers towards an increased use with light guns of high explosive shell. It is confidently predicted that within the next few years the proportion of high explosive shell carried by the French battery will be greatly increased. These ideas as to the value of the high explosive shell with delay action fuze for light field guns are so at variance with those officially held by us (Report of Field Artillery Board on Firings at Fort Riley in 1909—published in Occasional Papers, No. 39, Engineer School) that it may be well to discuss the subject somewhat at length.

In the first place, the points to which we have, perhaps, attached most attention in studying the possible use by light-guns of high explosive shell with delay action fuze have been the attack of troops in trenches and the demolition of heavy stone walls. The French regulations specify several classes of targets against which the use of high explosive shell is deemed appropriate, but the vast majority of French officers consider that by far the most important of these uses is the attack of the personnel of shielded batteries.

The French admit that to obtain effect with the high explosive shell a large expenditure of ammunition is necessary. Differing, however, from the conclusions of our Field Artillery Board, the French hold that this expenditure is not only frequently justified, but that effective results may be obtained under conditions which preclude the use of shrapnel, or render necessary a far greater expenditure of that projectile than would be the case in employing the high explosive shell. Against shielded field artillery the French regulations state that an expenditure of about 50 high explosive shell, uniformly distributed over an area of 100 meters by 100 meters, is sufficient to secure an effect of 33% against any artillery within that area. Most French officers consider that this estimate is entirely too conservative.

The writer was fortunate enough to witness comparative tests or rather a demonstration between the French shrapnel and high explosive shell. The target consisted of two shielded batteries, each of six guns and six caissons, each piece having 5 cannoneers who were placed in their positions for serving the piece and were not, as a consequence, represented as taking the maximum possible cover. The targets thus arranged were placed side by side, with an interval

of some 50 or 60 yards, and were fired at by two batteries also placed side by side and firing simultaneously. After ranging, one battery fired 48 shrapnel at its target while the other battery fired 48 high explosive shell at its target. The targets were so located as to be partly visible from the battery commander's stations, but the conditions were such that the smallest practicable bracket was 100 meters, range 2600—2700 meters (2843—2952 yards). The results were as follows:

The battery against which shrapnel was used had 15 cannoneers hit, two caissons partly smashed, and one gun wheel entirely demolished (The gun wheel demolished and one of the caissons hit were in the same section). The battery against which high explosive shell was used had 28 cannoneers hit. Evidently there may be a radical difference of opinion as to the conclusions to be drawn from the above. If we simply consider the effect actually obtained we may conclude that each hostile battery was, at least temporarily, placed entirely out of action upon exactly the same expenditure of ammunition. On the other hand, if one considers that the direct hits in the one case with none in the other were abnormal, and only looks at the effect on the personnel, he might reach the conclusion that the high explosive shell was the more effective. Manifestly the above data are not sufficient to enable one to draw hard and fast conclusions as to the value of the French high explosive shell. I can only say that in my opinion the French high explosive shell is extremely effective at all ranges giving ricochet on impact. The reason for this effectiveness is to be found in the unusually large bursting charge and to having found the most favorable amount of delay to give the fuze. Holding this opinion, it is believed that we should not definitely abandon the shell for light-field guns until, after having developed a shell carrying a bursting charge comparable in weight or power to that carried by the French shell, further experiments are made. Considering only our present shell there can be no question as to the wisdom of abandoning the shell for a single type projectile. Our conditions render much more imperative the simplification of questions of ammunition than is the case with those nations who look only to the conditions of an European war. This necessity might, in any case, ultimately determine us to abandon the shell. But to thus abandon a projectile

before putting it upon such a basis as to enable us to compare it with that used by other nations is a doubtful policy.

In some ways it seems that in our experiments we sometimes lose sight of the practical. To give a specific case, it appears that in experiments conducted in 1908 and 1909 comparative tests were conducted with light-field guns firing different kinds of projectiles and fuzes against well constructed stone walls of a thickness of 3, 4 and even 6 feet. It is difficult, by any stretch of the imagination, to conceive of a campaign in which our light-field guns would even semioccasionally be called upon to demolish well constructed stone walls 6 feet in thickness. It is much easier to believe that the walls which our light guns will usually be called upon to attack will have a thickness not much greater than 18 inches. It seems that it may well be that data as to the most suitable projectile or the most desirable amount of retard in a fuze, obtained by firing against stone walls 6 feet thick, are of less practical value than those obtained by firing against objectives that we are likely to have to attack in war.

Again, it is hoped that the writer may be permitted to point out that any conclusions which may have been reached as a result of the tests of 1909 as to proportion of shell and shrapnel, and especially as to the amount of delay to be given the fuze for the high explosive shell, should not be regarded as final. The reason for this assertion is the fact that a very important part of that test was conducted against a field work of an impracticable type—a type, moreover, which practically all nations began to abandon soon after the Russo-Japan war. In fine, it is believed that in the tests of 1909 an undue importance was given to penetration. In the consideration of siege guns and mortars, penetration is of all importance. That penetration is a governing consideration in questions affecting light and heavy field guns and howitzers is, I believe, due to mistaken conceptions as to targets likely to be encountered in field warfare. It is not to be understood that the writer believes that the experiments made at Fort Riley were useless. On the contrary, a great amount of useful and invaluable data was secured, and, even though no other results than confirming our engineers in the decision to abandon obsolete types of field works had been obtained, the tests were more than justified.

Before leaving the subject of projectiles the writer cannot resist mentioning the idea of "neutralizing the enemy." This idea was extremely prevalent, a few years ago, in all writings by French

officers on field artillery matters. We have followed their lead to a greater or less extent. At one time the writer firmly believed that "neutralization" was the one and only great aim in the application of field artillery fire. That this is still the opinion held by many of our field artillery officers is indicated by the frequency with which one sees or hears "neutralization" and "keeping down the hostile fire" in technical writings or discussions.

This idea apparently results from the fact that we have abandoned the pursuit of the ideal and are inclined to content ourselves with half way results already obtained. Recognizing the fact that shrapnel fire from field guns would not reach infantry in trenches who were not attempting to fire, we have been led into practically asserting that the sole function of field artillery in such cases is to "keep down the hostile fire." This idea loses sight of the field artillery's full responsibility in carrying out the basic principle of war—the destruction of the enemy. The idea is likely to lead us into errors similar to those of many years ago when generals sought to replace the real decision by finesse in the play of checkerboard like moves intended to prevent the enemy's action without the sad necessity of killing him.

In exactly the same measure that the most reliable means for preventing an enemy's movements is to kill him, so is the only gauge of our power to "shake his morale" and to "keep down his fire" to be found in the number of killed and wounded inflicted upon him and in the time required to effect those losses. That the French have come to somewhat similar conclusions as to the real way to "neutralize" an enemy is shown, among other indications, by the fact that, not content with having developed an unusually efficient shell for reaching sheltered troops, they are known to be now busily engaged in trying to perfect some form of light field howitzer.

There are many field artillerymen who believe that the howitzer alone will, in many cases, enable us to realize that power of killing the enemy without which there is no such thing as neutralizing him. breaking down his morale, or keeping down his fire.

Miscellaneous Remarks on Data:

Aside from questions already discussed, it will be seen that most of the miscellaneous data given do not show a very marked advantage one way or the other.

It will have been noticed that the height of the French wheel is considerably less than ours. Not only is this true, but in the French matériel the bottom of both limber and caisson chests extends below the axle. Since the French place the rounds in the chests in a vertical position with the point down, it will at once appear that the center of gravity is very much lower in the French matériel than in ours. In action the French caisson is placed with its rear end on the ground, the trail is so hinged as to permit its being lowered to the ground also, and the doors open sideways. The cannoneers serving ammunition thus have more protection horizontally and less vertically than ours have. In the French arrangement of the caisson there are certain minor advantages, but it seems hardly worth while to discuss them for the simple reason that our conditions do not permit following the French system of caisson construction. The French matériel is constructed for use in a country in which good roads are found everywhere, consequently a far smaller diameter of wheel and especially a much less free space under axle can be tolerated than under our conditions. It is believed that, considered in the light of the different conditions, our Ordnance Department has produced a matériel which has a very considerably greater useful carrying power than has that of the French.

In finishing with the numerical data, it should be pointed out that those data indicate two very positive advantages in favor of our matériel—1st the amount of traverse on the carriage is greater by 36 mils; 2d, the weight of gun and limber loaded is more nearly equal to that of caisson and limber loaded.

We may now take up certain features which are of none the less interest for the fact that the comparison can not be made by parallel columns of figures.

Recoil System:

The French employ the hydro-pneumatic system for checking the recoil. In principle the system is quite simple.

(The figure is simply a sketch; it is probable that there is only one cylinder in the 75 m.m. matériel).

From the diagram it is at once seen that on recoil the oil is forced through an orifice and that at the same time, the movable diaphragm

compresses the air and thus stores up energy for returning the gun in battery.

The following points seem worthy of special notice: The air must necessarily be under an initial pressure in order to secure the complete return in battery. The initial pressure is secured by forcing an excess of oil into the oil chamber. The excess of oil is so calculated as to give a certain elasticity to the system. This elasticity is sufficient to take care of any probable wastage of oil on the one hand and to take care of any expansion due to heating on the other. To avoid the irregular pressures resulting from too greatly reducing a given volume of air, it appears that the portion of the cylinder which contains the air is of considerable greater cross section than that portion in which the pistol head works.

As is well known the French consider the details of their recoil system as one of their most important military secrets, and they guard it with a jealous care. The principal advantages of the system appear to be:

1. The weight saved can be advantageously used elsewhere.
2. There are no springs to break or to become weakened through use.
3. Rapidity of fire is without appreciable effect on the completeness of the return in battery.
4. The certainty of action appears to be absolute.

Aside from the difficulties of the details of construction, which no people other than the French appear to have satisfactorily solved. I am unable, after having seen many thousand rounds fired, to discover any real disadvantage in the French recoil system.

Laying in Elevation:

The French gun differs from ours in that the French utilize the system known as the "independent line of sight" whereas we do not.

In the French system, the gun is given a certain angle with respect to the cradle, and the cradle is moved with respect to the carriage proper in such a manner that a fixed portion of the former is brought into the horizontal plane or into a plane corresponding to a given angle of site. The means for accomplishing these two operations are partly under the control of the cannoneer corresponding to our No. 1, and partly under that of the gunner.

The rear of the French gun is, in effect, connected, in the vertical plane, with the cradle by a bar so arranged as to be lengthened or shortened by suitable gearing under the control of No. 1. This bar is graduated in ranges and the gearing is so arranged that it locks automatically at the range set off as soon as the handle controlling the gear is released by No. 1. No. 1 has thus given the gun an inclination with respect to the cradle such as to obtain, with the cradle in a certain position, the indicated range. It remains to bring the cradle into this position. The means for doing this are under the control of the gunner and consist of a level, so arranged as to be movable on the bar attaching it to the cradle, and of the gearing for giving the cradle motion in the vertical plane.

The French system has certain advantages. Among these rapidity of fire will be mentioned later. Aside from rapidity of fire is the fact that the French No. 1 always does the same thing—direct laying or indirect laying—he therefore has less to think of and can not only be made more nearly mechanical but can be made efficient with less natural ability.

Advantages usually have corresponding disadvantages. In this case, as will have been noticed, the principal disadvantage is that if the transverse axis of the piece be not horizontal, the range set off by No. 1 no longer gives the true elevation. The error thus made due to sloping ground may be calculated for any particular case; as a rule it is unimportant.

In determining the efficiency of a modern field piece, stability is of prime importance, for on stability depends, in part, rapidity of fire, which we propose to discuss later. To absolutely determine the stability of the French gun as compared to our own, it would be necessary to conduct a series of tests under identical conditions. From observation, as well as other indications, the writer feels justified, however, in saying that so far as concerns stability in the vertical plane there is little if any difference between the two pieces. That this result has been accomplished under conditions calling for a considerably greater diameter of wheel is greatly to the credit of our Ordnance Department.

Laying in Direction:

As has already been noticed, the traverse of the gun on the carriage is, in the case of the French matériel, accomplished by displacing

the trail upon the axle; the center of motion is therefore the trail spade. As a consequence the axis of the French gun is always in the plane of the trail.

To further increase the stability of the gun in the horizontal plane, the French have also devised a system known as "abatage." Briefly stated, this system consists in wheel shoes so fashioned as to offer resistance to lateral thrusts. The shoes, when in position, are connected by rods with the axle and with the trail.

The French gun, due to the arrangements just described, is more stable in so far as concerns motion in the horizontal plane than is our own.

The movement in azimuth of the French gun is accomplished by suitable gearing controlled by the gunner.

The French sight has a motion of 360 degrees around a vertical axis, the limit of graduation being one mil. The complete circumference is divided into four quadrants. The least reading on the azimuth circle is 200 mils. The micrometer head is divided into 200 equal parts, thus permitting a least reading of one mil. The optical part of the instrument consists of an opaque prism presenting two white lines, one line being horizontal, while the other is vertical. To use, say, the vertical line the head must be moved rapidly up and down in such a manner as to apparently prolong the line beyond the limits of the apparatus. The line may thus be made to coincide with any selected point, either by traversing the gun or by changing the sight reading. The horizontal line serves in direct laying to give automatically the angle of sight. This horizontal line is seldom used for the simple reason that, whether in an open or concealed position, the French seldom use direct laying. The gunner must change his usual position in order to lay on an aiming point to the flank or rear, or even on any aiming point making a considerable angle with the axis of the piece.

There is no arrangement on the French sight permitting it to be leveled transversely. By construction the sight is level in the sense of the axis of the bore when the angle of site is zero; it is out of level when the angle of site is anything other than zero. The resulting error may be computed for any particular case. (Assuming that one of the wheels of the piece is lower than the other by twenty-two inches, the error amounts to only five mils. Given the French method, this error is absolutely without importance).

It is perhaps hardly necessary to say that the French have no sight shank graduated in ranges. The sight always occupies a position at a fixed height, except that there is an extension device permitting raising the sight entirely above the shield and wheels when necessary for lateral laying.

The French sight possesses three advantages: 1. It is cheap. 2. It is simple in construction, strong, and not easily thrown out of adjustment. 3. The division into quadrants facilitates reciprocal pointing.

The disadvantages of the French sight, as compared with our own, are so numerous that it is unnecessary to point them out. In the writer's opinion, taking cost and everything else into consideration, our panoramic sight is far and away superior to the French sight. This statement does not, however, apply to the method of attaching the sight to the gun carriage.

Fuze Setting and Fuzes:

The French have not adopted the ring fuze but adhere to the old system. The fuze in use is exactly similar in principle to that formerly used in our 3.2-inch matériel.

The French fuzes are cut in a machine which takes two rounds simultaneously. In principle the construction of the French fuze setter is simple. In appearance it resembles a box which, when in operation, rests on the ground and opens to expose two levers for cutting the fuzes and handles for operating the range and corrector scales. On either side of one end of the box is a receptacle for a round of ammunition. Toward the transverse axis of the box the receptacle is pierced by a slit which permits the fuze knife to enter the receptacle and the fuze upon being actuated by the corresponding knife lever. A stud on the fuze insures it being placed in the receptacle in a certain relative, fixed position. Turning the range scale raises or lower the receptacle and at the same time gives the latter a motion of rotation. Without further explanation it will be seen that, since the knife remains in a fixed position, it is possible to present all parts of the time train to the knife by simply setting off the range and the corrector. Should the range and corrector remain the same between successive rounds the fuze is, of course, ready to be cut as soon as it is engaged in the receptacle.

It will at once appear that the French means give a far greater

rapidity in fuze setting than does our system. Each system requires three men. As a very conservative estimate, I should say that the capacity of the French fuze setter is more than *treble* that of our own. It is perhaps worthy of notice that the French fuze setter may be instantly detached from one caisson and attached to another or to a limber and that it may be operated without being attached to anything.

The disadvantage of the French system is that a fuze once cut and not fired is lost for any longer range. In reality, especially in war, this disadvantage is more theoretical than practical.

As far as concerns accuracy, it may be said that the probable error in height of burst for the French fuze is about the same as that given by our handbook for our own fuze (about one mil at mean ranges).

Rapidity of Fire:

The first impression one receives at target practice is that, *once fire is opened*, the French fire more rapidly than we do. As the practice progresses, this impression is strengthened to such a point that one concludes that, measured by French standards, we have no *rapid fire* batteries.

The greater rapidity of fire obtained by the French is due to three causes: (a) System, including commands, etc.; (b) Training; (c) Matériel. We may notice under the first head that the French signal for opening the fire is the announcement of the range; that in no case does the gunner enunciate two words as the signal for firing; that in ranging, the interval between successive shots in the battery salvo is practically never greater than two seconds; etc., Under training we may note that the French are more persistent in the training of the gun squad and that they make no attempt to fully train all cannoneers in all duties; much less as drivers. Finally, and most important in training, is the fact that a French battery is allowed about twice as much ammunition for target practice as is one of ours. Under matériel we have already noticed some of the things making for the greater rapidity of fire of the French guns.

It only remains to combine the different causes; before doing so, however, I wish to make it clear that the greater rapidity of fire which the French owe to matériel is principally apparent in fire for effect—that is, it is markedly apparent only between successive

rounds fired on a single command with the same data or with data varying slightly.

Let us suppose a French battery in action and that, having the guns established in direction and determined a short bracket with a height of burst of one mil, the captain desires to use "Volley Fire—Two Rounds." Under this supposition we will briefly trace what happens in the French battery.

In the first place, the French battery always has, during any interval in the fire, two rounds in the fuze setter of each piece and the breech block of each gun is open.

The French captain commands, for example—*"Correcteur 20—Par deux—3000."* The captain gives no further commands or signals. At each piece the fuze setter sets off the corrector and the range and with a simple downward motion of his hand cuts the fuze. No. 1 first sets off the range and then closes the breech as soon as the round is inserted. The gunner centers the elevation bubble if it is not already centered. It is important to remember that the elevation, more properly the angle of site, bubble is *absolutely* independent of the range, the gunner does not, therefore, have to wait for the range to be set off before centering the bubble. The gunner calls out *"Prêt"* and No. 1 fires without further command.

We now come to the second round: As soon as he had passed the first round to No. 2 the fuze setter, with a single motion of his hand, cuts the second fuze and, as a result, No. 2 had the second round in his hands before the first shot had been fired. Returning to No. 1;—immediately upon firing the first shot No. 1 half raises from his seat and opens the breech block before the gun returns in battery. As soon as the second is inserted No. 1 closes the breech block and is ready to fire on the command *"Prêt"* of the gunner.

The stability of the French gun in the horizontal plane is such that No. 1 does not have to wait for this command. In short, with the French gun the time necessary between successive shots fired on the same data is reduced to the time of recoil, the insertion of a cartridge, the closing of the breech, and the grasping and pulling of the firing lanyard.

Let us now follow, in outline, our battery in the solution of the same problem: Our captain commands—"Volley Fire—Two Rounds—Corrector 30—Range 3000." The captain must afterward command or signal "Commence Firing." To be sure, he may give

this latter command at once, still it must be given and the chiefs of section must repeat it. Ignoring, however, this latter command, we find that in conveying exactly the same data and orders our captain has enunciated exactly half as many again words as has the French captain: these words are "Volley—Fire—Range." Considering the usual cadence of commands, it is fair to say that these three words require for their enunciation not much less than three seconds. Three seconds is, in absolute time, no great thing perhaps (even this is, in the application of fire, debatable), but no one can fail to realize that time is made up of seconds. Yet we are not through with the comparison of these initial commands for setting into motion a single fire for effect. It will have been noticed that in the French commands the method of fire follows the corrector, and thus separates the corrector and the range by an appreciable interval. This interval is sufficient to permit the cannoneer setting fuzes to set off the corrector without having to carry the range in his mind. This is not the case under our system, and the difference is still more remarkable in the case of more complete data. Under our system the method of fire precedes all data other than the indication of the aiming point. Under the French system the method of fire precedes only the definite signal for loading and firing. The latter system is certainly the more logical, for under it one of the cannoneers commences his work at the word of command.

Let us now take up the service of our gun. It is believed that enough has been said to show that in the service of fuze setting we are hopelessly outclassed by the French. We will, therefore, pass at once to the duties of our No. 1. Our duties are given in detail, and in their order of performance, in Par. 237, F. A. D. R. To make the analogy complete we will assume that we start, as do the French, with the breech-block open. Under this assumption the duties of No. 1. and their order of performance, are, under Par. 237, as follows: (1) Closes the breech-block as soon as No. 2 has inserted the round; (2) lays the piece for range (involving first, setting off the range; second, centering the bubble; (3) calls "Set" when the piece is correctly laid for range: (4) grasps the firing handle with the left hand when the gunner calls "Ready"; (5) fires at the command "Fire." Coming to our gunner we find that he gives the direction, calls *"Ready,"* after No. 1 has given the call *"Set,"* and then commands "Fire." It is to be remembered that in

giving the direction our gunner must first set off the range. Comparing the duties of our No. 1 with those of the corresponding French cannoneer, we notice: first, our man has more to do; second, we see that the Frenchman is more logical for, during the instant in which the fuze setter is being set and the first fuze is being cut, the French No. 1 sets off the range immediately upon its being announced.

The comparison might be carried farther—for example, our gunner waits to hear *"Set"* before announcing *"Ready,"* then our No. 1 waits for "Fire" before firing, whereas, we are referring to fire for effect, the French only use the one word *"Prêt,"* but it would seem evident that at every turn the French gain a fraction of a second and that when combined those fractions make a very appreciable time.

In the course of several consecutive rounds fired with the same data any differences in time are, of course, accentuated. Without insisting further, it is believed that enough has been said to make it appear that there is foundation for the following statement: The French, in "Fire for effect," *habitually* fire more rapidly than is at present *possible* for our batteries. To reduce this statement to figures showing exactly the difference in the rapidity of fire is not easy; to do so we should, to be accurate, require many problems solved under exactly the same conditions by batteries operating side by side. In order, however, to give some definite statement we may compare certain data obtained by personal observation at French target practice with data obtained by our Field Artillery Board and contained in the official publication "Gunnery and Explosives for Field Artillery Officers."

For our matériel the data which we choose appears on page 49 of the publication mentioned and are as follows:

"6, Six different battery problems, involving direct laying at a moving target representing cavalry emerging from concealment some 1,200 yards away from the position of the battery and charging the guns. The sleds in each case continued the run until they reached the guns; ammunition allowance for each battery, 28 shrapnel.

"This problem involved the most rapid work possible at the fuze setters, and was solved in as low as 1 minute and 30 seconds from the first to last shot of the series," etc.

During the target practice of 1912 the writer timed three separate French batteries in the execution of zone fire with indirect laying; the *greatest* time was exactly one minute from the *announcement of the range* to the *last shot*. The time from first shot to last shot was in all three cases a fraction less than 50 seconds.

As is well known, the French zone fire (*Tir progressif*) is exactly the same as that formerly used by us (now suppressed) and consists in firing from each piece two rounds at each of four ranges differing successively by 100 yards. The total number of shots fired by the battery in executing zone fire is thus 32.

It was realized that the cases cited are far from giving an exact basis for comparison. It seemed, however, necesary to chose the case cited from the report of our Field Artillery Board for the following reasons: (a) Out of the six cases of six different battery problems each, reported by the Field Artillery Board, it will be noted that the first and third occupied fifteen minutes or more each, and that at least the first included adjustment: (b) considering cases 2 and 5 we find erratic bursts due to the personnel; in at least one of these problems the "erratic" bursts were as much as 1000 yards short. Since in one case it is stated that the solution of the problems "required rapid work" and in the other that the solution "required great speed," it is fair to assume that at least a portion of the "erratic bursts" were due to the endeavor to work the material beyond its capacity. (c) Comparison could not be made with number 4 for the problem there noted apparently included two adjusting salvos. (d) Finally, number 6 is the only case in the entire quoted report of the Field Artillery Board in which the beginning and ending of taking time is definitely connected with the several phases of the problem.

Returning now to the comparison between the rapidity of fire of the French piece and that of our own gun, we must first point out that it is to be regretted that the quoted report of the Field Artillery Board does not state definitely whether or not more than one range was used. In any case, one very important fact is brought out. The language of the report makes it clear that, at present, the limiting factor in the rapidity of fire of our gun is the fuze setting. It might also be pointed out that the time given by the quoted report of the Field Artillery Board is the lowest shown by six batteries, and that at the time the tests were conducted

those batteries were, for reasons unnecessary to state here, probably above the average of our batteries. The time obtained for our batteries therefore, probably very nearly represents the *capacity* of our matériel. On the other hand, we are taking the greatest time in the fire of three French batteries, and since these batteries were probably not much above the French average, it is probable that the time was farther from realizing the capacity of the matériel than was so in our tests.

In any case, we have for our battery the *smallest* time as 7 shots per gun in 1½ minutes; a rate of 4 2/3 shots per minute. For the French battery we have 8 shots per gun in 50 seconds; a rate of 9 3/5 shots per minute. It will be noted that the French rate of fire is slightly greater than double that of our gun. It should be pointed out that an exact comparison of volley fire and volley fire sweeping would show perhaps even a greater difference. As indicating the capacity of the French gun in this respect, it may be said that the interval between the successive rounds in volley fire or volley fire sweeping usually varies between 3 and 5 seconds. Be it understood that the statement just made does not refer to a single piece but to a battery. For example, if the French command correspond to our "Volley Fire—Two Rounds," the eight shots required will be fired in a time varrying between 3 and 5 seconds from first shot to last shot. We may thus establish a rate of fire for the French, in fire for effect, ranging from 12 to 20 aimed shots per minute; an average rate of some 16 aimed shots per gun per minute.

Measures for Increasing the Rapidity of Our Fire.

At another time the writer hopes to give reasons for believing that rapidity of fire can not be too great. For the purpose at hand it would seem unnecessary to give those reasons, for we must all agree that our present rate of fire is not sufficient. Considering, then, only our present matériel, or with slight modifications, let us sum up, in outline, the measures necessary to put our gun in the same class, as regards rapidity, with the French gun. We will follow the same subdivision hitherto used.

(*a*) System:—We should thoroughly go over our mechanism of commands. Introducing in some cases a more logical sequence; suppressing unnecessary words, etc. Finally we should change

some of our methods, not only with a view to rapidity but, in some cases, for the sake of accuracy.

(*b*) Training:—We should abandon certain ideas of trying to train all men for all posts and tend more towards specializing. It is *essential* that we have more ammunition for target practice. The efforts in this direction should receive sympathy and encouragement, not to say assistance, from all officers of whatever branch. Finally our gunner's examination should be so arranged as to permit the man examined to do exactly what he would do, and at the *exact instant*, were he in action.

(*c*) Matériel:—Our fuze setter is hopelessly inadequate and should be replaced by a more efficient design.

Given an efficient fuze setter, it is believed that by adding another man to our gun squad we can attain the same rate of fire as the French.

Conclusions—Notes on the Characteristics of the Field Gun of the Near Future.

If, in the above, the writer has dwelt especially on what he believed to be defects in our methods or matériel, it must not be thought that he belongs to that class who see nothing good in our own institutions and who go mad with delight over everything foreign. But pointing out shortcomings, at least those which may be corrected, serves in general a more useful purpose than that praise which tends to cause us to think that we have reached the acme of perfection. His reason, then, for pointing out what he considered our defects is simply his belief that these defects may be corrected—and easily corrected, too.

In so far as concerns matériel it is again pointed out, and it should always be remembered, that our Ordnance Department has had to meet conditions unknown in Western Europe. That the Ordnance Department has or has not successfully met those conditions is a matter of opinion. The writer's own opinion is that, given the efficient fuze setter which no doubt the Department can and will produce, it only rests with our Field Artillery to make itself capable of coping with any existing matériel on those terrains on which they are likely to meet. Notwithstanding this satisfaction with existing conditions, it is believed that the time has now come when a great change in field artillery matériel can be foreseen.

On account of the enormous stores of war matériel on hand in all the great European powers, it is probable that those powers will be slow to change their existing armaments. Inasmuch, however, as we yet have much field artillery matériel to procure, there is no reason for our waiting to follow the lead of France or Gernmany in such change of design as may be found desirable. It will be remembered that all existing matériel results from theoretical studies, principally by the French, and that a revolution rather than a change was brought about by these studies. A revolution, however, never immediately brings about a finished institution. The product of a revolution needs to be put into every day life, requires much polishing, must needs have many corners smoothed, and undergoes many changes, suffering numerous additions and subtractions before it reaches that finished state which approaches an ideal and best enables it to fulfill that purpose for which it was created. We have now the advantage of studies made during more than ten years actual use of the new matériel. Methods applicable to that matériel have, to a certain extent, been used in the greatest of modern wars. The artillery of every country has followed and fixed upon methods which are very similar, and the field artillery tactics of the future are well outlined. Notwithstanding that it is true that the personnel is not yet fully abreast of its matériel, it is none the less true that the matériel is not capable of permitting the fullest development of the now firmly fixed methods and tactical ideas.

At another time the writer hopes to present these methods and tactical views, and to attempt to logically deduce therefrom the outlines of a matériel best suited to the artillery tasks involved. Nevertheless, the subject appears to be connected with this paper, and the following is therefore offered as indicating lines which we could now begin to follow advantageously:

(1) The adoption for each battery of an observation ladder having the following characteristics: Capable of being extended to give a maximum height of not less than 40 feet; the ladder to be so arranged as to be run up quickly and so as to be able to utilize any height from minimum to maximum extension; the observer to be protected by a shield and to have the necessary facilities for using his instruments without constraint. Obtaining this ladder is of such importance that we can well afford to replace a caisson (body) by it.

(2) Development of a fuze setter of such capacity as to be able to utilize the greatest rapidity of fire of which the gun itself is capable.

(3) Greatly increasing the amount of traverse on the carriage while preserving or increasing, the stability now possessed by the French gun carriage.

(4) Increasing the rapidity of fire. To do this it would seem that either the "independent line of sight" must be adopted or else an automatic breech machanism must be sought.

(5) Development of a fuze which will give the maximum possible effect in the employment of the high explosive shrapnel. Such a fuze would permit the ordinary use as shrapnel, the use of the projectile as a high explosive shell bursting on time, and the ordinary use of the projectile on impact. Should such a fuze be impossible, or even should it be possible, we should reopen the study of the high explosive shell. It goes without saying that we should always continue to strive to increase the accuracy of the time fuze.

(6) The sight and other apparatus for laying should undergo very considerable alterations. It seems impossible to specify in a suitable way these alterations without some discussion. I therefore depart from the rule followed up to the present and will introduce a brief discussion. The panoramic sight and other devices for laying are theoretically perfect, or nearly so. Nevertheless, the apparatus we use does not lend itself to the most practical methods in the conduct of fire under battle conditions. In determining upon the starting point in the search for the most suitable apparatus we have only to recall a simple fact whose truth can not be questioned. The field of battle is not a suitable place for making mathematical computations or for converting elementary impressions into scientific expressions. In order to comply, so far as possible, with this elementary truth, we may say that suitable apparatus would fulfill the following conditions:

(*a*) The captain should not have to retain data in his mind and should be able to convert his impressions into commands by a kind of reflex action rather than by a mental effort of transforming what he sees into mathematical formulae.

(*b*) The personnel charged with the execution of the captain's commands should not be required to make a calculation of any kind, but all calculations should be made mechanically and, as far as possible, automatically.

Taking up conditions (*a*) above stated, let us suppose that a captain is adjusting his fire by battery salvos. Under that supposition, we will examine the captain's impressions resulting from his obsrvations of fire, and seek the simplest possible means by which he may, *by reflex action*, correct the data for a succeeding salvo. The fall of the shots of a salvo, together with the target present, to use a French expression, a picture to the eye of the captain. Assuming errors in all the elements of the data, this "picture" conveys certain impressions to the brain, as follows:

The fall of the shot of the directing (right) gun is to the right or left of its portion of the target; the front covered by the four points of burst is greater or less than the front of the target; the points of burst are too high or too low; the range is too long or too short.

Perhaps the easiest way to decide upon the simplest method for converting for foregoing impressions into commands is to assume a concrete case and then ask ourselves what we want to do. We will suppose, then, that the captain has the following impressions: The first shot is to the right of the target—the front covered is less than that of the target—the bursts are too high—the sense of the salvo is short. It is evident that the captain wishes to do four things: (1) Shift the sheaf to the left; (2) open the sheaf; (3) lower the corrector; (4) try a longer range.

We thus have our commands ready made, for example—Left by (say) 40—open by (say) 5—lower by (say) 3—longer by (say) 400. It may be objected that the commands just indicated do not follow the stated condition to a logical conclusion and that logically the captain should, if there be any merit in the arguments, transmit only his impressions to the guns. We would agree with this view except for the fact that it would present certain difficulties which are avoided by the proposed method.

Continuing the ideas expressed in the typical commands we have given with the condition stated as affecting the personnel at the guns, we readily see the principle of the apparatus we have in mind. The principle is very simple, and only requires that each part carrying an index be provided with a scale so as to permit mechanically performing the mathematical operations indicated in the commands. It can readily be seen that no important difficulty in arranging this is to be found unless it be in the case of the sight. With the sight

arrangement must be made not only to add or subtract a certain number to the readings of all the sights, but, in addition, we would require that the gunner be able to mechanically add or subtract the deflection difference; that is to say, a number multiplied for each gun by the number of platoon fronts which separates it from the right piece. It is desirable that this power of arithmetically increasing or decreasing by mechanical means, be applied to all the apparatus, but in the case of the sight it is, as we have noticed, indispensable.

Needless to say that the auxiliary scales we have suggested should be marked in accordance with the suggested commands rather than according to the mathematical operations to be performed.

In connection with the question of instruments, it should be pointed out that it is desirable to have a greater distance between graduations than now exist. Naturally this means increasing the size of the limb of the instrument, which is not, in all cases, practicable. It is believed, however, that in some cases the limbs and micrometer heads are unnecessarily small. A large limb or micrometer head permits coarser graduations and, in practice, tends to lessen errors.

The foregoing outline only includes, with the exception of the question of fuzes, things which are now either accomplished facts in one form or another, or else are so easy of accomplishment as to present no difficulties whatever. It is believed that our Ordnance Department can not only meet the requirements given in outline, but can also meet certain other requirements of an ideal system. Such an ideal system would not absolutely eliminate errors, for the personal element always remains, but it would enormously decrease the mistakes, and the increase in the effect of our fire would be in proportion.

It is all very well to say that a captain must be able to remember a dozen figures and be able to make any kind of computation; that the chiefs of platoon and of sections, and the gunners must be able to add, subtract, etc., instantly and without making mistakes. All this sounds well, but we all know that captains do, in peace practice, forget their last data, and that some of us do make errors in computations. We also know that the mathematical computations made by chiefs of platoons, etc., are not always exact. Moreover, we know that all these things consume *time*.

PSYCHOLOGY OF THE BATTLEFIELD.*

BY LIEUTENANT ROBERT M. DANFORD, 5TH FIELD ARTILLERY.

The moral forces in war have been recognized by all the great soldiers of history.

Napoleon said that "the moral forces in war are to the physical, as three is to one," and Scharnhorst deplored the fact that the psychological phenomena of battle was so little studied. He recognized the powerful part it plays, and considered that his officers should more thoroughly understand it.

What are and whence cometh the mysterious forces which sometimes drive men forward in a hail of bullets to certain death, and then at other times drive them in panic from a field on which little or no danger exists? That these forces arise in, or are suggested to, and act through the mind, we know. When a man is panic stricken we say that he has lost his presence of mind. What does that really mean; what is the actual condition of the man's mind, and does the study of psychology explain it, or help us to understand or control it? It at least gives us theories if no positive facts.

Psychology, or the science of the human mind, is one of the most interesting and also one of the most mysterious sciences of the day. It is said to have originated before the time of Aristotle, by whom it was expanded and improved. However, it is only recently that it has taken the position of a universally recognized science. At the present time it is demanding unusual attention and consideration, due, no doubt, to the fact that there have recently sprung into existence at least six different schools of mental healing, all successful to certain degrees, and whose success seems to depend upon the scientific application of the laws of psychology. These laws, however, are still vague and in great dispute. Their study has been pursued by means of extensive observations upon persons in abnormal mental states, upon persons having some mental peculiarity, upon the development of the minds of children, upon the languages, institutions, mythology, and arts of different races, and by means of the comparative study of biography.

The law of central forces and the theory of the equilibrium of the

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* Written under the direction of Colonel (now Brigadier General) Eli D. Hoyle, 6th Field Artillery, for the Garrison School.

solar system, depends upon the basic hypothesis of the Newtonian theory of gravitation. The science of chemistry is built upon the hypothetical theory of the existence of the atom. Likewise in psychology we find a basic theory and this theory advanced by some psychologists is that the human mind is dual in its character. Each individual is thought to possess two separate and distinct minds, each endowed with separate and distinct characteristics and functions. For convenience, these have been termed the objective mind and the subjective mind. The objective mind is the thinking, acting, feeling, willing, controlling, reasoning mind. The subjective mind is the one which is constantly amenable to control by suggestion. It is capable of deductive reasoning but is incapable of inductive reasoning. In general terms the difference between the two minds has been described as follows:

> The subjective mind takes cognizance of its environment by means absolutely independent of the physical senses. It receives by intuition. It is the seat of the emotions and is the storehouse of memory. It performs its highest functions when the objective senses are in abeyance. In a word it is that intelligence which makes itself manifest in a hyponotic subject when he is in a state of somnambulism.

Some authorities think that the subjective mind is the soul of man. One of the most interesting experiments illustrating the action of the subjective mind is related by Professor Carpenter, of Boston, who placed a young gentleman in a hypnotic state at a private gathering in the city of Washington. It is described in the following paragraph:

> "The company was composed of highly cultivated ladies and gentlemen of all shades of religious belief; and the young man himself, who will be designated as C, was a cultured gentleman, possessed a decided taste for philosophical studies, and was a graduate of a leading college. In his normal condition he was liberal in his views on religious subjects, and, though always unprejudiced and open to conviction, was a decided unbeliever in modern spiritism. Knowing his love of the classics and his familiarity with the works of the Greek philosophers, the professor asked him how he should like to have a personal interview with Socrates. 'I should esteem it a great privilege, if Socrates were alive,' answered C. 'It is true that Socrates is dead,' replied the professor; 'but I can invoke his spirit and introduce him to you. There he stands now.' exclaimed the professor, pointing towards the corner of the room. C looked in the direction indicated, and at once arose, with a look of the most reverential awe depicted on his countenance. The professor went through the ceremonial of a formal presentation, and C almost speechless with embarrassment, bowed with the

most profound reverence, and offered the supposed spirit a chair. Upon being assured by the professor that Socrates was willing and anxious to answer any question that might be put to him, C at once began a series of questions, hesitatingly and with evident embarrassment at first; but, gathering courage as he proceeded, he catechised the Greek philosopher for over two hours, interpreting the answers to the professor as he received them. His questions embraced the whole cosmogony of the universe and a wide range of spiritual philosophy. They were remarkable for their pertinency, and the answers were no less remarkable for their clear-cut and sententious character, and were couched in the most elegant and lofty diction, such as Socrates himself might be supposed to employ. But the most remarkable of all was the wonderful system of spiritual philosophy evolved. It was so clear, so plausible, and so perfectly consistent with itself and the known laws of nature that the company sat spell-bound through it all, each one almost persuaded for the time being, that he was listening to a voice from the other world.

"The conclusive answer to this proposition is that: C was in the subjective state. He had been told that he was talking face to face with a disembodied spirit of superior intelligence. He believed the statement implicitly, in obedience to the law of suggestion. He saw, or thought he saw, a disembodied spirit. The inference for him was irresistible that this was a demonstration of the truth of spiritism; that being assumed, the rest followed as a natural inference. He was, then, simply reasoning deductively from an assumed major premise, thrust upon him as it were, by the irresistible force of a positive suggestion."

It is for this very reason, some psychologists say, that the spiritualist medium believes thoroughly that she is in converse with a disembodied spirit. It is well known to hypnotists that when an idea is suggested to a subject, no matter of how trival a character, he will persist in following that idea to its ultimate conclusion, or until the operator releases him from the impression.

This brings us to another attribute of the subjective mind claimed for it by psychologists, that of memory. It would perhaps be hazardous to say that the memory of the subjective mind is perfect, but there is good ground for believing that such a proposition would be substantially true. It is believed that this has been proven beyond the shadow of a doubt in the observation of insane persons, and persons delirious in sickness. The power of the world's greatest minds seems to lie in the ability of the person's objective mind to completely master and control its subjective mind, so that the latter with all its emotions, and with all its wealth of memory can be used whenever the objective mind so wills. As an illustration,

"It is related of Clay that on one occasion he was unexpectedly called upon to answer an opponent who had addressed the Senate on a question

in which Clay was deeply interested. The latter felt too ill to reply at length. It seemed imperative, however, that he should say something; and he exacted a promise from a friend, who sat behind him, that he would stop him at the end of ten minutes. Accordingly, at the expiration of the prescribed time the friend gently pulled the skirts of Mr. Clay's coat. No attention was paid to the hint, and after a brief time it was repeated a little more emphatically. Still Clay paid no attention, and it was again repeated. Then a pin was brought into requisition; but Clay was by this time thoroughly aroused, and was pouring forth a torrent of eloquence. The pin was inserted deeper and deeper into the orator's leg without eliciting any response, until his friend gave it up in despair. Finally, Mr. Clay happened to glance at the clock, and saw that he had been speaking for two hours; whereupon he fell back into his friend's arms completely overcome by exhaustion, unbraiding his friend severely for not stopping him at the time prescribed. The fact that Mr. Clay on that occasion made one of the ablest speeches of his life, two hours in length, at a time when he felt almost too ill to rise to his feet, and that his body at the time was in a condition of perfect anesthesia, is a splendid illustration of the synchronous action of the two minds, and also of the perfect control exercised by the subjective mind over the function and sensations of the body."

There is perhaps no better description on record of the sensations of a speaker, when the synchronous action of the two minds is perfect, than that given by Daniel Webster. A friend had asked him how it happened that he was able, without preparation, to make such a magnificent effort when he replied to Hayne. The reply was substantially as follows;

"In the first place, I have made the Constitution of the United States the study of my life; and on that occasion it seemed to me that all that I had ever heard or read on the subject under discussion was passing like a panorama before me arranged in perfectly logical order and sequence, and that all I had to do was to cull a thunderbolt and hurl it at him."

Another theory of psychology deserving of consideration in connection with this subject is that the subjective mind of one individual is capable of thought transference with the subjective mind of another, and that this power is most potent when the objective mind is in abeyance. This power is called mental telepathy, and to a limited extent it is recognized by all persons, for almost everyone has experienced the surprise of discovering that he was thinking of the same thing as another person present. Psychologists declare this power to be almost unlimited. They declare that it, together with the perfect memory of the subjective mind, is the source of the so-called supernatural powers of the clairvoyant and trance medium fortune tellers. The medium tells you something you declare that

you alone knew. She has read your subjective mind. This is a very interesting and mysterious subject, and psychologists have gone deeply into it, but without any absolute and certain results, further than the fact that the theory seems correct.

There is still another faculty of the subjective mind which deserves our notice in connection with this subject. It is the seat of the three so-called animal instincts. These are the instincts of self-preservation, reproduction, and the protection of offspring. The most active and powerful one of the three is that of self-preservation. This seems to be present both in the subjective as well as the objective mind, and it is declared that the former is often active to a strangely remarkable degree in averting the individual from impending danger. Very frequently this activity is displayed in the form of premonitions. Professor Hudson says of them: "It is true that the subjective mind is often able to impress strongly the objective mind, especially when danger to the person is imminent, or when some near relative or dear friend is in danger. Such impressions are known as premonitions."

The above theories are only a few of the many embodied in the very interesting and mysterious subject of psychology, and I have mentioned these because they seem to explain some of the strange moral phenomena on the field of battle. It seems that, in the face of great danger, fear has an effect akin to that of hypnotism on one's mind. Unless this effect is neutralized by the action of a strong objective intelligence, the strange law of suggestion will control the actions of the individual. In other words, when the objective mind in placed in abeyance through any means, as by hypnotism, intoxication, or fear, the intelligence which then controls the individual is amenable to suggestion. Upon the field of battle the officer is almost always the source of this suggestion. For this very reason Capt. L. Z. Soloviev, in his "Actual Experiences in War," declares war to be a battle of company commanders. I quote him as follows:

> The worse the conditions of the fight, the fiercer the combat, the greater the losses, fatigue, tension, the strain upon nerves, the greater grows the importance of the officer and the result obtained by 150 to 200 men in battle depends upon the company commander. The present war may be called a war of company commanders. Each eye-witness of battle may confirm how continuously, how narrowly, the men watch their officer. These scores of lives depend upon his activity, his energy, and his personal courage. The soldiers

judge by their officer, the condition of affairs, the greater or lesser danger, the success or failure.

It is perhaps hard to analyze the average mind when its functions are influenced by imminent danger or death. It seems, however, that in the extreme case, the active or objective mind is placed in complete abeyance, or paralyzed as it were, and that the instinct of self-preservation then completely controls the actions of the individual. Recall as an illustration, the Iroquois Theater disaster in Chicago. It seems that when there rang through the crowded building the cry of "fire," this horribly emphasized by the flames suddenly bursting from the stage, the power of reason was completely lost by all, and each individual was actuated only by the effort to save himself in the mad panic which followed. Numbers of people jumped from the galleries upon the mass of struggling humanity below, this in several cases resulting in death, and showing beyond doubt that these people at least were bereft of reason. The exits from the theatre were soon effectively barred by men, women, and children, trampled to death. It seems probable that had one person in that audience possessed the power of mind to remain uninfluenced by fear, and had he, in a loud commanding voice, ordered the people to remain seated and then to withdraw in order from the burning building, scores of persons in their delirium of fear would have accepted the suggestion, or would have been recalled to their senses, and many, many lives would have been saved.

On the field of battle the psychological phemenon is the same. There it is the officer's business to so control the men that he can in reality command their reason. Captain Soloviev again states as follows:

"We had occasion to note how a resolute, imperious, commanding shout acted in a marvelously quieting way upon the men. 'Why are the sights not set in that squad? Squad commander, what are you thinking about? Examine and correct immediately.' This means that there is nothing unusual, that everything is going as it ought, and that there is no cause for fear. The men grow calmer and forget that the bullets are whistling around them. They endeavor to set the sights correctly, to take a better position for firing, and begin to aim."

It seems to be the verdict of those who have had experience, that the most harrowing, the most nerve-racking trial possible on the field of battle is that of remaining inactive in danger, or under fire. This is entirely in accord with the psychological theory involved, for

under those conditions, fear has nothing to interfere with its action in producing its hypnotizing effect upon the mind of the soldier. He thinks only of himself and his safety, of his friends and loved ones at home, possibly of his wife and children and their destitution in case of his death, of the horrible nature of the wounds he has seen or heard described, of the physical pain, anguish, and possible death that they entail, and the more he thinks of these gruesome possibilities, the more unnerved he becomes, the more certain he feels that the next bullet will hit him. But once he begins to act himself, the tendency is to recall the reasoning mind to its function, and thus drive away and forget the suggestion of fear. It is most important for an officer to realize this point, and to use every effort possible to keep the minds of the men actively employed whenever it is necessary for them to be placed in such a trying position, not only for the sake of the men, but for the maintenance of control of himself as well.

It is reported that in our late war, in the trenches around Manila, it was found well-nigh impossible to prevent the men from engaging in furious fusilades at odd hours during the nights. The lonely sentinel on the outpost becomes, in his inactivity, a prey to his own mind. His imagination increases with his terror until he sees a foe lurking in every shadow, and hears one in every breath of air that stirs. Finally, when he can bear the strain no longer, he fires, impelled doubtless by the instinct of self-preservation. Other sentinels, in the same frame of mind as he, take the shot as a positive suggestion that their imagined foes are real, and the fusilade proceeds along the entire line. Russia and Japan, in their late war, soon learned that it was not advisable to post sentinels alone. This was frequently done in the early part of the war with the result that the continuous false alarms given by the outposts, kept the troops in a state of unrest and nervous exhaustion. As soon as they began posting three or four men together these alarms ceased, and the information gained by the outposts was of a more reliable character. There is always a sense of security when two or more men are in company on such dangerous duty, and this doubtless contributes its influence toward retaining to the mind its reasoning faculties.

Although activity contributes its part, and that a very strong part, by which the soldier on the field of battle maintains his reasoning faculties, it is by no means a positive assurance that the man's mind

is in its normal state. Many instances of battle show that some men fight as in a trance. Very frequently they are seen loading and firing into the air. Just now, and for this reason, the Infantry is contemplating a mechanical device, which, when fitted to the rifle will prevent its discharge except when its elevation is such that the bullet will strike in the zone occupied by the enemy. It is often told of how muskets gathered from the field of Gettysburg contained as high as 26 charges. It requires no further proof to convince one that the man who was loading and pulling the trigger was bereft of reason, or, as psychologists would say, he was fighting while in the subjective state, and his actions were controlled by the law of suggestion.

As has been stated, one of the properties of the subjective mind is that of memory. There are several different kinds of memory, but the kind that interests us in connection with this subject, is that which is termed motor memory. Without it we would forget how to walk. With it, walking has become to us an operation which requires no conscious mental effort; it has become an instinct. This is the memory which enables the musician to become so expert on the piano as to be able to perform while thinking of something entirely different, or in some cases, while actually sleeping. This is the memory which unconsciously comes to our aid on the field of battle, and drill, drill, drill, in time of peace is the agent by which this memory is stocked or trained, and rendered valuable on the battlefield. Our men should be so carefully and constantly drilled that, with their faculty of motor memory, the drill becomes instinct, or as we say, second nature to them. Whether true or not, the old story of how the practical joker shouted "Attention" to the old soldier as he was crossing the stream, thereby causing him to assume a rigid position and drop his dinner pail into the water, illustrates the point exactly. Frederick the Great said:

> Military education and training induce certain habits and customs, which, in course of time become crystallized into instinct, and we must not overlook the fact that men in the stress of battle act by habit and instinct, for they are too perturbed by the terrible sights around them to be capable of calm reflection or deliberate calculation.

Referring again to the assertion by psychologists, that man in the subjective mental state is often in a condition of complete anaesthesia, we find many curious instances in battle to show that this is true. A captain in the 102d Illinois regiment, in the battle of Resaca,

Ga., was shot above the left ear, the bullet cutting to the skull, and making a gash some three or four inches in length. The officer did not know that he was hit until after the battle, when, on removing his cap, the blood streamed down the side of his face. Another man in the same battle was struck in the abdomen. The bullet tore an ugly looking hole in his clothing, and the man sank to the ground with the words, "Boys, I'm killed." When carried to the rear and examined it was found that he had evidently been struck by a spent ball, and that its force had just been sufficient to penetrate the clothing. It is said that it is extremely dangerous for a hypnotist to place a subject in the hypnotic state, then to strike him gently and tell him that the blow has killed him. The above case seems to be analogous to this. The soldier was really in a hypnotic state. He was conscious that a bullet had struck him. He knew the deadly effect of bullets. The result was a positive suggestion to him that he was killed.

In his "Recollections of a Private Soldier," Mr. Frank Wilkeson, under the chapter, "How Men Die in Battle," says:

> At the Wilderness, just before Longstreet's soldiers made their first charge on the Second Corps, I heard the peculiar cry a stricken man utters as a bullet tears through his flesh. I turned my head, as I loaded my rifle, to see who was hit. I saw a bearded Irishman pull up his shirt. He had been wounded in the left side just below the floating ribs. His face was gray with fear. The wound looked as though it were mortal. He looked at it for an instant, then poked it gently with his index finger. He flushed redly, and then smiled with satisfaction. He tucked his shirt into his trousers, and was fighting in the ranks again before I had capped my rifle. The ball had cut a groove in his skin only. The play of this Irishman's face was so expressive, his emotions changed so quickly, that I could not keep from laughing. Near Spottsylvania I saw, as my battery was moving into action, a group of wounded men lying in the shade cast by some large oak trees. All of these men's faces were gray. They silently looked at us as we marched past them. One wounded man, a blond giant of about forty years, was smoking a short briar-wood pipe. He had a firm grip on the pipe stem. I asked him what he was doing. 'Having my last smoke, young fellow,' he replied. His dauntless blue eyes met mine, and he bravely tried to smile. I saw that he was dying fast. At the North Anna River, my battery being in action, an infantry soldier, one of our supports, who was lying face downward close behind the gun I served, and in a place where he thought he was safe, was struck on the thighs by a large jagged piece of shell. The wound made by this fragment of iron was as horrible as any I saw in the army. The flesh of both thighs was torn off, exposing the bones. The soldier bled to death in a few minutes, and before he died he conjured his Northern home, and murmured of his wife and children. Wounded

soldiers almost always tore their clothing away from their wounds, so as to see them and to judge of their character. Many of them would smile and their faces would brighten as they realized that they were not hard hit, and that they could go home for a few months. Others would give a quick glance at their wounds and then shrink back as from a blow, and turn pale, as they realized the truth that they were mortally wounded. The enlisted men were exceedingly accurate judges of the probable result which would ensue from any wound they saw. They had seen hundreds of soldiers wounded, and they had noticed that certain wounds always resulted fatally. They knew when they were fatally wounded, and after the shock of discovery had passed, they generally braced themselves and died in a manly manner. It was seldom that an American or Irish volunteer flunked in the presence of death."

Clausewitz considered courage to be of two kinds, 1st, that resulting from temperment, contempt of death, or habit; 2nd, that resulting from pride, patriotism, or enthusiasm. The latter condition is not so much a normal condition as an impulse, and consequently is not so reliable as the former. The two combined make the most perfect kind of courage. Taking this view, it would seem that the former (that resulting from temperment, contempt of death, or habit) is innate, while the latter (that resulting from pride, patroitism, or enthusiasm) must be acquired. In this connection it is interesting to note that General Rogniat says:

"If men are to be brave, you must make them so; because courage is not innate in us, it is an artificial and not a natural quality. We are all born timid; it is so ordained by Nature, who, in the interest of their own preservation, inspires all living things with a feeling of fear that induces them to avoid what may injure them; courage is the quality that enables us to overcome and conquer this feeling."

Against this, however, General de Marbot says:

"This is not true, courage is innate and fear artificial. Man likes to destroy everything that may injure him; that is the true law of Nature."

Napoleon also says:

"Courage is an innate quality, one cannot acquire it," and then he adds, "when one has no fear of death, he causes this fear to enter the enemy's ranks."

Lord Wolseley regarded courage as the mental correlative and equivalent of perfect physical health. He stated that his experience had taught him that high courage was generally accompanied by bodily soundness. Disease, impaired health, pain, fatigue, or hunger have a very depressing effect on men's nerves. Napoleon has many

times referred to that "rare two o'clock in the morning courage." A warm pleasant day, an eloquent orator, a brass band, a crowd of admiring women, and a battle cry like that of "*Remember the Maine*," will inspire the whole male population to enlist for the war. But this is not courage; it is enthusiasm, and it is conspicuous by its absence, when, a few months later these men lie in the trenches, tired and hungry, perhaps soaked to the skin in a cold beating rain, and await the attack at daylight, sullenly conjecturing the dire possibilities which the battle of the morrow may have in store for them. It is then that their courage or their lack of it becomes apparent. Although enthusiasm is not courage, it is a powerful ally. Enthusiasm will conquer cities if it can be sufficiently aroused at the psychological moment. It will lift up the weak and carry them through, and it will support and encourage the strong. We can hardly imagine a charge upon a defensive position in which the men make the final assault without cheering. In their drills, they should be, and are taught that this is proper, for in action this cheer or yell plays a far more important role than the casual thought would give it. It is double and tremendous in its moral effect. It is the death knell to the defenders, a signal that their defense has been unsuccessful, that defeat is at hand, and that flight is perhaps justifiable. To the assaulting troops it is a cheer of encouragement and comradeship, a yell of triumph, a signal of victory. Many are the times that the Indian war whoop has struck terror to the hearts of the bravest pioneers, while the Confederate yell and the Yankee cheer have played their powerful and important roles in many a bloody conflict.

Enthusiasm may be inspired by appealing to love of country or race, to esprit, to love of glory or power, to religion, or to hatred or revenge. The two latter are generally the ruling passion of the mob. It is a well-known fact that a mob seems to generate a psychic force which can neither be seen nor heard, but which can be very strongly felt. At the psychological moment the dominant instinct is unloosed by the action, probably, of some individual, who assumes the role of leader, and the whole mob, in blind enthusiasm, follows where he leads. It is interesting in this regard to note the remarks of Col. Maude relative to battle. He states:

"When the advance line takes contact, their men being still fresh and well in hand, education and reason can still play their parts; the troops may be expected to endeavor to judge distance, adjust their sights, and make

intelligent use of cover. But as the day wears on officers have to begin to reckon with the result of fatigue in some, excess of excitement in others, and of intense absorption amounting almost to hypnotization evenly distributed throughout all. Gradually the action of the reasoning faculties ceases, and instinct, or those habits which are born in a man and by training acquire even greater strength than mere instinct, will assert themselves, and then it rests with the officers whether at a given moment the whole command degenerates into an ordinary mob, or remains amenable to some measure of control. By the time the final climax approaches, the men are a mob, nothing else. Then the art of the leader consists in conferring upon that mob, by his superior will power, and knowledge of how to exercise it, the required implse to ensure action in a forward direction. This was essentially the point in which Napoleon excelled. He knew the exact position to assume, the precise phrases to use with which to touch the bed-rock instinct of the men, and though under the circumstances probably not fifty men actually could have heard his voice, the thought, the supreme will power which formed the magic phrase, vibrated through the whole mass, often many thousand strong, and launched them on the path of victory.

"A crowd thus set in motion can only be destroyed, but never stopped except by the physical obstacle of their own dead. Men no longer wait to count their losses, or pick up their friends; nine-tenths of them are quite unconscious of their own bodies, which are borne forward by a species of exaltation of the soul which renders their owners insensible to all ideas of personal risks.

"Thus there are three separate and successive stages in a battle for which our training has to provide. In the first, as already said, the chief demand is made upon the intellect; in the second, on the instinct of duty; and, in the third, on that function of the mind which is most susceptible to hypnotic suggestion."

In this connection Capt. Soloviev states:

"The fiercer the hostile fire and the nearer the enemy, the more difficult it is to control the fire, especially in defensive action. The men grow more anxious, the tension of their nerves more intense, and the danger seems to grow nearer and greater with the approach of the enemy. It is most important at that moment to keep the fire discipline well in hand, and to observe narrowly and see that the firing shall not be transformed into aimless rattling of rifles, which betrays the fact that control has been lost over the company, for in such moments it is impossible to vouch for what the company is going to do. It is on this account that it is so difficult to keep fire discipline well in hand during a battle, and to maintain a reasonable and well-sustained fire. Only by excellent training during peace time and with such discipline that not a single man shall fire until the order has been given, and that the command and whistle shall immediately make them cease firing, can order be maintained, and effective fire be delivered."

The personality and reputation of the leader is a powerful factor of defeat or success. Napoleon's appearance on the field of battle

always provoked amongst his men the wildest enthusiasm, and as before stated, he seemed to know and understand how to ride to victory on this whirlwind of their passions and enthusiasm. In all his addresses to his men, he bribed them with glory and love of France. His soldiers came to regard him as invincible, and his enemies came to regard him as unconquerable. One of them once said, "I regard the Emperor Napoleon as the equivalent of at least 40,000 men." His succession of victories constantly tore down the morale of his enemies and as constantly built up that of his own men. It was an exemplification of the old maxim. "Nothing succeeds like success." Turning to the Russians in Manchuria we might add the converse, Nothing defeats like defeat. The Russian rank and file became, we might say, saturated with the idea of inevitable defeat; they came to feel that no matter what the outcome of any particular battle or skirmish might be, the ominous order to retreat would never fail to come.

It is hard for human nature to play a losing game. Some men, it is true, are at their best in adversity, some soldiers, as Murat, are best in a losing battle, but these men are very rare. The idea of defeat depresses the loser and blunts his ability, while the idea of victory encourages the winner and stimulates him to still greater activity and effort. Witness the moral element in the base ball and foot ball game to see that this is true.

Again, the idea of luck, whether real or imagined, has a tremendous moral effect. Napoleon was a great believer in luck. He felt that during his most brilliant career he was lucky, and he asserts that he played his luck to the limit. One's feeling of luck inspires confidence, leads to greater risks, which in turn leads to greater or more brilliant victories, in battle no less the same as in cards. Frederick the Great was also a strong believer in the Fortune of War. On one occasion a distinguished general solicited employment, and spoke at great length to impress the king regarding his experiences and high qualifications. When he had done Frederick made but one remark, "Are you a lucky man?" Luck, however, is always liable to change, as it did in Napoleon's case.

The greatest and most successful soldiers in history have been those who, by their personality and strength of character have won from their men confidence, love, admiration and respect. Frederick is the most prominent example of a leader who was successful without possessing the love or devotion of his men. His was a discipline

of fear, and it is related that his soldiers were valorous because they feared Frederick more than they feared the enemy. Caesar, Hannibal, Napoleon, Cromwell, Alexander, and Washington were loved by their men. An incident which inspired admiration and devotion in the hearts of his men is related of Alexander as follows:

"On one occasion the Macedonians were perishing for want of water. A small quantity was brought to Alexander in a helmet, but he would not drink, because the young general instinctively knew the power of moral effect in war. He felt that he was called upon to set the whole army an example of self-restraint and patient endurance of the peculiar suffering that was afflicting the troops."

Colonel Maude declares that:

"The art of command depends not so much on the knowledge of technical instruction as it does upon the knowledge of human nature. To be a leader of men, an officer must be a successful student of human nature. Some years ago in Lucknow there was a very bad outbreak of cholera in a certain Infantry regiment, and something amounting to panic set in. The officers who were away were all recalled from leave, and amongst them was the senior major, who possessed, in a very high degree, the art of inspiring devotion in his men. As his carriage passed the guard-house at the barracks, the sergeant of the guard caught sight of him, and, as he dismissed the men, he said to them, 'Ulloa; old Jim's back—now, you mark my words, there won't be another case in the barracks this time.' And there was not. The news of his coming went round in a flash, despondency disappeared, and even the sick recovered."

To inspire one's men with confidence, is a gift of the most inestimable value to an officer. If men feel that they can rely on the ability and judgment of their commander, they will follow wherever he leads. "Stonewall Jackson's troops were unconquerable," says Lord Wolseley, "because they had unbounded confidence in their God-fearing leader, who in his turn trusted them most fully, and believed they could accomplish anything."

It is said that orders and counter orders, marches and counter marches are sure to disorganize the best disciplined army in the world. They betray a vacillating, wavering, uncertain mind, a lack of judgment, and quickly cause men to lose confidence. A man of a nervous, irritable, or excitable disposition, cannot inspire the same confidence in men as can one who is possessed of a cool, calm, and quiet temperment. It behooves officers to recognize this most important point and try to school themselves against losing their self-possession through irritability or excitability.

The cool, light-hearted temperment of Hannibal is described by Plutarch in his life of Fabius, as follows:

"Before the great battle of Cannae, Hannibal rode up to a hill, to take a view of the enemy, then drawn up for battle. One Gisco, a man of his own rank, happening to say, "The numbers of the enemy appear to me to be surprising." Hannibal replied with serious countenance, "There is another thing which has escaped your observation, much more surprising than that," and, upon his asking what it was: "It is," said Hannibal, "that among such numbers, not one of them is named Gisco." The whole company was diverted with the humor of this remark, and as they returned to camp, they told the jest to those they met, so that the laugh became universal. At sight of this, the soldiers took courage, thinking it must proceed from the great contempt in which their general held the Romans, that he could jest and laugh in the face of danger."

It should not be left unsaid that religion has its very important place in the desirable qualifications of the soldier. Although we are content to allow religion to occupy a very insignificant place in our lives, few men there are who do not possess a deep-seated reverence and respect for the principles of the Christian religion. An appeal to a man's religious instincts is very often the strongest kind of an appeal that can be made to him. Who but feels that the eloquent and fervent prayer uttered just before the battle of Bunker Hill, touched a responsive chord in the hearts of the patriot soldiers, rendering them more determined to do or die.

We expect and have a right to expect that officers, as a class, are braver and more courageous than the men under their command. It is stated that courage and bravery depend to a very marked degree upon a man's station in life. A man of noble family or high birth is expected to be, and generally is, a brave man, while a slave is a notorious coward. Von der Goltz says that courage and bravery increase with good breeding, refinement, and education. This is due to pride. An officer is in a position of responsibility, and his pride overcomes his natural tendency to fear. He feels that he must be an example to his men, and there are very few cases on record where American officers have proven cowardly in battle.

The officers and men of the American Army have an enviable record to maintain, and it is hoped that pride of race and country will ever render them unconquerable to their enemies. Gen. Grant says in his memoirs concerning the battle of Shiloh, "As I watched that terrible battle, I could see that it was Southern dash and daring against Northern firmness and determination, and my heart welled

up within me as I thought that, if ever again united, they need never fear a foreign foe."

While tactics may be changed and changed again to suit the new and improved implements of war, and while theorists may talk of the impossibility of future wars, human nature will ever remain the same. While it does war will be not only possible, but probable, and when the struggle comes the effect obtained upon the field of battle will be due not so much to the calibre of the gun or to its ballistic perfections, as to the quality and character, and the training of the man who stands behind it.

ALONG WHAT GENERAL LINES SHOULD OUR AMMUNITION SUPPLY SERVICE BE ORGANIZED.

BY LIEUTENANT CLAUDE B. THUMMEL, 5TH FIELD ARTILLERY.

(*A Paper read at the School of Fire for Field Artillery.*)

I am not proposing the *proper* way to organize our ammunition supply service; it has, however, occured to me that the following is one of many ways of solving a very difficult problem.

Taken as a whole we now have no organized ammunition supply service, and that for the divisional field artillery may be said to be only partially proposed.

In the plans for the reorganization of the army it has been proposed to place the small arms ammunition resupply with that of the artillery, under charge of artillery officers. In this case any organization which would suffice for the artillery would, with a few modifications, apply to the small arms resupply. With that thought in mind this paper was written.

Drill regulations and field service regulations have fixed upon a certain number of rounds to be carried for each gun, *i. e.*, for the 3-inch gun, 464. This number seems large, but experience of modern war shows it to be necessary. At the battle of Liao-Yang, 16 Russian batteries, 128 guns, in 2 days fired 108,000 rounds, or 422 rounds per piece per day. General Kuropatkin in his book "Russian Army and Japanese War" gives the average expenditure per piece per day as 55 rounds and the maximum as 522 rounds. Reduced to terms of one piece fighting for one hour these figures show an average of 10 and a maximum of 210 rounds.

As, at any time, any piece, battery, or battalion may be called upon to expend its maximum supply, it is well to have with or immediately accessible for each gun the amount that experience has shown will approximate this maximum—that is about 500 rounds. This has taken shape in our service in a certain number of caissonfuls.

The amounts to be carried in the field of operations are as follows: For the 3-inch gun, 464; 3.8-inch howitzer, 312; 4.7-inch gun, 336; 4.7-inch howitzer, 180; 6-inch howitzer, 168.

Owing to the increasing weights of the larger calibers the same proportionate numbers of rounds cannot be carried immediately

with the guns as with the 3-inch materiel, without unduly lengthening the combat train.

The following proportions are carried in the ammunition columns:

3-inch gun	106	rounds, not quite	25%
3.8-inch howitzer	144	" " "	50%
4.7-inch gun	168	"	50%
4.7-inch howitzer	90	"	50%
6-inch howitzer	84	"	50%

The foregoing figures show the number of rounds per piece, *on wheels*, in the immediate field of operations. In case of a battle lasting longer than one day there must be a supply close by from which these carriages can be refilled as soon as emptied. It is with the problems of this resupply to the firing units that we have to deal.

Assuming the proposed organization of the divisions and armies as given in the report of the General Staff, on the Organization of the Land Forces of the United States, the following methods of supply are suggested:

1*st*. The firing line to be supplied by the combat trains, these to remain with the organizations to which they belong and supply no other units. These will be—with the artillery, the battery or battalion combat train under charge of its proper officer; with the cavalry and infantry, the battalion combat train under charge of the battalion supply officer.

2*nd*. These combat trains to be supplied by the division ammunition trains which will consist of 2 battalions, one of 3 companies and one of 2 companies.

3*rd*. In addition to the divisional columns, when divisions are combined into field armies, there should be an ammunition column of 1 battalion of 3 companies for the auxiliary division troops.

4*th*. These division ammunition columns to be resupplied by the "Line of Communications trains" consisting of 4 ammunition companies organized into 2 battalions.

5*th*. These last mentioned units to be filled at the advance supply depot from the rail or water line of communications.

The combat trains for all units are at present provided for.

The division ammunition column according to the above mentioned General Staff report is organized as follows:

1*st Battalion*—1 gun ammunition company; 1 howitzer ammunition company; 1 infantry ammunition company. The gun ammunition company is composed of forty-eight 3-inch caissons. The howitzer ammunition company is composed of twelve 3.8-inch and twelve 4.7-inch howitzer caissons. The infantry ammunition company is composed of 54 ammunition wagons.

2*nd Battalion*—1 artillery train company; 1 infantry train company. The artillery train company is composed of 24 wagons for 3-inch ammunition, 10 wagons for 3.8-inch howitzer ammunition, 14 wagons for 4.7-inch howitzer ammunition, 6 artillery store wagons containing spare parts, 1 spare 3-inch gun and limber, 20 spare artillery horses, and 20 spare mules. The infantry train company is composed of 54 ammunition wagons and 30 spare mules. Details of personnel is given in the Report on the Organization of the Land Forces of the U. S.

Auxiliary Division of Field Army ammunition column to consist of:

One artillery ammunition company; one artillery train company; one small arms ammunition company. The artillery ammunition company is composed of twelve 4.7-inch gun caissons and twelve 6-inch howitzer caissons. The artillery train company is composed of twelve 4.7-inch gun caissons, twelve 6-inch howitzer caissons, two artillery store wagons containing spare parts, and thirty spare artillery horses. The small arms ammunition company is composed of the ammunition wagons of the troops assigned to this division upon mobilization, organized into a single company.

Line of Communication column is composed of 2 battalions of 2 companies each. Each battalion is composed of 1 artillery train company and 1 infantry train company. Each artillery train company is composed of 26 wagons for 3-inch ammunition, 9 wagons for 3.8-inch howitzer ammunition, 12 wagons for 4.7-inch howitzer ammunition, 4 battery store wagons for spare parts (2 for 3-inch guns and 1 each for 3.8-inch and 4.7-inch howitzers), 20 spare artillery horses, and 20 spare mules.

The infantry train company is composed of 54 wagons for small arms ammunition, and 30 spare mules. The strength of these companies will be the same as train companies of the division ammunition companies.

To provide for the personnel and equipment of the various trains it is proposed as follows:

1st. *That the combat trains remain as now provided for.*

2nd. *Division ammunition columns.*

(*a*) Gun ammunition companies.

Since there are 48 3-inch guns in each division, and the gun ammunition company contains 24 3-inch caissons, it is proposed that each battery armed with 3-inch guns be issued 2 additional caissons with necessary equipment, and that the authorized peace strength of horses and men be sufficiently increased to supply one caisson with a complete crew, that is 7 horses, a corporal and 7 privates.

(*b*) Howitzer ammunition companies.

Owing to the weight of the larger caliber ammunition, a greater proportion is carried in the division ammunition columns. A howitzer ammunition company needs 1½ caissons per gun, so it is proposed that the necessary caissons, 6 per battery, be issued and the strength increased sufficiently to man and horse 2 caissons.

(*c*) The artillery train company consists of 24 wagons for 3-inch ammunition, 10 wagons for 3.8-inch howitzer ammunition, 14 wagons for 4.7-inch howitzer ammunition, and 6 store wagons. It is proposed to issue 2 wagons to each 3-inch battery, 5 wagons to each 3.8-inch howitzer battery, 7 wagons to each 4.7-inch howitzer battery, and 1 artillery store wagon (of the type with which the battalion is equipped) to each battalion headquarters. It is further proposed that each organization be increased by enough men and animals to man and horse one wagon in each 3-inch battery, and 2 wagons in each 3.8-inch and 4.7-inch howitzer battery.

(*d*) The infantry company consists of 54 wagons; these companies also supply the divisional cavalry. It is proposed to issue 4 wagons to each battalion headquarters, and 2 wagons to each squadron headquarters, the headquarters detachments being increased sufficiently to man and horse 1 wagon.

The commissioned personnel can be obtained from the excess officers provided in the proposed reorganization; that is, of the 51

officers per regiment as proposed, 47 are all that are actually required, leaving 1 captain and 3 lieutenants available for this duty. For the division service, one of the lieutenant colonels could be placed in charge of the ammunition service, 2 captains command battalions, 5 first lieutenants command companies and 1 lieutenant act as staff officer. In case of war all of these should have volunteer commissions of one higher grade. The remaining officers could be filled by volunteers designated in time of peace. In case of a larger unit, as a field army, one other lieutenant-colonel would be selected and placed in charge of all ammunition service of the army, including the line of communications column as far back as the advance supply depot.

The additional men and animals can be used in routine work except that in the annual maneuvers they should be gathered and drilled as the ammunition columns. These men and animals will form the nucleus for the expansion into the division ammunition columns in case of war, the various organizations being filled up and mobilized. Upon arrival at the mobilization camp the men, animals and material will be immediately transferred to the ammunition supply service. The men assigned to this service during peace should be qualified upon the expansion to fill the positions of the noncommissioned officers.

The commissioned personnel could be used as militia instructor except that during the annual maneuvers and target practice season they should be present with and actually use the material and men for ammunition supply service.

3rd. *Line of communication column.**

The material for the column could be stored at one of the arsenals within the territorial department in which the division is stationed and to which it is to be attached. One company could be organized as far as men and animals are concerned, in case of mobilization, this company to be expanded into the four companies of the column.

During peace it should be commanded by a captain from the heavy regiment, who would be given a volunteer commission of lieutenant-colonel upon expansion. The remaining officers, except battalion commanders, would come from volunteers designated in time of peace. Battalions would be commanded by lieutenants.

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* Column given was that of a single division.

commissioned volunteer majors. This company could be utilized for general duty at the arsenal.

Since the heavy regiment has but two battalions of two batteries each, the remaining officers would be available for auxiliary division ammunition column and consolidated line of communication columns.

The auxiliary division ammunition column would be commanded by a captain of the regiment commissioned a volunteer major, with 3 lieutenants commissioned captains commanding companies; the remaining officers would be volunteers.

In case of mobilization of a field army the lieutenant-colonel of the heavy artillery regiment would be placed in charge of the ammunition service of the army, with the volunteer rank of colonel. It is proposed that in case of war a colonel of artillery be given volunteer rank of brigadier general, and placed in charge of all ammunition supply from arsenal to firing line.

Our Field Artillery Drill Regulations are a bit uncertain about the point of responsibility of resupply. In one paragraph (886) they say: "The troops engaged in battle must be kept free from all anxiety as to the ammunition supply" while in the same paragraph is said "The general control of the ammunition supply within the Field Artillery Brigade rests with the Brigade Commander. The Field Artillery Brigade Commander must keep himself informed as to the expenditure of ammunition and must take proper steps to replenish the supply from the advance supply depot." Surely a person commanding the artillery of a division has more important work to do than looking after the ammunition supply of his brigade. Likewise the men of the firing line should not be allowed to worry one instant about their ammunition supply.

In view of the above, in case of war the chief of the ammunition supply service works in connection with the Chief of Ordnance and the Chief of the Lines of Communication. It is his duty to keep on hand in the advance supply depots an amount of ammunition equal to that on wheels with the armies as far back as, and including the Division ammunition columns.

The chief of the service of the army at the beginning of an engagement will move forward the lines of communications trains. These trains carry sufficient ammunition to completely refill the division ammunition trains of the army.

Communication is constantly maintained by the elements in rear with those in front by wire and messenger.

The chief of the army supply service remains with the Commanding General, being thereby enabled to direct his columns where expenditure has been greatest.

It is above all else the duty of the man in the rear to keep the ammunition carriages of the man in front full at all times.

NOTES ON THE EMPLOYMENT OF ARTILLERY IN THE THE BALKAN CAMPAIGN.

BY CAPTAIN G. BELLENGER, FRENCH FIELD ARTILLERY.*
Translated from The Revue D'Artillerie, Nov. 1913.
BY MAJOR W. S. MCNAIR, 6TH FIELD ARTILLERY.

1. EMPLACEMENT OF BATTERIES.

In Thrace, after the fights northwest of Kirk-Kilissé, the Bulgarians operated over terrain with gentle slopes, which they used by drawing back from the covering crests. This necessitated distant observation stations and the use of telephones. The Turkish artillery generally declined the duel, so the usual rôle of the Bulgarian artillery was the support of their infantry. The slowness of transmission of commands was often an annoying obstacle to the opportune delivery of their salvos.

In Macedonia, the Servians fought in a mountainous country with steep slopes, which ordinarily obliged them to approach close to the covering crests, although I have observed this close approach at Kumanovo and at Monastir in places where it did not seem to be obligatory. I therefore conclude that it was voluntary. This method appears to have permitted a better use of their rapidity of fire.

At Yenidze-Vardar, the only terrain on which I have been able to study the action of the Greeks, it does not appear that their artillery sought much defilade. I personally went over the exact terrain occupied by a battery; also that occupied by its target. The pieces were emplaced with dismounted defilade. The target was infantry, which was fired on obliquely at a range of not more than 1,000 meters at the most.

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* Captain G. Bellenger, of the Artillery, accompanied Colonel Mondesir, of the Engineers, during a tour of study of the Balkan theater of war, a duty on which the latter was detailed last April. Captain Bellenger was able to visit, between April 7th and June 3d, Adrianople and the principal battle fields of Thrace and Macedonia. He has thus been able to collect several lessons of the war through personal examinations and interviews. We hope to interest the readers of the *Revue* by publishing an extract from his notes concerning the use of artillery, both in the open country and in the siege operations about Adrianople, but always with the reservation that we hold authors responsible for their opinions.

As to the Turks, it seems that at least some of their batteries ignored indirect fire. To the east of Tarkbey (battle of Lule Burgas) I inspected in detail the position of a battery. It was posted so as to fire directly over the top of the crest, where complete defilade could have been easily obtained. It was the same at Kumanova. At Monastir, the Turks, backed up against the mountains, had established batteries of which three pieces were well defiladed by the use of secondary crests, and of which the fourth, separated from the others by a distance of 150 or 200 meters to the rear or to the flank, had a good direct view of the target; probably this fourth piece had been used as a directing piece.

I should remark here that the officers, whether Bulgarians, Servians or Greeks, who accompanied me over the terrain, were well qualified to explain to me their operations, and that under the most advantageous circumstances. The explanation which I received from the Turks—quite numerous for Thrace but almost none for Macedonia—were, for very good reasons, not given on the ground.

2. OCCUPATION OF POSITIONS.

All the belligerents declared that a battery seen moving within gun range was a battery annihilated. Anxiety for cover during the march of approach frequently caused the Bulgarians to employ their guns at ranges greater than 5,000 meters. With them, if we except the assault upon Adrianople, I could find evidence of but one battery only that had advanced over terrain not entirely covered from view of the enemy. The terrain of Lule-Burgas very well lent itself to the advance of batteries for employment at ranges of 2,000 or 3,000 meters, by means of traversing during the night the slopes descending to the northwest of Karagatch, at a distance of 4,000 or 5,000 meters from the enemy. This move was not made and does not appear to have been attempted.

The Servians, in this respect, were less timid. At the battle of Monastir, the four field pieces which the Morava division succeeded in dragging to the crest, took advantage of each night to approach the enemy by steps of 1,500 to 2,000 meters, letting the guns down the steep slopes by hand with ropes. This advance of batteries during the night, over ground that was under fire during the day, frequently practiced by the Servians, was not without its disadvantages. For instance at Kumanovo, a battery had moved by night to a place completely exposed by day. In the morning, it was overwhelmed

with projectiles. I have traced out the mounds of earth thrown up to cover each piece, and if the battery commander had not himself stated on the ground, that he had escaped from this bad situation, I should have believed that he had been annihilated.

The difference in this respect between the Bulgarians and Servians is easily explained by conditions in time of peace. The Servian artillery battalion, they told me, had about 180 horses for the three batteries. The Bulgarian battalion had 90 for two batteries, including the horses of the cadre of the 3d Battery, which was formed only on mobilization. The Servian battery, therefore, would have on the battle field twice as many instructed drivers and horses accustomed to maneuver; and the instruction of the battery harnessed was perhaps a great deal more advanced with the Servians in time of peace.

3. PREPARATION OF FIRE.

The officers that I have seen generally consider our method of forming the sheaf of fire as too complicated, and furthermore, of little utility in war, where it is generally necessary, from the opening of fire, to break up the regularity of the sheaf in order to direct the planes of fire on the important points of the target. The only precaution really necessary in the formation of the sheaf is not to cross the planes of fire. It is better to have the sheaf of fire too open.

I have noted above a case of preparation of fire by means of a directing piece. But this procedure, employed by the Turks, was admittedly bad, for it led to the almost immediate sacrifice of the directing piece, whose rôle was thus very quickly ended.

4. EXECUTION OF FIRE.

All of the belligerents* whom I have heard declare that their adversaries fired much too high, and that such high bursts have no effect. Bulgarians and Servians, however, claim to have fired very low for the identical reason of the want of effect of high bursts. According to the Bulgarians, the fire of the Turks, while generally very high bursting, was very irregular.

These remarks explain, in part, what was said above. The artillery troops fired at the extreme ranges of the guns in order to have

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* I have received from all of the allies, accounts of the Turkish fire; I have had plenty of Turkish accounts of the Bulgarian fire, but none of the Servians and Greeks.

their communications to the rear well covered. At distances of 5,000 meters and beyond, the heights of burst become very irregular, and the normal height in mils corresponds to a considerable absolute height. The remaining velocity of the shrapnel is small and the fire necessarily of little effect.

They have not cited a single case where zone fire was used.

The shrapnel and the time shell appear to have been equally feared by the infantry. I have gathered nothing in particular regarding the choice of the one or the other. Against the latter, which has a very wide open sheaf, the Bulgarian infantry often protected themselves in their trenches by covering their heads with their intrenching spades.

5. EFFECT OF FIRE.

The Servians have been said to have produced important destructive effects. It has been impossible for me to verify those statements, but, in Thrace, these effects seem to have been rare, while neutralization and immobilization were frequent.

The Turkish troops were almost always intrenched. From the beginning they were composed of at least three-fourths reservists without instruction, were badly officered, organized over night, and perhaps, if we except the attacks led by Moukhtar Pasha and Djemal Bey at Bunar-Hissar, and by Djavid Pasha at Kumanovo and Monastir, had no great desire to move forward. Their immobility can be attributed as much to their faults of organization as to the guns of the enemy. On the contrary, the Bulgarians, although keen to advance, always intrenched as soon as they came under artillery fire. This employment of intrenchments extended from the firing line to the reserves, and it was thus that numerous trenches were constructed solely for protection against artillery fire and without themselves affording any field of fire. The impression which I received on the battlefields, in spite of my confidence in my own arm, is that both Bulgarians and Turks have feared too much—quite too much—the enemy's artillery fire. But be this fear well founded or not, the artillery's power of immobilization is considerable.

The Servians also sought protection against artillery fire. However, the trenches dug for their reserves, instead of being arranged one behind the other as close as possible, like those of the Bulgarians, were echeloned in depth and so placed as to have a field of fire.

While protecting the reserves against artillery fire, they have also concerned themselves with the eventual use of the trenches against a return of the hostile infantry.

I have heard everywhere of the moral support which the guns gave to the infantry. This moral support appears to have often been its principal rôle, especially when the use of too much defilade interfered with the opportune delivery of fire on account of slowness of transmission of commands.

6. TARGETS AND KINDS OF FIRE USED.

Buildings were rare on the battlefields of Thrace and Macedonia. Such as existed were built of wood, earth and clay, and usually were situated near streams at points difficult to defend; they usually were the scenes of only unimportant skirmishes. Nowhere have they shown me where there was systematic fire against buildings.

Entrenchments were used constantly. The Bulgarians neutralized them by shrapnel fire and attacked them at night with the bayonet. The Servians carried trenches by day by close cooperation between the infantry and artillery.

There are on the battlefields of Thrace and Macedonia considerable areas of ground covered with brush, but not exactly woods, and now and then with clusters of trees (although the maps sometimes show woods). There was no occasion for attacking woods.

As regards the attack of the hostile artillery, having seen the danger of destruction to a battery seen in motion, Bulgarians, Servians and Greeks employed the maximum ranges of their pieces, rather than cross an exposed area. At the battle of Yénitzé-Vardar, the artillery of the 2d and 3d Greek divisions would not cross, in day time, the Balidza bridge, on which the Turks had their guns laid at a range of 6.2 kilometers. These divisions, by reason of this, postponed their attack until the next morning while waiting for their artillery.

Bulgarians and Servians both assert that a battery not concealed is always destroyed by a concealed battery. In support of this opinion, I have found a case of the destruction of a Turkish battery at Tarkbey, of which the guns, attacked in front and flank, were abandoned by the personnel before they were destroyed; also, the case of another Turkish battery at Kumanovo (also attacked in flank while engaged in front) and several cases of isolated pieces at Monastir. On the other hand, at Kumanovo, as I have said, a

Servian battery, perfectly visible, although attacked in front, escaped destruction.

I have observed in this connection that in war in the open field as well as in siege operations, the destruction of guns has always been the result of oblique or flank fire.

As to the duel between concealed batteries, the belligerents declare it to be almost useless. In such a case, it often appears to be best to give direct support to the advance of one's own infantry. This infantry, by advancing, may either make an attack on the concealed battery or seize a more advantageous position for our battery. If neither of these solutions be possible, the duel is prolonged without much result.

It should be remarked that because of lack of previous preparation, aerial means of observation were almost entirely wanting in this campaign, notwithstanding the presence of aviators. In no case has the artillery made use of balloons or aeroplanes for the observation of masked targets.

7. DISTRIBUTION AND DISPERSION OF ARTILLERY.

We can not, as far as the Bulgarians are concerned, speak of the corps and divisional artillery without first pointing out their organization and formations which are so different from our own. The Bulgarian division corresponds in effective strength to our army corps; it has twenty-four battalions of the same theoretical strength as ours, but bigger by more than one-tenth, in order to provide for probable losses (the losses with us are not filled except as they occur). This division includes also three groups of three batteries of four guns each, that is 36 rapid-fire guns, although we have 120 for the same number of foot soldiers. Each regiment of Bulgarian artillery also mobilized a second regiment of six batteries of six pieces of 87 millimeter Krupp guns. These reserve batteries were used in great numbers in the divisions in the siege of Adrianople, but I have neither seen nor heard of them elsewhere. Perhaps certain active divisions handed over their reserve batteries to the 10th and 11th Divisions as soon as formed; perhaps the difficulty of transportation caused the order to send these batteries before Adrianople for the lightening of these divisions which they encumbered rather than aided.

The Bulgarian division, being equivalent in effective strength to our army corps, has the artillery at the disposal of its chief, rather

than being divisional. It should logically play the rôle of our corps artillery, that of a mass ready to make the breach at the point chosen by the commander for obtaining a decision.

But that is of no importance. The Bulgarian division is divided into three brigades of eight battalions each, which, organically, have neither cavalry nor artillery. Throughout the campaign, these three brigades marched in parallel columns whenever it was possible to make separate itineraries for them, and they fought side by side. As each brigade claimed the assistance of the artillery, the division commander assigned the three groups in advance to the three brigades. In their turn, the brigade commanders generally split up the groups at their disposal. They have frequently gone very far in this subdivision. At the battle of Seliolou I verified (by personal inspection, and statement of a squadron commander) that one platoon, completely detached, was itself split up, each piece having its own target, although there was no special need of firing on either target at the time. The squadron commander, in relating the fact, expressed his astonishment that the platoon had not fired as a whole on each target in turn. He had made this comment to the chief of platoon, who had persisted in firing the pieces separately.

Therefore, although the legal organization of the Bulgarian artillery corresponds with the idea of a corps artillery without divisional artillery (that is, an artillery entirely under the direct orders of a general commanding a force equivalent to our corps), the employment in no way corresponds with this conception. The siege of Adrianople excepted, one sees nowhere the action of a powerful mass of Bulgarian artillery whose intervention in the action discloses the will of a chief. One might imagine a return to battalion artillery. Furthermore, the siege of Adrianople always excepted, there was no action in Thrace in which the artillery could boast of having played a decisive rôle.

The explanation of this dispersion of the artillery seems to me to arise, in great measure, from the lack of teams in time of peace; the Bulgarian battalion could then horse no more than one firing battery. Where could it acquire practice in the maneuver of the battalion, and how could they have a hold on the higher round of the ladder? There is, then, a great danger in reducing the teams too much in time of peace—that is, in reducing the means of maneuvering. There results from this practice habits which, in war, betray us into an irrational organization.

The Servians had the same number of rapid-fire pieces for the weaker divisions (16 battalions instead of 24). They were therefore proportionately stronger in artillery. The Servian division commanders never relinquished control of their artillery in favor of their subordinates. With the Bulgarians, the division commander commands three brigades; with the Servians he commands his four regiments directly.

The action of the Servian artillery corresponds more nearly to that of a unit within a command, which the commander keeps in reserve or employs at a predetermined point. At Kumanovo, the first day, the division of the Danube kept in reserve six batteries out of nine. At the fight at Alince (or of Prilep) the division of Morava, having no artillery opposed to it and having eight batteries at its disposal, kept three for the support of its infantry, and sent five to the Division of the Drina, which had been stopped by a strong hostile artillery. At the battle of Monastir, this same division could drag up to the crest but a single field battery, and as the range was too great for the mountain guns, these were sent to the division next on their right,* which had the use of them, as well as of the remaining light batteries of the Drina division, which fought on the level ground. They thus secured important and powerful masses of artillery.

However, the Servian artillery of the Morava division presents, at this battle of Monastir, a very interesting case of dispersion of the groups. This division could bring up to the crest but four guns. The caissons remained below, but an infantry regiment brought up by hand 2,500 rounds of ammunition and the fuze-setters. But as there was need of artillery against several targets at that time, and as the terrain furnished emplacements for but four pieces, the battery was broken up into four sections, each commanded by an officer, and each acting as a battery. Sweeping and rapidity of fire helped out the numerical deficiency in guns.

8. EXPENDITURE OF AMMUNITION.

I have not been able to get any exact figures except as to the 2,500 rounds mentioned above for a battery of four guns at the

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* At the battle of Monastir, the Second Morava Division formed the extreme right in the mountain, alongside the First Morava Division, and, in order to insure unity of action in that locality, its commander placed himself under the orders of the commander of the latter.

battle of Monastir. But everywhere, Bulgarians, Servians and Greeks have told me that the expenditure exceeded all expectations and that resupply was very difficult. The stopping of the Bulgarians after Lule-Burgas, and that of the Servians on the Vardar after Kumanovo, appeared to be due in great measure to the necessity for filling the empty caissons before proceeding further.

The march of the Greeks on Salonica, although the military situation appeared to call them to Monastir, had international political reasons. They were equally justified by the necessity of assuring themselves a new base of operations, ammunition being exhausted, and the convoy being unable to go to the army through the defiles of the Olympic mountains.

9. HEAVY ARTILLERY AND HOWITZERS.

In France, we consider before everything else in howitzer fire, the curvature of the trajectory. The Bulgarians and Servians appear, on the contrary, to see nothing in it but the great range and power of the projectile. Astonished at not hearing these pieces spoken of except in this light, I put the question of the curvature of the trajectory. They made the reply that they had never felt the need of it.*

It should be noted that the Bulgarians and Servians brought along in rear heavy guns of 120 millimeters as well as their howitzers. I asked if they were equally serviceable. The Bulgarians did not mention the use of howitzers, except in the case of Adrianople and Tchataldja and at the battle of Bunar-Hissar. This use was not because they needed curved trajectories or powerful pieces, but because of a critical situation which required the use of all available resources. On the part of the Servians, the heavy artillery was used only at Monastir, and there, on account of its range, it was used to support the infantry beyond a large flooded place which they were compelled to traverse in order to attack the enemy.

A special case of the use of the 120 mm. heavy gun was told me by a Servian officer, in connection with the subject of the attack of a mountain position of which the name has escaped me, and against which the field artillery could find no position. A 120 mm. gun, brought up to a distance slightly greater than 10 kilometers, opened fire, after having buried its trail in order to increase the range.

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* See "Some Lessons of the Balkan War," *Revue d'Artillerie*, Vol. 81, page 315.

This fire was very successful, not that it was really effective, but because it demoralized the Turks, who were surprised at receiving the large projectiles where they believed themselves to be sheltered from all artillery fire.

The heavy artillery has, then, been of use in some special cases, but solely by reason of its range and power and not on account of the curvature of its trajectory. Do the services thus rendered compensate for the other inconveniences involved? I took pains to elucidate this point in the various conversations I had with Bulgarian and Servian officers, and this is what I concluded: One of two things, either the enemy is established in a defensive position, or, he still has enough energy to assume the offensive. In the first case, which is that of Monastir, the enemy's position is known before the combat; it is possible to use against him the light guns and the use of the special pieces is not justified. If our enemy has enough vigor to take the offensive, the two armies encounter each other in motion and there are no entrenchments prepared. And is there any respite for our enemy to prepare entrenchments between the time when the offensive attack is opened and disorder and defeat no longer permit him to prolong the fight? At Kumanovo the Turks had no respite between the arrest of the offensive and the rout; at Lule-Burgas, there was a respite, the Turks entrenched, and thereby gained some advantage.

What was the difference between Kumanovo and Lule-Burgas? There were two, the grouping of the artillery, and depth of formation. The Bulgarian artillery, spread out along the Karagatch, was nowhere powerful enough to open a breach for its infantry. This infantry, almost abandoned to itself, had to wait for night to clear the last few hundred meters which separated it from the enemy. When it had cleared this distance it was exhausted and thrown into disorder. No compact reserve followed close behind to clinch the success. This infantry was therefore at the mercy of an offensive return, which, happily for the Bulgarians, the Turks did not attempt. The best that the victors could do was to hug the conquered ground and reorganize on the spot. They took hours to get into condition to advance further, and when they were able to do so, the enemy had been able to recuperate and establish himself in a new position. The battle was long drawn out.

The Servians attacked with a mass of artillery sufficient to make an opening; the infantry was then able to dislodge the enemy's lines

by day, and that without excessive losses. As the Servians had considerable reserves behind their lines, and as the attack succeeded by daylight, they at once proceeded to make the most of their successful attack. I do not say that Kumanovo was followed by a pursuit like that at Jena; but if, after Kumanovo, the Servians did not immediately push their success, they did, at least, push the enemy vigorously on the same day.

On the whole, the concentration of artillery fire seems to be the factor which decides the attack of today; and a formation of reasonable depth is the true means of shortening combats by launching fresh troops through the enemy's lines.

Other engagements confirm this way of viewing the question. The only fight of long duration in which the Servians were engaged was that of Monastir, where flooded ground threw the decisive point into mountainous terrain almost impracticable for artillery. Success was obtained by a night attack on a knoll which dominated the position of the Turks and their line of retreat.

It was not, then, in general, the progress of modern technique which prolonged the battles and gave time for the construction of trenches, but, rather, the indecision of the leaders or mistakes in the conduct of the operations.

It should be noted that the use of intrenchments in field warfare is no novelty. Turenne and Maurice of Saxony encountered them; and, more recently, it was not with heavy artillery that Hocke took the lines of Wissemburg, or Napoleon the entrenched camp at Heilsberg.

Napoleon always kept in hand a mass of artillery and the infantry reserves needed for the carrying out of his plans. By those means he won the battles of Jena and Austerlitz in a few hours. Modern means permit as quick a victory, if one has the necessary determination.

So, if I have learned my lesson properly, the need of heavy artillery with an army does not proceed from technical improvements; it appears rather to be connected with the temperament of the commander.* In operations which develop rapidly, and especially if there is much maneuvering, the heavy artillery will rarely find employment; in operations in which it is sought to eliminate risk by prudent methods, it will more frequently play an important part.

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* And probably also with the accidents of the terrain.

TACTICAL STUDIES.*

BY BREVET CAPTAIN E. DOSSE, FRENCH INFANTRY.

THE NECESSITY POR PRACTICE IN TREATING TACTICAL SITUATIONS.

To adapt one's self to any line of human activity, in which the study of war is of the first importance, the mind should be trained and developed by technical work. It should gain skill from experiment and practice, using memory for more perfect assimilation. After this difficult but indispensable apprenticeship, we can attempt only certain simple problems which permit us to apply the principles studied. Later, when the mind has been developed by numerous exercises, original ideas may appear. This training of the mind is necessary in tactics as in any other science.

Every officer, if he is sincere, will admit his mental confusion when, for the first time, he was called upon to make a tactical decision, to express it clearly in the form of an order, and, especially, to explain his reasons.

To him the situation will appear complicated, the order received impossible of execution, the information incomplete. He does not see the mission to be accomplished, arising clearly, stripped of all its details. He confounds the end to be obtained with the means to be used, and allows details to crowd out thought. The result of this confusion is indecision, lack of clearness, poor execution of a badly-expressed idea, and, consequently, loss of prestige of the officer in the eyes of his subordinates.

Every conscientious officer should seek, therefore, to improve his mind so that without an effort, instinct will lead him to the rational solution of the concrete cases which will arise in the field.

To this end a course should consist of:

1st, Doctrine—the body of fundamental principles, simple, few in number, resting on the basis of experience and common sense;

2nd, A method whose purpose is:

To direct the course of reasoning along broad lines—free from narrow rules;

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* Translated and reproduced with the permission of the Publishers, Berger-Levrault.

To cause the student to think out a simple solution based on a system of reasoning and conforming to the general principles which must be followed;

Then to express without effort the decision in a short and correct order.

This is tactical study.

But the faculty of easily, coolly, and calmly solving numerous tactical problems does not, you may say, correspond to the art of making a rapid decision on the field, and expressing it in clear and concise orders amidst the excitement of battle, and does not take into account fatigue, discouragement, surprise, excitement, and inertia, all so important in war.

The theoretical solution adopted, however correct it may be, may be upset in battle by some entirely unforeseen fact, or by a simple delay in the receipt or execution of an order.

These criticisms are just. Study, however, will not do away with practice and chance, which upon the field of battle, as elsewhere, are great factors of success. On the other hand, the task of an officer making his decision in the silence of his office, after a long study with the aid of definite information, is clearly easier than that of the commander of a force giving orders in the midst of noise, receiving information often contradictory, and having to submit to the brutal proof of facts.

These assertions, far from disproving our theory, only confirm it. It is, in fact, in the excitement of battle, when the mind of the leader is dulled by fatigue and worry, that the superiority of the trained mind manifests itself by giving the power of handling a situation without worry, however great may be the danger. Besides, a leader arriving late, at times far away from the scene of action of tomorrow, in giving his first orders merely solves from the map the tactical problem presented by the enemy. He then leaves to his subordinates the task of carrying out his dispositions according to the details of the terrain which the map does not give.

But are not maneuvers sufficient, and are they not at the same time both theoretical and practical training? Without a doubt, besides being useful training for troops as regards collecting information, making rapid decisions, and transmitting orders, they are in themselves a necessary exercise for commanders and staffs, and an indispensable supplement to map work. But they cannot suffice for the instruction of officers, because they are not frequent enough, and

they may destroy ideas by an erroneous interpretation of results and by conclusions without foundation.

It is not rare, in fact, to see a solution contrary to good sense crowned with success as a result of obstacles created by cultivation, the absence of bullets, the shortage of umpires, the short time allowed for the critique, or even through personal reasons. We can all recall examples confirming this assertion. War is not to be learned in absolute fashion except in actual war. Is there any reason for neglecting the means, often imperfect, of obtaining practice? The big machine which we take pains to maintain remains long in a garage before it rushes into a difficult race. Then, there will be no time to learn to run it.

Therefore we must prepare ourselves, not only by carrying on maneuvers on actual terrain as frequently as possible, but also mentally, by the study of history, then by training our minds in tactics with the aid of problems simulating war, next physically, by accustoming ourselves to fatigue, and finally above all, morally, by forming our character and elevating our hearts with the idea of sacrifice to the Fatherland.

We will then be ready to submit to the final test upon the field of battle, the only test where we can be judged with the full knowledge of the case.

I. DOCTRINE.

Admitting the necessity of tactical study, let us recall that its purpose is to guide the mind along a course which will assist it in reaching a decision in conformity with doctrine in concrete cases, both on paper and the actual terrain.

The very simple principles upon which doctrine rests are contained in the Field Service Regulations and in the Drill Regulations. Before practicing the system, in order to grasp its meaning it is necessary to read the above-mentioned books, picking out general ideas rather than rules of execution.

Without here attempting a study of regulations, we simply propose to select the principles which must be known and applied in war, and to point out what must be demanded of the various arms of the service—infantry, artillery, cavalry, engineers, and aviation corps, that is to say, their special roles, the capacities of each of the

offensive, on the defensive, on the march, in reconnoitering, in surveillance, and their co-ordination in war.

GENERAL PRINCIPLES.

MORAL DOCTRINE.

The French Doctrine rests on two fundamental principles.

1. The offensive.
2. Strength of will.

THE OFFENSIVE.

The purpose of war is to destroy the enemy, materially and morally. The only means of attaining this result is to attack from the start with the resolution to push forward at any cost, no matter what losses may result. To proceed in any other manner is sure to result in a certain and inevitable check, and would be against common sense and the French spirit. To act on the defensive is only the part of a weak force on the field of battle. It should only be resorted to by a definite order or through absolute necessity. In these two cases, the force which takes the defensive should continue to be aggressive and attack at every opportunity.

STRENGTH OF WILL.

The first condition for a successful enterprise is determination to accomplish a purpose, above all the purpose of the leader. But in war to have a firm resolution means willingness in advance to sacrifice one's life and the lives of one's subordinates. A leader cannot rely on a force which is not absolutely resolute in executing his orders in every particular. Strength of will is an indispensable military virtue. Far from crushing initiative, it must on the contrary, urge upon the subordinate the search for the best means of accomplishing with intelligence and without temerity, the orders received.

The offensive and strength of will make up what may be called the Moral Doctrine of an army. The study of correct dispositions of forces, perfection of armament, attention to details, become useless if every man is not stirred by this feeling. To this doctrine may be added as corollaries the two indispensable sentiments, initiative, and comradeship in arms.

Initiative.

It seems useless here to plead for the initiative, but it may be remarked that only those officers are capable of taking the initiative who have worked and studied enough to understand general situations and to understand the principal motives of the orders they receive.

Comradeship in arms.

The words of General Cardot, "Find the way to strike together," defines this military sentiment of the first order. Comradeship in arms—the desire to act, and to aid one's fellows at every opportunity—is one of the noblest and most productive of military virtues. It was to this that the Germans in 1870 owed a large part of their successes. In a large measure it is due to our having neglected it that we met defeat. It calls for a close relationship and a mutual esteem founded on complete and disinterested devotion to the general cause.

DISPOSITION OF FORCES.

Every leader should dispose of his forces so as to be both strong and free. This corresponds to the ability to act with his greatest strength in order to carry out his mission, and

To guard himself with a sufficient force, although with the smallest that will meet this task. To this end he keeps himself informed, covers himself, and uses his force cautiously whenever the nature of his position permits; he makes detachments only when necessary; sees to the mutual support of the various arms; makes sure of everything that relates to the functions and duties of those in command; maintains tactical connection, encourages initiative; and enters the action without hesitation as soon as he finds it necessary, having no other aim than success at any cost.

On the other hand, every subordinate endeavors to maintain connection with the nearest units; assists, according to his orders, those same units whenever he finds occasion to do so, avoiding isolated action; aids other arms than his own with every means available, in the accomplishment of his mission; rejoins the main body from which he was detached as soon as his mission has been accomplished, and, finally, marches right up to the enemy's guns, unless his mission prevents.

TERRAIN.

Winning terrain is a great aid and often is necessary in accomplishing a definite purpose. Yet it is only a means of advancing, and should in no case be regarded as a definite end unless it results in material and, above all, moral damage to the enemy. A position, no matter how advantageous it may be, gains only a value by the manner in which it is occupied; it only can be of permanent assistance in allowing more troops to be used elsewhere in pushing forward.

THE ROLE OF EACH OF THE ARMS.

AERIAL NAVIGATION.

The aeroplane has in its favor:

Its mobility.

Its rapidity.

Its practical invulnerability from rifle fire at altitudes greater than 800 meters.

Thanks to these qualities, its radius of activity (about 150 kilometers) permits it:

To carry information.

To detect movements of the enemy's reserves.

To estimate the chances of success in the attack.

To rapidly carry information and orders over great distances.

The objections to its use are:

The necessity of reaching great altitudes in order to be safe.

Its weakness both on the offensive and the defensive.

The impossibility of its making useful flights in unfavorable weather, of stopping to make observations, and of being used at night.

These conditions give rise at certain times to difficulties of observation, and prevent the constant use of the aeroplane in maintaining contact, making necessary the employment of cavalry to complete its work.

The dirigible has qualities identical to those of the aeroplane. Its sphere of action, however, is greater, reaching at times 500 or 600 kilometers. It offers the advantage of being capable of transporting a number of passengers and heavy loads, and of being able to travel at night. But it has the following faults:

Its greater vulnerability up to altitudes of about 1500 meters.

The difficulty of replenishing the gas supply.

The danger of making a landing in an open country.

The necessity of sheltering it under sheds designed especially for this purpose.

Its speed, moreover, is less than that of the aeroplane.

CAVALRY.

Cavalry has for its advantages:

Mobility.

Speed.

Shock action or fire action.

Thanks to these qualities, it has a rather large sphere of action, and the chances of its being captured are very remote. These considerations consequently assign it:

To carry on scouting and reconnoitering either at short or at great distances. This is its principal use.

To seek information from afar, obtain it by strategy, and bring it back rapidly.

To maintain contact.

To hold for a time remote defiles which the enemy is trying to force.

It unexpectedly attacks an enemy off his guard, charges unsupported artillery, breaks up convoys, and with the aid of its rifles and the artillery attached to it, scatters disorder through a force or an encampment which it has succeeded in approaching.

Its disadvantages are:

Weakness of its fire (in proportion to its effective strength).

The limitations of its sphere of action as compared with that of aerial navigation.

Its lack of hardihood.

The difficulty of employing it at night.

These faults result in:

Preventing it from making an attack or maintaining a resistance which requires a long and methodical action, such as the attack of a village held by infantry.

Making it difficult to establish a service of security beyond its cantonment, if its fighting strength is small.

Requiring it to be used cautiously in order to avoid useless fatigue.

Preventing it from taking the offensive against unshaken and alert infantry unless the attack is moved by a spirit of self-sacrifice.

Obliging it if its effective strength is small to take refuge behind the outposts of infantry at nightfall so as to rest up its horses.

INFANTRY.

The advantages of good infantry are:

Obstinacy in attack and defense.

Flexibility in maneuvering.

Great power of fire action at close range.

Instant opening of fire (as compared with artillery).

Sturdiness and resistance against fatigue.

These qualities give it great possibilities on both the offensive and defensive. In fact, they permit the infantry:

To advance, not only concealing itself from view and avoiding the bullets of the enemy whenever the terrain permits, but when necessary advancing even under fire.

To cling to and burrow into the ground, which it alone can win.

To be brutal.

To get along by itself in the exceptional case when it is isolated.

To maneuver under every condition, by day, by night, in all sorts of weather and on every terrain.

To assert itself.

To surprise the enemy on covered ground or at night, and to protect itself against similar action by the enemy.

To carry on continuous effects.

The faults of the infantry are:

Slowness in changing position.

Powerlessness of its fire, against inanimate objects and at long ranges.

These faults render wide flanking movements and distant reconnaissance difficult for infantry, and make necessary the assistance:

Of artillery, in case the infantry has to advance through areas beaten by the fire of hostile artillery or held by well-sheltered infantry, especially if the terrain is open and affords no cover.

Of cavalry, which keeps it informed and surmounts the difficulty experienced by infantry outposts in pushing out far enough to be able to maintain an effective watch, and above all to send back in time to the main body the information which has been gained.

ARTILLERY.

Artillery has the following advantages:

Effectiveness of fire.

Action at great ranges.

Rapidity of fire.

Ability to concentrate its fire on a definite point, even if it is posted along a broad front.

Ability to fire from cover.

Strength of its matériel, and cover which it affords its personnel.

These qualities permit it:

To watch over the sectors of terrain which are in view of its commander and which it can constantly menace with its fire.

To surprise a force poorly covered and at short range.

To destroy solid obstacles.

To use all its guns from the very beginning of the combat, without ceasing to be of service on this account.

To be practically safe from absolute destruction as far as its matériel is concerned.

Consequently: on the offensive it can open a path for accompanying infantry and allow it to advance; on the defensive it can delay the enemy, compelling him to take cover and to deploy in order to avoid losses.

The disadvantages of artillery are:

Its employment is limited exclusively to fire action.

Its uselessness at night, save in exceptional cases and when the firing data have been determined during the daytime.

The dependence of its action on the occupation of a position from which it may be able to fire.

The weakness of its formation on the march.

Its slowness in opening fire, unless everything has been made ready beforehand.

The difficulty of moving the pieces by hand.

The impossibility of protecting itself effectively without assistance of the other arms.

Consequently, on the march it is kept far enough from the front to be safe from a surprise by hostile artillery, but near enough to take part in an action as early as possible.

It its mission does not forbid, it takes up positions under cover,

as long as it does not have preponderance of fire, under the penalty of becoming immobilized by hostile artillery.

It needs the assistance of infantry, or, if this is lacking, that of cavalry. These arms insure its security by day or by night, on the march, at halts, and in combat, and never leave it to itself, no matter what the situation may be, whether far from or close to the enemy; they also capture and cover positions from which it can fire.

In a force composed of the various arms (the normal case):

Aerial navigation obtains and transmits information over great distances.

Cavalry carries information, maintains contact, covers its own forces, and carries out surprises.

Infantry wins terrain, occupies it, supports the cavalry, and covers the artillery.

Artillery clears the terrain for the action of infantry, opens paths for it, or covers its retreat.

II. METHOD.

Treating a tactical situation is nothing else than applying to a concrete case the doctrine which we have just been sudying. In tactics there is nothing absolutely definite, and a fixed plan should be strictly forbidden. Thus, it is impossible to indicate a solution for each particular case in the form of a formula. Yet there is a course of reasoning which, proceeding by successive and logically related deductions, avoids, if one follows it as an actual directing trend, useless trials and big mistakes, and leads to a simple decision, free from any definite scheme.

What is the procedure in rationally treating a tactical situation?

Read the problem or the order.

In fact, one should first read everything. This advice, which seems childish, is nevertheless far from being useless, if we interpret the word *read* in the sense of *understand*.

It occurs frequently, when just about to formulate an order, that one sees that the idea which gives rise to this order is based on an incorrect interpretation of the data received, or that an important phrase which has escaped unnoticed, modifies the sense of the

mission as first understood. Therefore, it is necessary to read the problem and read it again, underlining all the important words, above all, those which concern the mission.

Realize the situation.

The mind should then seek to estimate the situation created by the data, and to assimilate it. This is a difficult effort, too often neglected in making the problem practical, and in reaching a solution possible of execution.

Frequently the error is made in the course of tactical map problems of neglecting practical considerations. It seems that equations are presented for theoretical solution without troubling about the realities which modify all warfare, without considering the distance to be covered and the resulting fatigue. It seems to be a question of moving pawns, when the actual purpose is an endeavor to lead beings capable of motion and thought. This results in impossibilities of such a nature as to give use to false conceptions through incorrect deductions, and leads, in certain minds, to a depreciation of this kind of practice. Therefore, it is harmful to study a tactical question or carry on a war game without fathoming the exact morale and physical condition of the troops in question.

We should let our imagination carry us to the actual terrain of the problem, take actual command of the force in question, and attempt to understand:

1. *The situation*, that is to say:
   - (*a*) The place where you are at that time.
   - (*b*) The position of the various units under your command.
   - (*c*) Their morale (whether in retreat, on the offensive, etc.)
   - (*d*) Their degree of fatigue resulting from previous changes of position.
2. *The corresponding situation of the enemy*.
   - (*a*) His supposed strength and composition.
   - (*b*) His morale.
   - (*c*) His distance.
   - (*d*) The roads which he may use, etc.
3. *The material situation*.
   - (*a*) The season, the day, and the hour.
   - (*b*) Climatic conditions (cold, heat, rain.)
4. *The nature of the neighboring country or the country to be crossed*.

(*a*) Features of terrain.
(*b*) Nature of streams.
(*c*) Woods, forests.
(*d*) Bivouacs, etc.

Fully comprehend the mission.

We then possess all the necessary elements for entering into the body of our subject, asking ourselves the well-known question which should constantly present itself to the mind so as to prevent it from going astray on a detail:

What is the consideration at hand? The answer is:

The mission.

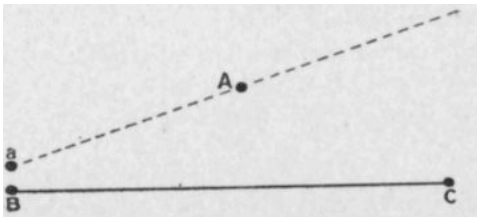
The mission must be the constant guide of tactical reasoning. It is necessary to enter into and conform strictly to the spirit in which it was conceived, without letting oneself be tempted by a personal interpretation. It must be admitted without discussion. Upon its receipt every personal opinion with regard to the general situation, no matter how well founded it may seem, should be set aside. Sometimes an order which seems at first illogical, is explained finally by the course of events.

The order which defines the mission consists generally of two parts:

Example:

A detachment composed of----------will move from a toward A, in order to cover the march of a column moving from B to C. One of these two parts, *the purpose*: "To cover the march of a column from B to C" is a definite order which must be carried out to the letter no matter what the circumstances may be or what sacrifices may be demanded.

The other: "Will proceed from a to A," is only a general means of accomplishing this end. The commander who determines upon it considers that, from the situation of the enemy, known to him at the time of issuing the order, from the terrain, etc., the best means of covering his force is to send a detachment to A.



The commander of the detachment must use the method indicated unless there is no possible way to carry it out. But he may be forced into circumstances where he can no longer use this method; or he may find it absolutely necessary to abandon it for some other more in conformity with the tactical situation, if the latter has changed. Then he is called upon to make a decision.

III. Decision.

To make a decision is to adopt a mission to the particular situation in which one finds himself (surroundings, data of the problem, etc.), and also to the terrain.

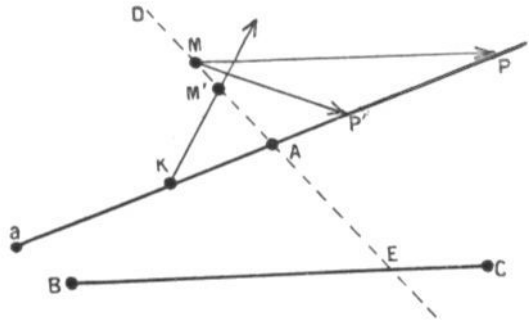
At the moment when he determines upon the mission of his subordinates, the commander often is far from the field of action. Arriving often very late, at night perhaps, he issues his orders after a study of the map, a course which often does not permit taking into consideration certain details, especially as regards artillery positions. Then it is for his subordinates, who have pushed farther forward, who may have received new information concerning the enemy and seen the terrain, to carry out the mission, keeping in view what they have learned and seen.

If the situation has not changed between the time when the order was issued in full by the commander and the time it was received by the subordinates, and if the terrain is represented accurately on the map, the first decision is frequently merely an exact copy of the mission received. On the contrary, if during the course of carrying out the mission, the situation be changed to any great extent, or if the features of terrain not represented on the map so require, it may become necessary to again adapt the mission to these changed conditions. This change is the *new decision*. At all events, *endeavor to reach a decision*.

Let us again consider the preceding example.

March from a towards A, to cover the march of column moving from B to C.

Let us suppose that upon his arrival at K the commander of the detachment learns that the enemy is marching from D on M, whence he can march on E, P, or P^1.



What must be done? Continue marching toward A? This would be applying strictly the letter of his mission, but it also would be proof of lack of initiative.

We have seen that the means indicated by the commander is to march to A, but his fixed purpose is to cover the column, BC. Must be inform the commander of this and wait for a new order? This would be out of question, as it would be losing time. The subordinate must undertake to make a new decision bearing only on the method.

This decision, conforming with the doctrine, depends:

(1) On the mission (to cover the march of the column from B to C.)
(2) On the particular situation.
(3) On the terrain.

In the case in question it may be, for example: To march in the direction M in order to attack the enemy, fall on him and prevent his gaining the flank of the column, instead of going to A and taking up his position there, leaving the enemy free to carry on operations wherever he may wish, beyond A, for example, towards MP′ or MP.

INITIATIVE.

The preceding example shows the necessity for initiative and at the same time defines the sphere in which it may be exercised without breaking down discipline.

It is not for the subordinate to modify the end of the mission assigned to him. He can only change the means of accomplishing his task, but he must have very important reasons for doing so. On the

other hand, a commander must avoid giving too detailed orders and limited precepts. Initiative comes from mutual reliance and esteem, acquired by working together, and an exchange of ideas which creates harmony of opinion. It is a duty on the part of a commander to keep up and develop this quality in his subordinates, always sustaining them and avoiding discouraging them with useless criticisms.

QUALITIES WHICH THE SOLUTION ADOPTED SHOULD PRESENT.

The solution adopted should be clear, simple, and logical.

These are qualities of all ideas originating in common sense. A correct idea is rarely complicated and is naturally very clear. These qualities do not by any means exclude bold and original solutions, which may meet success in war more than in any other field.

PRECONCEIVED IDEAS.

A decision, under certain circumstances, is based on a preconceived idea, especially if one feels stronger morally than the adversary, and also in certain particular cases (in mountain campaigns, for example).

But a decision should in no case rest on an idea preconceived without free will, that is to say, on an assumption created by imagination, excitement, or fear. This course leads to mistakes of the worst kind, counter orders, disorders, and even disaster. It is frequent fault which must be avoided.

HESITATION.

It is important to find out in a very general way what course the enemy might pursue against one's own forces. In so doing care should be exercised not to put implicit faith in information received, not to arrive at too complicated deductions nor to consider as a certainty a possible maneuver of the enemy. Above all, one should not see difficulties and impossibilities on every side.

Hesitation on the part of a commander discourages the good will of those who carry out his plans, destroys all their confidence, and dissipates most brilliant ideas. Success comes only to men of strong will.

Coolness, an indispensable attribute of a leader, must allow him, from his knowledge of the character of his subordinates, to select from the mass of information which reaches him, that part which,

through its importance, may influence his decisions. But, on the other hand, he must not expect to be fully informed in order to reach a decision, nor must he change his decision under an impression of a slight modification in the general situation. The information received is often incorrect, incomplete, seldom affording a correct view of the situation; and yet action is necessary, for inaction is the greatest fault which can be committed in war.

In conclusion, the simplest solution, dictated by the idea of pushing straight towards the end in view, is nearly always the best.

One should remember that in tactics, as in every science, of which the elements are not strictly mathematical but depends in part on moral reasons difficult to appreciate in theory, there is no one solution. There is but one general result to attain, the carrying out of the will of the leader. There is but one danger to fear, resort to half-way measures and mixed solutions, which always prove poor.

A good, fixed idea, however original it may be, yet conforming to doctrine, has a large chance of success, even if it differs markedly from the average solution adopted by everyone else, a solution which must be carefully guarded against in forming one's ideas.

FORMULATING THE DECISION.

The decision must determine in a precise yet very general manner:

(*a*) The intention
  (1) To move, or
  (2) To take up a position.

(*b*) (1) The direction of march, or
  (2) The area to be occupied.

(*c*) The urgency for moving forward, if that course is to be followed:
  (1) Immediately.
  (2) Tomorrow, etc.

(*d*) Plans of action of the detachment in the presence of the enemy:
  (1) Offensive.
  (2) Defensive.

(*e*) The end to be attained. In the preceding case, it will be, for example):
  (1) To march.
  (2) Towards M.

(3) After having done this.
(4) To attack the enemy,
(5) With the purpose of crushing him and preventing him from reaching the flanks of the column BC.

RÉSUMÉ.

The method to be followed in reaching a decision in a tactical situation is as follows:

Read the problem or the order.

Read it again.

Underline the important passages, and above all those which concern the mission.

Ask oneself the following questions, in succession:

Where am I?
What are the forces I command?
Are they tired or not; what is their morale?
Where is the enemy?
What is his strength and what is his morale?
How far off is he?
By what direction will he make his appearance?
Is it day or night?
What is the temperature?
What is the nature of the country occupied by my troops?
What is my mission?
What is it about?

Then make a decision.

I shall march
towards ----------
then ----------
in order to ----------

I shall take position
in the zone of ----------
in order to ----------

The decision must be made definitely and carried out to its very end, without reconsideration, until a new mission from the commander, or a great change in the situation, may modify it.

IV. MEANS EMPLOYED IN EXECUTING A DECISION.

After having made a decision, a method must be adopted to put it into execution with the means at hand. The first part of the decision

shows that the force must march or take position. In both cases, the unit in question is often divided into two parts.

The first part, the main body, being designed to carry on the action, is held safe from surprise by shock or fire up to the moment of its engagement, and is placed in the most favorable situation so as to carry out its rôle. Moreover, it is necessary to give it the space and time necessary for the maneuvering which will precede the action.

The second part, that which serves to maintain security, assures the first part freedom of action, gaining for it an area proportional to its effective strength, in which it can move and maneuver without consideration of the enemy's intentions.

GENERAL PRINCIPLES GOVERNING THE DIVISION OF FORCES.

The division of a force into the main body and into that part employed in the service of security is based on the following considerations:

(1) *Tactical*.—The use of the smallest possible number for the actual service of security, in order to save the greatest number for the main action. At the same time, the service of security must be maintained with a sufficient force.

(2) *Welfare and comfort of the troops*.—To employ in the service of security, which is always fatiguing, the smallest possible number, in order to husband one's troops. This consideration is especially noteworthy when the enemy is far off, particularly when no encounter is to be feared. In proximity to the enemy the main consideration is the ability to act, no matter what fatigue and loss may result.

How to March the Main Body to Occupy a Position.

The main body must be able to bring about the greatest effect, and to move easily in the direction chosen to produce this effect.

To Produce the Greatest Effect.

We have seen that in order to bring about this end the personnel for the service of security and the number of detachments must be reduced to a minimum, so as to employ the largest possible force in the action proper.

To Move Easily in the Direction Selected.

The main body may be disposed in three different ways: in a

single column, in several columns, along the same front, in echelon formation.

In single column.—This arrangement is the normal method for moving small units along a single road. For larger units it presents the grave difficulty, in case of an encounter, of limiting the main body to a progressive action, which is often slow, as a result of the route which the various units in rear must follow before being able to participate.

Consideration of the troops' welfare and lack of roads do not always permit the utilization of all the cantonments available.

In several columns along the same front.—This arrangement is useful in bringing on a crushing action. It is used especally in pursuit, in an attack on a weaker enemy, in crossing wooded country, rough country, etc. It is almost the rule in mountainous country. But on long marches it depends in a large measure on the practicable roads. Its inconvenience lies in the fact that it makes changes in direction difficult.

In echelon formation.—This arrangement has the advantage of the two preceding methods without having their disadvantages. It is often adopted in proximity to the enemy. It is composed of columns or lines which may be formed in echelon along a front as well as in a deep formation, in such a way that

(1) The body of troops in this disposition can turn when necessary in any direction.

(2) Action is facilitated in the most menaced direction. Let us assume that a force is moving in the directon M and that the enemy is found to be present in the general direction X, that is to say, to the front and to the right. This force places the units A, B, and C between itself and the enemy in the direction in which it expects to act. Covered by these, the main body marches in echelon formation in the rear and to the right. Thus:

If information is received that the enemy is coming from M:

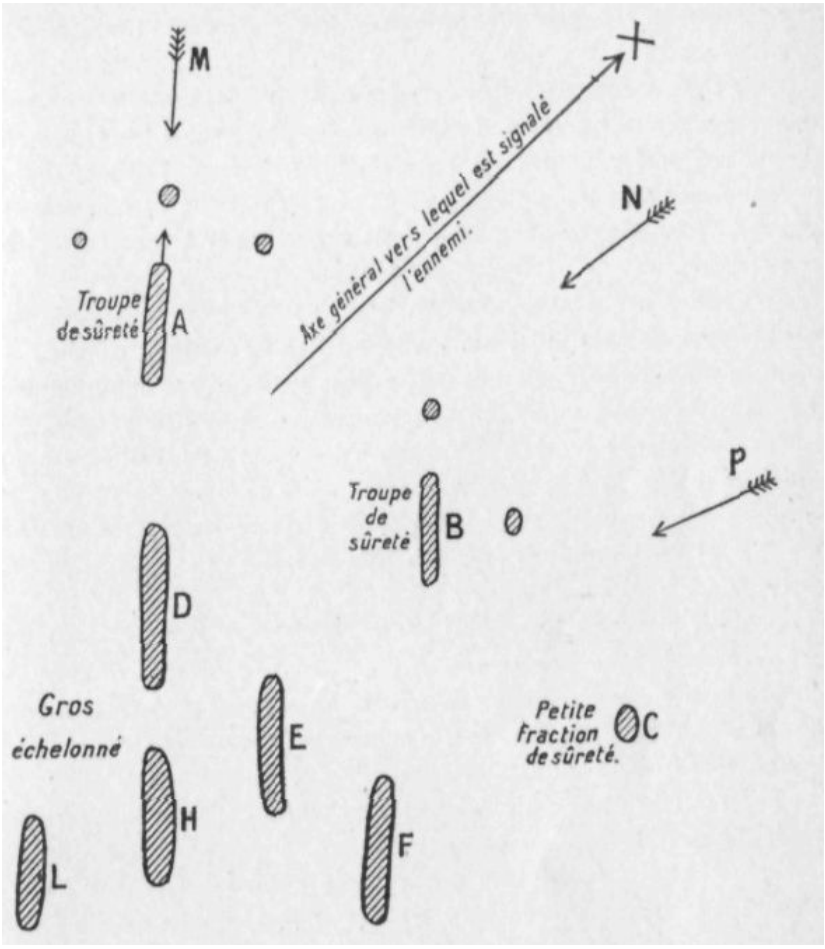
A comes into action, and B can assist it on the right.

D and the other units support it.

If the enemy, moving from N or P, makes an attack:

B or C act, A assisting them on the left.

D, E, and F support them.



How the Main Body is Covered?

The unit of security must march or take position in such a way that the enemy cannot come in contact with the main body without the latter being warned in advance and being able to take proper measures.

What is the Direction in which a Force is Menaced?

From the general situation results the fact that the enemy is reported to be in one or more well-defined zones. Each of those corresponds to one or more directions which are menaced, or sheaves of routes of communication leading toward the enemy.

In the case where the force in question, or even the enemy is on

the march, it is important to determine not only the directions menaced at the time of departure but also those which may be menaced during the march, merely by reason of their direction. Naturally, these menaced directions do not include those which, on occount of their irregularity, would force the enemy to make an excessive detour to make contact possible.

METHODS OF INSURING LIBERTY OF ACTION ALONG MENACED DIRECTIONS.

(1) By information, which warns of the approach of the enemy within an area proportional to the time necessary for maneuvering, that is to say, in proportion to its effective strength.

(2) By the action on the offense or defense of the units of security which drive back, halt, or delay the enemy, allowing the main body the time and space necessary for its intervening, and completing, if possible, the information regarding the enemy.

By Information.—This function, at the start, belongs to aerial scouting, if it can be employed.

There should be reconnaissance by officers or noncommissioned officers in the menaced directions, the object being to seek information at a distance concerning the enemy. There should be no hesitation in sending these patrols very far when necessary. They even can be started out at night. But their number, save in exceptional cases, should be limited to one officer and one noncommissioned officer per squadron, in order not to rapidly disorganize this unit.

The majority of the cavalry, rather than seeking out the enemy, has the function of covering the main force in well-defined directions, going even as far as crests from which hostile artillery might fire effectively. The principal duty of the main body of cavalry is:

To inform the detachments of the presence of the enemy in the direction or directions menaced.

To delay, if possible, an attack which it has detected.

To guard as well as possible the important columns, moving successively from place to place.

It remains as far as possible under the orders of one leader. Nevertheless, in very broken country, there may be an advantage in splitting it into two or more parts, each covering a well defined sector.

The use of the main body of cavalry varies according to whether the force is on the march or in position, or whether the sector assigned

to it is in front, in rear, or on a flank. Each of these cases will be considered.

At night the cavalry, with the exception of a few outposts, generally is drawn in behind the infantry. Here we are dealing with only small units of cavalry.

A very small part of cavalry is charged with the maintenance of tactical connection between the important units of security, and between the various parts of the unit to which it is attached. Moreover, cavalry may be called away from its usual function of serving as a covering force, in order to be employed in acting rapidly against a point where rapidity is essential and where infantry would be late in arriving.

(2) *By offensive or defensive actions*.

This part belongs to the special units charged with covering well defined directions, and these are advance guards, flank guards, rear guards, and outposts. We shall take up the function and composition of each of these, examining successively their functions, first on the march, and secondly in position.

MARCHES.

How to march the main body.—Before studying the rôle and composition of those units charged with maintaining security and insuring freedom of action during marches, it is well to know how the main body which these units must cover, acts on the march, and to determine:

The general order of march.
The route to be followed.
The time of departure.
The distance to be covered.
The method of putting the troops in march.

General Order of March of the Main Body.

In a force made up of all the arms there is no fixed rule for the arrangement of troops on the march.

Far from the enemy the matter of comfort is the principal consideration. The main body is divided into several columns if possible and convenient. The different arms are separated.

On approaching the enemy the matter of comfort gradually gives place to another consideration.

How an arrangement is made most suited to the mission and to combat.

Close to the enemy the tactical situation dictates the formation. The distances and intervals are generally closed in such a way as to allow the units to enter into an engagement or support each other.

Distribution of the several arms.

Close to the enemy *cavalry* is principally employed in the service of security. Far from the enemy it marches apart from the rest of the troops. *Infantry* occupies the central position in the column. *Artillery is* pushed forward towards the head of the columns, but in such a way as to have to its front three battalions, including the advance guard. It is always surrounded mainly by infantry, and, in the absence of infantry, by cavalry. The *engineers* are for the most part detached along with the units of security.

Route of march of the main body.

When far from the enemy, the best route is the shortest one, utilizing the roads suitable for all the arms which make up the main body.

When near the enemy, the route, if possible, avoids defiles, follows, preferably, if the mission allows, roads hidden from the enemy and especially from aeroplanes, and is short. Above all, it must allow the fulfillment of the mission.

The third consideration is often in contradiction with the first two. In this case circumstances and the position of the enemy alone decide which of the three is most important.

When a force enters a zone beaten by hostile fire, the route, if possible, and if the mission permits, utilizes the roads where the troops may find shelter.

Time of departure of the main body.

The time of departure depends principally:

(1) On the tactical requirements of the mission. For example, there may be a great advantage in reaching the end of the march as soon as possible, so as:

(a) To get the start of the enemy.

(b) To avoid a combat under disadvantages.

(c) To carry out a surprise.

(2) On the time required by the commander.

(a) For preparing the order.

(b) For communicating it to the troops.
(c) For assembling them in their cantonments.
(d) For marching them to the starting place or rendezvous.

The first consideration often makes a night march necessary. As this has the disadvantage of tiring the troops, it is only resorted to when strictly necessary, especially in order:

To conceal the march (from aeroplanes, etc.), and to avoid a surprise.

To anticipate the enemy in the occupation of a position.

To make a night attack on an enemy provided with superior artillery.

To make an attack at dawn.

To make a flank movement in a zone beaten by superior artillery.

On the other hand, a commander must never hesitate to make a night march if the situation requires.

Distance to be covered depends on the mission, the nature of the country to be traversed, and the climatic conditions.

The distance which can be covered by infantry serves as a basis: Twenty-two kilometers is an average march; 35 kilometers is a long march, and a march of 40 kilometers is exceptional. If the average is exceeded for more than a few days, the wear on the troops is too great.

But there are instances where the end must be reached at any cost, and then the marches are lengthened without regard to wear and fatigue.

Method of putting the main body in march.

The column may:

(1) Be given a rendezvous before starting out (an infrequent procedure):

If the force in question is small and if the units composing it are near each other.

If the units must be brought together as soon as possible.

Finally, if the column is small and the units are formed together for the first time.

The rendezvous should:

Be sheltered from the view and the fire of the enemy.

Be far enough beyond the original position to avoid useless marching.

Finally, it must be well guarded.

(2) Be given an initial or starting point which the units must pass at a given time.

The starting point is chosen so as to cause no single unit to uselessly lengthen its march in reaching it. It should be accurately fixed and provide ample room so as to avoid crowding.

The time when a unit must reach the initial point of a march depends on the time required by the units preceding it in the column in passing this point.

This time depends on the rate of march and the length of the column.

The rate of march of a column is 4 kilometers an hour (including a ten-minute halt every hour).

The length of the column depends on its formation and extension.

Keeping these elements in mind, the average length of the various elements in route formation is generally as follows:

Infantry:	One battalion,	400 meters.
	One regiment,	1,400 "
Artillery:	One battery,	300 "
	One battalion,	1,000 "
Cavalry:	One squadron,	120 "
	One regiment,	600 "
A division:	12,000 meters.	
An army corps:	36,000 "	

Method of Covering the Main Body.

Being familiar with all the elements of the main body on the march, we can consider, as above indicated, the directions menaced during the march. We then have everything required for determining the force to be employed in the service of security and the method in which it is to be utilized.

The strength of the force employed in the service of security is in proportion:

To the strength of the force to be covered.

To the distance of the enemy.

To the number of menaced directions.

To the extent of the mission.

It usually does not exceed a third of the total strength, but there is no fixed rule.

Employment and distribution of this force.—Knowing the menaced direction, we can tell whether the movement is straight towards the enemy, a flank movement, a retreat (retrograde movement).

In principle, a force guards itself on every side in all of these cases, but the distribution of the troops employed in the service of security varies in each case according to the direction of the zone occupied by the enemy. The strongest force is naturally placed on the most exposed side, the least exposed side being merely watched.

Let us take up separately each kind of march.

A MARCH STRAIGHT TOWARDS THE ENEMY.

Main body of cavalry.—On a march of this kind, the main body of cavalry generally receives an order to precede the advance guard by leaps and bounds, to keep it informed and, in case of an encounter with the enemy, to cover the advance guard as long as possible by dismounted action. The extent of these leaps and bounds generally depends on the obstacles of terrain. Cavalry should, as a rule, be constantly ahead of the advance guard, or at least on the obstacle ahead of that reached by the advance guard.

It must be allowed initiative; however, it is well to indicate in a very general way the leaps which it may make.

A small part of the cavalry, usually the smallest fraction, is generally placed under the orders of the commander of the advance guard, in order to insure immediate security.

The principal element of protection in a march straight towards the enemy is:

THE ADVANCE GUARD.

Its mission.—The mission of the advance guard during a march is:

(1) To cover the march of the main body.

(2) In case of an encounter with the enemy to bluntly force a passage as far as it is possible to do so.

(3) To insure the point of arrival of the main body.

(4) To reconnoiter the enemy's position by an attack.

Characteristic of the advance guard.—The rôle of the advance guard on the march is strictly offensive. It should not be halted except by serious resistance, under the penalty of constantly and uselessly retarding the column it is covering. The fact that it is marching in a definite direction indicates its intention to crush all opposition,

unless this is absolutely impossible. The characteristic of the advance guard is *brutality*.

Composition of the advance guard.—Infantry is the nucleus of the advance guard.

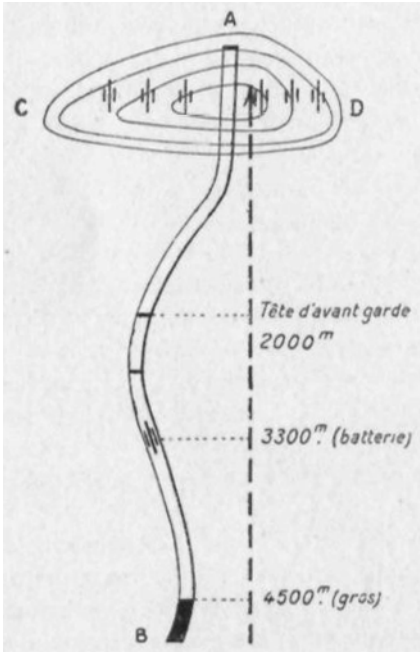
If an encounter cannot take place during the march on account of the great distance of the enemy, the advance guard serves merely as a protection against hostile cavalry. If an encounter may take place during the march, the strength of the advance guard in infantry depends:

On the total strength of the force.

On the mission of the detached force.

The offensive power of the advance guard must be in accordance with its mission. Its effective strength should be increased when this mission becomes more strictly of an offensive nature.

Artillery usually has no place in an advance guard consisting of less than three battalions. Its strength is in proportion to the number of infantry in the advance guard.



NOTE.—Let us suppose that an advance guard composed of 2 battalions

and one battery is marching along the road from B to A, and that the cavalry has been pushed back on the front of the advance guard, just as it is about 2000 meters from the elevation C D. The battery is at this moment about 3300 meters from this elevation, and may be surprised in route formation by hostile artillery posted along C D. It must make a half turn on the road, and it becomes more cumbersome than useful. If, on the other hand, it marches at the head of the main body, a surprise at a distance of 4500 meters is less likely, or almost useless. Its safety and freedom of action are greater. Therefore, artillery is not ordinarily assigned to advance guards of less than three battalions, but there is no fixed rule.

The Engineers assigned to a force march with the advance guard, in order to clear the road of obstacles and to open the roads to traffic before the arrival of the main body, so that there will be the least possible delay.

Distance between the advance guard and the main body varies between a minimum and a maximum.

The minimum distance depends on the following requirements:

(1st.) That of securing the detachment during the day time, its strength permitting, against surprise by hostile artillery. The first units of the advance guard must therefore be able to cover with their fire (at ranges of about 800 meters) the nearest artillery positions from which the enemy might fire on the column. Their distance on absolutely flat and open terrain is the range of artillery, 5500 meters less 800 meters. The more the terrain is covered the less is the risk of being seen at great distances by the enemy's artillery, and consequently the advance guard may march closer to the main body. On the other hand, the more open the terrain the greater is the danger of being surprised by hostile artillery, and the advance guard must be that much further from the main body.

(2nd.) That of insuring the space and time needed for deployment in case of contact with the enemy. The extent of the area required for maneuvering the main body varies according to the size of the force to be deployed.

The time necessary depends on the strength of the force, on the facilities for transmitting orders, on the route formation, and, finally, on the difficulties which the terrain offers for maneuvering.

The maximum distance is the greatest distance at which the advance guard can effectively cover the main body without danger of being cut off by a force of the enemy or crushed before the arrival of

reinforcements. The maximum distance is approximately the distance in which the advance guard can cover itself by its own means. If, for any reason, it becomes necessary to go beyond this limit, the service of security of the advance guard must be supplemented by flank guards.

The more the terrain is covered the smaller must be the distance. The more it is opened the greater is the distance which may be taken conveniently. At night the distance must be very small.

From what part of a force must the advance guard be chosen? A force must be very large in order to be able to furnish for several days in succession a unit capable of maintaining security on the march and at halts. A weak advance guard furnishes the outposts on halting, but it is relieved on the next march by troops detached from the main body.

Flank guards on a march straight towards the enemy.—The route followed by the main body is divided into a certain number of successive steps, separating the main obstacles of terrain. For each one of these steps the opportunity for employing one or two flank guards must be considered. The flank guard, on a march straight towards the enemy which may develop into a flank march, has an especial importance on the menaced flanks. In directions not menaced, it is composed either of a weak force of cavalry or infantry or even of a mere cavalry patrol, no mention of which is made in the order. The flank guard in this case is generally mobile.

Rear guard in a march straight towards the enemy.—Its duties are to ward off a surprise by cavalry or raiding parties. It is composed of an infantry force with a small number of cavalry attached if, by reason of the proximity of hostile cavalry, a surprise is expected; or it may consist of a small force of cavalry, often only a cavalry patrol, if there is no reason to expect a surprise.

FLANK MARCHES.

If the enemy is reported on the flanks of the route to be followed, the march becomes a flank march.

Main Body of Cavalry, supported by small units of infantry, may be used as a flank guard, if the enemy is reported as being far off or very weak. It moves successively in each menaced direction. Used in conjunction with other arms, it is put under the order of the

commander of the flank guard. If its strength is great, a brigade for example, artillery may be attached.

FLANK GUARD.

Mission.—The mission of the flank guard is to cover a flank, obtain information, and keep watch, and to retard the enemy in case of an attack, long enough to allow the main body freedom of action.

Characteristics.—The flank guard must be self-reliant, and not compel the main column to come to its support. It may happen that its rôle is not an offensive one, and in this it differs from the advance guard, but its leader must not hesitate in attacking the enemy if he considers it the best way of stopping the latter's advance towards the main body.

If the action of the flank is not on the offensive, it may be obliged to resort to combat during the retreat, the two main elements of which are capacity of resistance and depth of formation. If one is diminished the other must be increased.

The nearer the flank guard is to the force it is covering, the greater must be its power of resistance, since it can only afford to lose little ground.

The greater its distance, the greater is the delay which it may cause the enemy, by resisting its advance at every advantageous position.

The flank guard has the advantage of being able to act without attracting the attention of the enemy. To this end, cavalry may receive orders not to go beyond certain limits in the menaced directions.

Tactical connection.—The commander of a flank guard must constantly maintain tactical connection with the main body. Thus he may determine the proper moment for successively abandoning zones occupied by him in a more satisfactory manner than by a calculation of time, often upset by the course of events.

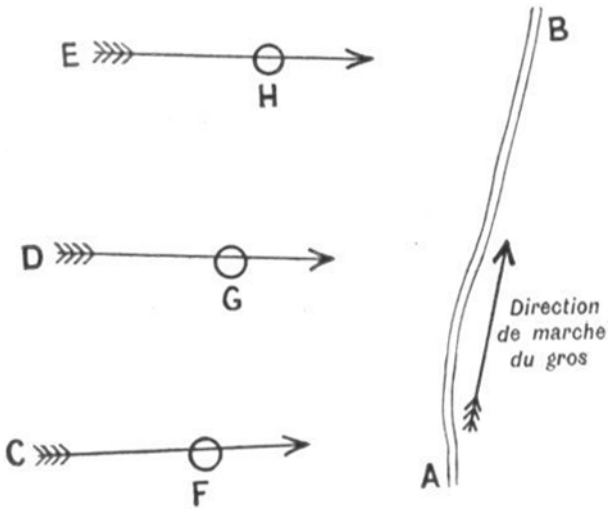
Knowing the various elements of the main body on the march, and the menaced directions, which kind of flank guard must be chosen? A flank guard is generally either fixed, mobile, or a combination of these two.

The fixed and mobile flank guard is the one most generally used. It moves in succession into each of the menaced zones, and takes position long enough to allow the main body to pass in safety.

Let us assume that a column is marching from A towards B, that the route is menaced in three directions, C, D, E.

The flank guard charged with covering the main body moves first to F, blocking the direction C, detaches a small force to occupy G and to block D provisionally, and sends forward a few mounted men to H to seek information.

As soon as it considers its function at F accomplished, it moves to G. Then it sends an advance guard to H, leaving a small rear guard at F in order to cover the direction C. in case the rear units of the main body may not have yet passed that point; and so on.



Each unit of the flank guard in taking position establishes communication so as to be able to move easily in every menaced direction.

This sort of flank guard, both fixed and mobile, is advantageous in covered country; also, when the menaced directions are few in number and well defined. Its employment allows the greatest initiative to the commander of the flank guard.

A fixed flank guard is the one most capable of holding effectively a sheaf of menaced directions. But it cannot be used at the same time along several such sheaves, if they are too far apart to be well guarded by a single unit and if a sufficient force for serious resistance can not be assigned to each. A fixed flank guard is especially useful

in case the route followed by the column to be covered is short, or the main body on the march is threatened only along one sheaf of menaced directions, all close enough to be held by a single undivided unit, for example, in passing a defile.

A mobile flank guard, due to the fact of its mobility, can usually maintain only a limited guard. Accordingly, it is used when the force to be covered is small, when the terrain is open, facilitating observation and offering no positions which could be held by the enemy, when the enemy is far off, and when the route to be guarded is very extended. A mobile flank guard usually follows routes parallel to the direction of the march of the main body.

Composition of a flank guard—Infantry.—The strength of the flank guard in infantry may be a third of its total strength. It depends upon the following considerations:

(1) Distance of the flank guard from the column. The smaller this distance, the greater must be the strength of the infantry. The converse is not exactly correct, but the strength in infantry may be smaller if the flank guard is pushed far enough forward.

(2) Distance separating the flank guard from the supposed position of the enemy.

(3) Facilities for resistance offered by the terrain.

(4) Length of the march.

Artillery.—Artillery, whose retarding action is carried out at great distances, is very useful in a strong flank guard. There is great need for using a part or even the whole of it, if all the forces of the enemy are reported to be on a flank (investing force).

Distance of the flank guard from the main body.—As in the case of the advance guard, the distance of the flank guard from the main body varies between a maximum and a minimum.

The flank guard must *at the minimum distance*, control with its fire the positions from which hostile artillery might fire upon the main body, see beyond the covered terrain (woods, crests, etc.), which separates the enemy from the main column, and make sure of allowing sufficient space for delaying the enemy during the time necessary for the column to pass a given point.

At the maximum distance it must block all directions which the enemy might use in slipping between the flank guard and the main body.

The greater the distance of the flank guard, the longer it may maneuver in retiring, and the longer it may cover the column.

From what unit must the flank guard be detached? Save in a case of urgent necessity, the flank guard is detached from the main body. Its place in column before being detached is generally in rear of the advance guard; its route and time of departure are determined so as to avoid delay to the main body and in order to give it time to reach its destination. When the march is suddenly changed from a march straight towards the enemy to a flank march (change in direction of march) it is advantageous to take the whole or part of the new advance guard for the original flank guard.

The time during which a flank guard must cover the main body while passing a menaced direction is the time required by the main body in passing this point, or the time required by the enemy in order:

To cover the distance separating it from the flank guard.

To cover the distance separating the flank guard from the main body.

ADVANCE GUARD ON A FLANK MARCH.

Mission.—Its mission is the same as that of the advance guard on a march straight towards the enemy.

Composition and strength.—These vary, being determined by reports of the enemy's proximity to the line of march.

If the enemy is reported to be along the line of march as well as on one flank, the commander of the force divides the troops furnishing security into a flank guard and an advance guard, keeping in mind the rôle of each. If the enemy is not reported along the line of march, the closer he is to a flank of the main body, the greater is the risk of being stopped by a hostile force designated to hold the front of the column during a flank attack. The advance guard in this case must be strong enough to prevent the main body from being stopped.

REAR GUARD ON A FLANK MARCH.

The rear guard is usually made up of a weak force of infantry, and its strength is proportional to the distance and composition of the enemy's forces.

RETROGRADE MARCH.

Main Body of Cavalry.—One of the principal dangers which may be encountered by a force in retreat is to be turned. Consequently, the

guarding of the flanks must be of special concern to the commander, and it is to the cavalry that this duty is confided.

REAR GUARD.

The function of the rear guard, in relation to the main body, is both to cover it and insure its freedom of action by delaying the enemy, if necessary. The rear guard should never take the offensive unless its mission demands self-sacrifice, or unless it clearly feels its superiority. Generally, it avoids being attacked. Since it must not call on the main body for assistance and support, it must feel entirely independent.

Composition of the Rear Guard—Infantry: The strength of the rear guard in infantry varies greatly. It depends: (1) On the composition and strength of the forces in question. (2) On the distance separating it from the enemy. (3) On the facilities for resistance afforded by the terrain. (4) On the physical condition of the troops, their morale, and the rate of march. (5) On the activity of the enemy, and whether the pursuit is more or less forced.

Artillery.—Thanks to its power of retarding the enemy, artillery is very useful in the rear guard. It can choose its positions in advance and carry out surprises. A large part of the artillery or the whole of it is assigned to the rear guard when the pursuit is being vigorously pushed by the enemy. In column formation it marches at the head of the rear guard, that is to say, near the rear of the main body.

Cavalry.—All the cavalry is left with the rear guard. Its duty is: (1) To watch especially the flanks in order to detect an enveloping movement, and (2) to cover the retreat in echelon formation and accompany the artillery in changing position.

Engineers.—The engineers are, for the most part, left with the rear guard.

The distance separating the rear guard from the tail of the column must be such that:

At the minimum distance the main body will be protected from the fire of hostile artillery; the rear guard must keep at a sufficient distance from the main body to be able to maneuver while in retreat without throwing the rear units of the main body into disorder.

The maximum distance must be such that the rear guard will not risk being cut off from the main body. This distance is not definitely

fixed, but is left to the judgment of the commander of the rear guard, who is alone responsible for the accomplishment of his mission.

ADVANCE GUARD IN A RETROGRADE MOVEMENT.

The composition of the advance guard in a retrograde movement varies according as to whether the enemy is or is not reported to the front as well as to the rear of the detachment. If the line of march is menaced, an exceptional case, the distribution of the units of security among the advance guard and rear guard is made according to circumstances.

If the enemy is not reported in front, the advance guard merely becomes a unit of security. Its strength is greatly reduced and its first object is to protect the main body against a surprise by cavalry, or to clear the terrain if necessary.

FLANK GUARD IN A RETROGRADE MOVEMENT.

We have already seen that the flanks of a rear guard are usually in great danger. Artillery, accompanied by cavalry, is especially to be feared; therefore, extra precautions must be taken. Aerial observations for large units may in this case be of great service.

(TO BE CONTINUED)

QUESTIONS FOR FINAL EXAMINATION FOR NONCOMMISSIONED OFFICERS.*

SCHOOL OF FIRE FOR FIELD ARTILLERY.

1- Show by a sketch example the principal requirements for a good military panoramic sketch, giving the conventional signs used for infantry, machine guns, and batteries.

2-(a) Why is it best to determine the initial deflection for the center of the target?

(b) Give three important reasons for selecting a distant aiming point in rear.

(c) In determining firing data what 5 elements should the chief of 5th section be prepared to furnish the B. C.

3-(a) Solve the following problem by the parallel or graphical method, giving the necessary figures:—

B. C. is 40 yds. to the left flank of the 5th sect. caisson; P. is 4000 yds. to the right rear;

T. is a 4 gun battery with flank caissons, measured interval between sections is 8 m.; R. is 2500 yds.

4-(a) Minimum R. for a sector is AS. 295, R. 2500; as measured from BC. station on crest; how will you determine line of guns in rear of crest, give details.

(b) If this crest is 9 yds. higher than the guns what is the distance of the guns from the crest?

(c) What is the correct AS. and R. at the guns?

(d) With the battery already in position what is the quickest way to determine whether the crest can be cleared?

5. Explain briefly the general duties of each individual of the battery detail.

6-(a) Make a table showing the deflection corrections for targets moving at a walk, trot and gallop, whose directions are straight, oblique and flank.

(b) Give reasons for this rule and show by diagram.

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* EDITOR'S NOTE.—The highest mark attained in this examination was 98%. This figure speaks for itself, and shows the possibilities of our noncommissioned officers.

7- Battery is in position with the following intervals:

: 16 : 20 : 28 :

Target is a hostile battery at twice the normal interval and R. is 2500.

(a) If AP. is 5000 yds. in the right rear, and DD. of – 4 is used, what distribution may be expected?

(b) What corrections in mils must be made for each gun so as to direct its fire upon its proper target? Draw a diagram and give figures.

8- Suppose the HB. to be adjusted for effect, firing battery using battery volleys at mid range:

(a) What is the limit of front that can be attacked with converging fire?

(b) What is the limit of front that can be attacked without resorting to sweeping fire?

9- Corrector for adjustment for the day is 25, actual R. of the T. is AS. 300, R. 3500. Suppose that in time fire the data given are AS. 298, C. 30, R. 3300;

(a) What is the probable HB?

(b) The probable Range of Burst?

(c) The probable interval of Burst?

(Assume 1 mil in AS. or C. gives a change of 20 yds.)

10- What is the probable HB. if in a BS. you observe:

(a) All graze 1, mil below the T.;

(b) 3 graze and 1 air;

(c) 2 graze and 2 air;

(d) 3 graze and 1 air;

(e) all air, 0, 2, 5, and 1 mil high.

11- Fire is adjusted with a BS. at mid range, giving 2 grazes 2 air bursts, 3 and 5 mils high;

(a) What is the probable HB?

(b) Is it necessary to have the fuze setting or the laying of the pieces checked up?

(c) In passing to fire for effect what change in corrector should be made?

13- What size bracket is recommended on the following moving targets, giving reasons in each case?

(a) Advancing or retreating cavalry, rapid gait;

(b) Infantry advancing or retreating by rushes;

(c) Battery moving by the flank in column of march, trot.

13- What size bracket is recommended on the following targets, giving reasons in each case?

(a) Battery in firing position;

(b) Machine gun battery in firing position;

(c) Infantry in the open; (d) Same in trenches.

14- Suppose a gunner reports a quadrant out of order, how will you tell him to lay his gun for indirect laying? Correct range being AS. 290, R. 3400.

15-(a) Speaking circuit is out of order, what test do you make to locate the trouble?

(b) Where would you first look for trouble in case of failure to get communication?

(c) What parts of the telephone should never be tampered with?

EXPERIMENT IN FEEDING HORSES.

Upon the approved request of the President of the Kansas State Agricultural College, certain experiments in feeding the horses of the Sixth Field Artillery were made at Fort Riley, Kansas.

The experimental feeding covered a period of about five months, from January 9th to June 1st, 1911.

Great care was taken that the feeding should be done in a scientific manner, and all pertinent facts were recorded.

The objects of the experiments were:

1. To make direct comparison of the use of various hays for horse feeding—such as timothy hay, prairie hay, alfalfa hay, the hay made from the small grains (wheat, oats and barley) and wild oats hay.

2. To find, if possible, a grain or a mixture of grains that will largely take the place of oats for horse feeding, and give the same results, but be more economical.

3. To make careful study of the influence of various grains, and various mixtures of grains for standard horse rations.

The rations fed, the number of horses receiving each ration, the number of days each ration was fed, and the cost per ration (at Fort Riley) were as follows:

Lot 1.

Oats	12 lbs.	Fed to 77 horses of Battery A, for 139 days. Cost $ .2241, per ration. This is the standard army ration for this locality except that bran was not fed. The bran was omitted in order to observe the effect as compared with results obtained with the standard ration.
Prairie hay	14 lbs.	

Lot 2.

Corn	12 lbs.	Fed to 80 horses of Battery A, for 139 days. Cost $ .1609, per ration.
Prairie hay	14 lbs.	

Lot 3.

Oats	8 lbs.	Fed to 74 horses of Battery B, for 108 days. Cost $ .2540, per ration.
Corn	4 lbs.	
Timothy hay	14 lbs.	

Lot 4.		
Oats	8 lbs.	Fed to 79 horses of Battery B, for 108 days. Cost $ .2027, per ration.
Corn	4 lbs.	
Prairie hay	14 lbs.	
Lot 5.		
Oats	4 lbs.	Fed to 73 horses of Battery C, for 113 days. Cost $ .1819, per ration.
Corn	8 lbs.	
Prairie hay	14 lbs.	
Lot 6.		
Oats	4 lbs.	Fed to 73 horses of Battery C, for 113 days. Cost $ .1880, per ration.
Corn	6 lbs.	
Alfalfa meal	4 lbs.	
Prairie hay	12 lbs.	
Lot 7.		
Oats	4 lbs.	Fed to 80 horses of Battery D, for 112 days. Cost $ .2354, per ration.
Corn	6 lbs.	
Alfalfa meal	4 lbs.	
Timothy hay	12 lbs.	
Lot 8.		
Oats	4 lbs.	Fed to 76 horses of Battery D, for 112 day. Cost $ .2020, per ration.
Corn	6 lbs.	
Bran	4 lbs.	
Prairie hay	12 lbs.	
Lot 9.		
Oats	4 lbs.	Fed to 74 horses of Battery F, for 111 days. Cost $ .2494, per ration.
Corn	6 lbs.	
Bran	4 lbs.	
Timothy hay	12 lbs.	
Lot 10.		
Oats	4 lbs.	Fed to 79 horses of Battery F, for 111 days. Cost $ .1762, per ration.
Corn	6 lbs.	
Linseed meal	1 lb.	
Prairie hay	12 lbs.	
Lot 11.		
Oats	12 lbs.	The same ration as No. 1, and fed to 18 horses of Battery E, for 141 days as a check feed for the following rations fed to small lots of horses. Cost $ .2241, per ration.
Prairie hay	14 lbs.	
Lot 11a.		
Barley	12 lbs.	Fed to 3 horses of Battery E, for 78 days. Cost $ .1863, per ration.
Prairie hay	14 lbs.	
Lot 12.		
Corn	8 lbs.	Fed to 18 horses of Battery E, for 141 days. Cost $ .1544, per ration.
Oats	2 lbs.	
Alfalfa hay	10 lbs.	

Lot 13.		
Corn	4 lbs.	Fed to 19 horses of Battery E, for 95 days. Cost $ .1268, per ration.
Oats	2 lbs.	
Wild oats hay	12 lbs.	
Lot 14.		
Corn	4 lbs.	Fed to 17 horses of Battery E, for 106 days. Cost $ .1448, per ration.
Oats	2 lbs.	
Wheat hay	12 lbs.	
Lot 15.		
Corn	6 lbs.	Fed to 22 horses of Battery E, for 140 days. Cost $ .1590, per ration.
Bran	3 lbs.	
Linseed meal	1 lb.	
Prairie hay	14 lbs.	
Lot 16.		
Corn	6 lbs.	Fed to 18 horses of Battery E, for 15 days. Cost $ .1377, per ration.
Barley hay	6 lbs.	
Prairie hay	12 lbs.	
Lot 17.		
Corn	6 lbs.	Fed to 19 horses of Battery E, for 51 days. Cost $ .1329, per ration.
Barley hay	4 lbs.	
Alfalfa hay	4 lbs.	
Prairie hay	10 lbs.	
Lot 18.		
Oats	10 lbs.	Fed to 19 horses of Battery E, for 72 days. Cost $ .1748, per ration.
Sugar	½ lb.	
Prairie hay	14 lbs.	

It can be stated that the animals of each lot did well on each ration, and that no ration was of low feeding value, but some were difficult to feed from a military standpoint.

The following conclusions have been drawn from the experiment:

1. Indian corn is about as good food for horses as oats—it is cheaper than oats. Anyone can tell good corn from poor, while only experts can pass on the quality of oats. The month of May, 1911, was very warm, but no heating effect from feeding corn was observed.

2. Alfalfa hay is a very valuable food for horses. It is not a dangerous food, as many think. No troubles of any kind were noticed among the horses fed alfalfa hay and they relished it greatly. As much vigor and stamina were observed among the horses receiving alfalfa hay as among others. The explanation of the great value of alfalfa hay is the fact that it contains a large amount of easily digested protein, and therefore may successfully replace a part of the grain (protein) portion of the usual ration. In those parts of the

United States where alfalfa grows to advantage it is often the only food given to horses, taking the place of both grain and hay as ordinarily fed. Alfalfa meal has no advantage over alfalfa hay and besides is troublesome to feed and transport.

3. Linseed meal to the amount of one pound daily produced excellent results. The horses of the lots receiving linseed meal were of fine appearance, had glossy coats, and were as spirited and lively as any horses in the regiment. The horses of Lots 10 and 15, which received linseed meal as part of their rations could be quickly picked from other horses in the same corral on account of their excellent appearance. Linseed meal contains a large per cent of protein and has the property of making digestible more of the nutrients of foods which are fed with it than are digestible if linseed meal is not fed.

4. Barley apparently gave as good results as oats but as only three horses were fed barley and the time of feeding was short, a good comparison could not be made.

5. While the standard ration of oats, bran and hay is excellent, other rations may be fed with confidence and safety, and at a much less cost.

No mention is made concerning the value of timothy hay as food for horses, because, although it is generally known that timothy hay is an excellent food, the quality furnished for use in this experiment was very poor.

The cost of the rations containing the small-grain hays and barley is based on the cost of these hays and barley F. O. B. at San Francisco, as the freight from that point was excessive.

It is believed that the 6 following rations are the best for military purposes in the Middle West section of the United States:

1.	Oats	12 lbs.	Bran may be substituted for part of the grain and fed once or twice weekly in the form of a mash or dry as desired. It should be fed pound for pound instead of grain at the usual feeding time. Bran is richer in protein than oats or corn and is besides a mild laxative.
	Prairie hay	14 lbs.	
2.	Corn	12 lbs.	
	Prairie hay	14 lbs.	
3.	Oats	8 lbs.	
	Corn	4 lbs.	
	Prairie hay	14 lbs.	

4.	Oats	4 lbs.
	Corn	6 lbs.
	Linseed meal	1 lb.
	Prairie hay	12 lbs.
5.	Corn	8 lbs.
	Oats	2 lbs.
	Alfalfa hay	10 lbs.
6.	Corn	6 lbs.
	Bran	3 lbs.
	Linseed meal	1 lb.
	Prairie hay	14 lbs.

The reduced weight of rations 4, 5 and 6, as compared with the weight of the standard ration is particularly important. In the feeding of 1000 horses (approximately the allowance on a peace footing of a regiment of Horse Artillery), the total weight of ration No. 4 would be 3000 lbs. per day less than the total weight of the standard army ration. That of No. 5 would be 6000 lbs. less, and that of No. 6, 1000 lbs. less.

No. 4 would be 3000 lbs. per day less than the total weight of the

BOOK REVIEWS

Technique of Modern Tactics. By Majors Paul S. Bond and M. J. McDonough, Corps of Engineers, U. S. A. 306 pp. Published by The George Banta Publishing Company, Menasha, Wisconsin. Price, $2.65, postpaid.

The authors in their preface say:

> "The purpose of this volume is to supply in compact form the help needed by the instructor—or student working alone—in the applicatory method of study. It is not intended as a text alone; its principal rôle is that of a guide to those engaged in the study of practical problems in tactics, either as instructor or student, for the preparation or solution of those problems. *** Nearly everything contained in this volume can be found elaborated in special treatises, but time is of special value to the military student, and this work gives in a single volume authoritatively the data that must otherwise be searched for through a small library."

After describing the general technique of solving military problems, the authors discuss in detail orders, patrolling, advance, rear, and flank guards, outposts, and the various forms of combat. The tactics of infantry, cavalry, and field artillery are discussed separately, and the functions of the special troops—engineers, signal and sanitary—are described. Field fortifications and the preparation of terrain come in for extended discussion illustrated with maps, and tables showing men, time, and tools necessary for the different classes of work. A chapter is devoted to the tactics and supply of the division.

Curiously enough, there is no discussion of the aeroplane, which must certainly be considered an important factor in modern warfare.

Some of the authors' doctrine concerning artillery seems open to criticism. They tell us that if the range greatly exceeds 4000 yards we must look for a closer position. The Field Artillery Drill Regulations give the first important consideration in the choice of an artillery position as "not much greater than 3000 yards," and the Field Service Regulations (paragraph 260) provide that "The artillery, guarded by other troops, is pushed forward to within 3000 yards of the hostile position, if practicable, etc." The impression is gained that the authors, like many of our officers, are inclined to think too lightly of direct fire, or stated differently, are apt to overestimate the possibilities of indirect fire. While fully admitting the virtue of this latter system, we still believe that there will be many occasions upon which the battery commander must turn over the function of gun-pointing to the individual gunners.

The authors make little or no mention of the use of artillery with the advance guard where this arm is handled somewhat differently, with more audacity and more dispersion, than in the main body. The use of the attacker's artillery in developing the defender's line—sometimes spoken of as reconnoitering batteries—is not discussed.

It is doubtful if artillery officers will admit the soundness of the theory that makes it necessary for the division or detachment commander to restore in

orders the authority of the artillery commanders over his combat trains, simply because these have been marching behind the infantry. It is true that this practice was inaugurated in the problems at the Army Service School a year ago, but there is nothing in either the Field Service Regulations or the Field Artillery Drill Regulations which justifies this course. In effect, it transforms the combat of our field artillery battalion into the light ammunition column of the German service, and it is only reasonable to believe that had our authorities desired this system they would have included it in our organization, instead of following the organization of the French whose tactical views in the handling of artillery have been largely followed.

With the exceptions noted the authors' discussion of artillery is clear and succinct, and well calculated to give a good understanding of the powers and limitations of this arm.

In other parts of the book there are several contradictions which are inclined to leave the reader in doubt; for instance, on page 133 we are told that "Cavalry operating alone, except for very short periods, should generally be accompanied by a sufficient train to provide reasonable comfort for men and horses," while on page 166 we read "Cavalry operating against the enemy has little use for trains."

The work, taken as a whole, is a valuable addition to our military literature. It epitomizes the whole subject of tact as taught at the Army Service Schools, and is the only work of the kind in English. To officers in charge of tactical instruction, either in the regular service or militia, as well as those studying alone, the book will prove invaluable, not only as a code of principles, but also as a text-book to be consulted as the occasion arises. To the officer preparing for a course at the War College, or the Army School of the Line, the book cannot be too highly recommended.

Fifty Years of the Rifled Gun. By Commandant Morelle (French Army). Published by Librairie Militaire, Berger-Levrault, Paris. Price, 1 fr., 50c.

This little work comprises four chapters. The first of these is devoted to a discussion of the progress in field artillery matériel and the coordination of action with that of the infantry during the last half century. The second chapter is given over to a discussion of the successive manoeuvre regulations which have appeared since the adoption of the 75 mm. rapid-fire field gun. the extent of fronts, the coordinated employment of various arms, the economy of forces, the occupation of positions, the use of explosive shell, and the employment of air-craft. The third chapter deals with the number of guns and, as most French writings upon this subject, considers the aspect of the difference in guns of the French and German army corps. The last chapter is a résumé of the discussion to which the light field howitzer has given rise.

The reader will recognize in this new study the earnestness and picturesque style which have marked the author's previous writings. The work is evidently designed to appeal to the lay reader as well as his brother in arms.

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TO CURRENT FIELD ARTILLERY LITERATURE.

Mules.—Their superiority for pack and draught purposes.—Deutsche Offizierblatt, January 8, 1914.

Horse Artillery in Cooperation with Cavalry.—British Cavalry Journal, January, 1914.

Field Guns in the Balkan War.—Table of principal data of field pieces of the Bulgarian, Servian, and Turkish Artillery.—Rivista di Artiglieria e Genio, November, 1913.

Field Artillery in the Balkan War.—Journal des Sciences Militaires, February 1, 1914.

FIELD ARTILLERY DIRECTORY.

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2*d Regiment (Mountain).*—Col. Eli D Hoyle: Manila.

3*d Regiment (Light).*—Col. Charles G. Treat: H. Q. and 1st Bn, Fort Sam Houston, Texas; 2d Bn, Fort Myer, Va.

4*th Regiment (Mountain).*—Col. Lucien G. Berry: Texas City, Texas.

5*th Regiment (Light).*—Col. Granger Adams: Fort Sill, Oklahoma: Bty D. Fort Snelling, Minn.

6*th Regiment (Horse).*—Col. E. A. Millar: Fort Riley, Kansas, Battery C. Fort Bliss, Texas.

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7*th Inspection District*.—Lieut. Frank Thorp, Inspector, Kansas City, Missouri.
Missouri.—Btry A, Capt. Eugene O. Sanguinet: St. Louis. Btry B, Capt. H. M. Boyer, Kansas City.
Kansas.—Btry A, Capt. W. A. Pattison: Topeka.
Texas.—Btry A, Capt. F. A. Logan: Dallas.
8*th Inspection District*.—Lt. B. M. Bailey, 5th F. A. Inspector, Denver, Colo.
Colorado.—1st Bn, Maj. J. B. Goodman, Jr.: H. Q., Btries A and B, Denver.
Utah.—1st Btry, Capt. W. C. Webb: Salt Lake City.
New Mexico.—Btry A, Capt. M. S. Murray: Roswell.
9*th Inspection District*.—Capt. E. H. Yule, Inspector, Oakland, Cal.
Oregon.—Btry A, Capt. Hiram U. Welch: Portland.
California.—1st Bn, Maj. Ralph J Faneuf, Hdqrs and Btry B Oakland; Btry A, Los Angeles; Btry C, Stockton.
Unassigned.
New Hampshire.—Btry A, Capt. Edwin L. Towle: Manchester.