THE FIELD ARTILLERY JOURNAL

SEPTEMBER-OCTOBER, 1935

PUBLISHED BI-MONTHLY BY

THE UNITED STATES FIELD ARTILLERY ASSOCIATION

September-October, 1935

CONTENTS

VOL. XXV No. 5

SEPTEMBER-OCTOBER, 1935

THE FIELD ARTILLERY JOURNAL

EDITED BY
DEAN HUDNUTT
MAJOR, FIELD ARTILLERY, UNITED STATES ARMY

Patron Saint of Artillery

PUBLISHED BI-MONTHLY FOR
THE UNITED STATES FIELD ARTILLERY ASSOCIATION
BY MONUMENTAL PRINTING COMPANY
1918-32 HARFORD AVENUE
BALTIMORE, MD.

Editorial Office, 1642 H Street, N. W., Washington, D. C.

Entered as second-class matter August 20, 1929, at the post office at Baltimore, Md., under the Act of March 3, 1879

Published without expense to the government

The Field Artillery Journal pays for original articles accepted

THE U. S. FIELD ARTILLERY ASSOCIATION
1624 H Street, N. W., Washington, D. C.

Please enroll me as a member of the Association and as a subscriber to *The Field Artillery Journal*. I enclose $3 for subscription and dues.

Name .....

Rank and Organization.....

Street .....

City ..... **State** .....

Please change my address

from .....

to.....

.....
(Signature)

.....

SECOND BATTALION 76TH FIELD ARTILLERY, UNLIMBERING

THE FIELD ARTILLERY JOURNAL

VOLUME XXV SEPTEMBER-OCTOBER, 1935 NUMBER 5

THE BATTLE OF THE MEUSE RIVER
A RIVER CROSSING

BY COLONEL CONRAD H. LANZA, Field Artillery

THE ALLIES

BY 3.00 P. M. 1 November, 1918, the American First Army had a clear picture of the results. It was then known that the V and III Corps had reached their objectives with less losses than had been expected. From statements of prisoners and from their numbers, it was evident that the enemy had been demoralized by our artillery preparation, and particularly by the heavy rolling barrage. On the other hand the I Corps had made but little progress, and a gap existed between this Corps and the V Corps on its right.

About 5.00 P. M. Major Generals McAndrews and Fox Conner, respectively, Chief of Staff and G-3 from GHQ, visited the Army Artillery CP, and, after inviting attention to the lack of success of the I Corps, inquired why this had occurred and what could be done to remedy the situation. It was explained to them that the V and III Corps, which had succeeded according to plan, had used an artillery preparation covering all areas in which the enemy might be found continuous from H minus 2 hours to the end of the battle. After H hour this preparation was accompanied by a rolling barrage of 155mm or heavier guns, frequently doubled and occasionally tripled, which scoured the terrain long in advance of the first infantry lines. The I Corps had declined to accept this type of fire and had substituted concentrations on what was believed to be enemy positions. As had previously occurred, the assumptions made as to the positions of the enemy had turned out to be wrong. The enemy, warned by the artillery preparation, had successfully defended himself, since his real positions had not been under serious fire. The Chief of Staff was told that the I Corps could be advanced at any time desired, upon short notice, provided the artillery was allowed to fire as experience had shown to be best. The Chief

of Staff then ordered, in the name of General Pershing, that a suitable artillery preparation, followed by a heavy rolling barrage be fired to move the I Corps forward at daylight 2 November.

The I Corps was notified by telephone of the Commander-in-Chief's order, and advised that the First Army would shortly send them an outline plan for the necessary artillery fire and for its control. This was sent out about 8.00 P. M. and showed graphically the artillery preparation and how much of it would be fired by the Army Artillery, of which two brigades of 155mm GPF, were available. The targets, the time to start and stop fire, and the number of rounds to be fired were shown for each target. It was left to the Corps to subdivide their assigned areas between the Corps Artillery and the artillery of the 78th, 77th and 80th Divisions, which were in line from west to east. A control sheet for the rolling barrage was also furnished. The plan was based on utilizing approximately 90 per cent of the rounds capable of being fired at the usual rate for each calibre during the entire battle, leaving the remaining 10 per cent of possible fire at the disposition of the Corps for unforeseen events. The ammunition required was provided.

The I Corps carried out the plan. The artillery preparation was duly fired. At H hour, on 2 November, the infantry jumped off, preceded by a light artillery barrage, which was itself preceded by the main heavy artillery barrage. There seemed to be little opposition, the advance progressed on schedule time, and the Corps arrived at its destination as planned. By afternoon a line through Harricourt was solidly held. The Army Artillery CP was thanked and complimented for the success of its plan.*

During the succeeding days, the American advance west of the Meuse met only slight opposition, and by 9 November the American line, whose direction of advance had been shifted to the northeast, reached the Meuse between Sedan and Stenay, without important fighting. All division artillery, and corps artillery in part were throughout always close to the front. It would have been impracticable to move all the artillery simultaneously, as the horsed batteries were short of animals, and those they had

———

*Compare with German account on page 411.

were in poor condition, due to lack of forage, mud, and lack of care. The motorized batteries had numerous disabled tractors and trucks, due to the accidents of war and the inability to secure spare parts. Due to continuous rains, heavy traffic, and some damage by the retreating enemy, roads were in bad order, and it was often necessary to double teams, or tractors, to move the pieces. Transportation was pooled within each regiment, and by moving by echelon, battalions were successively brought forward, leaving at least one battalion in each regiment constantly ready to fire. The motorized batteries had the best of this, as their motor vehicles could work for longer periods than the animals. Because of this heavy duty, there was lack of time, partly due to exhaustion of the men, for proper examination of either animals or motor vehicles, and they grew less in numbers, while those that remained were in poor condition. They lasted until the Armistice, but it was doubtful if they would have lasted much longer.

It was considered desirable to advance the railroad artillery. of which several regiments were available. Reconnaissance was made to locate possible routes. No routes were found. There were railroads within the territory abandoned by the enemy, but they had been so damaged as to make rail movements impracticable until after extensive repairs had been made. In addition to the destruction of culverts and bridges, and the burning of water tanks and stations, miles of track were damaged by every rail joint being blown in two by a grenade, or a small charge of explosive. This made it necessary either to take up the broken rails and substitute new ones, or else cut off the damaged ends of rails, drill new bolt holes and relay with new splice bars. There were no spare rails in anything like the quantity needed, nor facilities for recutting and redrilling miles of track. Motorized artillery was consequently the only heavy artillery which could be kept up to the advancing front.

The First Army had issued an order on 31 October, providing that if, as expected, the forthcoming battle around Buzancy would result in a withdrawal of the enemy, a vigorous pursuit would be started immediately. Zones of action were prescribed. Corresponding orders followed down through Corps and Divisions. Instead of the main axis of advance being to the north-

NOVEMBER 1ST. LINE
OCTOBER LINE
OCTOBER 14TH
OCT. 14
MEUSE River
RIVER
Aire River
LINE

west as it had been, it was changed to the northeast. This was caused by the success of the battle of Buzancy, coupled with similar successes by the Allies near the sea in Belgium and north France, the two victories having resulted in pinching out the German salient in France. Instead of the two wings of the Allied forces having a converging advance, Marshal Foch desired that, there now being no salient, a straight line advance commence. In view of this change the Divisions of the Army would arrive successively on the Meuse from east to west, starting with the 5th Division of the III Corps, whose right flank was already on the river just south of Brieulles. As soon as it was known that the I Corps had on 2 November closed the gap on its right and the French Fourth Army to the left of the I Corps was still further forward, the First Army ordered the change in direction to be placed in effect.

On this day the OPs reported smoke from many fires east of the Meuse. This was assumed to indicate that the enemy was destroying stores and supplies preparatory to a retreat believed to be under way east of the river, as was known to be the case west of the river. It was decided to seize a bridge head somewhere between Brieulles and Dun-sur-Meuse. At 4.00 P. M. on the 2nd, the First Army issued an order for this. The III Corps was directed to attack at 6.00 A. M. 3 November, with the mission of securing and holding the high ground on the west bank of the Meuse overlooking Dun-sur-Meuse, Sassey-sur-Meuse and Halles. Strong patrols were to be sent across the river to the east and to the north towards Mouzay and Stenay, to maintain contact with the retreating forces of the enemy. Army Artillery 155mm GPFs were ordered to accompany advance guards, in order to bring fire without delay on enemy lines of communication through Montmedy and Lamouilly.* To interfere with the enemy's withdrawal and to disturb his staff arrangements, shell fire was ordered to start at once on Mouzay, Sassey-sur-Meuse, Montigny-devant-Sassey, Wiseppe and Stenay. This fire was also to protect the flank of the advance of our columns. Stenay was found to be out of range, and it was understood that this fire would start later when practicable. All fire was to continue day and night until our infantry reached these objectives.

_____

* About 7 kilometers N. W. of Stenay.

The III Corps had in line the 89th, 90th and 5th Divisions, in order, from west to east. Of these only the 5th could, in view of the change in the axes of advance, reach the Meuse by the following day. The Corps having issued an order in correspondence with the Army order, the 5th Division directed their 10th Brigade, which had its right on the Meuse, to push patrols across that same night in the vicinity of Brieulles, to maintain contact with the enemy.

The Meuse River had an average width of about 25 meters, and a depth of approximately 5 feet. On account of the current and the depth, it was not fordable. North of coordinate 86 (about 800 meters north of Brieulles) and south of coordinate 84.5 (south edge of Bois de Chatillon), the river was out of its banks and was from 600 to 800 meters wide. This left a space of around 1500 meters where it seemed possible that a bridge could be constructed. There was known to be a ford just south of Brieulles, but it was assumed that this would be covered by enemy fire, and a poor place to cross. East of the river and at varying distances from it, was a canal. This was about 20 meters wide, with also about 5 feet of water. Due to the fact that its walls were vertical, of stone, and about 3½ meters high, it was difficult for a man in the canal to get out.

At midnight, 2-3 November, Companies E and F, 6th Infantry, were ordered as a strong patrol to cross the river immediately and obtain contact with the enemy. Company F, 5th Engineers, was attached for required technical work. The patrol moved into Brieulles, which they found vacant, and then continued south along the Meuse. It was dark and raining, there was little artillery activity and no infantry firing. A place for crossing was selected just north of the flooded area, near coordinate 84.7 (opposite the center of the Bois de Châtillon). Here the river was separated from the canal only by an embankment. Beyond the canal was the Bois de Châtillon. There was no information as to the enemy. It was evident that it would be impossible to conceal movements across the river valley, except under cover of darkness or fog. It was decided to cross without waiting for extensive reconnaissance. No artillery support had been arranged for, as the enemy was assumed to be retreating, and there seemed to be no need for artillery.

There was no interruption to the work of the engineers, and by 7.00 A. M. on the 3rd they had a foot bridge completed over the river. It was now daylight, and the OPs reported no targets were to be seen and no sign of any enemy. It appeared that there would be no opposition. Company E started over the bridge to the narrow strip of land separating the east bank from the canal. Immediately heavy machine gun fire was received, apparently from somewhere inside the Bois de Chatillon. The advance stopped. Some men were across the river, but they were unable to cross the canal. The balance of the patrol fell back and sought cover. There was a bridge about 600 meters away, and an attempt was made later to cross there. The bridge was found to have its spans broken, and this, combined with severe machine gun and artillery fire, prevented any crossing near Brieulles on this day.

The III Corps, less the elements of the 5th Division already on the Meuse, advanced, as had been directed, at 6.00 A. M. 3 November. No opposition was met, and the 5th Division gradually closed in to the northeast approaching the Meuse, where in general it had arrived by noon. It then proceeded to send out the strong patrols ordered to cross the Meuse. Every time an effort was made to cross the river, strong machine gun and artillery fire was received, and no crossing was possible. The other divisions closed in to the right, but did not reach the river on this day.

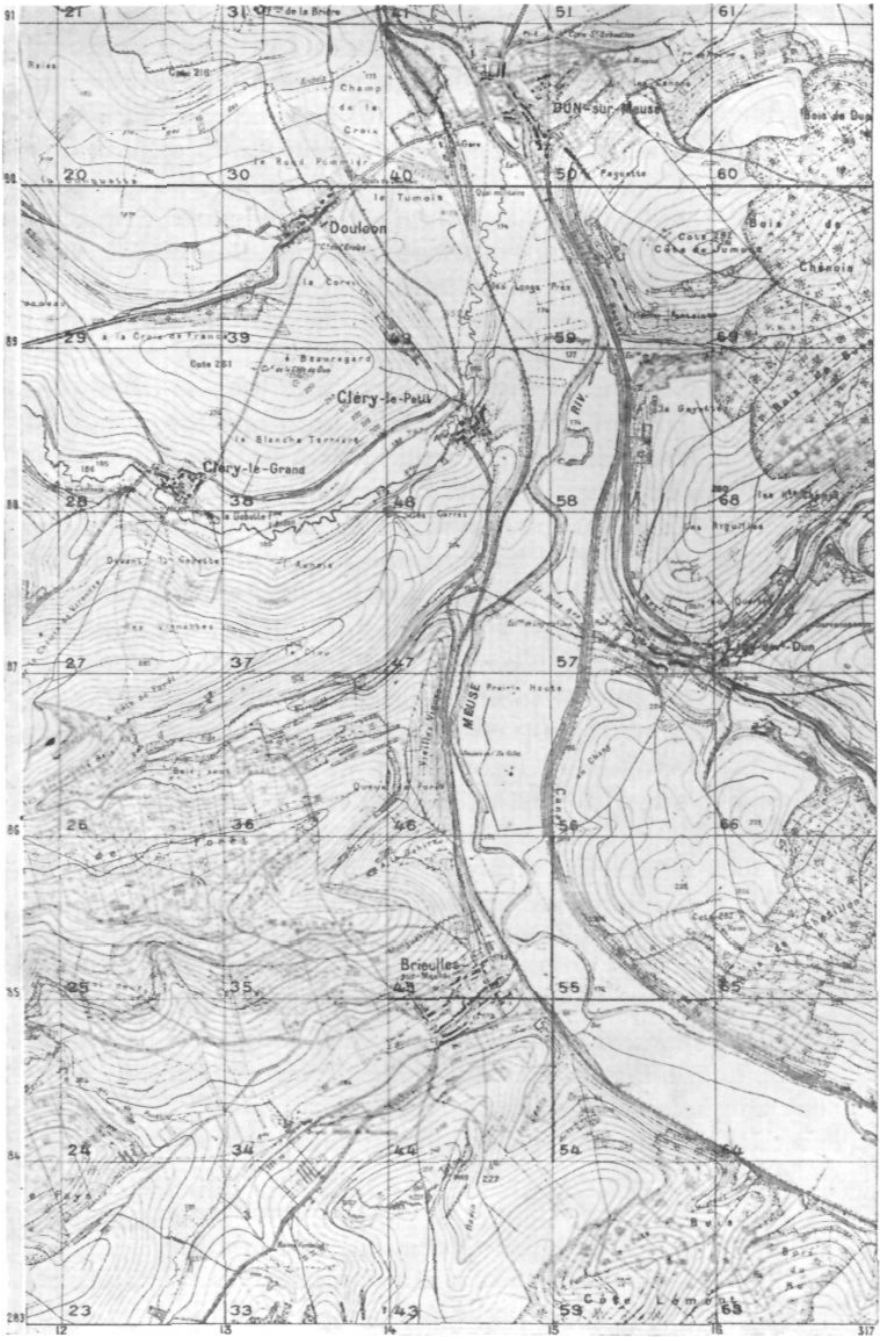
As soon as the First Army knew that the III Corps had with its right division reached the Meuse River, while the remaining divisions were advancing in line according to plan, it issued an order at 12.50 P. M. 3 November, directing the III Corps to develop a bridge head east of the Meuse in the vicinity of Liny-devt-Dun and Dun-sur-Meuse. The Corps was ordered to utilize to the utmost the fire of the Army Artillery to assist their advance and to break any hostile resistance.

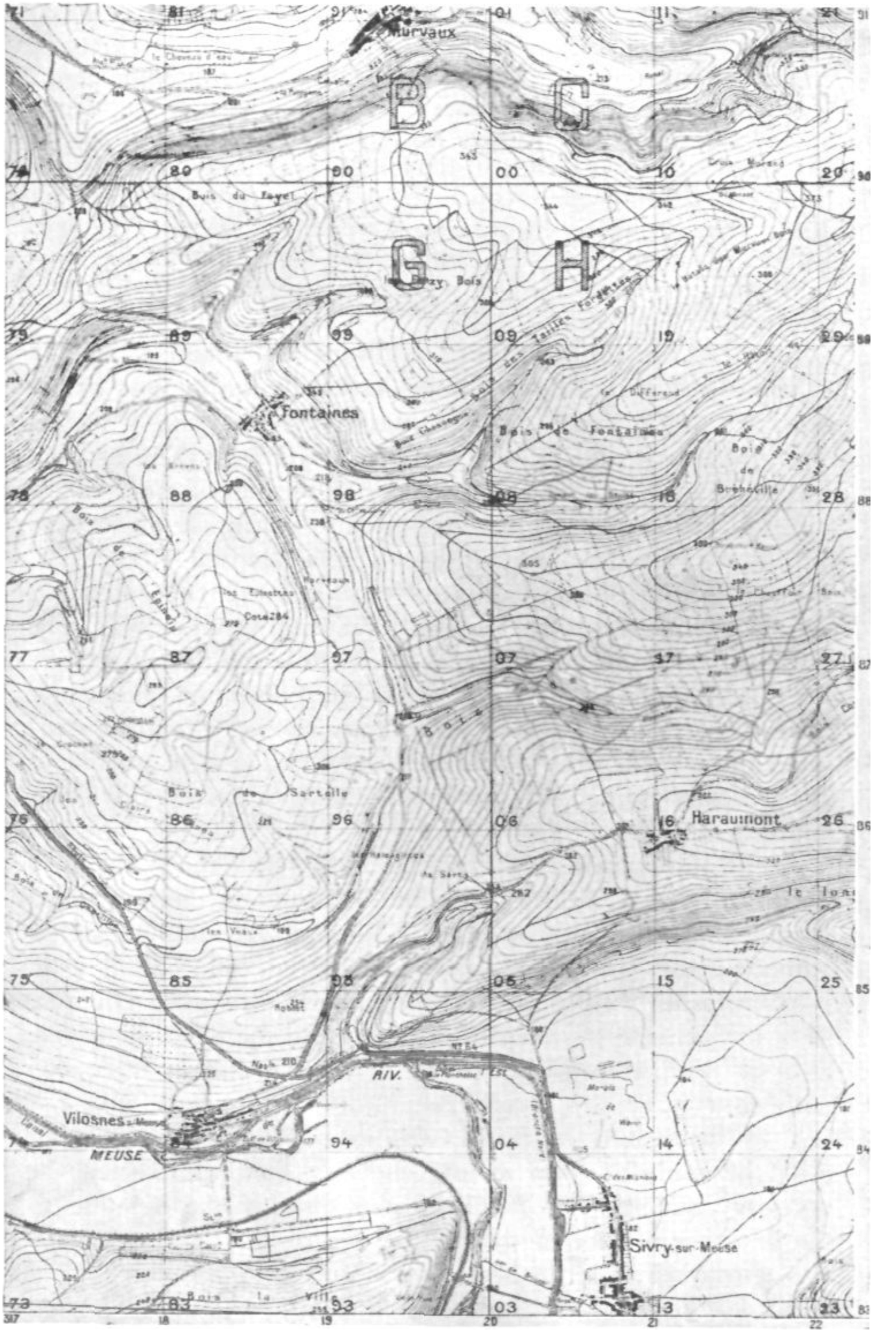
At 1.40 P. M. the III Corps Air Service reported:

"Departure 11.50 A. M., return 1.00 P. M. Mission: general reconnaissance XVII Corps,* in particular 79th Division, north and northeast to Remoiville, 100 to 400 meters. Lieut. Lake, 9th Squadron observer. Camouflage apparently veils the movement

———

*In line east of the Meuse, to the right of the III Corps.


Champ de la Croix
DUN-sur-Meuse
Bois de Dun
le Tumois
Douloon
Bois de Chênois
Clery-le-Petit
Clery-le-Grand
MEUSE
Brieulles
Côte Lamet


Murvaux
B
C
G
H
Bois du Fayel
Fontaines
Bois de Fontaines
Bois de Sartelle
Haraumont
Vilosnes
MEUSE
RIV.
Sivry-sur-Meuse
Cote 284
Bois la Ville

just east of the Meuse River. We flew for 15 minutes in this territory, and practically every northbound road was filled with traffic. Numerous fires looked like ammunition, throughout the entire territory. Enemy appears in full retreat east of the Meuse. All northbound roads packed with troops, artillery and trucks. Roads running southwest of Remoiville practically choked with traffic. At Remoiville troop train of 19 cars was pulling out, and a great crowd of enemy troops are on the siding. We fired several hundred rounds of ammunition on them. They fired back with incendiary bullets. Our map was too far south to locate self."

The III Corps believed that there would be no serious defense of the Meuse and that they would be able to advance in march order with an advance guard in standard formation. They requested the Army to place one battalion of GPFs at their disposal, with a view of attaching its batteries to the supports of the advance guards, which could be expected to reach, during the following day, the high ground near Brehéville and Brandeville, from where it should be possible to observe the retreating enemy columns crossing the vast low land just beyond. The GPFs, from these advantageous positions were to utilize their long range to fire on the heads of the enemy columns, block their retreat, and thus afford an opportunity to our infantry to envelop them. The 66th Field Artillery Brigade was ordered to furnish the battalion, at such time and place as the III Corps might designate.

About this time the III Corps found that the 57th Field Artillery Brigade, belonging to the V Corps on their left, had strayed into their zone of action. Without reference to higher authority, the III Corps seized this brigade and placed it in position to fire across the Meuse in support of the 5th Division. This division was directed to cross over to the east side of the river as soon as possible. As it was assumed that there was nothing important to attack, no attack orders were issued, nor any H hour designated. It was expected that the crossing could be made as soon as the engineers had constructed the necessary bridges. The V Corps complained to the Army as to the improper seizure of one of their brigades, but the brigade was temporarily lost to them before orders for its return could be made effective.

At 3.30 P. M. 3 November, the 5th Division issued a field order for crossing the Meuse, in compliance with instructions received. The order stated that the enemy to their left was "in full retreat" and that it was believed he was also withdrawing in their own front. The plan was for the 9th Brigade to cross in the vicinity of Clery-le-Petit, while the 10th Brigade crossed near Brieulles. The American First Army had no bridge trains, so two pontoon trains were borrowed from the French XXXIII Corps. The III Corps had foreseen the need of these trains, and they had been brought up to the Bois de Cuisy and concealed therein. They were now ordered to proceed after dark, one train to the south exit of Dun-sur-Meuse, or if this were an impracticable place to cross, then about 1 kilometer further south; while the other train was ordered to Brieulles. During the afternoon, the 9th Brigade occupied Clery-le-Grand and Clery-le-Petit, thus bringing the entire division in line along the west bank of the Meuse.

The 10th Field Artillery (75mm) was detailed to support the south attack from positions near Brieulles; the 76th and 77th Field Artillery (75s) the north attack from positions near Clery-le-Grand; while the 13th and 18th Field Artillery (155mm How.) were detailed in general support, and located around Cunel. All batteries found OPs on the hills overlooking the Meuse. Visibility was excellent that afternoon, and with the sun at their backs observation was all that could be asked for. But no targets were discovered, and there was no enemy activity. It seemed as though the enemy had withdrawn. A large number of problems were fired however against edges of woods, ridge lines and similar targets, and the fire registered.

To assist the 5th Division and to prevent orderly withdrawal by the enemy, the Army ordered the French 86th Artillery (10 batteries 155mm GPFs), which were already east of the Meuse but south of the 5th Division zone of action, to fire in a north and northeast direction, to interdict enemy rendezvous points. The regiment advised at 3.25 P. M. that only one battery faced in the desired direction and that this battery had only 50 rounds of ammunition. Necessary orders were given to face other batteries in the proper direction. The Ammunition Trains reported that additional ammunition was already on the way, and by 6.00 P. M. they delivered it.

The 5th Division did not fix any hour for the crossing. The troops were to cross during the night, whenever they could, and it was expected that two bridges would be completed before morning. Troops in column, preceded of course by advance guards, would then start the pursuit of the enemy, with the mission of reaching the line: Lion-devt-Dun—Murvaux—Fontaines. From photographs and previous information the III Corps had located what was supposed to be 15 hostile battery positions some distance beyond the Meuse. As these positions were out of range of their own artillery, the Army was requested to neutralize them from 6.00 A. M. to 9.00 A. M. the next morning, in order to give the 5th Division a fair start. The Army likewise found that these batteries were so far in rear of the front that only one French regiment of 19cm guns (6 batteries railroad) could cover them. They were directed to neutralize these targets as requested. The III Corps stated that no other artillery support was needed, although they had no objection to artillery firing during the night, but after daylight no artillery fire was wanted except as had already been indicated.

During the afternoon of 3 November the III Corps drafted an order for next day's operations, but did not issue it, as it was decided that it would be necessary to see what success the troops had after they had crossed the Meuse. They did not expect much opposition, and advised the Army that their plan would depend on the operations east of the Meuse. The First Army had doubts as to this, and at about 5.00 P. M. directed the III Corps to avail itself fully of the services of the Army Artillery, by direct arrangement, in order to be certain of obtaining the much desired bridge head by morning. To insure this, Army Artillery was displaced far forward, and two regiments of 155mm GPFs were placed in position to cover the heights east of the Meuse, opposite the 5th Division.

About 9.45 P. M. the III Corps decided that, as there was to be no attack and no H hour, no artillery support was needed. The only thing wanted from the artillery was to neutralize the 15 hostile batteries already indicated. The 5th Division was directed to start crossing immediately and to continue to do so until they were over.

For the south crossing the 10th Brigade detailed Companies

E and G. 6th Infantry, to make a temporary crossing by foot bridges to be laid by Company F, 5th Engineers, pending the completion of the permanent bridge, construction of which was to commence as soon as the pontoon train arrived. Soon after darkness on the 3rd the engineers started work on a foot bridge south of Brieulles. Nothing unusual occurred, and the bridge was finished shortly after midnight. One company of infantry crossed and deployed along the edge of the canal. Engineers followed with a second foot bridge to be used over the canal. Suddenly they were met by a hurricane of machine gun fire and, a little later, by artillery fire, which forced the entire command to find shelter behind the banks of the canal and river. When the firing died out, another effort was made and the foot bridge was placed across the canal, while a second foot bridge was started over the Meuse. While this work was progressing, the enemy at about 12.30 A. M. again opened a terrific machine gun fire. No more work was done that night. About 2.00 A. M. on the morning of the 4th, and after the enemy fire had ceased, a rush was made over the bridge across the canal. Eight men found their way over, when a tremendous fire of machine guns, artillery and trench mortars stopped the entire movement—men taking shelter anywhere they could. No enemy could be seen. All that was known was that at least the infantry fire appeared to come from inside the Bois de Chatillon. The infantry now opened fire against this Bois, with such intensity that they soon exhausted all rifle grenades and infantry howitzer ammunition on hand. The 10th Field Artillery fired a large number of problems to support the infantry, with apparently no effect. They could not see any targets, and fired at the edge of the Bois de Chatillon, the ridge line to the north, and at other places which had been registered on the previous afternoon. The infantry made several new attempts to cross the canal, but all were shot down. About 5.15 A. M., while it was still dark, the few men across the canal advanced into the Bois de Chatillon, on a front of 300 meters. They had no artillery assistance. Fifteen minutes later they ran into a hostile counter-attack, which was strongly supported by artillery fire. Enveloped on both flanks, they were swept back across the canal. The enemy made no effort to leave the Bois, and did not follow beyond that line.

All during the 4th, this small force of troops remained near the river. The bank afforded shelter, and losses were not severe, but it was impossible to change the situation during daylight. After 5.00 P. M., when darkness once more settled down, the infantry renewed their attempt to cross the canal. They secured a footing, and advanced on into the woods, capturing 9 prisoners, from whom it was later ascertained that the enemy only had one company of infantry of about 40 men in the Bois de Chatillon. The advance, however, was stopped on account of darkness. Nothing had been done in the south attack to construct a permanent bridge, pending the results of the crossing over the foot bridge.

The 9th Brigade had selected, on the 3rd, a position near coordinate 89.2 (just north of the junction of the canal and river), near Clery-le-Petit, for constructing the permanent bridge during the night. But nothing was accomplished, as the pontoon train could not be found. Its commander had led it to the vicinity of Doulcon, which was what he understood by the designation south exit of Dun-sur-Meuse. Finding no activity in the vicinity, he decided that obviously this had been found to be an impracticable place at which to cross, and that consequently the place now was 1 kilometer to the south. Finding a road leading in the desired direction, he followed it for one kilometer which placed him on top of a hill (hill 261). He thought this a peculiar place for a river crossing, but his orders seemed to be clear that this was where he was to go to, so after taking appropriate precautions for concealing his train, he awaited orders which he assumed would arrive whenever his train was wanted. He considered the situation due to the inexperience of the Americans; probably to be expected under the circumstances. The 9th Brigade had sent out guides along roads to the south and west for the pontoon train, but they failed to look on hilltops, and it was 7.00 A. M. before the concealed train was located. It was then considered impracticable to move it off the hill and down to the river until darkness once more set in.

For a long time neither the III Corps nor the 5th Division knew what the situation was. Believing that the crossing would proceed according to plan, the Corps at 3.40 A. M. on the 4th, ordered all artillery fire suspended west of coordinate 317 (north and south line just east of Milly), so as not to endanger the

heads of the advance guards. After daylight the OPs could see the valley, and reported that there were no bridges and no one crossing. The 76th Field Artillery then started to fire continuously, but as no targets were seen, the fire was directed against prominent terrain features, and particularly hill 292 (Côte de Jumont. 1.2 Km S. E. of Dun-sur-Meuse), and hill 260. There was no enemy reaction. The valley was apparently free of any enemy.

It became evident to the Army during the morning of the 4th that the III Corps was not securing a bridge head across the Meuse. At 1.00 P. M. it issued an order directing the French XVII Corps, which was east of the Meuse, north of Verdun, to advance on and seize the heights southwest of Brehéville, while the III Corps was to continue its movement and seize the Côte St. Germain and the high ground south of Murvaux. The order specified that both Corps would furnish the Army Chief of Artillery with details of their plans and time tables, in order that the Army might intelligently use its artillery to further the attacks.

The CP of the III Corps was inspected about 1.00 P. M. by the Chief-of-Staff GHQ. The situation, which at this time had become clear, was explained, and it was added that in accordance with the Army order, of which advance information had been received by telephone, the 5th Division would cross the Meuse by the following morning and obtain a bridge head. The Chief-of-Staff expressed surprise that the operation was to be thus long delayed and stated that it was extremely important to push the Germans hard. In his opinion the bridge head ought to be secured that same day. The Corps thereupon, at 2.00 P. M., ordered the 5th Division to attack across the Meuse that very afternoon. The 5th Division desired to wait until night, but being overruled by telephone, directed both of its brigades to attack immediately.

In view of the preparations being made, the III Corps at 3.25 P. M. notified the Army that they would be unable to furnish details for next day's attack, either to the Army or to its Chief of Artillery for coordination of artillery fire, as the attack was already in progress, and everything depended on the outcome of the present operations.

The 9th Brigade prepared to cross the Meuse without delay near coordinate 89.1, which was just north of the junction of the river and the canal. This avoided the problem of crossing the latter obstacle. It was decided not to wait for the pontoon train, as it would be difficult to bring it up during daylight; instead, foot bridges were to be used. Although no targets had been noted, there was some doubt as to whether the enemy had evacuated the east bank of the river. It was consequently believed best to have an artillery preparation. It was limited to 30 minutes. to be fired by the 76th Field Artillery, plus such assistance as the Division 155mm howitzers could give. All available machine guns were also to be utilized. Visibility was excellent, and promptly at 3.30 P. M. 4 November the batteries opened fire. As no targets could be seen, assumptions were made as to the location of the enemy, and fire directed on these places. There was no reply to the fire, and the OPs having reported nothing to be seen, at 4.00 P. M., two battalions of infantry, echeloned in great depth, left the cover on the hills and advanced to the river, crossing the flat valley land, which afforded little concealment. Company B, 7th Engineers, followed, carrying material for foot bridges. At 4.20 P. M. the 2nd Battalion, 60th Infantry, and the 2nd Battalion, 61st Infantry, had reached the bank of the river, and the engineers started work on the first bridge. At this moment a tremendous fire of machine guns and artillery burst on the exposed troops with great suddenness. The infantry sought shelter and found it, but the engineers bravely continued at their posts. Shells sank their boats as fast as they could be placed in the water and by 6.00 P. M. no boats were left. The attack had to be suspended.

The 10th Brigade did not attack during the afternoon as ordered. It later claimed that the telephone message to do so had not been received in time by the brigade commander to enable the necessary preparations to be made.

At 7.30 P. M. the 3rd Battalions of both the 60th and 61st Infantry were ordered to start another crossing southeast from Clery-le-Grand, near coordinate 86.5 (1.3 Km N. of Brieulles), where the Meuse is at the foot of steep hills along its west bank.

The check to the crossing of the 5th Division became known to the First Army around 5.00 P. M. It decided to intervene without

waiting on the III Corps, and ordered its artillery to support the attack without delay and without regard of requests from lower authority as to restrictions of fire. The Army Artillery by 6.00 P. M. had batteries in action, firing as follows:

	Rounds per hour Caliber		Total Rounds
Targets	155mm	19cm	per hour
Bois de l'Epinois[1]	150	50	200
Bois du Fayel	240		240
Bois de Chénois[2]	250		250
Bois de Bussy[3]	260		260
Bois de Sartelle	50	50	100
Bois de Châtillon	100		100
Total rounds per hour	1,050	100	1,150

[1]1.4 km. east of Lion-devt-Dun.
[2]East of hill 292 (Côte de Jumont).
[3]N. E. of hill 260.

This preparation, of almost 20 heavy shells per minute, was continued uninterruptedly until about 5.30 A. M. the next morning. This fire was in addition to the fire of the 5th Division Artillery, which had four regiments of 75mm guns and two regiments of 155mm howitzers. These also fired steadily all night. In all cases the entire wood was swept with fire.

After it became apparent that no crossing would be made on the 4th, the III Corps issued an order for operations proposed for the 5th. After announcing that the enemy was continuing his retreat, it directed that the 5th Division continue its advance across the Meuse, while the 90th Division, coming into line along the river further north, reconnoiter for a crossing near Stenay, while sending patrols over between Wiseppe and Sassey. The French XVII Corps, to the right of the III Corps and already over the river, in accordance with the orders from the Army, previously referred to, issued orders to advance on the morrow to the heights southwest of Brehéville. At 8.00 P. M. the 5th Division, assured of a heavy artillery preparation clearing the woods in its front and of support to be obtained from the French Corps flanking operations on its right, and knowing that the two remaining divisions of the III Corps on its left were in position to assist in crossing, ordered its two brigades to advance the next morning to the line from Côte St. Germain to south of Murvaux. Construction of bridges over the river was to be rushed.

At 9.30 P. M. the Air Service reported heavy enemy traffic on roads leading north and east from Stenay. The 66th Field Artillery

Brigade was ordered to take these roads under fire. Only one battalion of GPFs was close enough to Stenay to make this possible, and then only because meteorological conditions were such that the normal range was slightly increased.

During the night 4-5 November the 5th Division, under cover of constant artillery fire, commenced to throw bridges across the Meuse, using the French pontoon trains. Near Clery-le-Petit, the engineers, favored by darkness, completed a foot bridge near coordinate 88.3 (opposite Cléry-le-Petit) by 12.15 A. M. There had been no opposition, and the engineers themselves crossed the bridge and started two additional foot bridges across the canal. Company M. 61st Infantry, followed the engineers and deployed along the canal bank, ready to advance as soon as the bridges were ready. At 12.45 A. M. the enemy suddenly opened a terrific artillery and machine gun fire, which stopped bridge building. But later the engineers resumed work, notwithstanding constant, heavy enemy fire. By 5.30 A. M. one of the foot bridges was completed and Company M crossed. The second foot bridge was not completed, as it was shot away time after time. Other infantry companies followed, and by 7.00 A. M. the 3rd Battalion, 60th Infantry, was over the river, while Company I, 60th Infantry, and Company I, 61st Infantry, were both across the canal, where they joined Company M, already over. Supported by constant fire of the 5th Division Artillery, the infantry now slowly advanced on hills 260 and 292. They were rapidly supported, as the enemy artillery weakened, and with daylight several fords across the canal had been discovered. By 9.00 A. M. the hills were in possession of the 5th Division.

The 10th Brigade also succeeded in crossing the river. Although the enemy artillery fired considerably during the night, work was started on an artillery bridge near Brieulles, using the French pontoon train. The enemy apparently did not discover the movement, as his fire hampered operations but slightly. By 1.00 A. M. 5 November, the bridge was finished. Infantry crossed at once and, meeting little resistance, by 7.30 A. M. had a sizeable bridge head in their possession, and were advancing beyond. By 10.00 A. M. hill 260. north of Liny-devt-Dun, had been passed, and our infantry were entering the Bois de Bussy and the Bois de Chénois. Nearly 100 prisoners, 49 machine guns, 6 trench mortars and 10 1-pounders were captured.

About 10.15 A. M. the OPs reported that the enemy had set fire to the bridge at Dun-sur-Meuse, and that enemy gas shell were falling in the Bois de Bussy and the Bois de Chénois. They could not locate any enemy batteries or in fact any targets. No opposition was met thereafter, and by 2.00 P. M. the 5th Division Infantry had entered Dun-sur-Meuse and were close to Murvaux.

The operations which followed and continued until the Armistice at 11.00 A. M. 11 November included no important events. The enemy resisted only to a small extent, and a line from Stenay to Brehéville, both inclusive, was secured by the First Army. Efforts to advance beyond encountered formidable opposition and it was evident that a strong force of artillery, with ample ammunition, would be required to enable a further advance to be made. Due to increasing distances from rail heads, supplies were low and deficiencies existed in transportation. The artillery was rapidly becoming less mobile, due to lack of replacements for disabled animals and motor vehicles and to poor condition of animals and vehicles present. Both animals and vehicles, with little or no care, were doing double work on reduced allowances of forage and repair parts. War conditions made it impossible to avoid this. It was evident that, the enemy having constructed a new line of resistance, this could be forced only after considerable reorganization. The Armistice put an end to what would have been a long wait, possibly extending through the winter into the following spring. In other words, the Allies managed to give the enemy the final blow just before it would have been necessary to stop the offensive to reorganize and to reequip.

THE GERMANS

After the decisive battle of Buzancy on 1 November, both the Third and Fifth Armies realized it was hopeless to maintain themselves west of the Meuse. Having consulted GHQ by telephone and represented the urgency of the situation brought about by their defeat, which they did not conceal, and the impossibility of stopping the advancing Americans until reenforcements had been received and reorganization had been made, they secured permission to withdraw. Orders were issued by the two Armies, respectively at 2.45 and at 3.58 P. M., 1 November, by telephone to their Corps. This was repeated down to lower units in a similar manner and reached the front lines between 6.00 and 8.30 P. M.

At this hour the Third Army found itself in a pocket. The French Fourth Army had penetrated deep to its right west of the Argonne, while the American First Army had penetrated equally deep to its left and was now just southeast of Buzancy. The front line troops commenced their retirement shortly after 8.00 P. M. It was very dark and rainy and roads were in poor condition. Evacuation of guns, matériel, trains and troops was no easy matter, although losses had not been severe and the position was relatively intact. The withdrawal was orderly but it was slow, the rear elements averaging about 1½ kilometers per hour. By daylight on the 2nd these were crossing a line through Harricourt. When, at about 4.00 A. M., the American artillery preparation fell with extraordinary ferocity on their former lines, these had long been empty and consequently no casualties occurred. After daylight the slow advance of the American heavy barrage was plainly observed. It was evident that it would not reach their present position and the troops sought rest with a view to continuing their retreat on the next night.

Further east, that part of the Fifth Army west of the Meuse had suffered severely on the 1st. Few troops remained, and these had lost almost all of their artillery and matériel. Withdrawal was simple, as there was little to withdraw during the first stages of the movement. On 2 November, GHQ confirmed in orders the verbal directions previously given to withdraw the German lines. These orders directed a retirement of all Armies to the line: Antwerp—Meuse River. Instructions were given to avoid serious contact with the Americans until this new line was secure. Moving by night and holding during the day, the Third and Fifth Armies gradually abandoned the terrain west of the Meuse in good order. They received ten additional divisions as early as the 3rd, and used these to reconstitute their lines by reorganizing. By 8 November this rearrangement had been completed, with a net gain of 6 divisions. The Armies still lacked guns and matériel but, although weak, they were ready to offer serious resistance. West of the Meuse, the Armistice stopped hostilities before it was necessary to fight another great battle.

East of the Meuse the task of the Fifth Army was complicated. Among its troops was the 106th Austro-Hungarian Division, holding a part of the front northeast of Verdun. It was about

to be relieved in the usual course by the 1st Austro-Hungarian Division, on 2 November, when the Armistice was signed by Austro-Hungary, involving an order to withdraw all troops from action against the Allies. The intended relief was to have been accomplished through the railhead at Remoiville, where the 1st Division had detrained and to which the 106th Division now hastened, without waiting for a relief. The 32nd German Division was hastily brought up to fill the gap. There was a great congestion of troops about Remoiville, on the 2nd and the 3rd, and a temporary hole in the line of 6 kilometers. Fortunately the enemy failed to discover what was occurring.

On 4 November, in answer to requests for reeinforcements for that part of the Army east of the Meuse, GHQ replied that no reserves remained and that these would have to be constituted locally.

The Fifth Army had no intention of abandoning its positions on the Meuse from Brieulles to Dun-sur-Meuse. The line was weak, but it was ordered to be held. The line from Liny-devt-Dun (excl) to the Bois de Châtillon (incl) was held on the morning of 3 November by the 192nd Division, which had only six weak companies of infantry of about 40 men each in the front line. From Liny-devt-Dun (incl) north to include hills 260 and 292, the line was held by the 11th Grenadiers and two machine gun detachments of the 228th Division. These troops were posted inside of the wood and away from terrain features. Due to shortage of ammunition, batteries were prohibited from firing except when necessary to prevent a crossing of the Meuse.

About 2.00 A. M., 3 November, an attempted crossing was discovered opposite the Bois de Châtillon. The attack was at first stopped by machine gun fire from the infantry outpost, later supported by artillery fire, after the coordinates of the enemy positions had been transmitted. During the 3rd the enemy did not attempt to cross the Meuse, but during the ensuing night a new infantry attack developed against the Bois de Châtillon. The Americans, despite opposition from the outpost and artillery fire, secured a foothold east of the river and entered the wood. Due to the small number of men present in the Bois de Châtillon—about 50 men—the commanding officer withdrew and asked for reenforcements. It was decided to counter-attack at 5.30 A. M.

with one battalion of infantry. The 192nd Division directed its artillery to support this movement and began firing an artillery preparation at 5.00 A. M., while it was still dark. The counterattack succeeded in stopping the river crossing, but the Americans retained a foothold in the Bois.*

No further attempts to cross the Meuse were noted until about 3.00 P. M. on the 4th, when the OPs reported an unmistakable gathering of troops opposite hill 260. The probability of an action developing here became a certainty when at 3.30 P. M. the enemy commenced an artillery preparation. Ammunition on hand being still low, and as the enemy shells were falling on unoccupied terrain and doing little damage, fire was ordered withheld until the enemy started to cross the river. Around 4.00 P. M. hostile infantry was observed descending the opposite slopes toward the river. They were so dispersed that they made but a poor target, and fire was still withheld. Behind the infantry were now seen other men carrying material, and at 4.30 P. M. these men commenced to construct a bridge.

Fire could no longer be delayed. The artillery opened fire and was immediately followed by the machine guns located on slopes of hills away from crests or other lines and from the inside of woods. The enemy infantry disappeared at once, but the bridge building continued. Batteries now fired on the bridge. They secured direct hits and stopped progress. It was evident that the batteries could easily prevent any bridge construction as long as observation was possible. Firing was constant for over an hour, when dusk prevented the OPs from further observation. Bursts of fire followed afterwards, based upon fire previously registered.

Just about this time—6.00 P. M.—very heavy enemy artillery fire commenced to fall upon the woods, inside of which were located most of the infantry and a few batteries of artillery. This fire was of considerable intensity. By midnight the infantry, partially exhausted from days of strenuous duty and finding it impossible to escape from the steady fall of shells, commenced to abandon their positions. The Fifth Army, confronted with this

*No record has been found in American accounts as to part of the 6th Infantry remaining all day in the Bois de Châtillon. It may be correct, but it seems probable that the advance of the Americans at about 5.00 P. M. this day (4 November) was thought by the Germans to have started from inside the woods, whereas it appears to have been an entirely new attack starting from the canal.

situation and further influenced by the shortage of ammunition, together with the news that the French south of Liny-devt-Dun were making progress north, thus turning the position, now decided to abandon the line of the Meuse south of Stenay. Orders were issued to withdraw by slow retirement during hours of darkness—day positions were to be maintained. Withdrawal started at once, and by daylight 5 November the Meuse had been left behind. There was no serious interference with the retreat and, by the 11th, the day of the Armistice, a new line had been established, behind which there were large stocks of ammunition. The troops were weak in numbers but in fair condition and prepared to fight to hold their new positions.

COMMENTS

The crossing of the Meuse by the 5th Division, originally contemplated for the night 2-3 November, did not succeed until the night of the 4th/5th. Three nights were required instead of one, although the resistance was by only small forces.

The first orders issued were march orders, the crossing to be made at first by patrols, then by advance guards, and then by columns. The first patrols met opposition at once, but nearly 48 hours elapsed before attack orders replaced the march orders. This delay was due to erroneous assumptions as to the enemy being in retreat, based partly on the fact that he was in retreat elsewhere and partly to air reports of having observed a retreat. We now know that the air report referred to a relief of divisions.

The canal east of the Meuse was found to be an unexpected obstacle. In view of the fact that the visibility was good, it should have been an easy artillery problem to make a practicable crossing over it for infantry. The solution of the problem lies in determining the angle which a line drawn from the top of the nearer wall of the canal to the bottom of the further wall makes with a horizontal plane through the latter point. Entering the firing tables with this angle as the angle of fall, we take out the corresponding range. With this range as a radius, and the target as a center, describe an arc.* A battery located on this arc, with adjustment to give 50% of bursts short of the canal, would have the maximum probability of obtaining hits on the far wall of the

*Using howitzers several arcs, depending on zone selected, could be used affording some choice for battery positions.

canal, with a view to breaking it down to make a practicable ramp for infantry. Some of the shorts could be expected to burst near enough to the nearer wall and break this down to some extent.

There were 12 batteries of 155mm howitzers and 6 batteries of GPFs available to fire many problems on the afternoon of the 2nd, when there was excellent visibility. If it be objected that this method would have warned the enemy as to where the crossings would occur, the answer is that he found it out anyway. The canal could have been attacked by fire at more points than that at which it was intended to cross and in no case was it necessary to cross immediately after completion of the fire.

This problem is ancient, having appeared regularly in books on artillery fire from the medieval ages down to the end of the last century. Since then it has practically disappeared from studies of modern artillery fire, presumably because it was believed that ditches, or canals, would no longer be obstacles found on the battlefield. With the growth of fortifications extending along the long stretches of frontier, as we now find them in Europe, it is doubtful whether a major task of artillery in the future may not be to break down these fortified lines, including some natural obstacles such as canals, railroad cuts, etc.

The use of 155mm GPF guns for advance guard duty was due to a misconception of these weapons by the staffs which issued such orders. These guns are valuable weapons. Due to the length of time required to place them in firing position from traveling position they are not suited for advance guard duty. Even if roads and bridges everywhere were in good condition for moving the heavy loads involved, hours would be needed to find a firing position and move the guns into them. This is too long for advance guard purposes, as situations develop quickly. This is outside the question as to whether advance guards in column formation where opposition is met are at present possible. All advances and retreats in the World War, during its later phases, were in line and in general at night. Under the threat of attack by modern aircraft and artillery, daylight movement of columns were made only in case of absolute necessity.

The ability of heavy artillery to drive defenders out of positions by steady fire was once more demonstrated in the battle of the Meuse. It may take considerable ammunition to accomplish, but it saves lives—and generally time.

A SERMON ON THE "MOUNT"

What Type Draft; Brewery, Hunter or Stream-lined?

BY LIEUT. COL. T. J. J. CHRISTIAN, Field Artillery

BY the introduction of fast machines, modern armies are geared today for a warfare of high speed. The motor vehicle has vastly extended the radius of action of transport, so that the major trend of modern warfare is towards fast-moving automotive elements in order to attain increasing strategic and tactical mobility. This pronounced emphasis on increased speed, due to the advent of motorization and mechanization, would seem to accentuate the importance of accelerating the rates of march of Cavalry and animal-drawn Field Artillery. It follows that the fast marches required under modern conditions should in turn place a greater emphasis on the importance of horsemanship and horsemastership in the Mounted Services. However, as an indirect result of the modernization program, and incident to replacing animals with trucks in all field trains and in one-half of the divisional regiments of light field artillery, a tendency has developed to relegate the horse to obsolescence.

As the booted and spurred cannoneer of yore watches the "4 × 4s and 2 dts" "go towing along," with the charge of tank and armored scout car, it is no wonder that he is witnessing the partial eclipse of the horse from his place in the sun. Perhaps it will be a total eclipse; in any event a revision of the "Caisson Song" seems to be in order.

In the meantime, what shall we do about the modern army horse in this, his tragic era of the auto? We can't streamline him, so how can we modernize the mount? "I.C. them all," say the extremely mechanical and motor-minded; and those who, like Ed Wynn "will stick to his horse," advise encouragement and interest in horsemanship to stimulate the remaining mounted units, and to preserve an important means of mobility.

The controversy, worn thread bare, of the horse vs the motor, reminds one of a breakfast table dispute between a husband and wife. This bitter controversy started over the pronunciation of the word *"neether"* or *"nyther,"* or vice-versa, as you like it. The husband insisted the correct pronunciation was "neether,"

but his wife was equally positive that he was wrong, as the proper pronunciation was not "neether," but "nyther." Before they came to blows, the Irish cook settled the argument, to wit: "You're both wrong, its *"nayther."*

There is also a middle ground on this subject of motorization. Those who prefer a seat in the saddle on a free-wheeling charger, to knee-action on a floating-powered "iron horse" may find consolation in the statement of the Chief of Staff in the hearings on the 1936 Appropriation Act "that on the battlefield the fastest element is the man on a horse."

Present policies for mechanization also recognize "in some special cases of difficult terrain, the horse, supplemented by motor transportation may still furnish the best mobility, and this situation is properly borne in mind in all our plans." The retention of animal draft in some of the light divisional units permits of the continued study of the comparative efficiency of both methods of transport. Such an arrangement is also in the nature of insurance against a theater of operations in which the use of motors may be very sensitive to the terrain. It may well be that the theater will be wholly suitable to motors, or it may be that horses must be used. Having both, we are ensured of having the nucleus of both types upon which to build a flexible war machine.

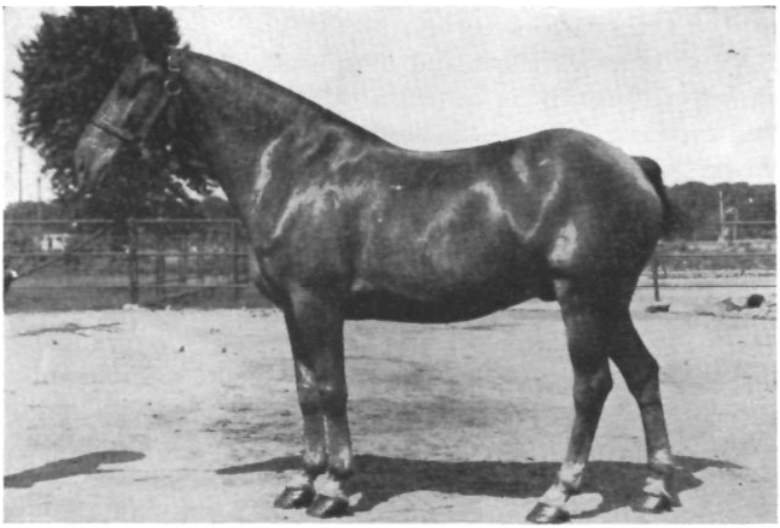
Having uppermost in mind motorization and speed, it is easy to demand and assume tactical and operative mobility on the battlefield. Yet in that combat area the fastest element will not be the motor, but the horse. It would, therefore, seem logical to extend the motorization program and to eliminate the horse one hundred per cent only on the common sense basis of the *proven*, practical fact that motor vehicles will be superior to horses under *all* conditions of combat; any other basis would lead to "shot gun" decisions, founded on the theory of leaping before looking. Whether the draft horse is now outmoded, or will gradually pass from the division into G.H.Q. as a special type of artillery, such as the pack, or mechanized, or whether the future organization will discard the horse as a relic of by-gone horse and buggy days, or whether in another war a commander will again shout the slogan of King Richard III: "A horse, a horse. My Kingdom for a horse!" whether—oh well, who knows?

In any event, we do know that a short horse is soon curried, and my sermon on the "mount" is preached.

Of more interest are the present efforts to improve the type of draft horse and to encourage horsemanship in the Cavalry and the Field Artillery. In regard to the former, attention is invited to photographs marked A, B and C, of three types of desirable draft horses for Field Artillery purchase. The horses were recently selected as the best suited types from the 6th Field Artillery and the 1st Battalion. 16th Field Artillery. These pictures, together with detailed descriptions of the "galloping" types have been furnished all buyers of draft remounts, as a general guide in the prospective purchase of draft horses for the Field Artillery. An extract of additional information for remount buyers may be of interest:

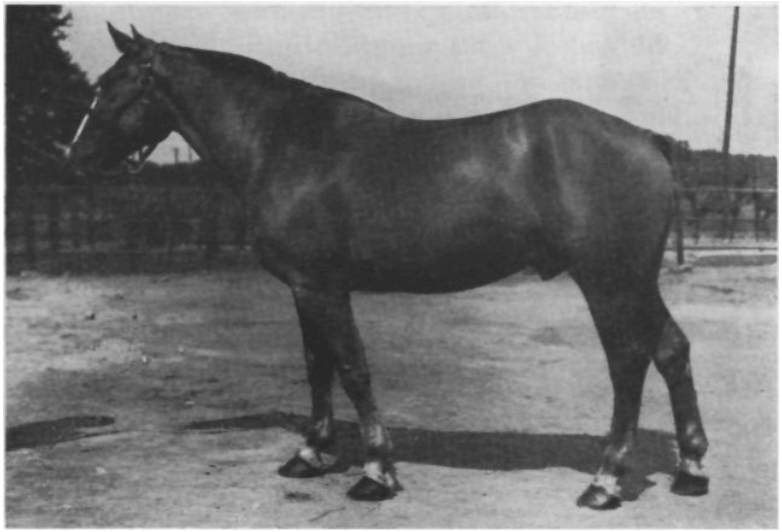
"Horses should be between 15 hands 2 inches and 16 hands 1 inch in height; those over 15 hands 3 inches in height, unless exceptional individuals both in conformation and handiness, should not be purchased.

"Horses weighing over 1,300 pounds should not be purchased, except when clearly outstanding—1,200 to 1,300 pounds will include the best horses for Field Artillery.



HORSE "A"

Name—Foch; Brand—M586; Sex—Gelding; Color—Chestnut; Breeding—Unknown; Age (present)—10; Heigh— 15-1¼; Weight (present)—1200; Girth—79″; Cannon—9¼; Where purchased—Chicago, Ill.; Price—$135; Where used—Single mount; Remarks—This horse will work well any place.



HORSE "B"

Name—Pershing; Brand—M536; Sex—Gelding; Color—Chestnut; Breeding—Unknown; Age (present)—7; Height—15-2; Weight (present)—1300; Girth—81½″; Cannon—9″¼; Where purchased—Chicago, Ill.; Price—$135; Where used—Near lead; Remarks—This horse will work well any place.

"The coarse, poor moving 'farm chunk' is not wanted. A horse showing breeding is desired—good half-breds, if possible with good necks, are preferred.

"'A' while an excellent and most useful horse could have a much better neck; 'B' is better in this regard, while 'C' is considered excellent. 'B' has the best shoulders of the three types.

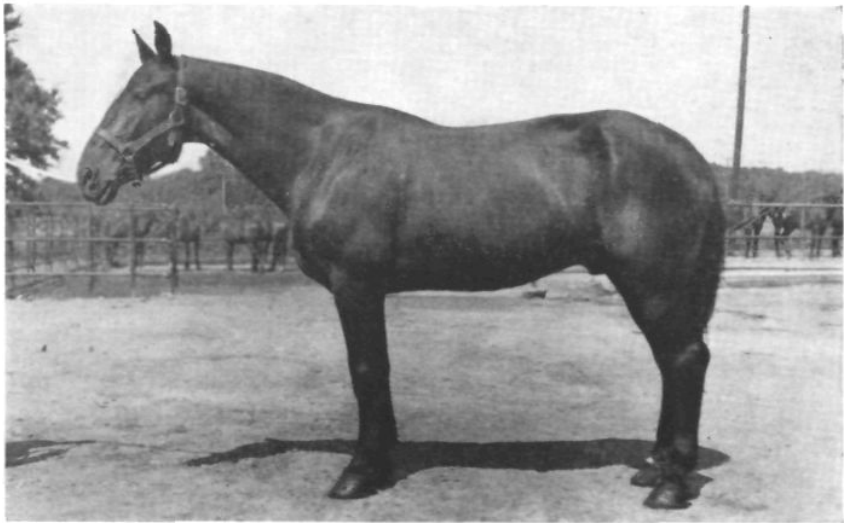
"Legs. 'A' has excellent front legs, his hind legs are good, but would be much better in our opinion if the hock was let down more. 'B' has the best hind legs of the three.

"Horses with big, clumsy feet are not desired—good feet of moderate size should be sought.

"Extremely short coupled horses are not as useful as horses with a little length. 'A' is a short coupled as any wanted; 'B' is a good length, and 'C' having a good strong loin is not too long. They should have ample girth, strong barrels, and sufficient substance.

"Good heads and active ears, also good full eyes are desired—these will ordinarily come on a horse filling all the above qualifications. 'C' has the least desirable head of the three.

"Last and the most important requirement: Field Artillery



HORSE "C"

Name—Speedy; Number—M274; Sex—Gelding; Color—Bay; Breeding—Unknown; Age (present)—10; Height—16.1; Weight (present)—1200; Girth—75¾″; Cannon—Fore 9½″, hind 10″; Where purchased—Chicago, Ill.; Price—$165; Where used—Wheel horse; Remarks—Tall but very powerful.

horses must be agile, or 'good movers.' In buying Field Artillery horses plenty of time must be allowed to examine horses in motion. A good straight walk and a true, springy trot must be shown. The horse must be able to walk out and trot out. The way of going is the most deciding factor."

For riding horses, a larger type than the light Cavalry mount and more closely resembling the "leaders" will be sought.

Differences of opinion exist in regard to horses, or else no race. If the best points of all three type horses could be combined into one, the composite picture might approach the ideal.

In the encouragement of horsemanship, every effort has been made to relax some of the restrictions now imposed by regulations in regard to ownership and maintenance of private mounts. It is understood that provisions for mounted pay are included in the estimates for the Fiscal Year, 1937. Regulations have been modified recently to authorize the shipment of private mounts by student officers attending the one-year course at Fort Leavenworth. It is expected that instructions will be issued in the near future to permit the purchase by mounted officers of top horses at the several Remount Depots.

SHIFTS

BY CAPTAIN BONIFACE CAMPBELL, Field Artillery

IT MAY be assumed that, in the vast majority of cases, the initial direction for targets attacked by observed fire will be obtained by a shift from a base deflection, or from a previous target. When the set up is axial, there is obviously little complication in determining the amount of the shift; the measured shift corrected by the ratio OT range to GT range will usually give satisfactory results. As the observer displacement increases, the determination of the proper shift is more difficult to obtain; this is especially true when the distance from the observer to the target differs materially from that for the guns.

Two general means are available for the rapid determination of the shift—plotting and calculation. Rapid plotting, either on a plane table or by means of a relocator sheet, is probably the most accurate rapid means available; its disadvantage is the necessity of some equipment and possibly greater time. Calculation requires no special equipment.

The parallel method described in TR 430-85 may be used; this method is satisfactory and free from complication only when the target offset is small and the OT and GT ranges are approximately equal. Where conditions are such that the parallel method is difficult to apply, a useful expedient is the *"d"* shift. This method consists essentially of determining where a round would fall on the gun—base point line if fired at the range of the new target; of measuring the shift at the OP from this point; and correcting this measured shift by the ratio OT/GT. The detailed steps in determining a shift by this method are as follows:

(1) Determine *d* (the apparent deviation of a burst for a 100 yard range change) for the base point, using firing tables or the formula $d = (1/10T)/(r)$.

(2) Measure the angular shift from the base point to the new target.

(3) Determine or estimate the difference in range between the base point and the target. Convert this range difference into angular deviation by the *"d"* relation—one *"d"* for each hundred yards range change.

(4) Correct the measured shift by applying to it the deviation

determined in (3). This correction is additive if the point of fall of a round fired at base deflection and at target range is on the opposite side of the O-BP line from the target, otherwise subtractive. If subtractive, and greater than the measured shift, the shift will be in the opposite direction from that noted at the OP.

(5) Multiply the corrected shift determined in (4) by the ratio OT/GT (or r/R), and send to the guns, in the usual units of announcement.

AN EXAMPLE

d on Base Point = 23 (use 25).

OT/GT = 2500/4000 = .6.

Estimated range change = -500 yards. A round fired at base deflection and at the target range will fall at *a*. 5 *d's* or 125 mils right of the base point.

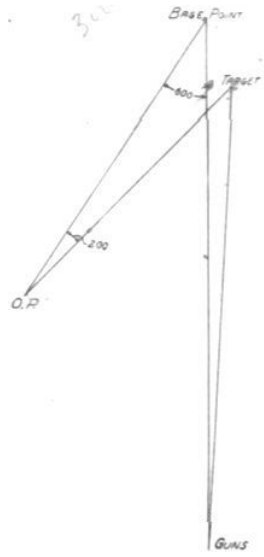
The measured shift is base point right 200.

The correction for range change will cause the burst to fall *within* the measured angle, and is therefore subtractive.

Right 200 -125 = Right 75.

Right 75 × .6 = Right 45.

By plotting, the result is Right 53.



The advantages of this method are simplicity, ease of mental calculation, and applicability to practically all firing setups. On the other hand, it is not especially accurate when very large range changes are made with a consequent rapid changing of *d*. In this case, a rough allowance should be made for the change of *d* in determining the correction. In any event, it is more universally applicable than the parallel method, and will generally produce more satisfactory results.

ARTILLERY AND CHEMICAL WARFARE

BY CAPTAIN M. E. BARKER, C.W.S.

POPULAR MISCONCEPTIONS

WE THINK in terms of pictures. When most of us think about chemical warfare of the past, we visualize a heavy pungent greenish-yellow cloud rolling along the trenches with soldiers clutching their throats and quickly dying in great agony. Of chemical warfare in the future, we see a sky full of airplanes dropping a deadly cargo of gas which, by some magical power, blots out life in whole areas.

Why do we have such mental phantasies? Because we have read the same thing so many times in lurid tales where the author was paid for the thrills and gasps he could produce, rather than the information he could convey.

Another group of authors have tried to convey the opposite idea and have used the word "Comical Welfare" to describe "Chemical Warfare."

Let's discard such extreme notions and examine the facts in the case with a view to forming a sensible idea of the properties of chemical agents: how they were used in the World War; and what limitations and possibilities are inherent in these substances for future military operations.

CLASSIFICATION OF CHEMICAL AGENTS

Some chemical agents are gases, some are liquids and many are solids at normal temperatures and pressures. Some of these substances produce a powerful effect on the human body, others produce a screening smoke, and still others produce incendiary effects. The agents that produce a lethal or dangerous effect on the human body when breathed, or brought in contact with the surface of the body, under field conditions, are called gasses and are stenciled in green with letters showing the symbol of the agent and bands to denote persistency. One green band indicates a gas which evaporates immediately after the shell or other container bursts, while two green bands indicate a gas that evaporates slowly. The symbol gives the composition of the filler used. A knowledge of the physical properties of the agents and the characteristics of the shell as to size, design, booster capacity,

and fuse, together with a knowledge of weather conditions and the terrain on the target enables the chemical officer to estimate the persistency (i.e., the length of time it takes the filler to evaporate) under any given set of conditions. One red band and the symbol in red letters indicates a chemical agent that produces a temporary but powerful irritant effect on the body. Such agents do not produce death nor endanger health under usual field conditions. Purple markings indicate an incendiary filling, while yellow markings indicate a screening smoke. Thus a fairly simple color scheme indicates the outstanding characteristics of the various groups of agents. Table I indicates the grouping of the principal agents according to the action on the body, while Table II shows the tactical classification of chemical agents.

The action of any chemical agent depends upon the amount of the agent that is breathed or brought in contact with the body. A small amount of agent produces a minor effect, while a larger amount produces a correspondingly more powerful effect up to the lethal dosage.

EFFECT ON THE HUMAN BODY

The lung irritants must be breathed in order to be effective. Phosgene (CG), for instance, when breathed to the amount of 160 milligrams, will produce death due to its corrosive action on the lungs. If the entire amount is breathed within the space of a minute or so, the action is immediate. If the agent is breathed for a considerable time in low concentration, the effects may be delayed several hours, and there will be no pain connected with the exposure.

The lacrimators affect the eyes only. The sternutators must be breathed to be effective, and their action may be likened to the action of a severe case of migrane headache, combined with seasickness. One (1) milligram of Adamsite (DM), if breathed, will produce incapacitation in the average individual for six (6) to twelve (12) hours.

The vesicants, either vapor or liquid, are rapidly absorbed into any part of the body with which they come in contact. Fifty (50) milligrams of mustard gas vapor breathed into the lungs will produce death in the average man, and thirty (30) milligrams of liquid mustard gas on two or three spots on the surface of the body will produce large watery blisters that will incapacitate

TABLE I

CLASSIFICATION OF PRINCIPAL CHEMICAL AGENTS

Common Name	*Markings on Munitions*	
VESICANTS		
Mustard Gas	2 Green Bands	HS Gas
Lewisite	2 Green Bands	M-1 Gas
Ethyldichlorarsine*	2 Green Bands	ED Gas
LUNG IRRITANTS		
Chlorine	1 Green Band	CL Gas
Phosgene	1 Green Band	CG Gas
Chlorpicrin	2 Green Bands	PS Gas
PARALYZANTS		
Hydrocyanic Acid*	1 Green Band	AC Gas
LACRIMATORS		
Chloracetophenone	1 Red Band	CN Gas
CN Solution	1 Red Band	CNS Gas
STERNUTATORS		
Adamsite	1 Red Band	DM Gas
INCENDIARIES		
Thermit*	1 Purple Band	TH Incend.
SCREENING SMOKES		
White Phosphorus	1 Yellow Band	WP Smoke
Sulfurtrioxide Solution	1 Yellow Band	FS Smoke
Hexachlorethane Mixture	1 Yellow Band	HC Smoke

*These agents are not standard in our service at present, but were used during the World War as follows:

a. Ethyldichlorarsine by the Germans.
b. Hydrocyanic acid by the French.
c. Thermit by the British and Americans.

TABLE II
TACTICAL CLASSIFICATION OF THE TYPE CHEMICAL AGENTS

Agent	Symbol	Type of Agent	Non-persistent		Persistent				Screening	Incendiary
					Moderately Persistent		Highly Persistent			
			Casualty	Harassing	Casualty	Harassing	Casualty	Harassing		
Phosgene	CG	Non-persistent Casualty	■	⊠						
Adamsite	DM	Non-persistent Harassing		■						
Chloracetophenone	CN	Training	Persistent or non-persistent according to munition in which used.							
CN Solution	CNS	Moderately persistent Harassing				■				
Ethyldichlorarsine	ED *	Moderately persistent Casualty			■	⊠				
Mustard Gas	HS	Highly persistent Casualty					■	⊠		
White Phosphorus	WP	Combustible solid smoke producer	⊠						■	⊠
Hexachlorethane Mixture	HC	Self-burning solid smoke producer							■	
Sulfurtrioxide in Chlorsulfonic Acid	FS	Atomizing liquid smoke producer							■	
Thermit	TH *	Incendiary		⊠						■

Legend: ■ = Principal Tactical Classification. ⊠ = Additional Tactical Classification.

*** Not standard in our service, but were used during the World War.**

COUNTERBATTERY WITH W.P. 4.2″ CHEMICAL MORTAR

COUNTERBATTERY WITH H.E. 75MM GUN

the individual for field service for about six weeks, unless the burn becomes infected, in which case a much longer period of incapacitation may be expected. Horses and other animals are more susceptible than men to the action of vesicants.

The most poisonous of all agents used during the World War was a nerve paralyzant, hydrocyanic acid, which is considerably more powerful than phosgene; but hydrocyanic acid proved to have very limited tactical value due to its rapid dissipation in the field, and the consequent inability of the artillery to build up effective gas concentrations with it.

There is no mystery about chemical agents. With the exception of the vesicants, the gases must be breathed to be effective; the lacrimators must reach the eyes; and the sternutators must be breathed. The screening smokes are harmless, and the incendiaries produce heat wounds if they reach the body.

PROTECTION REQUIRED

The gas mask is adequate protection for all classes of agents, except the vesicants and the incendiaries. Overhead cover is necessary for the incendiaries, while special protective clothing is needed for the vesicants.

TACTICS AND TECHNIQUE OF CHEMICAL AGENTS

The gases (i.e., lung irritants, vesicants, and paralyzants) have been used to produce casualties, or the threat of casualties. The incendiaries may be used for the same purpose as well as to cause fires. The irritants (lacrimators and sternutators) are used to temporarily disable men or force them to mask. The screening smokes are used to blot out observation and provide temporary artificial cover. All these tactical effects are sought normally by the field artillery.

During the World War, the field artillery was the principal arm employing chemical agents. In spite of the great improvement of the airplanes and the development of effective chemical munitions for airplane use, the author believes that field artillery continues as the most important disperser of chemical agents. The strictly chemical weapons, the cylinder and the Livens projector, are not available as frequently as is artillery. This, we believe, is necessary because of the weather limitations inherent in gas cloud attack; and the time required to install Livens projectors.

The tactics and technique of various chemical agents can be illustrated by historical examples, of which there are a great variety since the A.E.F. suffered 351 gas attacks and some 74,600 gas casualties, nearly a third of the total battle casualties. A study of American and German reports shows that one (1) hospital gas casualty was produced by about:—one (1) gas cylinder; five (5) projector shells; twenty-five (25) artillery shells. About 80 per cent of the A.E.F. gas casualties were caused by German artillery shells.

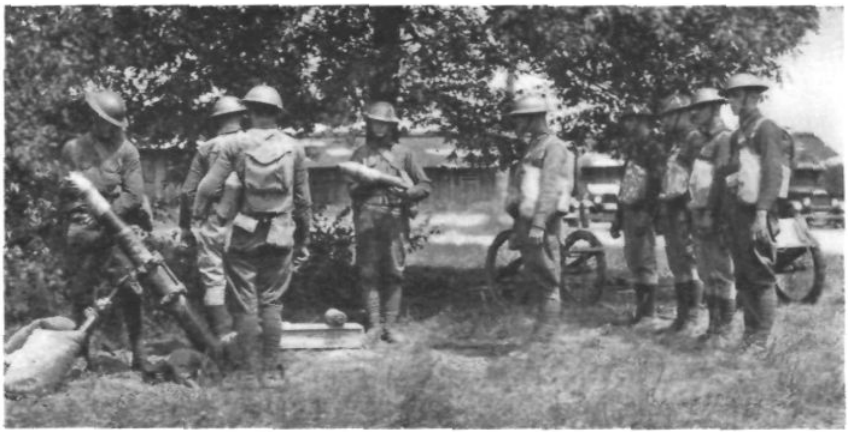
PHOSGENE (TYPE OF NON-PERSISTENT CASUALTY AGENT)

Phosgene is a non-persistent casualty agent, hence can be used shortly before an attack and in offensive situations generally. It should be used in sudden bursts of fire in order to build up a high gas concentration and secure casualties before the alarm can be given and men can adjust their masks and their horses' respirators. Phosgene is suitable for use in large shells, such as the 155-mm. Howitzer and the 4.2″ chemical mortar.

(a) At the Bois des Clairs Chênes, France, in October, 1918, a part of the 3rd American Division was held up by a machine gun nest in the edge of the woods. A phosgene concentration was fired on the machine guns which silenced them at once. Eleven (11) machine guns and forty-three (43) prisoners were captured without further resistance.

(b) In the Meuse-Argonne operations, battalion concentrations of 60 rounds of phosgene from 155-mm. Howitzers were fired on a number of German batteries. Every battery fired upon was out of action for at least six hours.

(c) A combination of phosgene and HE shells was used frequently in counter-battery and on targets of opportunity. In



4.2″ CHEMICAL MORTAR SQUAD AT DRILL

September, 1918, on the Vesle River, the Germans used this method of fire with great effect on the American reserves.

MUSTARD GAS (TYPE OF PERSISTENT CASUALTY AGENT)

Due to its long persistency, even in warm weather, mustard gas can be used for harassing and casualty action without restriction in a stabilized situation and on the defensive, only. On the offensive, it can be used to create artificial flanks, to render important terrain untenable, and for distant counter-battery. Mustard gas is suitable for use in the 75-mm., the 105-mm. and the 155-mm., both howitzer and gun.

(a) The position occupied by part of the 103rd Infantry of the American 26th Division in the Tryon Sector near Champlon was bombarded by German artillery during the night 26-27 September, 1918. Approximately 450 shells of 77 and 105-mm. caliber fell on the position. The terrain occupied was low marshy ground with a few trees and bushes, an ideal mustard gas target. There was very little wind. 165 hospital casualties were produced.

(b) Twenty thousand (20,000) artillery shells, carrying 250 tons of mustard gas, were fired by the Germans from April 7 to 9, 1918, on the British position south of the La Bassee Canal and at Armentieres, thus creating two mustardized flanks on a front of ten (10) miles. The German attack of April 9th. 1918, took place in the gap between the two mustardized areas. The mustard gas caused many casualties in the British lines. The

two areas were evacuated prior to the German attack, which was successful.

(d) In the Meuse-Argonne offensive, the left flank of the American First Army Corps (the 77th Division) was enfiladed by artillery and machine gun fire from German positions in the Bois de Bourgogne. Three attempts were made to advance, but without success. The 77th was replaced by the 78th Division and four regiments of artillery mustardized the woods over an area about 6000 × 2000 meters. 16,395 mustard gas and 10,726 phosgene and chlorpicrin 75-mm. shells were fired on the area, together with some 4,000 155-mm. SH shells, on the night 30-31 October, 1918. On November 1st, the 78th Division advanced without resistance from this woods. The Germans, who had been ordered to hold the woods at all costs, suffered a large number of casualties from this gas attack.

HARASSING AGENTS (CNS) AND (DM)

This class of agents is used to force the enemy to mask and thus exhaust him, slow down his movements and interfere with his mobility. CN solution (CNS) may be taken as the type agent for artillery use for this purpose. If no masks are available the opposing force can be put out of action and rendered helpless for a period of hours.

Tests have shown that wearing the mask reduces the rate of march or the ability to fire a battery by about twenty-five per cent (25%) for well trained troops during the first hour and progressively thereafter, so that they are nearly exhausted after six hours in masks. Green troops are more seriously affected. Merely putting on the mask reduces aimed infantry fire on definite targets by twenty per cent (20%).

A small number of rounds of artillery shells are required to harass a unit area, so the expenditure of ammunition for this purpose is well worthwhile.

(a) The French were assembling their forces for a counter-attack. The German artillery was called upon to slow down the assembly of troops and break up the counter-attack if possible. An area of 100 square kilometers was fired on during an entire night. One hundred thousand shells of mixed calibers were used, mostly filled with diphosgene and chlorpicrin. The attack was broken up and the French suffered over a thousand (1,000) hospital casualties. (Verdun, June 21 and 22, 1916.)

BURST OF A 75MM MK II GAS SHELL FILLED WITH HS.
Note the mist of liquid particles formed by the explosion.

(b) CN, DM, and CN-DM mixed, have been used on many occasions by the National Guard, the police, and prison guards to subdue mobs and desperate criminals.

(c) The Germans used ethyldichlorarsine as a shell filler for this purpose during the last six months of the World War. Sneeze gas similar to DM in action was filled into Blue Cross shells by the Germans and used for harassing. Several hundred thousand Blue Cross shells were used against the Allies.

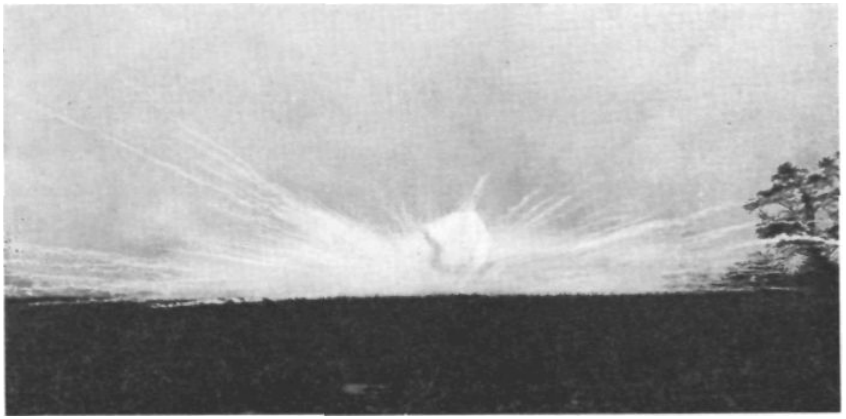
SCREENING SMOKE

The necessity for, and the value of, screening smoke is now thoroughly understood. The subject has been discussed frequently in these columns during the past few years. A study of historical examples; the tests conducted at Edgewood Arsenal, Fort Sill and Fort Benning all point to the great effect of smoke on aimed rifle fire and observed artillery fire. When harassing agents are mixed with the smoke shells, and the individual is forced to wear a gas mask when covered by the smoke blanket, he becomes practically useless until either the smoke or the gas has dissipated.

COMPARATIVE EFFECTS OF GAS AND HE

The following qualitative conclusions are drawn by the author from a study of proving ground tests and the use of gas during the World War:

(a) Against troops standing in the open. HE and shrapnel are slightly more effective than gas (HS).



AN IDEAL BURST OF A 4.2″ SMOKE SHELL (WHITE PHOSPHORUS)

(b) Against targets of all descriptions in woods, gas (HS) is much more effective than HE or shrapnel.

(c) Against troops in fox holes in the open there is not much choice, but against troops in trenches, gas (HS) is more effective than HE or shrapnel.

The effects of both gas and HE fires decrease as the protection increases. If troops have poor gas protection, then artillery with gas shells is usually far more effective than HE, as was demonstrated by the German artillery against the Russian and Roumanian armies.

Gas is more effective at night than during the hours of sunlight, as has been shown both on the proving ground and on the battlefield. In general, gas is more effective in area fire for personnel neutralization than is high explosives. However, for destruction of material on definitely located targets and for cutting wire, HE is of course far superior to gas.

CONCLUSION

Gas and HE supplement each other as a filling for field artillery shells. A proper balance in the number of shells of each type enables the artillery to produce its maximum effect on the enemy. The relative number of shells of different types will depend on—(a) the climate and the theatre of the war, (b) the state of training of the enemy and the efficiency of his protective equipment. and (c) the tactical situation.

THE BIWEEKLY INSPECTION OF MOTOR VEHICLES

BY IST LIEUTENANT MAURICE W. DANIEL, FIELD ARTILLERY

IN Army Regulations 30-1075 the commanding officer of a post, camp, or station is directed to "Require all motor vehicles in operation to be inspected for mechanical deficiencies, appearance, lubrication, adjustments, and carelessness and indifference in operation not less than once in every two weeks. The result of the inspection of each vehicle will be recorded and a copy of any deficiencies furnished the commanding officer of the post, camp, or station under whose jurisdiction the vehicle is being operated." This inspection is commonly known throughout the Field Artillery and the Army as the *technical inspection*.

The motor vehicle inspection system is designed to maintain vehicles in serviceable operating condition for the maximum time at the minimum of expense. The driver's inspection before each trip to see that his vehicle is filled with gasoline, water, and oil, and that all parts are in proper working order; his inspection during operation, during a halt, and after operation; all are designed to accomplish this result.

Motor vehicles need considerable care to keep them operating efficiently from day-to-day. At times the whole vehicle should be gone over to detect and make necessary adjustments, to tighten loose bolts, nuts, and screws, to replace lost cotter pins or parts; in general, any work necessary to put the vehicle in first class condition. Army Regulations, quoted above, require that such an inspection of each vehicle will be made every two weeks.

If worthwhile results are to be obtained, it must be possible to make the inspection in a reasonable time; it must produce information of value; it must be as simple as possible; it must insure that all parts of the vehicle are inspected; and corrective measures must be indicated and accomplished. The inspection described hereinafter is designed to meet these requirements.

During a recent visit to one of the popular car assembly plants it was noted that each new car that came off the assembly line was thoroughly gone over in a manner that can be adopted, with a few changes, by the Army and used as a Technical Inspection. All nuts, bolts, and screws on the entire vehicle were tightened, and

such adjustments as necessary were made. This work was accomplished by five men in the surprisingly short time of sixteen minutes. For the purposes of technical inspection in the Army, the job of checking the brake linkage adjustment (requiring the exclusive time of one mechanic) can be omitted as it will not be necessary to loosen and readjust all of this mechanism unless it has been deliberately thrown out of adjustment. Therefore, only four mechanics will be required for the inspection.

Tentative tables of organization for a battery of light truck-drawn (75-mm. guns) field artillery assign one motor sergeant, one chief mechanic, and two auto mechanics to the shop crew. In addition, there should be at least one competent driver understudying in the shop to furnish a replacement in the shop crew. There are, therefore, at least four men available to make this inspection.

A pit, over which the vehicle can be run, and so constructed as to permit of simultaneous work underneath and alongside of the vehicle, will facilitate the work. All four men will work at the same time and the duties are so arranged that all finish their respective jobs at approximately the same time. This system will work admirably at a permanent station where a pit may be available, but it is also within reason to use any gully or ditch over which the vehicle may be run during field duty. Even without a pit the men who work underneath can reach all the parts while on their backs.

The inspection outlined below is prepared for a 1934 Chevrolet truck or station wagon but, with this outline as a guide, a similar inspection may easily be made out in a short period of time for any make of vehicle. The main parts of all trucks are more or less alike and, with small changes where necessary, this outline will fit any vehicle, and the time required for the inspection will not vary much.

Two of the four men work above the pit, one on the right side and one on the left side; the other two work in the pit. The two in the pit split their work so that they will have about the same amount to do. With the transmission as the dividing line, if the rear man covers the transmission and everything to the rear of it, and the other covers everything in front of the transmission, the time will be about evenly divided. The two men working

above have approximately the same amount to do if the man on the left covers the inside of the cab in addition to everything on his side of the vehicle. All four have to work together and at times aid each other, as, for example, in adjusting the brakes the man on top must operate the brake pedal during the adjustment by the pit crew.

Each man must have his own tools so that time will not be wasted in borrowing tools back and forth. The tools necessary to make the inspection on a 1934 Chevrolet truck are listed with the duties of each man. Time will be saved if each man above the pit wears an apron provided with suitable pockets in which his tools may be carried. A suitable compartment tool holder, suspended from the side of the pit, should be furnished the pit crew.

In training the mechanics for their particular job it is suggested that each go over his duties "by detail" one at a time. The instructor should read off the duties and have the mechanic perform the operations accurately and correctly. After this preliminary instruction each mechanic should be required to study his duties until he has memorized them. Following this the four should work together on the inspection of another vehicle, from memory. At the conclusion of this inspection they should be given a list of their duties with which to check their work. There will be some things forgotten, of course, but eventually they will be able to do the operations correctly from memory.

Mechanics soon will discover that if each does this inspection work conscientiously the repair work on the vehicles will be cut down to a minimum, thereby reducing his work instead of increasing it.

This method of training the mechanics was tried out with the result that the fourth vehicle inspected by the crew required thirty-two minutes. This included time for each man to read over his paper and go back and do the things he had overlooked. It is reasonable to expect a considerable reduction in this time after the crew has attained facility through practice.

The motor officer should act as the chief inspector and check the operations as the mechanics are performing them. As soon as they are completed he should try several of the nuts or parts

they have tightened or adjusted to see that the inspection was properly done. To simplify his work he should carry several wrenches along with him for that purpose.

During the inspection things will show up that can not be done at the time of the inspection. These things must be considered as repair jobs and will have to be taken care of by the shop crew later on. When the need for any repair job is discovered it should be announced to the motor officer. He then determines the extent of the work necessary and makes out an "Unserviceable Vehicle Tag" giving the location of the defect and a description of the repair work to be accomplished. This tag is hung on the door handle of the cab or other convenient place. Then when the vehicle goes into the shop for the repair job the mechanics will know exactly for what to look and what to do. The "Unserviceable Vehicle Tag." as recommended by the Field Artillery School, is a shipping tag on one side of which are spaces for a description of the repair job, and the signatures of both the motor sergeant and the motor officer. These signatures indicate that the motor sergeant and motor officer have inspected the repair job after it is completed. On the other side are spaces for cost of parts, hours of labor required, and the mechanic's signature.

This latter part of the tag furnishes information necessary for the Vehicle Service Record Book, and serves also as a check on the mechanic if the job does not hold up. Only one job should be put on each tag, and the mechanic should complete each job before he starts on another. The tag will be removed by the motor officer after his inspection; it must not be removed by any one else.

DETAILS OF THE INSPECTION

The operations to be performed by each mechanic in this proposed inspection are given below. At the end of each list any explanatory notes necessary are added.

RIGHT SIDE INSPECTION OPERATIONS

(1) Listen for peculiar noises.

Tighten cylinder-head bolts and rocker-arm bolts.

Check valve clearance.

Tighten coil bracket bolts.

Tighten all clip bolts on right side of dash.
Tighten hood-fastener brackets, front and rear.
Tighten gas-line connections at fuel pump and carburetor.
Tighten fuel pump.
Check sediment bowl for cleanliness.
Tighten octane selector to block nut.
Tighten radiator shell bolts.
Tighten radiator shell to bracket bolt.
Tighten water outlet bolt, right side.
Tighten accelerator bracket.
Check engine splash pan for being too close to block (¼″ clearance) and tighten bolts.
Tighten right front body bolt.
Tighten headlight tie bar to radiator shell, nut
Tighten hood handle bolts.
Tighten starter switch connection.
Tighten starter bolts.
Tighten radiator tie bar, front and rear.
Tighten starter housing bolts.
Tighten hood and clip screws, front and rear.
Tighten all hose clamps (snug).
Tighten octane selector connection (snug).
Tighten push rod cover-plate screws.
Tighten radiator shell to radiator bolts.
(2) Check breaker points.
Check wire insulation.
Tighten ignition-timing clamp screw.
(3) Check wheel bearings and king pins.
Tighten fender to fender brace bolts.
Tighten headlight tie bar to fender brace nut
Tighten headlights.
Tighten wheel hub nuts.
Tighten spare wheel on carrier.
Tighten rear fender bolts.
Tighten door lock screws and all door screws and cap screws.
Tighten dovetail bumper screws.
Check door and spare-tire keys and locks for proper fit.
Check battery terminals and test battery.
Check for missing grease connections.

Check fastenings for top and body cover.

TOOLS NEEDED

1 ⅜″ × 7/16″ double end wrench.
2 ½″ × 19/32″ double end wrench.
1 11/16″ × 19/32″ double end wrench.
1 ⅝″ × 25/32″ double end wrench.
1 ½″ box end wrench.
1 9/16″ box end wrench.
1 ⅝″ box end wrench.
1 ¾″ box end wrench.
1 ⅞″ socket.
1 offset handle for socket wrenches.
1 socket extension (long), for socket wrenches.
2 screw drivers 6″ and 14″.
1 plier, combination.
1 hydrometer.
1 set thickness gauge.

(1) The engine should have run long enough to be thoroughly warmed before the inspection starts and should be left running until the man working on the right has completed the adjustment of the valve clearances.

(2) The man working on the left will turn the crank until the breaker points are separated.

(3) The men working in the pit will jack the vehicle off the ground and, while it is jacked up, the men working on top will grasp the front wheels top and bottom and wabble them for this check.

LEFT SIDE INSPECTION OPERATIONS

Listen for peculiar noises.
Tighten left cylinder-head bolts.
Check fan for trueness.
Tighten windshield-wiper suction-line connection at manifold (snug).
Check all lights.
Tighten exhaust-flange nuts.
Tighten carburetor to intake manifold bolts (snug).
Tighten intake to exhaust-manifold bolts.
Tighten manifold to cylinder-head bolts.
Tighten left water-outlet bolt.

Tighten steering gear to frame.
Tighten fan-belt adjustment bracket bolts.
Tighten generator-housing bolts.
Tighten oil-line connections at oil distributor (snug).
Tighten oil line to gauge clip at motor block.
Tighten mastjacket clamp bolt and adjusting clamp.
Tighten radiator shell to radiator bolts.
Tighten all clip bolts on left side of dash.
Tighten left front body bolt.
Tighten hood-handle bolts.
Tighten horn-bracket bolts.
Tighten radiator shell to bracket bolt.
Tighten radiator tie-bar, front and rear.
Tighten water-temperature gauge connection at cylinder head.
Check engine splash pan for being too close to motor block (¼″ clearance) and tighten bolts.
Check water-pump packing nut.
Tighten generator lead wire (snug).
Tighten hood end clips—front and rear.
Tighten both hood-fastener brackets.
Check oil in crankcase.
Check wire insulation.
Check for missing grease connections.
Check oil-cleaner mileage.
Tighten fender to fender brace bolts.
Tighten headlight tie bar to radiator shell, nut.
Tighten headlight tie bar to fender brace, nut.
Tighten wheelhub nuts.
Check wheel bearings and king pins.
Tighten rear fender bolts.
Tighten door lock screws.
Tighten dovetail bumper screws.
Tighten all door screws and cap screws.
Tighten instrument-panel screws.
Tighten mastjacket to instrument panel.
Check mirror, sunvisor, and windshield wiper.
Check steering gear.
Adjust clutch and brake pedal stop, check clutch-pedal lash—1 inch.

Check fastenings for top and body cover.
Test compression on each cylinder with crank.
Turn crank for check on breaker points.
Check for radiator leaks.
Check tools.
Check fire extinguisher.

TOOLS NEEDED

1 7/16″ × ⅜″ double end wrench.
1 ½″ × 9/16″ double end wrench.
1 ⅝″ × 11/16″ double end wrench.
1 ½″ box end wrench.
1 9/16″ box end wrench.
1 ⅝″ box end wrench.
1 ¾″ box end wrench.
2 screw drivers 14″ and 6″.
3 9/16″, ⅝″, ¾″ sockets.
1 offset handle for socket wrenches.
1 pliers, combination.

PIT INSPECTION OPERATIONS

Tighten body bolts—be sure to tighten body bolt back of muffler.
Tighten rear axle bumper nuts.
Tighten rear bumper to frame bolts.
Tighten rear spring shackles.
Tighten gas-line connection at tank (snug).
Tighten gas line to frame clamp bolts.
Tighten muffler and tail-pipe clamps.
Remove shock-absorber arm nuts and try shock absorber, tighten capscrews to frame.
Tighten brake-carrier bracket nut.
Tighten rear and front spring saddle U Bolts, both sides.
Tighten running-board mat screws, both sides (snug).
Tighten universal joint housing to cross member bolts (snug).
Tighten universal joint bolts.
Check rear cab hold-down bolts.
Tighten rear-axle housing nuts.
Tighten pintle bolts.
Tighten gas-tank strap nuts and check gas tank for leaks.
Tighten transmission bolts.

Check oil in rear axle and transmission.
Tighten front bumper to frame bolts and tighten front bumper clips.
Tighten tow hooks.
Check front spring-shackle bolts.
Tighten brake-carrier bolts.
Tighten tie-rod clamp nuts and check for bent axle and tie rod.
Tighten cross member to frame bolts at rear of motor.
Tighten motor-support bolts, both sides.
Tighten front fender apron to radiator-shell bolts and screws.
Tighten pitman arm nut.
Check oil pan screws.
Check drain plug in oil pan.
Check radiator to cross-member bolts.
Check clutch and brake pedal stop—lash clutch, if necessary.
Check muffler and battery for clearance at frame.
Check battery for leakage.
Check frame for cracks and rivets.
Check for broken springs.
Check for missing grease connections.
To check foot brake, put 1½″ block between pedal and floor.
Check stoplight.
Centralize brakes.
Check that all brake rods and levers are at right angles when brakes are set.
Adjust brakes at brake shoes.
Check tires for wear and wheel-wabble.
Check wiring.

TOOLS NEEDED

3 or 4 jacks (for both axles).
2 pliers (1 side cutting).
2 hammers.
2 ⅝″ box end wrenches.
2 ½″ box end wrenches.
2 9/16″ box end wrenches.
2 ½ × 19/32″double end wrenches.
2 7/16″ × ⅜″ double end wrenches.
2 screw drivers 6″ and 14″.
1 15/16″ × 1″ double end wrench.

1 ¾″ × ⅞″ double end wrench.
1 ⅝″ × 25/32″ double end wrench.
2 9/16″ × 11/16″ double end wrenches.
2 long small chisels.
1 T handle for socket wrenches.
1 offset handle for socket wrenches.
7 ½″, 9/16″, ⅝ ″, 11/16″, ¾″, ⅞″, 11/16″ sockets.
2 ¾″ box end wrenches.
2 ⅞″ box end wrenches.

A running inspection is necessary to complete the job and can be made by any of the mechanics. It is as follows:

RUNNING INSPECTION

Oil gauge, speedometer, ammeter, gas gauge, heat indicator, steering, brakes, transmission gear shifting, clutch operation, unusual noises, carburetor adjustment.

RECORDS

A record of all items that appear on the "Unserviceable Vehicle Tag," accompanied by a statement of the spare parts required and the date of expected completion, should be kept. Another statement, as to the serviceability of the vehicle, also should be made for entry in the Motor Vehicle Service Record Book (Q. M. C. Form 248, as required by AR 30-1075). This record should be made in the form of a report in duplicate, one copy to be sent to the commanding officer and the other to be kept on file for examination by an inspector. When work is required that is beyond the facilities of the organization shop and the vehicle or a unit assembly must be sent to a Quartermaster repair shop, that information must be included on the report.

SPECIAL NOTICE

U. S. Field Artillery Association Prize Essay, 1936

An annual prize of $300.00 is offered by the United States Field Artillery Association for the best essay submitted by any Field Artillery officer of the Regular Army, National Guard or Reserve Corps on any subject of current interest pertaining to the Field Artillery.

The following rules will govern this competition:

(1) The award of prize to be made by a committee of three members to be nominated by the President of the Field Artillery Association voting by ballot and without knowledge of the competitors or of each other's vote.

(2) Each competitor shall send his essay to the Secretary-Treasurer of the Association in a sealed envelope marked "Prize Essay Contest." The name of the writer shall not appear on the essay, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary-Treasurer, with the motto on the outside and the writer's name and motto inside. This envelope will not be opened until after the decision of the committee.

(3) Essays must be received on or before January 1, 1936. Announcement of award will be made as soon as practicable after that date.

(4) The essay awarded the "United States Field Artillery Association Prize" will be published in the FIELD ARTILLERY JOURNAL as soon as practicable. Essays not awarded the prize may be accepted for publication in the FIELD ARTILLERY JOURNAL at the discretion of the editor and the writers of such articles shall be compensated at the established rate for articles not submitted in competition.

(5) Essays should be limited to 8,000 words, but shorter articles will receive equal consideration.

(6) All essays must be typewritten, double spaced, and submitted in triplicate.

THE UTILITY OF RADIO-OPTICAL WAVES IN RADIO COMMUNICATION AND THEIR POSSIBLE FUTURE ADAPTATION TO THE COMMUNICATION AND FIRE DIRECTION SYSTEMS OF THE ARTILLERY BATTALION

BY 1ST LIEUTENANT REX E. CHANDLER, FIELD ARTILLERY

THE purpose of this article is to point out the advantages and limitations of radio waves of the centimeter variety in radio communication and their possible future use in the communication and fire-direction systems of the artillery battalion.

The ultrashort-wave spectrum, as far as present developments have gone, may be divided into two distinct wavelength bands. The wavelengths between one and ten meters can be classed as ultrashort. In this region commercial sets have been constructed and their capabilities and limitations classified. The technique for generation, transmission and reception of waves of this order is well known. However, wavelengths between one and one hundred centimeters present a new band of frequencies whose characteristics require a different and new technique. In this band we begin to depart from pure radio principles. Conventional radio circuits whose operating characteristics gave excellent results at two meters will not function below one meter. Radio tubes which oscillate well at five meters will not oscillate at all below one meter. Since the propagation of radio waves of the centimeter variety seems to follow the same principles which govern the propagation of light waves this band of wavelengths (one centimeter to one meter) has been termed radio-optical.

This optical effect permits the use of a radiating antenna system in which easily portable equipment may be used to concentrate the transmitted energy into a beam. With such equipment the number of operating channels for any given band of frequencies is greatly increased. By its nature such transmission insures a communication system which would be practically impossible to intercept by any enemy. With properly designed radiating systems in this new band of frequencies all the energy

may be concentrated in a narrow beam with tremendous increase in efficiency. The limited range, freedom from skip-distance effect, static, and fading which is making the present five-meter band of wavelengths of such value to short-range communication systems are present in this band wavelengths. Such transmission is not affected by fog, rain, vagaries of weather, or climatic conditions.

The use of radio-optical wavelengths for communication purposes is not entirely new. In 1896-1897 Marconi succeeded in obtaining a range of two miles, using waves of about one meter. However, these wavelengths were not considered seriously as a means of communication until about 1930. It was about this time that Marconi reported the phenomenal range of one hundred miles, using a wavelength of sixty centimeters. About the same time a Japanese scientist, Shintaro Uda. obtained a range of thirty kilometers on a wavelength of fifty centimeters. In 1931 Marconi was connected with the establishing of a commercial beam-communication link across the English Channel. This link operates on a wavelength of eighteen centimeters. It connects the airports of Lympe and St. Inglevert and is used to report the arrival and departure of commercial aircraft at these airports. Parabolic reflecting mirrors are used to concentrate the radiation. This installation is perhaps the first commercial use of radio-optical wavelengths.

During the Century of Progress exhibition in Chicago, in 1933, the Westinghouse Company displayed an unusual piece of radio-optical equipment. A nine-centimeter transmitter and receiver, using a voice-modulated transmitter of the magnetron type and a crystal detection receiver, was used to demonstrate voice transmission and reception from one balcony to another. A twenty-four-inch parabolic mirror concentrated the radiated power in a beam which was reflected by plane metallic mirrors from one balcony to the other. This apparatus is reported to have had a transmitting range of about one mile. Since that time, with further modified receiving equipment, a range of thirteen miles has been obtained.

Before continuing with a discussion of the propagation of radio waves of the radio-optical region, a short review of the engineering problems involved in the use of generators to produce

oscillations at these frequencies is in order. As the minimum wavelength of radio transmission was reduced it was found that the tubes used to generate oscillations at ten meters were unsuited to wavelengths of five meters. Subsequent improvements in tube design have made their use at shorter wavelengths practicable. By refinement of tube design, and care in the adaptation of apparatus, conventional radio circuits may be used to produce oscillations as low as one and one-quarter meters. Here the limit of improvements of tube design and

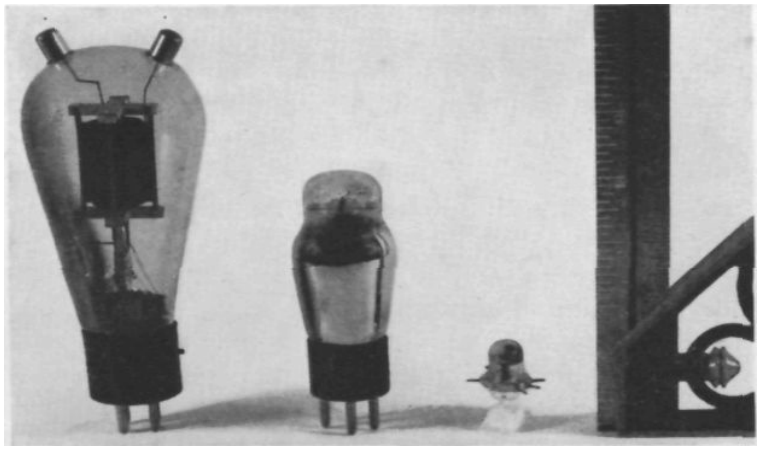


FIGURE 1. COMMERCIAL TUBES USED TO GENERATE OSCILLATIONS AT VERY HIGH FREQUENCIES

1—Type 800 transmitting tube.
2—Type 57 receiving tube.
3—"Acorn" type tube.
Note comparative physical characteristics of these three tubes.

refinement seems to have been definitely reached. If we are to go lower in the production of radio wavelengths without prohibitive loss of power, we must have tubes of different characteristics. As we push a tube designed to operate at low frequencies toward the upper limit of its oscillating frequency we run into many faults which render it unsuited for use from a practical standpoint. It takes the same input power to produce in effect a much less efficient generator than if the tube were operated at a frequency for which it is designed. Many tubes are insensitive and difficult to make oscillate. Those which do oscillate at a frequency of around 3,000,000 cycles (one meter) are unstable and the tuning is broad. To investigate the oscillating properties of conventional

types of commercial tubes a linear oscillator was built and several tubes tried out (Fig. 1). One of the higher-powered types with a rated output of fifty watts was tried. With reduced plate voltage it was made to oscillate weakly at about 3,270,000 cycles (92 centimeters). Its operation at this frequency was both unstable and uncertain. A low-powered receiving tube was next tried and its general characteristics were about the same as the higher-powered tube except that it appeared to be somewhat more stable at frequencies around one meter. With this tube a wavelength of about eighty centimeters was obtained. A Lecher-Wire Bridge was used to check the wavelength (Fig. 2).

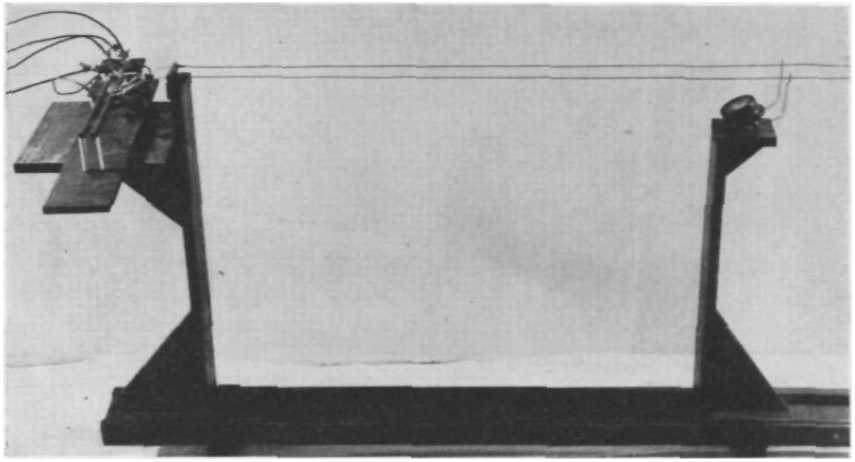


FIGURE 2. LECHER WIRE BRIDGE USED IN CHECKING THE WAVE LENGTHS OF HIGH FREQUENCY OSCILLATIONS

Standing waves were placed upon the two parallel wires by attaching each line to the grid rod of the linear oscillator. A radio frequency meter, mounted on a movable base and connected across the parallel wires was moved along the wires until a maximum reading indicated a current node. The distance between these current nodes (½ wave length) was read from a scale and pointer along the base of the bridge.

NOTE: Another method, just as effective in locating current nodes, is to connect a plate current milliammeter in series with the High Voltage lead to the oscillator. A shorting bar is used instead of the R.F. meter on the movable bridge base. As the shorting bar is moved along the parallel wires, current nodes will be indicated by the dip of the pointer on the milliammeter.

The frequency limitation of radio tubes of present design is due to a number of contributing factors. The capacitances between the elements of the tube are so large that when added to the tuning capacitance, the inductance-to-capacitance ratio is too low for a value of impedance sufficient to produce oscillation within the tube. These interelectrode capacitances and the inductance of the lead-in wires to the electrode form a tuned

circuit within the tube which set the upper limit at which the tube will oscillate. The length of the lead-in inductances is so great that much of the output voltage appears within the tube, where it is unavailable.

From the foregoing it may be seen that most of the limitations are associated with the extremely large ratio of value of internal inductance and capacitance of the tube to the external inductance and capacitance required to produce the desired high frequency. The values of the interelectrode capacitance and lead-in inductance are directly proportional to the magnitude of the linear dimensions of the tube. From this it can be seen that for good design at any wavelength the linear dimensions of the tube and circuit should be in proportion to the wavelength used. Since tubes of conventional design are found to have their lowest efficient operating wavelength at about five meters, if we take the above interpretation, a tube to operate efficiently at fifty centimeters should have its linear dimensions reduced ten times.

A new type of tube, known as the "acorn" tube, has recently been manufactured for commercial use. The physical dimensions of this tube have been so reduced that it may be used in conventional circuits at a wavelength as low as fifty centimeters (Fig. 1). This tube was tried in the linear oscillator and was found to be comparatively stable and to oscillate well at a wavelength of sixty centimeters (Fig. 3). It was used in a transmitter and receiver (to be discussed later) at ninety centimeters (at maximum rated characteristics) and seemed to handle about the same as the ordinary triode at ninety meters.

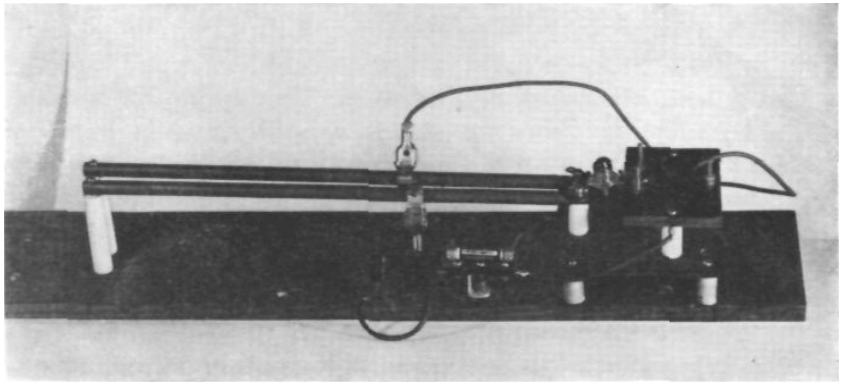


FIGURE 3. ACORN TUBE OSCILLATOR USED TO GENERATE OSCILLATIONS AT A WAVELENGTH OF 90 CENTIMETERS

With this "acorn" tube we seem to have reached about the limit of physical dimensions for tubes of conventional design. The internal structure of the tube, with its plate, grid, filament, supporting wires, and leads is at just about a minimum consistent with practical manufacture.

Another recent development which may prove of value to the advancement of radio-optical transmission and reception is the announcement of a new line of metal-shell receiving tubes. Tests have indicated them to be of greater continued efficiency than the present glass-encased tubes. They provide their own shielding, and the metal case is a better conductor and radiator of heat than the glass. They are not only smaller and more sturdy but provide better electrical characteristics than the conventional tube. Short leads, small internal construction, and effective shielding permit the tube to be used at much higher frequencies than have heretofore been obtained with the glass tube. By virtue of their rugged construction alone they will be especially adaptable to military field service conditions. Undoubtedly we will see this tube in general use in all military sets within the next few years.

Tubes of conventional design have been manufactured, which will operate to produce oscillations as low as fifteen centimeters. However, if we are to go lower in the radio-optical wave band it is necessary to use some other method of generating the high frequency required. One type of electrode oscillator now coming into use is known as the magnetron. This tube does not have a conventional grid but employs a strong magnetic field to control the flow of electrons between the plate (or anode as the plate is called when using this tube) and filament. In this tube the electrons, instead of following a radial path, are deflected by the magnetic field and follow a spiral path. Two types of this tube have been reported: one in which the oscillations are produced within the tube itself, the frequency being independent of the external circuit; the other of a type which is controlled entirely by its external circuit. These are of the split-anode construction and have a relatively low efficiency rating; in most cases the maximum has been about 8 per cent. A modification of the magnetron known as the end-plate magnetron has produced a tube capable of producing an output of two and one-half

watts at nine centimeters. The efficiency of this tube was found to be approximately 12 per cent.

The maintenance of stable electronic oscillations in tubes of the magnetron variety is entirely dependent upon the constancy of the voltages supplied. In tubes of conventional design, the oscillations primarily are dependent upon the constants of the oscillatory circuits connected with the tube. Elaborate precautions are taken in using the magnetron to provide voltage regulation which will insure constant-current supply for the magnet unit, which regulation compensates for variations of the resistance of the magnetic field, caused by the heating of the coils. As pointed out by Mr. W. D. Hershberger of the Signal Corps Laboratories: "The fact that voltage as well as tube structure controls frequency, and hence stability of operation, has forced users of microrays to employ bulky and heavy arrangements for stabilizing supply voltages."

In the practical utilization of any band of radio waves for a given purpose it is especially important to give careful consideration to the apparatus by which the radiation is to be initiated. Fortunately the design and construction of antenna systems for radio-optical wave transmissions are greatly simplified and facilitated because of the comparatively small dimensions required. With this reduction in physical characteristics it is possible to manipulate the antenna system to accomplish many results which at longer waves would be impracticable and too costly. We may concentrate radiation by various means and in various forms with a tremendous increase in efficiency and we may control the angle of this concentrated radiation.

In the case of radio-optical transmissions we find it practical to concentrate the beam by means of some form of metallic reflector or a combination of metallic reflectors and directors. Where a parabolic reflector is used we may consider the diameter of opening as the diameter of the source. As pointed out by Mr. Hershberger a tabulation of the diameter of source for various types of radiation (A Survey of Radio-Optics—Signal Corps Bulletin, July-August, 1934), the opening of a parabolic mirror to produce a beam having a total width of fourteen degrees at ten centimeters will be about 3.3 feet.

"The saving in power effected by beam transmission is considerable.

If we deal with a parabolic reflector using a ten-centimeter radio wave, and producing a beam width of fourteen degrees, the gain in the radiated power in a chosen direction is approximately 360/14 squared, or 660. The fact that the use of such a portable metal mirror permits one watt of power to be as effective, other things being equal, for communication, as 660 watts broadcast in all directions, together with the degree of secrecy attained by confining the radiation to an angular spread of fourteen degrees, accounts for the importance of electromagnetic waves in the radio-optical range. All of which would be most encouraging were it not for the fact that it is at present simpler to generate 660 watts at 5 meters than 1 watt at 10 centimeters."

Various methods have been used to concentrate the radiated power into a beam. The parabolic mirror was covered in the foregoing discussion. It gives us a uniform degree of vertical and horizontal polarization of the electromagnetic wave. Another form, derived from the early Marconi reflectors, is a series of half-wave rods or wires mounted on a parabolic curve with the antenna at the focus. This is in effect a parabolic cylinder. The spacing of the reflecting rods has much less wind resistance than a plane cylinder, yet is as equally effective in concentrating the radiated power. The directional characteristics of this reflector are such that the concentration of the beam in a vertical plane is about 33 per cent wider than in the horizontal plane. A new and rather unusual type of antenna system was developed by H. Yagi. This system has been found as effective in concentrating radiated power into a beam as the parabolic forms. In the "Yagi" antenna a single half-wave antenna is used, backed by one or more reflectors and fitted with a series of directors strung out in front of the antenna along the line of transmission (Fig. 4).

Within the radio-optical band all of the above types of antenna systems are readily portable. Of course as we go down in the band the system becomes comparatively smaller and more compact, consequently more rugged and adaptable to field service conditions. They may be mounted upon an azimuth-measuring base such as our BC Telescope tripod and rotated through horizontal or vertical angles. Thus the angle of radiation of the concentrated power may be controlled. The directional properties

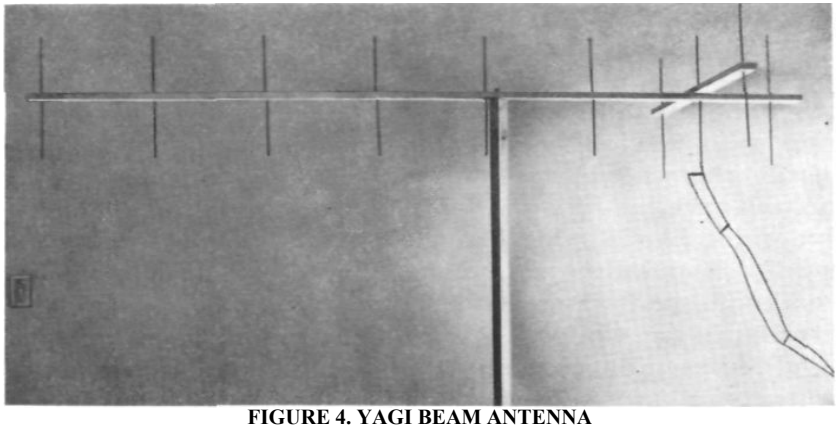


FIGURE 4. YAGI BEAM ANTENNA

NOTE: The antenna length (the antenna is the rod at the end of the two parallel feeders) was cut to 95% of a half wave = 42.7 cm, the three reflectors to 97% of one-half wave length, the six directors to 85% on one-half wave length. An idea of the physical dimensions of the antenna system may be gained from these lengths.

of these antenna systems have been found to be even more effective for reception than for transmission. Consequently if we set up a beam transmitter with the beam directed toward a receiving station, the receiving operator could swing his antenna system through a vertical or horizontal arc until he obtained the maximum signal from the transmitting station. The horizontal azimuth from any given base line and the vertical deviation from the horizontal could be measured. Conversely, knowing the azimuth and vertical deviation of a station, the full concentrated power of a transmitter may be directed at a receiving station.

In all radio communication using wavelengths above about 25 meters we find that the signal heard at the receiving station may have followed either or both of two paths. One path, the direct or "ground" path; the other path the reflection or refraction by the Heaviside layer. At short distances from the transmitting station we receive principally the ground wave. As the distance increases this ground wave is rapidly attenuated, the rate of attenuation varying inversely as the square of the distance; consequently we must depend upon the air wave for reception. At short wavelengths we do not begin to receive the reflected air wave until we have gone some distance beyond the limiting range of the ground wave. This phenomena, called "skip-distance," found in wavelengths between 7 and 25 meters, will vary with

the height of the Heaviside layer, which changes with day and night, has seasonal variations, and is sensitive to atmospheric conditions. The assumption is that in the case of a twenty-meter wave the angle of reflection or refraction through the Heaviside layer is not so sharp as that of the longer wavelengths, consequently it may not return to earth until a distance of a thousand miles or more has been covered. As the wavelength is still further reduced this "skip-distance" phenomenon is accentuated and the skipped distances become greater, hence below a certain wavelength the wave never returns to the earth. The minimum wavelength for the longest skip distance seems to vary from about 25 meters on winter nights to about 7 meters under abnormal summer day conditions. It would therefore seem justifiable to assume that wavelengths below one meter in length would be immune from long-distance pickups under all conditions.

Since there is no evidence to the contrary to disprove the above theory, the writer believes that radio-optical transmission will have a *limited range* which can be determined by the power of the equipment and the ground attenuation of the wave for line-of-sight transmission. Thus, if we build a transmitting set whose maximum line-of-sight range is such that it will just reach from our artillery area to the liaison officers in the front lines we can feel assured no peculiar phenomenon will allow it to be picked up beyond and within the enemy line.

This limited-range feature and beam concentration would seem to give us a degree of secrecy never heretofore conceived in connection with radio transmission. It will, providing we keep in mind that such transmission follows the law of optics and that line-of-sight transmission is all that we may expect. It is not affected by changes in atmospheric conditions. We could transmit at night, through fog, rain or snow. But the transmitting and receiving stations would have to be placed so that there were no intervening natural obstacles such as hills or thick woods. In other words, to utilize its limited-range feature we must consider more carefully than heretofore the placing of the transmitting and receiving stations.

The line-of-sight requirement is not rigid. By increasing the power of the transmitting station we can "fill in" behind crests with the signal and go through any natural or man-made obstacle

for short ranges. However, by increasing the power of the transmitter we increase its range beyond line-of-sight. This line-of-sight bugaboo seems to have established itself in the minds of those unfamiliar with radio to the point where they are afraid of the ultrashort and radio-optical wave bands. In some 130-centimeter tests run between Hartford, Connecticut, and Boston, Mr. Ross A. Hull reports a range of 35 miles through the Connecticut hills with a relatively low power transmitter. At no time was the signal below the noise level of the receiving set. As he stated in comparing the five-meter and 130-centimeter bands: "It is our impression that the signals on the new band (130-cm.) soak into valleys and generally cover the landscape more effectively than the five-meter signals have done."

From a military standpoint we are interested in the number of communication channels which a band of radio frequencies will provide. If we take our present channel width of 20 kilocycles we will have, between one (300,000 kilocycles) and one hundred (3,000 kilocycles) centimeters, 14,850 new communication channels. However, it seems logical to presume that when we do start delving into this new band of frequencies we are going to be forced to alter our present conception of channel widths. Sets will undoubtedly be used in closer proximity to each other; there will be more sets in a given area; and we will not have the frequency stability needed to operate a number of channels with 20-kilocycle separation. Undoubtedly the number of channels made available will be more dependent upon the limited range and beam features than upon the actual frequency channels.

To obtain first-hand information upon the operating characteristics and propagation of radio optical waves it was decided to build a transmitter and receiver which would operate within the band. Lack of apparatus and laboratory facilities limited such equipment to that portion of the band in which a more or less conventional circuit could be used and in which commercial radio tubes could be had. As stated before several types of commercial tubes were tried and only one, the "acorn," seemed to oscillate well below one meter. A superregenerative receiver was built which worked well between 82 and 104 centimeters (Fig. 5). To keep the linear characteristics of the external circuits in proportion to the dimensions of the acorn tube a small padding condenser

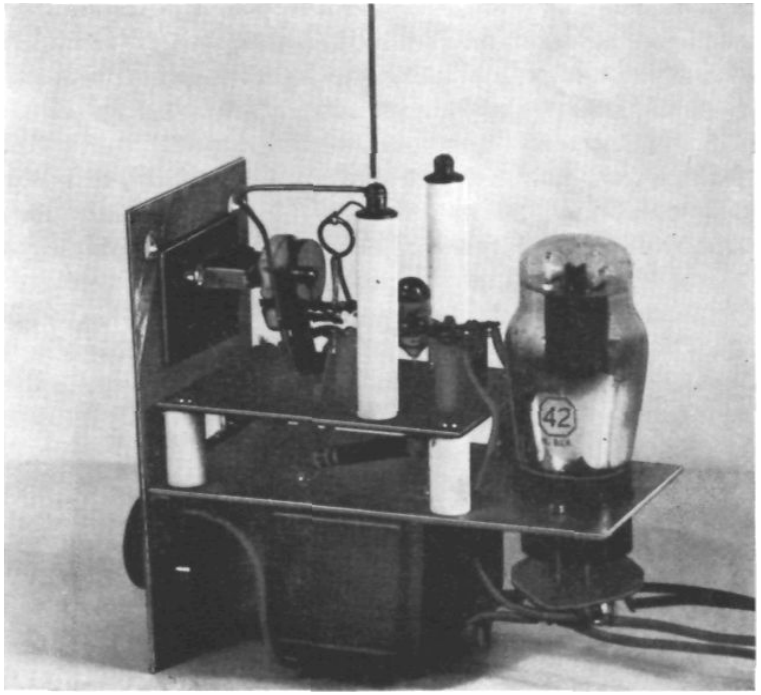


FIGURE 5. THE ACORN TUBE RECEIVER

was used (the smallest variable condenser available on the commercial market), the inductance consisted of one turn of wire on a half-inch diameter. The transmitter was the linear oscillator type (Fig. 3). After some trimming of the grid and plate rods and considerable adjustment it was made to oscillate well at a wavelength of 90 centimeters. Plate and grid modulation for voice and tone were tried. The circuit seemed to respond better to grid modulation so a 1,000-cycle tone was used to modulate the grid for the tests conducted with this transmitter. A "Yagi" type beam antenna system was built to operate at 90 centimeters (Fig. 4). A short untuned transmission line was used to feed the half-wave antenna in the conventional "zep" manner.

A rather hurried test of the field strength characteristics was made. The test was not conclusive: however, it did show: That with simple, low-powered equipment, in the radio-optical wave band, we can obtain about all the range we need for normal artillery communication purposes; that the "Yagi" beam antenna

can be made to beam; and that for distances up to about 2,000 yards we can expect these waves to fill-in behind crests and other natural or man-made obstacles with signals strong enough to be used; for greater ranges we must choose locations for transmitters and receivers near the line of sight.

From the foregoing discussion of the radio-optical wave band, its advantages and limitations, we can arrive at a logical analysis of its future application to and utility in the communication and fire-direction system of the artillery battalion.

Battle conditions may dictate that the battalion commander employ a system of fire direction wherein he and his staff will direct and *conduct* the fire of three or more widely dispersed batteries. As pointed out by General Upton Birnie in a discussion of the use of forward observation posts: "The desirability of locating observation posts in one's own zone of action indicates that forward observation is rather likely to be the rule in future wars. With the perfection of the liaison method of conduct of fire and the possibility that radio may be much more widely used in the future than in the past, it is imperative that we practice the use of forward observation." Fire direction and forward observation presuppose an excellent system of communication. Therefore if we can tie fire direction, which includes the necessary survey work and forward observation, into the communication system so that the same equipment may be used for both we have gone far toward simplicity and efficiency.

Let us suppose that a battalion in an advance guard action goes into position at night to support an attack. No air photos of the area are valuable; the maps are inadequate for fire-control work; time is so limited that the usual survey work to locate battery positions and a battalion base line is impossible and registration in the target area is prohibited. (One of those "Situations" which we are told is the rule rather than an exception in combat). The situation would present a difficult problem to the battalion commander and his staff, and the fires he could deliver in the early stages of the attack would be uncertain at best. However, let us suppose that each of his batteries has a nondirectional limited range transmitter operating in one of the radio-optical wave band channels. The battalion is equipped with two beam transmitters and receivers of relatively high power, mounted on azimuth-measuring

bases using the same channel, and each liaison officer has one beam transmitter and receiver, with an auxiliary nondirectional antenna. The Bn C locates his command post. The Com O places one of his beam stations near the fire-direction center at the CP and the other at the end of a taped base line three or four hundred yards away. This base line is plotted on the fire-control chart. The BC, Battery A, locates the position of his right gun. His radio operator sets up the radio at this location and starts transmitting A's. Base Station 1 at the command post picks up his maximum signal with his beam receiver and records the angular deviation from the base line and the angle of site. He then transmits his call sign to indicate to the A Battery operator that he has heard him and has his location. Base Station 2 performs the same operation. Both stations report their measurements to the draftsman at the fire-control chart. Thus the position of A Battery is plotted on the fire-control chart with relation to the battalion base line, and the elevation with respect to the CP is recorded. As each of the other two batteries come into position the same data are determined and recorded. The liaison officers move out to join the supported infantry unit. Ln O 1 sets up his transmitter. The two base stations locate him the same way they did the batteries and report the readings to the fire-control center. As soon as he has received acknowledgment of his location from both base stations he transfers his transmitter and receiver to his beam antenna and listens-in for Base Station 1. As soon as he has located this station he directs him to cut down his power until it is barely readable. Thus transmission into enemy territory is cut to a limited range. Base Station 2 performs the same operation with Ln O 2. Base Station 2 is connected with the fire-direction center by a short telephone line. Thus the Bn C has contact with his forward observation, has all the necessary survey work completed to bring fire to bear on any target reported by his observation, and ONLY ONE FREQUENCY CHANNEL HAS BEEN USED. All of this can be accomplished by the time the batteries are in position and ready to fire.

The above hypothesis would require, in our present knowledge of the action of radio-optical waves, considerable thought and care in the placing of the radio stations of the battalion. The

communication officer and his operator would have to be thoroughly familiar with the capabilities and limitations of their equipment. In commenting upon such a situation presented to him, Mr. Frederick A. Kolster who has had as much experience with radio-beam transmission and reception as any engineer in this country, replied: "Fundamentally the general scheme as you have presented it to me is entirely sound and capable of being successfully reduced to practice. However, there is one very serious practical difficulty in attempting to utilize very short waves for accurate direction determination and triangulation. This difficulty lies in the fact that unless operations are conducted over flat open country considerable trouble will be experienced due to refraction, shadow casting and interference patterns caused by direct and indirect radiations. For example, it would be practically hopeless to attempt to obtain accurate triangulation if the nature of the terrain over which the transmission was effected were wooded or hilly country. In other words, to carry out your plan effectively it would be necessary to be extremely careful in choosing the locations for the transmitting and receiving stations in order to have the least obstructed path for the radio beam."

The full realization of the use of radio-optical communication equipment in the manner which I have outlined for the artillery battalions is dependent upon the future technical advances in the manufacture of light portable equipment. The possibilities of this band of frequencies, with its beam and limited range features, offer a promising field for future communication needs. Its advantages are apparent, and the limitations are such that they may be partially overcome by a minimum of care upon the part of the using service. If the advances within the next few years are commensurate with the advances made in the past in radio communication we can readily foresee the practical application of this band of frequencies in the communication and fire-control system of the artillery battalion.

NOTES ON FOREIGN ARMIES

THROUGH THE COURTESY OF COLONEL ROBERT R. McCORMICK, EDITOR, THE CHICAGO TRIBUNE

Germany:

While the recruits of Germany's new army are preparing for their new service, Germany's military experts, like those of her neighbor nations, are busy devising new tactics and equipment to combat the machine gun menace, which, they declare, will play an even bigger part in modern strategy than it did in the World War. Light guns, with especially effective high explosive shells, and small tanks are to help the modern soldier defend himself in a new war.

Two main principles have been guiding the men who carried on the general staff work of a Moltke and Ludendorf for the German army when mapping out the new tactics. Infantry, they say, must be made more mobile and more self-sustaining than it was in the World War. To be able to fight machine guns, tanks and enemy airplanes when artillery is still lumbering way in the background, modern infantry has been equipped with specially light guns built for this purpose. Germany is still experimenting with various gun models. Its most successful new guns to date are the 3.7 centimeter and 4.7 centimeter models which fill the experts with great admiration. The gun in itself is very similar to those devised in other countries but its specially powerful high explosive shells are reported to be of extraordinary deadliness.

The second motto which men of Germany's Reichswehr could be heard repeating when speaking of new tactics, sounds rather startling at the first moment: "A soldier should never encounter a machine gun in his woolcoat. He must wear his strongest armor." The answer to the riddle is the small tank, preferably a two to five man contraption which can maneuver rapidly and yet be strong enough to stand machine gun fire. The English army is supposed to have developed the best tank for this purpose. Germans and observers of matters military in Germany claim the English tanks are superior to anything the Germans, French, Poles, or Czechs have constructed in this line. Germans have remained very secretive about their tanks.

Several companies of every German infantry regiment have been equipped with the new 3.7 and 4.7 centimeter guns and their crews have been trained to use them to fight machine gun nests

and airplanes flying at lower altitudes. The explosive shells are said to be so powerful that they can cripple an airplane if they explode in its neighborhood without directly hitting it. New, lighter trench mortars have been constructed to fight machine gun nests. The companies which have no guns, have light tanks to give them a feeling of safety when they encounter machine guns.

The Czech Skoda Works which cooperated with Germany's Krupp Works in the World War have been working on the same problem. They manufacture today for Czechoslovakia and her arms customers throughout the world, cooperating with the French Schneider Creuzot Works. Experts declare the Skoda Works have constructed a special small mountain gun and light trench mortar for the benefit of their infantry in its fight with machine guns, inspired by the same desire as the Germans, to keep their infantry independent and self-reliant while slowly-moving artillery follows in their wake.

England:

The British artillery has recently developed a new light howitzer for close support of the infantry. In other words, it is to go along with the infantry and shell emplacements, entanglements, fortifications and bridges at a range of 1,800 yards. The howitzer is 3.7″ caliber and tractor drawn. The tractor is fitted with Rolls-Royce engines of the same type as fitted into whippet tanks. In muddy country the howitzer is placed over a steel wire mesh carpet which is carried in the tractor. The heavy rubber tires secure the delicate mechanism of the weapon from jolting. A similar weapon, only somewhat lighter, is in existence in the French Army, but it is claimed that the British weapon is superior in the power and durability of its carriage and also in the durability of the howitzer itself. These howitzers like all modern developments of the weapon in the British Army approximate more and more to the gun. It is in fact a hybrid—half medium field gun, half light howitzer. Supply wagons on caterpillar tractors carry 150 rounds.

The British have also developed an anti-tank machine gun. It is mounted on a motor tractor with a concave shield of 1 inch hardened steel to protect the crew. It peppers the hide of an advancing tank at a range of 1,000 yards with hard nosed high

explosive bullets 1 pound in weight. One or two unfortunate accidents have taken place owing to jamming. The smooth running of the belt or tape that feeds the magazine is so far in a laboratory stage, but that the hide of a tank can be pierced with deadly accuracy by this weapon has been proved over and over again. No other army is said to possess such a weapon, though all are experimenting with it. The anti-tank machine gun moves like its enemy, on caterpillar wheels.

France:

As an accompanying weapon for infantry, with the special object of knocking out machine guns, the French use extensively an 81mm Brandt Mortar, considerably improved over wartime models, particularly with regard to accuracy. They are experimenting with a 120mm Brandt Mortar and with a 60mm model which will, if satisfactory, be established as company equipment. It can be carried by one man, the 81mm model by two men.

This, of course, is nothing radical in the way of tactics against machine guns, merely an extension of war time methods. The French still place their main reliance upon massed artillery, and massed tank attacks. Despite the incomplete success of tank attacks during the war, they have, until very recently, counted heavily on the efficacy of tanks in reducing machine gun positions providing they were capable of sufficiently high speeds and were used in much greater numbers than during the World War. Light and medium tanks are favored. Lately, however, they have gotten disturbed over the steady evolution in anti-tank weapons and tactics. The French have recently adopted a very light and mobile Hotchkiss 25mm Anti-tank gun which fires almost as fast as a machine gun and is claimed to have the necessary penetration. The Germans are thought to have something even better. It is now feared that tanks, unless employed in undreamed of numbers, will before long be effectively neutralized by these new weapons. To sum up, there is no really new weapon for neutralizing machine guns known here and no revolutionary change in tactics but a very marked advance in the anti-machine gun tactics employed toward the end of the World War. This advance has been continuous but it is not certain that it has not been offset by the successive perfections of the automatic rifle and its increased use.

DEATH! THEN WHAT?

BY CAPTAIN J. H. DOHERTY, FINANCE DEPARTMENT

SECTION I

THERE is a saying in the Army that "time, tide and army transports wait for no man, and for darn few women." Be that as it may, Death, frequently symbolized by a cadaverous long-whiskered old gentleman carrying a scythe, misses no one, and is so inconsiderate as to call at inopportune times and frequently when the individual is least prepared for his reception. Death is by no means a pleasant subject to contemplate or talk about. So seldom is it discussed that the members of the deceased's family are usually left without sufficient information to make a prompt and efficient settlement of his estate.

When an officer or enlisted man dies, the widow is usually in a highly emotional state at the very time when all her faculties are needed to initiate action to secure all the rights and benefits to which she is entitled. The information furnished here has been compiled with the hope that it will help to smooth out some of the rough places and furnish a ready reference at a time when it is most needed.

The laws and regulations governing the granting of pensions and other allowances change so frequently that some details of this paper may be out of date by the time it is published. Officers and enlisted men should endeavor to keep up-to-date data where their families will find them in emergency, or arrange with a dependable agency to look after these things.

Each of the 24 subjects briefly discussed here should be carefully read by all those who desire, while still living, to do what they can to lighten the burden thrown upon the widow. It is most important that somewhere each officer and enlisted man should have a complete, up-to-date, file containing his last will and testament, his insurance policies, records of stocks and bonds, deeds to real estate, original marriage and birth certificates, a brief statement of his desires for burial, a copy of his last income tax return, and other important records. In the event that a man or his wife has been married previously, there should be a record of the death or legal divorce of the former spouse. Affirmative

proof must be established that widows or other dependents claiming a pension are legitimately entitled to it.

We frequently hear the assertion that the Veterans Administration is hard-hearted and so bound up in red tape that processing claims is slowed down by what appear to be unnecessary and sometimes impertinent calls for additional information regarding the widow's rights: actual experience has shown that these things are necessary in order that the Government's interest may properly be safeguarded. Widows must realize that they are claiming a pension from the Government (the Government is claiming nothing from them) and that they must prove to the full satisfaction of the authorities that they are entitled to the compensation. This fact should be kept in mind: a widow may be paid insurance, adjusted compensation, etc., for one or more husbands, but she is restricted in her pension rights to her last husband.

A specimen of a last will and testament is contained in pararagraph 23; this may be modified to suit individual circumstances.

With one or two exceptions, names and numbers of forms have not been stated due to the fact that they are frequently changed; however, the basic principle involved is stated in each title. Readers should keep in mind that whenever the words "wife" or "widow" are used the instructions or suggestions apply equally as well to "other dependents."

SECTION II

1. BURIAL PLOT. In the event the deceased owned a burial plot in a civilian cemetery, his wife should have knowledge of that fact and information as to its location. A written statement of the deceased should also exist concerning his desires as to where his remains shall rest. In the event that the deceased desired burial in a federal cemetery, such as Arlington, that fact should be known to his widow. This is a question of immediate concern when death occurs and should be definitely settled prior to that time. If the remains are to be interred in Arlington, a telegram should be sent to the Commanding Officer, Washington Quartermaster Depot, War Department, Washington, D. C., stating the number in the funeral party, the date

and hour of arrival of the train upon which the remains will reach Washington, and whether interment is to be made immediately or the remains are to be placed in a vault pending further arrangements. There is no expense attached to the services furnished in Washington. Another matter to be considered is that the Government furnishes a headstone for the grave. These stones are of regulation design and size (42″×13″×4″) the upper 24 inches being above ground when in place. Should the widow decide to have a memorial more elaborate than that furnished by the Government, the design, if it is to be erected in a federal cemetery, must be approved by the Quartermaster General, and the cost must be paid by her.

2. DIRECTIONS FOR BURIAL. Regardless of where the death of military personnel on active duty occurs, it is highly important that The Adjutant General of the Army be notified immediately, stating the time and date, and if possible, the cause of death. Army regulations require that Commanding Officers notify The Adjutant General's Office by *radio, cable* or *telegraph immediately* upon the death of an officer under his command. This is of importance to The Chief of Finance. The Adjutant General and to the Press Relations Section of the General Staff. If death occurs on an army post, or in an army hospital, there is very little the widow is required to do.

All Quartemasters have contracts with undertakers which provide that the remains of all officers and enlisted men shall be embalmed, furnished a casket, and transported to the local cemetery or to the train. There appears to be no reason why, when contractors are available, they should not be informed that the family of the deceased wishes the funeral and equipment exactly as required by Government contract with no embellishments and no extra expense. If interment is to be made at a cemetery some distance from the place where the death occurred, Army Regulations provide that the remains shall have an escort; the normal arrangement is for the widow to escort the remains, and as such, transportation at Government expense is authorized. In the event death occurred at a place other than an army post, after notifying The Adjutant General, the widow should get in touch with the nearest Quartermaster who will make the necessary arrangements for burial. However, if death occurs at a place so

remote from an army post that it is not practical to secure a contract undertaker, the widow is authorized to arrange for the preparation of the remains for burial, including a suitable casket. The cost to the Government for this service should not exceed $100.00. When unusual circumstances justify it the Quartermaster General will approve an expenditure of not to exceed $150.00. In cases of this nature it is advisable for the widow to keep a memorandum of all expenses paid by her in order that she may be reimbursed. It is preferable to have the undertaker submit an itemized bill direct to the Quartermaster General. A more elaborate casket than that furnished by the Government may be ordered but the added cost over and above the contract price must be paid by the widow.

Without any intent to speak disparagingly of a necessary business, it should be realized that undertakers may be expected to secure as large and expensive an order as possible. Relatives are apt to feel that absence of pretentiousness is indicative of a lack of respect. These two tendencies can cause considerable unnecessary expense. Retired officers not on active duty are not entitled to burial at Government expense except that the Veterans Administration will allow $100.00 for this purpose if it can be affirmatively proved to the satisfaction of the Administration that the deceased was a veteran of a war and did not leave an estate worth more than $1,000.00. Deceased retired officers are entitled to burial in Government Cemeteries.

3. SIX MONTHS' GRATUITY PAY. The widow of every army officer or soldier on active duty, whose death is not a result of his own misconduct, is entitled to a gratuity payment equal to six months' pay. The word "pay" means only base, longevity and flying pay; it does not include rental or subsistence allowance. Payment is restricted to a wife or minor child previously designated by the officer or soldier. (A.G.O. form 41.) Payment of this gratuity, other than to a wife or a minor child, will be made only when the dependency can be affirmatively established, and where such person has been designated by the deceased as his beneficiary. Practically all finance officers have a supply of blank forms upon which this claim may be made. In the continental United States the form should be submitted to the Finance Officer. U. S. A. Munitions Building, Washington, D. C.

If death occurs in an overseas possession, payment may be made by the Department Finance officer. There is a popular impression that the six months' gratuity pay is intended to cover funeral expenses. Such is not the case.

4. ARREARS OF PAY. The widow is also entitled to the pay and allowances earned by the officer or soldier from the date of last payment to and including the date of his death. This payment includes base and longevity pay, rental and subsistence allowance, flying pay, etc. A blank form upon which to set forth this claim may be obtained from the local Finance Officer. The actual payment of this voucher may require considerable time as it is not paid by army authorities and must be submitted to the General Accountancy Office, Washington, D. C., for settlement. Before payment is made, it must be ascertained that the officer or soldier is not indebted to the United States or its instrumentalities. The widow may hasten the settlement of this claim by discharging all outstanding financial obligations of her husband to Army agencies such as post exchange, commissary, etc.

5. ARMY MUTUAL AID ASSOCIATION INSURANCE. In the event the deceased officer was a member of the Army Mutual Aid the Secretary of the Association immediately telegraphs or cables $1,500 to the beneficiary. This payment usually is made the *same day* the report of death reaches the War Department. It is here deemed appropriate to state that the Army Mutual Aid Association maintains an organization in Washington, which is able to render great assistance to widows and other dependents in the settlement of claims for pensions, bonus, war risk insurance, other insurance, etc. In the cases that have come to the personal attention of the writer, the widows of officers who carried insurance in the Army Mutual Aid were most appreciative of the courtesy and service rendered by the Association in the settlement of their claims, some even going so far as to state that the service obtained after death was alone worth the premiums paid.

6. U. S. GOVERNMENT INSURANCE. The widow should consult some well-informed agency, a lawyer, or the local Red Cross Representative, for advice as to the proper preparation of her application for settlement of U. S. Government insurance. At the time the officer or soldier took out the insurance he designated

a beneficiary to whom payment was to be made; or, during the life of the policy he may have written to the Veterans Administration and had the policy endorsed to change the beneficiary. In either event the designated beneficiary at the time is the only person who can collect Government insurance. It is not necessary to prove any degree of dependency in order to secure payment. It frequently happens that young officers take out Government insurance, designating their mother as the beneficiary. Subsequently these officers marry, but neglect to change the designation of beneficiary from the mother to the wife. If death occurs the wife is left stranded and payment must be made to the mother. Keeping the designation of a beneficiary up to date is a detail that should not be overlooked. It is here deemed appropriate to discuss briefly the total disability benefits on Government insurance.

Each U. S. Government life insurance policy contains a proviso covering total permanent disability (permanent as distinguished from temporary). In the event of total permanent disability, the Government waives the payment of further premiums and pays to the insured $5.75 per month as long as the insured shall live, for each $1,000.00 of insurance carried. If death occurs before 240 payments have been made, the balance is paid in one lump sum to the beneficiary. For a small additional premium the Government will endorse any policy now in force to include a total disability provision (temporary). This was authorized by Section 311 of the World War Veterans Act of 1924, as amended July 3, 1930. With this proviso in force, any policyholder who suffers any impairment of mind or body, which continually renders it impossible for the disabled person to follow any substantially gainful occupation, will be paid $5.75 per month for each $1,000.00 of insurance, commencing with the first day of the fifth month of such disability, and continuing during the time of total disability. Also, premiums on the policy are waived and the face value of the insurance is not reduced or impaired in any manner as a result of the total disability.

The total disability payments (temporary) may be concurrent with, or independent of, the total permanent disability provisions already contained in the policy. The cost of this additional protection

for total disability is comparatively small. So expensive has this turned out to be for old-line insurance companies that practically all have ceased writing this form of insurance. Retirement from the Army is not considered sufficient evidence of disability, and many officers who have carried disability insurance with the Veterans Administration and commercial companies have been much surprised to learn that abnormal blood pressure, heart disease, kidney trouble, certain major injuries to eyes, limb and other parts of the body are not considered permanently and totally disabling by either the Veterans Administration or commercial insurance companies. Those interested in securing a total disability provision attached as a rider to their Government insurance policies should write the Director of Insurance, Veterans Administration, Washington, D. C.

7. ADJUSTED SERVICE CERTIFICATE (BONUS). If the officer had active service during the World War, provided such service was not in the regular army, and the officer or soldier held no rank higher than that of captain, then he is entitled to a stated amount, based upon the length and character of his service, for what is known as the World War Bonus, more properly designated as Adjusted Service Compensation. The Adjusted Service certificate should be found among the effects of the deceased officer or soldier, and the widow is entitled to the proceeds of the face value of the certificate. The certificate itself does not contain the name of the beneficiary, but there should be on file in the Veterans Administration a statement designating a beneficiary. When changes are made acknowledgment of receipt should be requested. It is possible for the officer or soldier to obtain loans up to 50% of the face value of the certificate, and the widow or other dependent should attempt to determine whether or not such a loan has been negotiated. In any event the present value of the certificate will be paid to the widow, or other designated beneficiary, by the Veterans Administration.

8. MONEY IN BANK. Not only are banks required to conform to Federal Statutes, but also to laws and regulations of the state in which they are doing business; therefore it happens sometimes that an officer or soldier who carries his account in his own name temporarily deprives his wife of the use of this money at a time when it is most urgently needed. Experience

has demonstrated that where an officer or enlisted man is married, the best plan is to have a joint bank account, for example.—"John A. and/or Mary B. Jones, either or the survivor." When the account is carried in this manner, the widow can draw against any balance remaining in the bank; otherwise it is required that the widow institute administration proceedings in the courts or probate the husband's will before she can have access to the bank balance.

Officers frequently find it convenient or necessary to negotiate loans from the bank, giving their presonal note. In cases of this nature the widow should make every effort to redeem any outstanding notes in order that her credit standing in the community may not be impaired. In passing, comment is due on the uneconomical and foolish practice some officers have of financing the purchase of an automobile and negotiating personal loans through financing companies or loan societies who charge for this service from 7% to 14%, when they can borrow from a bank at 6%. Do not forget that when you obtain a $100.00 loan to be repaid in ten monthly installments of $10.00 each you usually get $94.00. When the last month rolls around, you actually have $4.00 of the borrowed money, while you are paying 6% on $100.00. Figure that interest rate for yourself. The only way a bank can make money is to loan money, and an army officer's signature is gilt edge. Get acquainted with the officials of one bank and keep an open account there, regardless of where you are stationed. If your credit standing is established, in a pinch you can always mail in a note where you are known. In case of a personal note executed by another officer the widow can either call on the drawer for the face value of the note or send it to her bank for collection.

9. PERSONAL PROPERTY: STOCKS AND BONDS. While he is alive, an officer or enlisted man can not be too careful in listing all personal property owned by him, especially stocks and bonds. In the event the stock certificates or the bonds have been placed in a safe deposit vault, a record of their location should be made and filed with his personal papers. Frequently for a small charge a bank will retain stock certificates in their files and issue a receipt therefor; such receipts should be placed among other valuable papers.

10. COMMERCIAL INSURANCE POLICIES. A record should be maintained of all commercial insurance carried, showing the face value, the name of the issuing company, policy number, the name of the beneficiary, the amount of premiums and how they are paid, and the form of the policy, i.e., whether it is a straight life, limited payment life, endowment or annuity.

Commercial insurance companies require proof of death; this is usually accomplished by having two persons who knew the deceased during life, view the remains before the casket is finally closed. If necessary they are then in a position to make an affidavit to the fact that the deceased is actually the person who was insured. The companies require this to avoid the payment of fraudulent claims.

When death occurs, the sensible thing for the widow to do, is to get in touch with the local agent of the insurance company who will advise her regarding the procedure to effect settlement on the policies. Some insurance companies will agree to mail or wire one-half of the amount of the insurance to the widow upon receipt of official notification of death from The Adjutant General.

11. DEED TO HOUSE OR OTHER REAL ESTATE OWNED BY DECEASED. In the event the deceased owned a house or other real estate, it will be necessary for the widow to go to court, to be appointed executrix of the estate. The law differs materially in the several states, and it is advisable to consult a lawyer or a banker regarding the correct procedure to obtain letters testamentary. It is highly important that the deed to the house, together with tax receipts, insurance policies, etc., be filed at some place known to the wife.

12. AUTOMOBILE—TITLE INSURANCE AND UNPAID NOTES. It is important that the title to the family automobile be filed with the other documents. It frequently happens that payments are due on an automobile that is comparatively new; in cases of this nature, the title to the car is held either by the bank carrying the notes on the car, or by a financing company. If the deceased left an estate. State Motor Vehicle Commissioners usually will transfer the title to the widow without recourse to law. A record of the insurance carried on the car should also be available. It is deemed appropriate

to state that insurance carried in the United Services Automobile Association of Fort Sam Houston, Texas, at the time of death is automatically continued until such time as the current policy expires, and the widow may now reinsure in the Association. The United Services Automobile Association appears to be a worthy and sound organization directed by personnel of the military, naval and allied services. It is actually effecting a saving on premiums for automobile insurance.

13. ARMY COOPERATIVE FIRE ASSOCIATION. FIRE INSURANCE ON HOUSEHOLD GOODS. A large number of officers carry fire insurance in the Army Cooperative Fire Association of Ft. Leavenworth, Kansas. This is a cooperative association, and each member is required to build up a reserve of $6.00 for each $400.00 of insurance carried. After the reserve is built up, the annual assessments for insurance amounts only to a proportionate share of the annual losses plus a small charge for overhead expense. In the event of death, the widow cannot carry this insurance but the policy of the member is protected for a period of two months after his death and the widow is then entitled to a refund of the equity that her husband had in the Association. Six months after the member's death this equity will be paid to the widow. The following is an extract from a letter received from the Army Cooperative Fire Association, which may prove enlightening:

> There has never been any case of requiring proof in making settlement with a widow. Unless we can find some account of the death of a member reported in the service papers or we hear direct from the widow or some friend, it is hard for us to keep track, and we have some accounts outstanding for several years, as we do know to whom or where to send the check.

In addition to being one of the least expensive forms of fire insurance that an officer can carry on his household goods, policies in this Association are also the most convenient as claims are settled by a board of officers appointed at the post where the fire occurred. This is a form of insurance that each married officer should carry.

14. U. S. PENSION. Widows or dependent children and dependent parents of officers and enlisted men who die from service causes—proved to the satisfaction of the Veterans Administration—are entitled to pension. The amount of the pension depends upon whether or not the death is peace time or war time service connected; also whether the deceased served in the military or naval forces during the Spanish War or World War. On March 19, 1935, President Roosevelt issued four executive orders establishing the following pension rate for peace time service connected death, regardless of rank:

Widow under 50 years of age	$22.00
Widow 50 years to 65 years of age	26.00
Widow over 65 years of age	30.00
Widow with one child, $7.00 additional for such child up to 10 years of age, increased to $11.00 from age 10 (with $6.00 for each additional child up to 10 years of age, increased to $9.00 from age 10). Pensions to continue until the child reaches the age of 18 years or, if unmarried and attending school, until age 21.	
Dependent Parent (only one surviving)	15.00
Dependent Parents (two), each	11.00

A more nearly complete statement of the papers necessary to substantiate a pension claim is contained in War Department Bulletin No. 7. 1934. It should be understood that unless the officer or soldier was a veteran of the war with Spain, the Philippine Insurrection, the Boxer Rebellion, or earlier wars, the pension is not paid when death occurs from other than service causes. In the case of an officer or soldier accidentally killed while on leave of absence, or death occurs as a result of some cause originating after departure from his station, the widow or dependents are not entitled to a pension. Neither is a pension paid in the case of an officer or soldier who commits suicide while on active duty, unless it can be proved that there existed some mental disease contracted in or aggravated by the performance of military duty. The widow should investigate the pension provision and, if entitled thereto, file a claim as soon after death as possible, as the pension starts only from the date the application

is received and not from the date of death. Registered mail is advised. Widows or other dependents must reconcile themselves to a relay, as much research has to be made before the application for a pension can be approved. Payment is made by the Veterans Administration.

15. COMPENSATION. Compensation is in the nature of a pension and is payable only to the widow or other dependent of a World War veteran who was entitled to receive compensation, pension or retirement pay for 30% or more disability, directly incurred in, or aggravated by service in the World War, and who died from a disease or disability not service connected and not the result of his own misconduct. Very few, if any, army personnel are entitled to this compensation, as their rights are determined under other laws. However, it is advisable to consult an informed agency concerning this matter.

16. ORIGINAL MARRIAGE CERTIFICATE. The widow is faced with the necessity of processing various claims. At least five of these claims require certified copies of the marriage certificate; these copies should be prepared before death, or at least the original should be available so that the widow can easily obtain certified copies. In the event either spouse has been married previously, original or certified copies of death certificates or divorce decrees are required and should be available.

17. ORIGINAL BIRTH CERTIFICATES. All the remarks pertaining to marriage certificates apply equally as well to birth certificates of children, for the reason that pension allowances fluctuate according to the number and age of minor dependent children of the deceased. Birth certificates are required and must be available. For establishing dependency of step-children or adopted children, procure legal advice; this qestion is too involved to cover in this short article.

18. AFFIDAVITS FROM WIDOWS. After death occurs, and in order to process a claim for pension, affidavits are required by the Veterans Administration; first, from the widow, giving a physical description of the deceased, including his height, weight, complexion, color of hair and eyes, age and such other items as occupation at the date of entering service, and the place of his birth; second, two affidavits for the deceased officer or

soldier and two for the applicant widow from two disinterested parties—not relatives—stating that the widow and the deceased had lived together continuously as man and wife since marriage. This may seem absurd but the affidavits are required.

19. INCOME TAX. It is very important that there be available to the widow a copy of the last income tax return filed by the deceased. Practically all revenue offices mail out income tax blanks in duplicate, and the best plan is to retain a file of duplicates readily accessible to the widow after death occurs. All officers while on foreign service are required to file income tax returns with the Collector of Internal Revenue, Baltimore, Md. Some officers forward returns to that office, regardless of where they are stationed, and find that it is a good plan to follow, as a continuous record is maintained in one office.

20. CERTIFICATES OF DEATH. Regardless of where death occurs, that is, whether on an army post or elsewhere, the law requires that a report of the death be filed with the Bureau of Vital Statistics. The widow should obtain from this Bureau at least five copies of the death certificate; these are required to support various claims for moneys due her. Securing these certificates may cause a delay of a few days, but it is a matter that should be attended to as soon as possible. Experience has shown that the undertaker is in the best position to secure the original and four copies of the death certificate.

21. HOUSEHOLD GOODS. The widow must determine where she intends to establish her future home. Army Regulations provide that the household effects of deceased officers and soldiers shall be returned to their home at Government expense. Procedure is outlined in AR 30-960, and the widow should consult the nearest Quartermaster for advice and instruction. It is important that an inventory of household goods be made: in fact an inventory of household goods is a desirable thing to have at all times. Where damage to household goods has occurred as a result of fire, water or the hazards of transportation, the important things to know are: (1) what you have, (2) the original cost, and (3) present value. This information is necessary to establish a claim for reimbursement of damage sustained.

22. TRANSPORTATION OF DEPENDENTS TO HOME. If death occurs at a place remote from the designated

home of the widow, curiously enough there is no provision for furnishing transportation at public expense. In such a case immediate payment of insurance is most helpful.

23. LAST WILL AND TESTAMENT. There are a few who have not made a will. This is such an important, albeit simple matter that it should be attended to by each officer and soldier. A sample copy of a will, which may be modified to suit conditions, follows:

IN THE NAME OF GOD. AMEN.

I, ..., being of sound and disposing mind, do hereby make, publish and declare this to be my last will and testament, hereby revoking all other wills by me hitherto made.

FIRST: I give, devise and bequeath all of my estate, real, personal, and mixed, in fee simple and absolute, to my beloved wife, ..., and I hereby appoint her my executrix, without bond, with full power to sell, mortgage, lease or in any other manner dispose of the whole or any part of my said estate.

SECOND: In the event of the death of my said wife, ..., prior to the death of myself, I give, devise and bequeath all of my estate, real, personal, and mixed, in fee simple and absolutely to my beloved daughter, ..., and I hereby appoint ..... of the City of ....., as my executor, without bond, with full power to sell, mortgage, lease, or in any other manner dispose of the whole or any part of my estate.

IN WITNESS WHEREOF I have hereunto set my hand this ..... day of ....., 19.....

..... (SEAL)

Subscribed, sealed, published and declared by ....., the above named testator, as and for his last will in the presence of each of us, who, at his request, in his presence, and in the presence of each other, at the same time, have hereto subscribed our names as witnesses this ..... day of ....., 19....., at ....., ...

.....

.....

.....

NOTES:

(1) In some States the Law requires three witnesses.

(2) A brief summary concerning the administration of deceased persons' estates can be found on page 223. World Almanac. 1935.

(3) A brief note concerning Wills may be found on page 209, World Almanac, 1935.

24. ARMY RELIEF SOCIETY. Practically all officers and their wives, as well as all enlisted men, are aware of the fact that they are frequently called upon to make donations, stage entertainments, fairs, etc., to raise funds for the Army Relief Society. Very few persons in the military service are aware of the benefits derived by army personnel from the efforts of this Society. It is readily apparent that the recipient does not advertise the fact that she is receiving help from the Army Relief, but the annual report of that Society indicates that it is doing excellent work in relieving distress of the widows and other dependents of both officers and enlisted men. At the time of death, should circumstances be such that a widow finds herself without funds and no immediate prospect of receiving any, she should consult the Chaplain or local Secretary of the Army Relief Chapter. In deserving cases loans or outright grants are made. The degree of distress is, of course, the determining factor and must be established affirmatively. Too much credit cannot be given to the officers of the Army Relief Society for their efforts. They serve without compensation, and efficiently distribute the funds entrusted to their care, striving always to accomplish the greatest amount of good for the largest number.

SECTION III

It is quite possible that several other questions may occur to individual officers and enlisted men. Experience has shown that in practically all cases the subjects previously mentioned are of vital concern, and the question now arises—what to do about it? The most practical and sensible thing to do, is to procure a container in which to keep all vital records. This may be of metal, canvas, or a large manila envelope. It should be labelled "Important Papers and Vital Records of ....," and should be kept in a safe place known to both husband and wife. It is suggested that the following or a similar form be utilized.

Blank spaces to be filled in with the necessary information:

1. BURIAL PLOT. I do (do not) personally own a burial lot. The lot is located in .....

2. In the event of my death, it is my desire that my remains rest in .....

3. SIX MONTHS GRATUITY PAY. The dependent designated to receive my six months gratuity pay is ....

NOTE: If birth, marriage, death or divorce has occurred since the last A.G.O. form 41, was mailed to The Adjutant General's Office, an amendment should be sent in immediately.

4. ARREARS OF PAY. See Section IV. Nothing can be done about this prior to death.

5. ARMY MUTUAL AID. I am (am not) a member of the Army Mutual Aid Association, and carry insurance in the amount of $..... The beneficiary is ……..… The policy number is ..... The Association pay benefits immediately. No formal claim required.

6. U. S. GOVERNMENT INSURANCE. I have (have not) U. S. Government Insurance in the form of a straight life, endowment, or ....., policy in the amount of $..... The beneficiary of the policy is ..... Policy Number.....

NOTE: If birth, marriage, death or divorce has occurred, the beneficiary should be changed and a change is not legally recognized unless it is endorsed on the policy.

7. ADJUSTED SERVICE CERTIFICATE. I have (have not) an Adjusted Service Certificate with a face value of $..... I have (have not) secured a loan against this certificate in the amount of $..... The beneficiary of my Adjusted Service Certificate is .....

NOTE: If birth, marriage, death or divorce has occurred, advise the Veterans Administration by letter. Changes are not endorsed on the Adjusted Service Certificate.

8. MONEY IN BANK. I have savings account in the following banks:

.....

I have checking accounts in the following banks .....
.....
I have (have not) a safe deposit box located in .....

9. PERSONAL PROPERTY. The following is a list of stocks and bonds owned by me, showing name of company, serial number, face value and interest rate: .....
.....
The stock certificates or bonds are (herewith or) in custody of .....
Bank .....

10. COMMERCIAL INSURANCE POLICIES. The following is a list of Commercial Insurance carried, showing name of company, nature of policy, face value, number, and the policies are located (herewith) in the custody of .....
Bank .....

11. REAL ESTATE. The following is a list of real estate owned by me, showing the general nature, location and value:
.....
.....
Deeds to the property are (herewith) (or filed with) .....
.....
Tax receipts, water rent receipts, etc., are (herewith) (or filed in) .....
Insurance on the property is carried in .....
Insurance Company of .....

12. AUTOMOBILE. I am (am not) the owner of an automobile insured in United Services Automobile Association or .....

13. FIRE INSURANCE. I am (am not) a member of the Army Cooperative Fire Association in the $..... class. I have fire insurance on household effects in the following insurance companies: .....

14. U. S. PENSION. See Section IV.

15. COMPENSATION. See Section IV.

16. MARRIAGE CERTIFICATES. My original marriage certificate is (herewith) or filed with .....
Original copies of death certificate or divorce decree from my former wife; or from the former spouse of my present wife, are (herewith) located .....

17. BIRTH CERTIFICATES. The original birth certificates of my children are (herewith) (or filed with) .....
.....

18. AFFIDAVIT FROM WIDOW. See Section IV. Nothing can be done about this prior to death.

19. INCOME TAX. A copy of my income tax returns for the past several years is (herewith) (or filed with) .....
.....

20. DEATH CERTIFICATES. See Section IV.

21. HOUSEHOLD GOODS. Inventory of my household goods, showing original cost and date of purchase is (herewith) (or filed with) .....

22. TRANSPORTATION TO HOME. See Section IV.

23. LAST WILL. My last will and testament is in the custody of .....;
is filed in .....

24. ARMY RELIEF. I have (have not) been a regular and consistent subscriber to the Army Relief Society, and it is (is not) my desire that my wife appeal to the Society for help in case of extreme distress.

SECTION IV

Let us assume that death has occurred and that the deceased has complied with the provisions of Section III, and let us further assume that the widow is now faced with disposing of the remains and processing various claims for her rights and privileges under the law. The following plan has proved to be generally satisfactory. It should be prepared and labelled "Instructions for the use of my wife or other dependent in the event of my death.":

1. As soon after my death as possible, notify The Adjutant General of the Army by telegraph. If death occurs on an army post this is automatically and immediately attended to by the Post Commander.

2. Consult the local Quartermaster, if on an army post, as to arrangements for burial (see paragraphs 1 and 2, Section III). In the event death occurs other than an an army post, wire the nearest Quartermaster for instructions or engage the services of

a local undertaker to make all necessary arrangements in connection with the disposition of the remains. Instruct the undertaker to send his statement for services to the Quartermaster General: first inspecting the bill to see that it is correct and not in excess of the agreed amount.

3. Arrange to have two persons view my remains before the casket is closed, for purposes of identification.

4. Assemble all my private papers, go over them and assure yourself that you have an original and four copies of birth, marriage and death certificates (also divorce decrees in appropriate cases). If you have not sufficient copies, write to the Bureau of Vital Statistics of the state in which birth, marriage, death or divorce occurred for official copies. Have the undertaker make arrangements to procure for you an original and four copies of the death certificate. Consult the nearest Finance Officer, the Chaplain, and the Local Red Cross representative for advice and assistance in obtaining the necessary forms to be used in filing claims. It is important that your claim for pension be initiated as soon as possible and forwarded to the Veterans Administration by registered mail, return receipt requested. Families of members of the Army Mutual Aid Association can save themselves much trouble by asking the Secretary of the Association to attend to the foregoing.

5. Prior to leaving your last home be sure to fill in the forms required by the Veterans Administration, establishing the fact that you were my lawful wife and have lived with me a stated period of years. This must be sworn to by two disinterested persons, not relatives, who have personal knowledge of the fact. (See paragraph 18. Section III).

6. Get in touch with a banker, and if necessary arrange for a loan pending the time insurance policies are paid.

7. See that all proper claims have been instituted. If necessary consult the Secretary Army Mutual Aid Association if I was a member; if not, then see the local Finance Officer, Chaplain or Red Cross Representative and make sure that claims are started for the following:

a. Six months gratuity pay.

b. Arrears of pay.

c. Government Insurance.
d. Adjusted Service Certificate.
e. Commercial Insurance Policies.
f. U. S. Pension.
g. Compensation.

(Army Mutual Aid Association is not listed as it pays insurance at once. No claim need be filed).

8. You must now decide where you will make your future home and advise either the Post Quartermaster or the nearest Corps Area Quartermaster where your household goods are to be shipped. This is done at Government expense and the furniture will be packed and shipped to storage or to your new home.

9. If the deceased left a comparatively small estate consisting of only personal property, money in bank (in a joint account) and an automobile, it is usually not necessary to have the will probated. However, if the estate is comparatively large and contains real property, stocks, bonds, etc., recorded in the name of the deceased, the will should be probated. It is advisable to consult a banker or lawyer for proper procedure in case of this character.

10. When leaving the post, transportation to the new home must be at your own expense.

11. The one golden rule to follow in all transactions is to retain original copies of all papers. You can always furnish duplicates: these are usually acceptable provided they are properly attested by a Notary Public or other official designated to administer oaths. Do not part with original papers unless required to do so.

CONCLUSION

Finally remember that death is inevitable; the only question is—when? We are all born into this world without our knowledge or consent. We pass through it, taking our share of its joys and its sorrows, and finally are projected into eternity, usually without our consent and contrary to our wishes. In our journey through this vale of tears, whether primitive savage or highly cultured, we all have many things in common. One thing is obvious—PRIDE: one thing is essential—A SENSE OF HUMOR: one thing is constant—CHANGE: and one thing is certain—DEATH:—So what?

FIELD ARTILLERY NOTES

The United States Field Artillery Association

In compliance with Article VII, Section I, of the Constitution, notice is hereby given that the Executive Council has fixed 4:45 P.M., Thursday, December 12, 1935 as the time of the anual meeting of the Association, to be held at the Army and Navy Club, Washington, D. C.

The business to be disposed of will be the election of six members of the Executive Council. Of these, three are to be elected from the Regular Army, two from the National Guard and one from the Field Artillery Section of the Officers' Reserve Corps and the transaction of such other business as may properly come before the meeting.

In view of the fact that the Constitution requires fifty per cent of the members in the United States to be present in person or represented by written proxies to constitute a quorum, it is urgently requested that the return post cards which will be mailed to the members of the Association be filled out and returned to the Secretary of the Association.

Soldier Athletics in Hawaii

The 11th Field Artillery Brigade at Schofield Barracks, T. H., has just finished a remarkable baseball season. With her teams in the post league the 11th Field Artillery won 1st place and the 8th and 13th Field Artillery teams tied for second place.

The 11th Field Artillery Brigade prides itself on the fine opportunities it offers athletes in baseball, football, basketball, track, boxing and swimming.

Flying Flivvers

The new wingless autogiro is equipped for operation on the highway as well as in the air. With the blades of the rotor folded back, the pilot will be able to disconnect the motor from the propeller and connect the power plant by a gear arrangement to the wheels. Rolling out of the garage, he will bowl merrily down the highway to the nearest field. Here he will take off, aided by a new jump feature recently perfected by Juan de Cierva, inventor of the autogiro. Like a flea, the giro will jump upward from 15 to 25 feet, then before it can drop back the propeller will take hold and normal flight begin.—George H. Engeman in *The Baltimore Sun*.

MILITARY BOOKS

Following is a list of latest books on military subjects which are recommended for their professional value as well as interesting reading:

	Price (*Domestic postage included*)
FIELD ARTILLERY: The King of Battles—*Maj. Gen. H. G. Bishop*	$2.00
R. E. LEE—*Freeman*, (4 vols., each)	3.75
INFANTRY IN BATTLE	3.00
ITALY'S PART IN WINNING THE WORLD WAR—*Colonel G. L. McEntee*	2.00
THE PERSONAL MEMORIES OF JOFFRE (2 vols.)	6.00
THE NATION AT WAR—*Gen. Peyton C. March*	3.00
THE GUNNERS' MANUAL—*Capt. Arthur M. Sheets, F. A.*	1.50
FOCH: THE MAN OF ORLEANS—*Capt. Liddell-Hart*	4.00
SPIES AND THE NEXT WAR—*Rowan*	2.50
RIDING AND SCHOOLING HORSES—*Chamberlin*	10.00
MY EXPERIENCE IN THE WORLD WAR—*Pershing*	10.00
VERDUN—*Petain*	4.00
REMINISCENCES OF A MARINE—*Lajeune*	4.00
JULY, 1914—*Ludwig*	3.50
FOCH SPEAKS—*Bugnet*	3.00
IT MIGHT HAVE BEEN LOST—*Lonergan*	3.00
THE OLD ARMY: MEMORIES—*Parker*	4.00
ULYSSES S. GRANT—*McCormick*	5.00
REMAKING OF MODERN ARMIES—*Hart*	3.50
INTRODUCTION TO MILITARY HISTORY—*Albion*	2.25
AMERICAN CAMPAIGNS (2 vols.)—*Steele*	10.00
FOCH: MY CONVERSATIONS WITH THE MARSHAL—*Recouly*	3.00
PRINCIPLES OF STRATEGY—*Maurice*	2.60
GERMAN STRATEGY IN THE GREAT WAR	4.00
COLOSSAL BLUNDERS OF THE WAR—*Woods*	2.50
POLO PONIES—*Cullum*	5.00
ROBERT E. LEE, THE SOLDIER—*Maurice*	4.00
FIFTEEN DECISIVE BATTLES—*Creasy*	1.25
ORDEAL BY FIRE—*Pratt*	3.00
MAP RECONNAISSANCE	1.60
OFFICERS' MANUAL (Revised)—*Moss*	3.00
OFFICERS' GUIDE, 1930	2.75
HINTS ON HORSEMANSHIP—*Lt. Col. McTaggart*	2.50
ARTILLERY TODAY AND TOMORROW—*Rowan Robinson*	2.00
SOME ASPECTS OF MECHANIZATION—*Rowan Robinson*	1.50
THE FELLOWSHIP OF THE HORSE—*Lt. Col. Goldschmidt*	5.00
LIFE OF GRANT—*Fuller*	5.00
THOUGHTS OF A SOLDIER—*Von Secht*	2.50
HORSE SENSE AND HORSEMANSHIP—*Brooke*	5.00
INEVITABLE WAR—*Lt. Col. Richard Stockton, 6th*	7.50

(Less 35% to members of all components of the services.)

A reduction of 10% will be made to JOURNAL readers who purchase any of the above books through the U. S. Field Artillery Association, with the exception of INEVITABLE WAR on which 35% is allowed.

The Association is in a position to obtain for its members not only books on military subjects but biographies and fiction as well at a reduction of 10%.

The United States Field Artillery Association

ORGANIZED JUNE 7, 1910

OFFICERS

PRESIDENT
MAJOR GENERAL UPTON BIRNIE, JR., U. S. Army

VICE-PRESIDENT
BRIGADIER GENERAL HENRY W. BUTNER

SECRETARY-EDITOR AND TREASURER
MAJOR DEAN HUDNUTT, Field Artillery, U. S. Army

EXECUTIVE COUNCIL

MAJOR GENERAL UPTON BIRNIE, JR., U. S. Army
BRIGADIER GENERAL CHARLES D. HERRON, U. S. ARMY
BRIGADIER GENERAL HERBERT R. DEAN, Rhode Island National Guard
COLONEL AUGUSTINE MCINTYRE, U. S. Army
COLONEL ROBERT M. DANFORD, U. S. Army
COLONEL STEPHEN ELLIOTT, Pennsylvania National Guard
COLONEL LEROY W. HERRON, Reserve Corps
LIEUTENANT COLONEL THOMAS J. J. CHRISTIAN, U. S. Army
LIEUTENANT COLONEL RALPH C. BISHOP, Reserve Corps

THE FIELD ARTILLERY JOURNAL

EDITED BY

DEAN HUDNUTT
Major, Field Artillery, U. S. Army

PUBLISHED BI-MONTHLY FOR

THE UNITED STATES FIELD ARTILLERY ASSOCIATION

BY MONUMENTAL PRINTING COMPANY
1918-32 HARFORD AVENUE
BALTIMORE, MD.

Editorial Office, 1624 H Street, N. W., Washington, D. C.
Entered as second-class matter August 20, 1929, at the post office at Baltimore, Md., under the Act of March 3, 1879

Published without expense to the government

The Field Artillery Journal pays for original articles accepted

---

Subscriptions to *The Field Artillery Journal:*

Domestic, $3 per annum.
Single copies, 75 cents.
Canada, $3.25 per annum.
Countries in the postal union, $3.50 per annum.

Checks drawn on banks in the Philippine Islands, Hawaii and Canada should include 25 cents for collection charges—from the Canal Zone 35 cents.