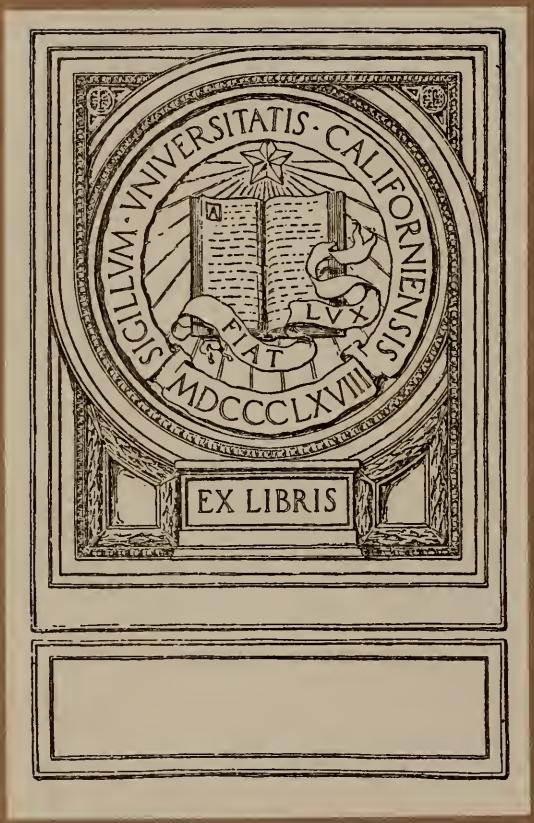
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Publication Number 6

THE UNITED STATES NAVAL RAILWAY BATTERIES IN FRANCE

Published under the direction of
The Hon. EDWIN DENBY, Secretary of the Navy

WASHINGTON
GOVERNMENT PRINTING OFFICE
1922

REAR ADMIRAL CHARLES P. PLUNKETT, U. S. NAVY.

Commanding U. S. Naval Railway Batteries in France.

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ERRATA.

Page 1, line 9: After the word "concentration" insert the words "and interrupting lines of communication."

Page 9, line 15: Instead of "rolling stock" read "bridges."

Page 9, line 23: Instead of "bombard a railway center at Tergnier" read "fire on a long-range German 'Bertha,' which was, however, removed before firing began. The railway center at Tergnier was then bombarded."

Page 21, line 11 from bottom: After the word "of" read (instead of "Rear Admiral Earle, Chief of Bureau of Ordnance") "the National Museum, Washington, D. C."

77542°—22

TABLE OF CONTENTS.

FOREWORD.

This monograph on the United States naval batteries in France has been divided into two parts for the sake of convenience.

Part I is meant to tell the plain story of the batteries in not too extended form and without the addition of too much detail of a technical nature, while Part II contains the professional and technical matter and other details necessary for a complete understanding of all phases of the undertaking.

No attempt has been made to write history, in the sense of apportioning praise or blame or of drawing final conclusions. The sole intention has been to put the reader in possession of a plain story, from authentic sources, of an enterprise of which not only our Navy but all Americans may well be proud.

Those who desire to study in greater detail the activities of our naval batteries will find the requisite material in the files, open and confidential, of the Navy Department, particularly of the Bureau of Ordnance.

The compilation of this monograph was done by Lieutenant Commander Edward Breck, U. S. Naval Reserve Force, who conferred with a number of participants in the enterprise; and the Bureau of Ordnance has kindly reviewed and approved it.

D. W. KNOX,
Captain, U. S. N. (Retired), Officer in Charge,
Historical Section, Navy Department.

THE UNITED STATES RAILWAY BATTERIES IN FRANCE.

Part I.

THE STORY OF THE BATTERIES.

INTRODUCTION.

During the period from September 6, 1918, until the signing of the armistice five United States naval batteries, each composed of one 14-inch 50-caliber gun carried on a special railway mount attached to ammunition and auxiliary cars, bombarded German bases and positions behind the lines in France with remarkable efficiency and important results.

These guns were more powerful than any others in use at the front, and played a prominent part in destroying railway and supply bases and generally in hampering concentration behind the German lines, besides lowering the enemy's morale. They thus contributed materially to the victory of the allied forces.

THE GENERAL IDEA NOT NEW.

The use of big-caliber guns by naval landing parties is not new.

In the Mexican War three 64-pounders and three long 32-pounders were used by Gen. Scott at Vera Cruz from the land side. During the Boer War one of the British cruisers was practically stripped of her guns, which were used at Ladysmith, Colenso, and Spionkop. Naval guns were used on land in the Chinese Boxer rebellion.

In the late war guns of smaller caliber were mounted by the Italians on railway trucks and run up and down the Adriatic, chiefly to prevent the shelling of the coast by Austrian submarines. On the defenses of Kiau-Chau the Germans mounted naval guns of calibers up to 11 inches.

ORIGIN OF THE UNITED STATES NAVAL RAILWAY BATTERIES.

The great importance of long-range artillery was particularly impressed upon the Allies by the threatening measure of success obtained by the German guns which bombarded Dunkirk intermittently from the neighborhood of Clerken and Moere in Belgium (the so-called Leugenboom guns), a distance of about 39 kilometers (over 24 miles), from April 28, 1915, until the retreat of the German forces

in 1918. Although the allied artillery fire against these positions was well directed, it failed to silence the guns, and it was feared that unless serious steps were taken their number and efficiency might grow to such an extent that, as soon as the German armies threatened, the channel ports might have to be abandoned, which would be nothing less than a catastrophe for the allied cause.

During the summer of 1917 Rear Admiral Ralph Earle, Chief of the Bureau of Ordnance, became convinced that a way must be found by means of very powerful long-range naval guns not only to reply to the Leugenboom batteries but also to bombard the German supply and concentration positions behind the front, and thus effectively hinder the enemy's preparations for attack.[1] Conferences with Maj. Gen. John Headlam, Royal Artillery, and Capt. André Tardieu, French commissioner, confirmed him in this view. Gen. Headlam had been commander in chief of all the British artillery on the western front until disabled by wounds.

To fulfill the mission and be absolutely effective it was evident that the batteries must be, in the first place, completely mobile, and, secondly, entirely independent logistically, not only of any artillery base but of any and all other organizations. Not only the guns themselves but the rolling repair shops, the cars for the machine shops, ammunition, cranes, and wireless outfits, as well as the barracks for the personnel, must form an absolutely self-sustaining unit, capable of going anywhere and operating at highest effectiveness without the help of any other organization, either American or allied, excepting as regarded the French railways. To provide such a unit was the problem.

On November 12, 1917, Rear Admiral Earle addressed the following letter to the Chief of Naval Operations:

NOVEMBER 12, 1917.

From: Chief of Bureau of Ordnance.
To: Chief of Naval Operations.
Subject: Long-range bombardments.

1. From reports of activities, dated September 29, 1917, along the Flemish dunes, the bureau notes:

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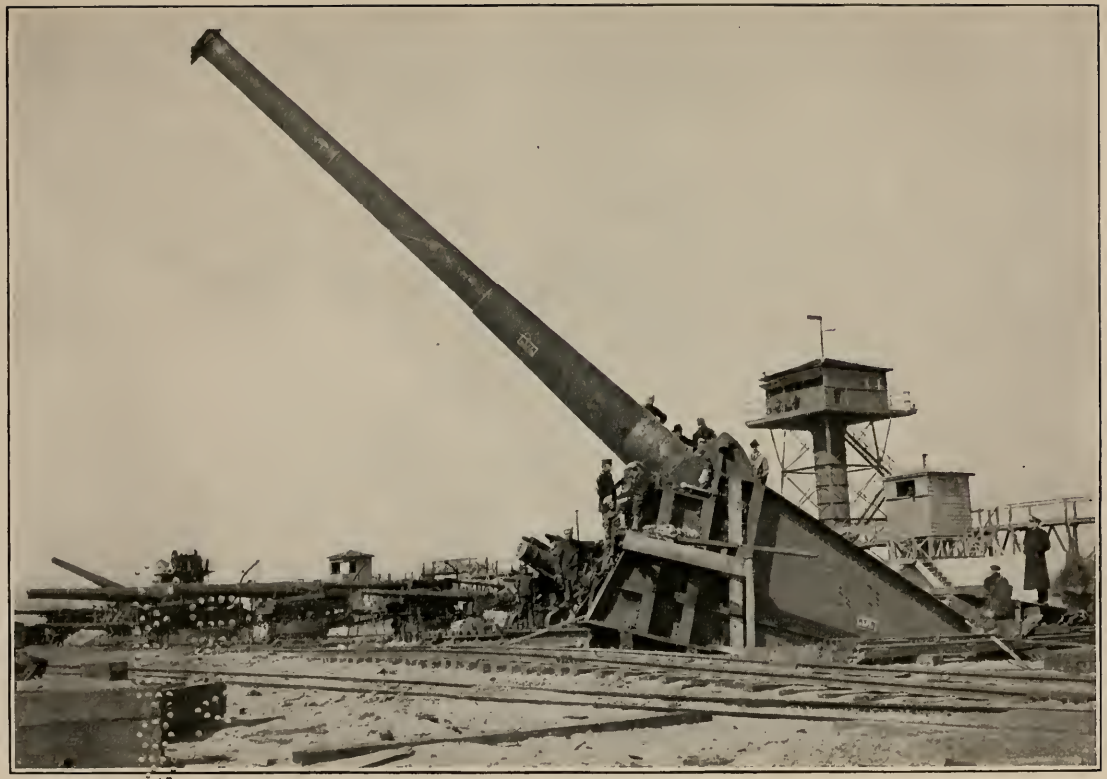
[1] NAVY DEPARTMENT, BUREAU OF ORDNANCE,
Washington, D. C., June 27, 1919.

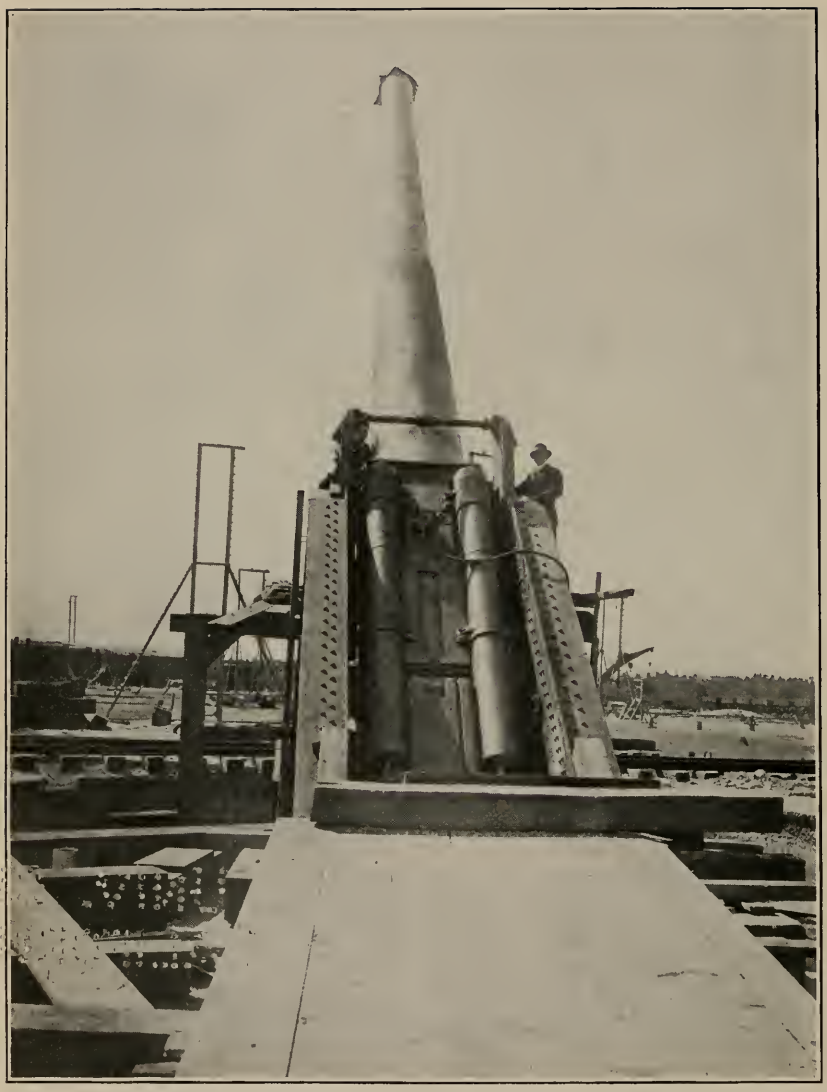
To: Office of Naval Intelligence (Capt. C. C. Marsh, United States Navy, Retired, Historical Section).
Subject: Naval Railway Batteries in France.
Reference: (*a*) O. N. I. let. CCM/LMACC June 11, 1919. (*b*) Bu. Ord. 1st 34752/880 (E3)—OBM of June 23, 1919.

1. In answer to paragraph 2 of reference (*a*) you are advised the present chief of bureau originated the idea of building and operating a battery of 14-inch 50-caliber naval railway mounts, and supplied the requirements and limitations of such a mount to the bureau's drafting room at the gun factory for their study and design. The requirements were based upon limitations of railway tunnels and bridges in France and on the mobility of the gun itself.

C. C. BLOCH,
Captain, United States Navy, Acting Chief of Bureau.



GUN IN PROVING-GROUND GIRDER.



GUN, SHOWING COUNTERRECOIL ARRANGEMENTS.

"On the Dune sector the British naval guns were unfortunately considerably outranged by the German guns. There are no British guns larger than 12-inch mounted on shore here. The big German gun which fires into Dunkirk is generally referred to as a 17-inch. * * * Its range has been measured as 50,300 yards."

2. The above suggests the possibility of our mounting several naval 14-inch guns along the coast, fitted with high angles of fire, and with specially formed shell, fitted with delayed action fuses, in order to outrange these German guns. Manned by our seamen, a battery of four of these guns might not be a bad answer to the long-range German bombardment of Dunkirk. Of course, in order to develop this range the bureau must have its auxiliary proving ground granted and operating.

3. Even were the guns mounted on vessels off the Belgian coast and there given a range of over 30,000 yards, considerable damage may be done to German positions. Such a vessel fitted, as it would be, with our new smoke-producing apparatus, might materially assist Admiral Bacon's monitors in their operations.

RALPH EARLE.

It will be noted that the original idea was to use these railway mounts behind the British lines in France, but changing military conditions prevented the British authorities definitely stating at which port the debarkation of the batteries was to be made, and they were therefore offered to Gen. Pershing, who accepted them, the acceptance being definitely approved by the War Department in a letter dated February 12, 1918.

The gun referred to was the 14-inch 50-caliber Mark IV Navy rifle. Fortunately ammunition for this arm was on hand in quantity, and there was also an adequate supply of the guns themselves, as our dreadnaughts Nos. 44 to 50, *Idaho*, *New Mexico*, etc., were armed with it, and it was to be used to equip the new battle cruisers, the construction of which was postponed in order to concentrate our efforts upon destroyers and other light craft. As a matter of fact, the guns actually mounted and used on the French front were taken from the spares for the commissioned fleet.

The Navy's new 16-inch rifles would, of course, have been a better arm for the purpose, but they were at the time not available in sufficient numbers.

The shipment of the 14-inch gun abroad was known to be feasible, as during the summer of 1917 shipments of 14-inch 45-caliber guns had been made to the British Admiralty.

It appeared from all investigations made in the bureau, that, if a suitable shore mounting could be developed, the Navy could have in operation in France a number of 14-inch guns within a period of six months from the time of approval of such a project.[2]

[2] Lieut. Commander L. B. Bye, United States Naval Institute Proceedings, June, 1919.

DESIGNING AND CONSTRUCTION.

The drafting-room force at the Naval Gun Factory, under the supervision of Lieut. Commander Harvey Delano, was given the task of developing such a mount, and on December 10 made the following report to Rear Admiral Earle, which he sent without change to the Chief of Naval Operations:

BUREAU OF ORDNANCE,
December 10, 1917.

Subject: Shore mounting for heavy guns.
Inclosure: Description of above mounting for 14-inch 50-caliber gun, Mark IV.

1. There is forwarded herewith a description and accompanying plates of the proposed railroad mounting for the 14-inch 50-caliber gun, also a description of the train carrying the personnel and equipment necessary for the operation of such a gun in the field.

2. It is the intention to use the 14-inch 50-caliber gun, Mark IV, mounted in slide Mark IV. In order to mount this gun and slide on the proposed railroad car, it will be necessary to make a new deck lug and jacking mechanism for raising the gun from the stowed position necessary for transportation to its firing position. A new elevating gear of the arc-and-pinion type will be required, as the screw type now used will require raising the gun too high from the tracks for stability in transporting.

3. The railroad mounting and equipment for a gun of this size will be of great value in assisting to overcome the fire from large German guns now being used against the lines of the Allies "on the Dune sector" in Belgium. In addition to this advantage, such a railroad mounting would be of considerable value in this country as a mobile battery to act in conjunction with the Army in case of invasion.

4. It is estimated that four gun cars and their accompanying trains can be constructed by contract within 90 days after the receipt of drawings, provided the work can be given Government priority both in securing the material and the manufacturing work involved. It is estimated that by giving this work precedence in the drafting room and with the hearty cooperation of all concerned, the drawings and necessary specifications can be completed by the 1st of February.

5. It is recommended that four gun cars and their trains be manufactured, making four complete batteries of the type described in the accompanying description, and that the six remaining 14-inch 50-caliber guns, with the slides, be held as spares to replace any of the guns in the battery when worn out or injured.

A. L. WILLARD.

On November 26, 1917, the Navy Department approved the construction of five 14-inch railway mounts, with a complete train equipment for each gun, and a sixth train to accommodate the staff for communication between the five batteries when in action at various positions along the lines.

The Bureau of Ordnance was instructed to go ahead. Battleship turret-mount designers, together with other men at the Naval Gun Factory experienced in bridge and locomotive work, were called into action to develop the detailed plans along the lines of their preliminary investigations.[3] * * * The work moved forward in spite of all discouragements. Holidays and Sundays were sacrificed, and every effort was made successfully to meet on the drawing board

[3] See Pt. II, "Personnel of Bureau."

all problems connected with this project. Many problems which had not been anticipated were encountered, and it was necessary to refer to all data on French railways and French railway practice that was avilable in the United States, and also to communicate with the commander of the United States naval forces operating in European waters for confirmation of data, for it was found that in many cases reports were conflicting.[4]

By January 25, 1918, 136 standard drawings and 11 sketches were ready for submission to bidders.

Each 14-inch naval railway battery was a complete self-sustaining unit, designed to operate individually or in conjunction with the several similar batteries. When two or more batteries were cooperating in the same sector their activities were directed by a single commanding officer, with headquarters on the naval railway batteries staff train. Fundamentally each battery consisted of a 14-inch 50-caliber naval rifle carried on a special railway mount, together with ammunition cars and auxiliary cars.[5]

After some unsatisfactory bids had been received new bids were opened on February 13, 1918, and on the same afternoon the contract for the construction of the gun cars and locomotives was awarded the Baldwin Locomotive Works, who promised to deliver them about June 15. The contract for the rest of the cars and other equipment was awarded the Standard Steel Car Co., the promise of delivery being between 100 and 120 days.[6]

The complete equipment called for in these two contracts was as follows:

6 consolidation locomotives and tenders (tractive power, 35,600 pounds).
10 ammunition cars.
5 battery kitchen cars.
5 battery headquarters cars.
15 berthing cars.
5 fuel cars.
5 workshop cars.
1 staff quarters car.
1 staff kitchen and dispensary car.
1 staff radio and spares car.
1 commissary car (staff).
6 construction cars.
5 construction cars with cranes.
5 sand and log cars.
1 executive officer's car.
1 staff office car.
1 staff workshop car.
1 set of equipment for staff workshop car.

Rear Admiral, then Captain, C. P. Plunkett, United States Navy, was detailed at his own request as commanding officer of the United States naval railway batteries, and he began the assembly and instruction of the personnel on February 20, in accordance with the carrying out of the following order:

FEBRUARY 19, 1918.

From: The Chief of Naval Operations.
To: The Chief of Bureau of Navigation.
Subject: Personnel for naval batteries for operation abroad.

1. The plans, as approved by the department, for sending five naval batteries to operate overseas contemplates the following personnel:

[4] Lieut. Commander L. B. Bye, United States Naval Institute Proceedings, June, 1919.
[5] See Part II, "Description of gun and mount."
[6] See Part II, "Award of the contracts."

1 commanding officer.
1 aid (liasion).
1 medical officer.
1 supply and pay officer.
1 clerk.
5 battery officers.
5 fire-control officers.
5 gunners.
5 machinists.

2. The following enlisted presonnel:

5 chief gunner's mates.
15 gunner's mates.
5 machinist's mates, first class.
5 carpenter's mates, first class.
5 blacksmiths.
11 cooks.
16 assistant cooks and mess attendants.
12 radio operators.
1 hospital steward.
6 hospital apprentices.
6 locomotive engineers.
6 firemen.
6 trainmen.
60 fire-control observers.
35 seamen (gun crew).
115 general ratings, artificer branch (construction crew).

3. Capt. Plunkett, United States Navy, has been directed to confer with the Bureau of Navigation and Ordnance with regard to the assembling of the personnel and material for purposes of training previous to departure from this country. He will confer with the bureau as to the time and places where this personnel will be needed.

W. S. Benson.

It was impossible under the circumstances to keep these preparations secret, and as the news of this interesting and important service at the battle front spread, no fewer than 20,000 officers and men requested to be allowed to join the expedition.

For instruction the men were divided among the naval proving ground, Indianhead, Md.; the Naval Gun Factory at Washington, D. C.; and the Sandy Hook proving ground, Sandy Hook, N. J., where they were given intensive training. They were required to put guns in place, load and fire them, disassemble them after proof, and become so accustomed to gunfire that they lost all nervousness. The handling of heavy weights or the firing of big guns became to them only a routine matter. They were required to operate trains, operate locomotives, to build railroad track, and perform any sort of task which was likely to give them experience that would be valuable while operating against the enemy. A number of men were assigned to the Baldwin Locomotive Works and to the shops of the Standard Steel Car Co. to assist in the inspection of the material while building. In this way many men became familiar with the smallest details of each and every part. The expedition demanded experienced men to run the locomotives and operate the trains on the railways of France. About 100 skilled mechanics were furnished from the United States naval training station, Great Lakes, and several engineers, firemen, and others to make up train crews volunteered for enrollment upon being informed of the country's need for them.[7]

The first 14-inch naval railway mount was completed in 72 days from the award of the contract and 120 days from the beginning of the first designs. The first mount was completed on April 25, 1918.[8]

[7] Lieut. Commander. L. B. Bye, United States Naval Institute Proceedings, June, 1919.
[8] See Pt. II, "Completion of the mounts."

FULL BATTERY AND TRAIN.

ASSEMBLING BATTERY LOCOMOTIVE.

TEST OF FIRST MOUNT AT SANDY HOOK PROVING GROUNDS.

As the naval proving ground at Indianhead had a maximum range of only about 15,000 yards, permission was asked and granted to conduct the proof of the first mount at the Army proving ground, Sandy Hook, N. J. This most critical test, that of firing the gun from the first mount, was conducted in the presence of Rear Admiral Earle and his chief officers, as well as many officers of our Army and of the naval and army services of our allies, and was successful. The first shots were fired from its gun-pit foundation at an elevation of 25°. Other shots were fired at an angle of 45°. The mount was then removed from its pit and fired from the rails at elevations of 10° and 15°. At every test the railway mount functioned as designed and was pronounced a complete success. Rear Admiral Earle was universally congratulated.[9]

During the construction period of all this equipment the contractors and all persons having to do with its building were spurred in their efforts by the repeated accounts of the German long-range guns firing into Paris, and the reports of the telling effect of the German long-range guns all along the front. The "German Berthas" were doing considerable damage to material and were having a serious influence on the morale of the French people. The Navy's foresight in preparing the expedition for foreign service was appreciated during May, for it was at this time that the Germans were making rapid advances and the channel ports were threatened. Through the Office of Naval Intelligence information was received that 380-millimeter guns originally intended for the *Hindenburg* had been mounted by the Germans—one near Lille to fire upon Dunkirk, one at St. Hilaire le Grand to fire upon Chalons sur Marne, the third near Pont à Mousson to fire on Nancy, and four more had been mounted two months before in a wood 4 kilometers above Crèpy, Laon. It was definitely established that 16 heavy naval guns had left Kiel toward the end of May for Belgium. They were believed to be 305-millimeter guns, manned by naval personnel, and were probably attached to the Marine Sonder Kommando.[10]

SHIPMENT TO FRANCE.

Though it had been planned to ship the guns to the British transportation centers, conditions in France had so changed, owing to the threatening of the channel ports by the Germans, that this plan seemed too risky, and Gen. Pershing was therefore consulted as to cooperation of the batteries with the Army. Gen. Pershing replied on May 23, requesting shipment of the guns, railway mounts, and rolling stock to France without delay. The sole reservation made by the Army was that Army tonnage should not be required for ocean transportation. St. Nazaire was assigned as the port of debarkation, and the necessary shipping was arranged for through the Bureau of Supplies and Accounts.[11]

[9] See Pt. II, "Congratulations on success of test."
[10] Lieut. Commander L. B. Bye. United States Naval Institute Proceedings, June, 1919.
[11] See Pt. II, "Arrangements for transportation."

The personnel chosen for the expedition was ordered to assemble at the Philadelphia Navy Yard, and the first draft, 250 men and 8 officers commanded by Lieut. Commander G. L. Schuyler, United States Navy, sailed on May 26, 1918, and arrived at St. Nazaire on June 10. The second draft, 207 men and 6 officers with Lieut. Commander J. W. Bunkley, United States Navy, in charge, sailed on June 15, and arrived at St. Nazaire on June 29. Lieut. Commander Schuyler commanded the naval detachment in France until the arrival of Capt. C. P. Plunkett on July 16.[12]

The first shipment of material was begun on June 20, when the U. S. S. *Newport News* from Philadelphia, and other shipments followed by the steamers *Bath* and *Pensacola* on July 4, and later the *Malang* and *Rappahannock*. The *Newport News* arrived at St. Nazaire on July 8, the *Bath* on July 21, the *Pensacola* on July 27, the *Malang* on August 11, and the *Rappahannock* on August 15.

Lieut. Commander D. C. Buell, United States Naval Reserve Force, who had superintended the construction of the railway batteries material for the Bureau of Ordnance, arrived at St. Nazaire on June 30, by which time most of the preliminary arrangements for the expeditions in France had been completed by Lieut. Commander Schuyler. Barracks were being built, arrangements had been made for mounting the guns in a French shop and for their storage, and conferences had been held in regard to moving the batteries over the French railways, the result of which was that no doubts were entertained concerning the possibility of moving the guns anywhere in France.

Upon the arrival of the *Newport News* on July 8, the naval battery was ready to proceed with the assembly work.

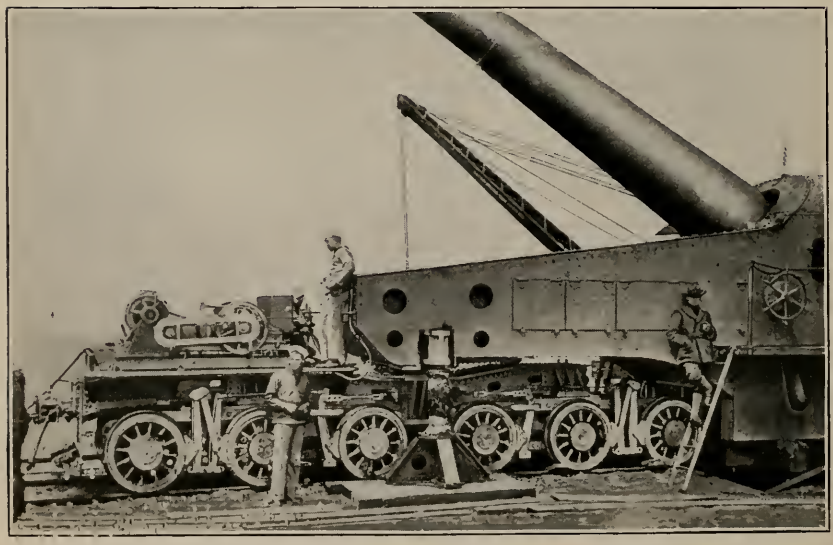
The Army's experience had demonstrated that in all cases it was advisable not to start actual erection until all material necessary for a complete unit was actually on hand and in the yard. This proved to be the best practice with the Navy material as well, for in making hasty shipments from the United States it was impossible to separate the enormous number of parts into those pertaining to individual trains; and, consequently, at St. Nazaire, when the first ship arrived, it was found that necessary component parts were missing and nothing was to be gained by commencing the erection of material before all had reached port and been unloaded.

The locomotive and car erection began on July 20. The assembly of the first gun was begun on July 26, and the first train was completed and ready to leave St. Nazaire on August 11.

In all the assembly work the men were seriously handicapped, for, in some unexplainable manner, all blue prints were missing. The resourcefulness of the American bluejacket was here again made evident, for those who had been detailed to assist in the inspection work at the Baldwin Locomotive Works and the Standard Steel Car Co. had kept individual notebooks. They had taken them to France, and with the sketches that these notebooks contained

[12] See Pt. II, "Dangers of voyage."

INTERIOR OF AMMUNITION CAR.



DETAILS OF FORWARD END OF GUN CAR.

many an unknown step in the putting together of the gun cars and the various other parts was accomplished.

It is needless to state that the work at St. Nazaire was done under high pressure. Rear Admiral Plunkett was continually receiving urgent requests to expedite the work and get his guns to the front.[13]

It was especially urged that some of the guns get into action immediately in order to search out and destroy the German long-range guns that were bombarding Paris. Two were got ready with the least possible delay. The first train left St. Nazaire on August 18, after having been inspected by the Assistant Secretary of the Navy, Franklin D. Roosevelt, and the second train on August 19, the destination of both being Helles-Mouchy, passing over the lines of the Orleans, the État, and the Nord systems. The speed was set for 6 miles an hour, as it was thought best not to attempt a greater speed until the railway beds and the French rolling stock had been thoroughly tested.[14]

Though the bombardment of Paris had ceased before the naval batteries were ready for action, tests were begun at once, both to try out the condition of the guns and to demonstrate their efficiency to the foreign officers. Battery No. 1 was moved from Helles-Mouchy to the French proving ground at Nuisemont on August 28, and Battery No. 2 was moved to Rethondes in the forest of Compiègne to bombard a railway center at Tergnier.[15]

These tests were highly successful.[16]

It was apparent from the beginning that the American naval guns were wanted all along the front, and they were constantly moved from point to point until the armistice was signed. Battery No. 1 was moved from the French proving ground to Soissons, where, on September 11, action position was taken near the cemetery of St. Christophe. Battery No. 2 proceeded to Fontenoy-Ambleny; meanwhile the remaining three batteries were completed at St. Nazaire, and left there for Haussimont (Marne) the latter part of September. No. 4 arrived at Haussimont on September 23, No. 3 on September 24, and No. 5 on September 26.

THE MILITARY SITUATION IN FRANCE.

The situation on the west front at this time was propitious for a demonstration to the desperate enemy of a new engine of unprecedented power. The Teuton armies were now at bay. In spite of repeated denials by the German Government, both the German high command and the German people were forced to acknowledge that

[13] See Pt. II, "Difficulties of assembly work."
[14] See Pt. II, "Start of the first guns."
[15] See Pt. II, "The guns welcomed by the people."
[16] See Pt. II, "The first tests."

the picked youth of America had arrived in great and ever-increasing numbers and that the beginning of the end was in sight. The promise of a definite victory of the U boats within a short time spurred the German troops on to hold their ground, or to yield it as slowly as possible.

The discovery of the presence of these formidable engines of war, far more powerful than any that had yet appeared in the campaign, must have been extremely disconcerting to the German leaders; and the military effect, as great as it was, must have been even surpassed by the blow to their morale. Austro-Hungary was weakening, and her note reached President Wilson during the very week in which our last naval guns left St. Nazaire for the front.

THE NAVAL GUNS IN ACTION.[17]

The naval batteries operated in France as five separate and independent units under the command of Rear Admiral C. P. Plunkett. His chief assistants were Lieut. Commanders G. L. Schuyler and J. R. Bunkley. The batteries were commanded as follows:

No. 1 by Lieut. J. A. Martin, United States Navy.
No. 2 by Lieut. (junior grade) E. D. Duckett, United States Navy.
No. 3 by Lieut. W. G. Smith, United States Navy.
No. 4 by Lieut. J. R. Hayden, Reserve Force.
No. 5 by Lieut. J. L. Rodgers, Reserve Force.

The full roster of officers attached to the railway batteries is:

Plunkett, Charles P., rear admiral, United States Navy, commanding.

Schuyler, Garret L., lieutenant commander, United States Navy, ordnance, gunnery, and orientation.

Bunkley, Joel W., lieutenant commander, United States Navy, executive, gun-gunnery and orientation.

Buell, Dexter C., lieutenant commander, United States Naval Reserve Force, construction officer (detached Sept. 30, 1918).

Hayden, Joseph R., lieutenant, United States Naval Reserve Force, train commander, gunnery and orientation.

Smith, William G., lieutenant, United States Navy, train commander, gunnery and orientation.

Martin, James A., lieutenant, United States Navy, train commander, gunnery and orientation.

Rodgers, James L., lieutenant, United States Naval Reserve Force, train commander, gunnery and orientation.

Duckett, Edmund D., lieutenant (junior grade), United States Navy, train commander, gunnery and orientation.

Davis, Homer B., lieutenant (junior grade), United States Naval Reserve Force, assistant to train commander.

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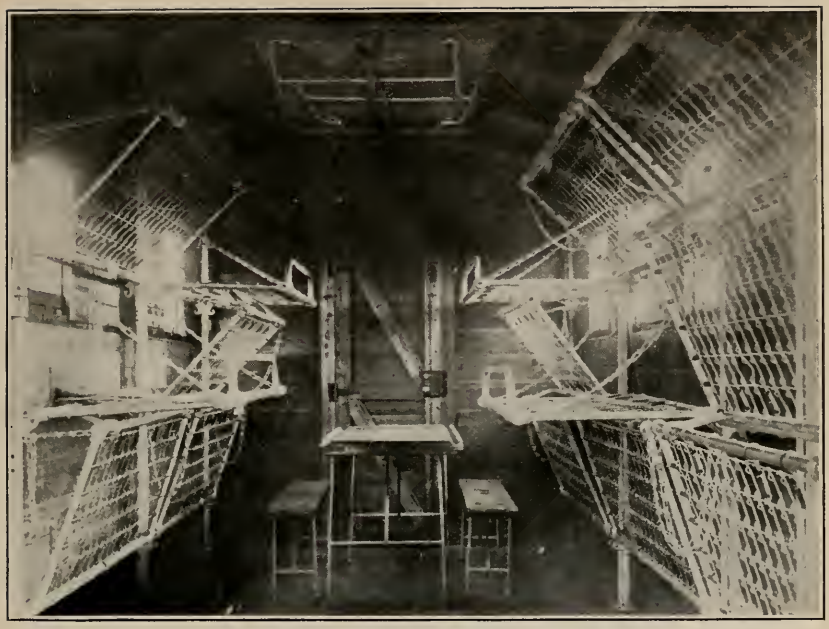
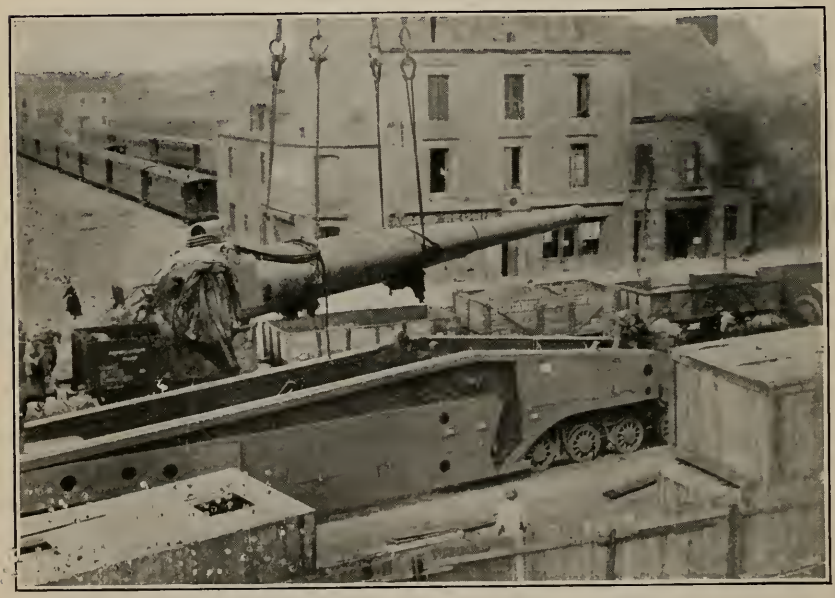
[17] Sources: Report of Rear Admiral C. P. Plunkett, U. S. N., "Navy Ordnance Activities, World War," published by Bureau of Ordnance; "U. S. Naval Railway Batteries," by Lieut. Commander L. B. Bye, U. S. N., in "U. S. Naval Institute Proceedings" for June, 1919; and other reports and articles.



INTERIOR OF BERTHING CAR.

INTERIOR OF TOOL CAR.

LOWERING GUN INTO SLIDE OF FIRST MOUNT.



UNLOADING GUN FROM SHIP AT ST. NAZAIRE.

Orr, M. B., lieutenant (junior grade), United States Naval Reserve Force, assistant to train commander.

Grylls, Humphrey M. K., ensign, United States Naval Reserve Force, assistant to train commander.

Allen, Roger, ensign, United States Naval Reserve Force, assistant to train commander.

Raymond, Philip T., ensign, United States Naval Reserve Force, assistant to train commander.

Davis, Winfield C., ensign, United States Naval Reserve Force, gas officer and assistant to train commander.

Cheffy, George, ensign, United States Naval Reserve Force, assistant to train commander.

Davis, Parlett L., ensign, United States Naval Reserve Force, assistant to train commander.

Linhard, Leon J., ensign, United States Naval Reserve Force, assistant to train commander.

LeBlanc, Thomas J., ensign, United States Naval Reserve Force, transportation officer.

Primeau, Albert K., ensign., United States Naval Reserve Force, assistant to train commander.

Baldwin, Frank, lieutenant commander (Pay Corps), United States Navy, paymaster and supply officer.

Stephenson, C. S., lieutenant commander (Medical Corps), United States Navy, senior medical officer and gas officer.

Morris, Laird M., lieutenant (Medical Corps), United States Navy, junior medical officer and gas officer.

Bugbee, Edwin P., lieutenant (Medical Corps), United States Naval Reserve Force, junior medical officer and gas officer.

Field, Thomas S., lieutenant (Medical Corps), United States Navy, junior medical officer and gas officer.

Andrews, E. D., lieutenant (Medical Corps), United States Navy, junior medical officer and gas officer.

Carr, George P., lieutenant (Medical Corps), United States Navy, junior medical officer and gas officer.

Eubank, Gerald L., ensign (Pay Corps), United States Naval Reserve Force, assistant to supply officer.

Gaffney, Francis L., ensign (Pay Corps), United States Naval Reserve Force, assistant to supply officer.

Anderson, Oscar E., pay clerk, United States Naval Reserve Force, assistant to supply officer.

The eventual itineraries[18] of these guns took them through practically every famous battlefield of the war. Throughout all these thousands of miles of travel the equipment of the batteries stood up well, and the guns operated continuously from the date the first one arrived at the front until the moment when their fire was ceased by terms of the armistice.[19]

In general, Batteries Nos. 1 and 2 operated with the French armies, while Batteries Nos. 3, 4, and 5 operated with the American Army at Verdun. During the Meuse-Argonne offensive No. 2 Battery was recalled from the French front and with Nos. 3, 4, and 5 kept the main

[18] See page 19 for firing positions of each battery.
[19] See Pt. II. Log of the naval railway batteries.

arteries of communication back of the German lines under constant fire day and night. After completing its mission No. 2 was returned to the French.

Prior to the assignment of targets for these guns on the French front the French proved Battery No. 1 at their proving ground at Nuisemont. They gave this giant gun a target located about 18 miles distant. Four shots were fired and all landed almost within a stone's throw of each other. The French general was so pleased with the result of the firing that he immediately went to Rear Admiral Plunkett and, after congratulating him, said: "Waste no more ammunition, but go and fire it against the Germans." After the proof firing of Battery No. 1 it was ordered to Soissons to commence a bombardment of the railroad yards at Laon. Here for the next 30 days, despite enemy counterfire and the bombs of aviators falling constantly around the gun car, the bombardment of the railroad yards was kept up.

To Naval Railway Battery No. 2, commanded by Lieut. (J. G.) E. D. Duckett, United States Navy, goes the proud distinction of having fired the first American shell from an American gun manned by American gunners at the Germans on the western front in the World War.[20] On September 6 from a point in the forest of Compiègne Battery No. 2 fired a shot at Tergnier, an important German railroad center, which was being hard pressed by the Allies. After the first shot the Germans began to evacuate the city, and no more shots were fired.

From this position the gun went to Fontenoy-Ambleny and began the shelling of an enormous ammunition dump located by the Germans in Besny-et-Loisy. Thirty-two rounds sufficed to wipe out this ammunition dump. From this point the gun left for Flavy-le-Martel and commenced firing on Mortiers, another important railroad center. Thirty-eight rounds were placed in this town, and on October 16 the Germans withdrew. After the withdrawal of the Germans from Mortiers the American Expeditionary Forces sent an urgent request for gun No. 2 and assigned it a position at Charny, near Verdun. The gun was rushed to this point and installed, and, on the day of

[20] Our entry into the war found us with few of the auxiliaries necessary for its conduct in the modern sense. The task of the Ordnance Department in supplying artillery was especially difficult. In order to meet our requirements as rapidly as possible, we accepted the offer of the French Government to supply us with the artillery equipment of 75's, 155-mm. howitzers, and 155 G. P. F. guns from their own factories for 30 divisions. The wisdom of this course was fully demonstrated by the fact that, although we soon began the manufacture of these classes of guns at home, there were no guns of American manufacture of the calibers mentioned on our front at the date of the armistice. The only guns of these types produced at home which reached France before the cessation of hostilities were one hundred and nine 75-mm. guns. In addition twenty-four 8-inch howitzers from the United States reached our front and were in use when the armistice was signed. Eight 14-inch naval guns of American manufacture were set up on railroad mounts, and most of these were successfully employed on the Meuse-Argonne front under the efficient direction of Admiral Plunkett, of the Navy. (Gen. Pershing's special report to the Secretary of War, December, 1919.)

CROSSING WOODEN TRESTLE IN FRANCE.

FIRST GUN ASSEMBLED MOVING TO TRACKS FOR COMPLETION.

its arrival, commenced a bombardment of the town and railroad center of Montmédy. Cessation of firing, due to the signing of the armistice, found this gun at Lunéville ready to begin operations against Metz.

Batteries Nos. 3, 4, and 5, left St. Nazaire on the 12th, 13th, and 14th of September, respectively, and after a considerable stay at the American reserve artillery base, were given orders to depart for positions near Verdun, from which they were to open fire on the German main line of communications, running from Metz to Sedan.

The account of the Bureau of Ordnance contains the following comment:

A glance at the map will show the importance of this target. At that time the battle front around Verdun ran in almost a straight line due northwest. A railroad connecting the cities of Metz and Sedan also ran in almost a straight line, paralleling the front and rendering it very easy for the Germans to shift troops from one point to another all along the lines between these two cities. The Germans had held this battle line for so long that they had brought this railroad to a high state of efficiency. The only alternative line for the transportation of troops from Metz to Sedan was a small and poorly built railroad running almost due north from Metz to Luxemburg City and from Luxemburg City almost due west to Sedan. These railroads formed a right-angled triangle.[21] Should the Americans be successful in cutting the straight line of communication from Metz to Sedan, it would force the enemy to transport troops by the 50 per cent longer route through Luxemburg and over the poorly improved tracks, etc., of the longer railroad. From this it may be readily appreciated why a captured German document referred to the Sedan-Metz railroad line as "the most important artery of the army of the west."

The city of Longuyon was a detraining point on this Metz-Sedan line, containing a main railroad yard with 15 long sidings and numerous storehouses. Montmédy had a large railroad yard, which frequently contained 400 cars, was the headquarters of the Seventh German Army, and had large troop barracks and an aviation field. Conflans was also an important railroad and detraining center, having 20 long sidings in the railroad yard and, in addition, a good-sized roundhouse and repair shop. The destruction of these centers could not fail to have an enormous effect on the facilities with which German operations on the western front could be conducted.

Naval Railway Batteries Nos. 3, 4, and 5 arrived at Verdun early in October, were quickly set in position, and commenced firing. The commencement of bombardment by the naval batteries was the signal for an intense effort on the part of the enemy to put them out of action. Shell bursts occurred regularly within 30 feet of the berthing cars and within short distances of the guns themselves. Numer-

[21] One of the most prominent of the enemy commanders, Ludendorff, writing of the trench warfare on the western front states his point of view that large numbers of heavy flat trajectory guns such as these Navy 14-inch 50-caliber guns are essential, "as fire falling well into the back areas had been found very effective, rendering supply and relief to the front lines more difficult, and during actual operations hindering the distribution of orders and the employment of reserves."

ous times the armor plate covering the gun car and ammunition car alone prevented them from sustaining serious damage. In addition, airplanes were frequently flying overhead and dropping bombs.

Up to the arrival of the naval railway batteries, these important troop and railroad centers on the Metz-Sedan line held by the Germans had been immune from artillery fire, for they were several thousand yards beyond the range of the biggest of the allied guns. The arrival of the naval railway batteries at the front greatly helped to turn the tide in the Allies' favor and contributed largely to the consternation created in the German forces by the vigorous tactics of the Americans.

Despite German counterattacks, a constant bombardment of the targets of Longuyon and Montmédy was maintained by the naval railway batteries. Battery No. 3 selected as its particular target the Longuyon aviation hangars and field; Battery No. 4, the railroad tunnel at Montmédy and the Montmédy yards; and Battery No. 5, the railroad yards at South Longuyon. On November 3, Battery No. 3 was moved to Charny and took for its target the freight yards at Montmédy. On November 4 an airplane observer reported the entire lower Montmédy freight yards on fire. Two days later, it was determined officially and so credited that the shells from Battery No. 3 had accomplished this work.

There was no let-up in the steady fire of the naval batteries at their respective targets until the last moment before the armistice went into effect. Battery No. 4 fired its last shot at 10.57.30 a. m. on the morning of November 11. This permitted the shot to land a few seconds before 11 o'clock.

SUMMARY OF FIRINGS.

The five naval batteries fired a total of 782 rounds against the enemy, as follows:

Report of firing.

BATTERIES NOS. 1 AND 2.

Date.	Battery.	Gun position.	Objective.	Number of shots.
Sept. 6	2	Rethondes	Tergnier	1
14	2	Fontenoy-Ambleny	Bensy-Loisy	10
15	2	do	do	12
28	1	Soissons	Laon	47
30	1	do	do	35
Oct. 2	1	do	do	30
3	1	do	do	19
9	1	do	do	25
10	1	do	do	43
11	1	do	do	43
12	1	do	do	43
11	2	Flavy-le-Martel	Mortiers	3
12	2	do	do	25
13	2	do	do	10
30	2	Charny	Montmédy	6
31	2	do	do	6
Nov. 1	2	do	do	13
2	2	do	do	30

Report of firing.—Continued.

BATTERIES NOS. 3, 4, AND 5.

Date.	Gun.	Range.	Gun position.	Objective.	Number of shots.
Oct. 23	3	38,380	Thierville	Longuyon	1
23	4	38,470	West of Verdun	do	1
23	5	38,580	do	do	1
29	3	25,900	Thierville	Mangiennes	10
29	4	25,990	do	do	10
29	5	26,080	do	do	10
30	3	36,830	do	Aviation field, Longuyon	6
30	4	39,340	Charny	Tunnel, Montmédy	6
30	5	36,800	Thierville	South of Longuyon	6
31	3	36,830	do	Aviation field, Longuyon	6
31	4	39,340	Charny	Tunnel, Montmédy	6
31	5	36,800	Thierville	South of Longuyon	6
Nov. 1	3	38,380	do	Longuyon	1
1	4	37,670	Charny	Garage, Montmédy	23
1	5	38,580	Thierville	Longuyon	44
2	3	38,380	do	do	25
2	4	37,670	Charny	Garage, Montmédy	20
2	5	38,580	Thierville	Longuyon	25
4	3	28,340	Charny	Louppy	27
4	3	27,910	do	Garage, Remoiville	17
4	3	36,850	do	Lower garage, Montmédy	12
3	4		do	Louppy	12
3	4		do	Garage, Remoiville	13
4	4	37,670	do	Lower garage, Montmédy	6
5	3	36,850	do	do	11
5	3	38,200	do	Upper garage, Montmédy	39
7	3	38,520	do	Bridge, Montmédy	50
8	3	36,850	do	Lower garage, Montmédy	6
9	3	36,850	do	do	25
9	4	25,990	Thierville	Mangiennes	10
9	4	38,470	do	Longuyon	10
9	5	26,080	do	Mangiennes	10
9	5	38,580	do	Longuyon	5
11	4	37,670	do	do	5
11	5	38,580	do	do	5

The guns were fired on 25 different days. There was no such thing as lightly and heavily engaged, and the guns did not engage the enemy. They were used for strategical purposes entirely and fired at ranges between 30,000 and 40,000 yards. Other artillery, of which there was a great quantity, could accomplish with less expenditure of ammunition and expense all the results that were desired at the shorter ranges. The number of rounds fired at any one time or on one day was governed by the results which they desired to obtain.

The ammunition supply for guns to be used in the field of active operations should be measured entirely by the life of the gun. It was not believed that the accuracy of the 14-inch guns would be more than 300 rounds and the Navy's provision for 300 rounds for each gun proved entirely adequate.[22]

METHOD OF FIRING.

All naval railway batteries were permanently assigned to the Railway Artillery Reserve of the First American Army, with advance base at Haussimont (Marne). From here they were "farmed out" to either a French or American sector as the strategic situation warranted. The following briefly describes the procedure in the case of a gun temporarily assigned to a French sector:[23]

Upon receiving the new assignment the battery commander first ascertained whether the new target could be reached from the posi-

[22] Lieut. Commander L. B. Bye, "United States Naval Institute Proceedings, June, 1919."
[23] See Pt. II, "General firing orders of the French general staff."

tion where the gun was already emplaced. If not the gun remained temporarily in the old position and the commander chose the new position from a study of the latest corrected railway map furnished by the Regulateur Général d'Artillerie. The new position was then fixed, sometimes on a railway track already in existence, but often on a curved spur or siding built for the purpose. The gun having been placed in exact position in absolutely correct line of fire by technical means not necessary to describe here, and placed over its new pit, all necessary cars and material were placed in a safe position from a quarter of a mile to a mile behind the firing position and everything carefully covered and camouflaged so as to escape the notice of the enemy aviators, who took photographs of the whole line at least once a month during the war.

Aiming points (prominent marks such as steeples or artificially placed objects) were then fixed near by for calculating purposes and telephonic communication established with the nearest artillery post and the nearest meteorological observation station (sondage station), which sent out broadcast every half hour in radio code an exact statement of its height above sea level, the velocity and direction of the wind at different altitudes, and the latest barometrical readings. All these data were collected and kept by an officer, who, if conditions prevented their regular distribution, could make fairly accurate calculations from the reports already received and tabulated.

The more important calculations, such as firing angles, were made by the battery commander himself. Shortly after the arrival of orders to be ready to fire at the new target an airplane arrived and reported to the commander for services as air spotters. This plane contained a pilot and an artillery expert, who were instructed in regard to two matters. The first was the particular part or section of the target (often an area a mile long) which his corrections of the fall of the shells should refer to in signaling back to the battery commander. The second was the position of the so-called signal panels (panneaux), which were used to signal back to the planes, since these could send but not receive radio messages. These panels were four in number and consisted of white sheets, a large one 9 by 9 meters in area and three others 9 by 3 meters, which were laid at some distance from the gun upon a flat, exposed piece of ground, to windward of the gun, so as not to be obscured by smoke, gas, etc. The officer in charge of the panels was in telephonic communication with the battery commander. When firing was to begin the airplane proceeded across the enemy lines to ascertain whether the target was visible enough for observation purposes. If so, it returned far enough toward the naval gun to see the panel station. The big sheet's presence meant that all was ready. The pilot then radioed

the battery, "Are you ready to fire?" The answer "Yes" was expressed (on command by phone from the battery) by one of the smaller sheets being spread at an agreed angle next to the larger sheet.[24] The airplane then returned to a position above the target to be bombarded and, within a few minutes, sent the signal to fire. The gun then fired three shots in quick succession, the fall of each projectile being observed and noted by the artillerist observer, who then made an estimate for correction of aim for all three shots together, not individually, the message being so and so many meters to right or left, or over or short, as the case might be.

The battery commander then applied the correction to his "spotting map,"[25] found out what it equaled in yards (all American measurements being in yards, not meters), worked out the correction, and changed the aim of the gun. While the plane was returning after the first three shots, this correction was made and the gun loaded for the second series of shots.[26]

Unfortunately it was impossible, for many reasons, to secure satisfactory airplane observation, only a small proportion of the 782 rounds being fired under such advantageous conditions. The system of spotting by airplane was an excellent one, but atmospheric conditions generally proved unfavorable. The plane had to attain a height of 5,000 or 6,000 yards, which meant that any clouds lying lower prevented vision. Frequently, too, when the weather looked ideal from the ground, with clouds flying high or no clouds at all and plenty of sun, there would be a low-lying mist that prevented spotting from a plane, though unnoticeable from the earth. Thus the signal "observation impossible" from the airplane often seemed incomprehensible to the battery commander.

The air was also full of all kinds of radio interference, and our planes were of course always actively opposed by the enemy guns and aircraft. All this accounts for the facts that, except for about 10 per cent of the shots fired, the artillerist had to get along without aircraft observation, and had to rely on calculations made from the known distance of the target and the ballistic capabilities of the gun. It was generally taken for granted that, when the gun had been aimed in accordance with these calculations, the projectile would fall not farther than 400 yards over or short of the center of the target, or more than 200 yards to one side. The problem was then to distribute the fire so that a large proportion of the shots would land on the region aimed at. The two great drawbacks to accurate firing of large guns at extreme ranges are the error in calculations (in fire control)

[24] See Pt. II, "Signals between airplanes and batteries."

[25] A chart divided into metric unit squares, the reported point of fall of each shot, or group of shots, being noted upon it.

[26] At the extreme range, say about 41,000 yards, or from 24 to 25 miles, the time of flight of a projectile was about a minute and a half.

and the dispersion of the gun itself, by which is meant the dispersion of the shots on the target, even when fired when the gun is in the very same aiming position.

It is apparent, even to the layman, that getting results with this kind of firing "in the dark" is a most difficult thing, which makes still more worthy of admiration the extraordinary accuracy of the fire of our naval batteries in France, as afterwards shown by examination of the targets bombarded.

For example, no observation was obtained at any time while operating in the Verdun sector, and the only way of obtaining any idea of the results of the firings was through the intelligence service. On November 5 the southern part of Montmédy was reported on fire; on November 11 a German prisoner reported that the firing on Montmedy had caused a great deal of damage, one shell landing in the yards and killing all the Germans in two coaches..

EFFECTS OF THE FIRING.

In regard to the actual, concrete effects of the bombardments by the naval batteries, it is evident that, on account of the unusually long ranges and the fact that the great majority of shots were fired without adequate observation, reports are of necessity somewhat unsatisfactory; but after examining all the evidence, direct and indirect, the conclusion is compelling, that the effects were very substantial in reality and still more so in their threat for the future.[27]

It is pointed out by Lieut. Commander G. L. Schuyler and others that Artillery preparation before attacks at the front was done by guns not of the largest caliber. The real function of the naval batteries was a peculiar and a deliberate one. It was principally to fire at freight yards and railway centers far behind the lines. The fire was usually withheld until several hours after an Infantry attack, which was usually about daybreak. If the guns had fired at the beginning of the offensive they would have shown the enemy the lines of communication covered, and he would have routed his trains another way round. It was therefore obviously wiser to wait

[27] Rear Admiral Plunkett, in a personal letter written early in November, 1918, says: "You have no idea what the extra few thousand yards mean in this game, both tactically and strategically. The difference opens up areas for destruction which are clearly beyond anything in existence here. It brings about situations for the enemy which are very difficult for him to handle, and which have a direct effect upon his tactics and strategy. Four years of this war have been largely devoted to meeting the so-called German offensive, and, now that the Allies have taken the offensive, it is necessary that we keep him guessing all the time, and the great element of surprise that is involved in the additional range that these guns give has a very strong effect upon the enemy in everything he is doing or plans to do; and, with rapid movements from place to place, he never knows when he will have to pull his freight or leave it for the Allies to grab."

[28] See Pt. II, "Nature of gunnery work done by the United States naval railway battery in France."

until his reserves and ammunition cars were being rushed up to support his troops, and then bombard the railway centers at a moment when they were most crowded. Thus heavy, long-range batteries do not work in a haphazard or continuous way, but at the proper tactical moment. Firing between times, "for good measure," is not simply wasteful, but it is calculated to help the enemy, and may at times prove disastrous. It had therefore to be prohibited. Naturally it was difficult at first for the personnel to appreciate the higher wisdom of this. The fact that it took a couple of days to dig the pit and make our 14-inch railway guns ready for firing, was not at all the handicap which it was expected at first it might be. All particulars of the target were in general known perhaps a week in advance. Everything could be worked out ahead of time in utmost detail and arranged in the most convenient form, so that during actual firing there was nothing to deal with except spotting corrections.

As a matter of fact, we attained results quickly because experience was gained at a rapid rate. There were no guns in action that approached ours in range except four 340-mm. French naval guns. A French gun was seen that had fired 280 rounds during the war, or about 70 rounds per year, while on more than one occasion our naval batteries fired 50 rounds or more in a single day.

Concerning the effects that could be accurately studied later, Lieut. Commander Bye says in his "Naval institute proceedings" article:

> The German retreat from Laon left the former targets of the naval railway batteries in the hands of the Allies. Rear Admiral Plunkett on October 14 visited this sector, going over the ground carefully. It was not difficult to recognize the shell craters formed by the explosion of the 14-inch naval projectiles. They were easily identified by their uniform size and great extent, and some contained a few fragments of the shells themselves, from which identification was made positive. The fragmentation of the shells was most excellent. No "duds" were found. All fuses functioned, and the nose of one shell was found 5 kilometers from the target. General Maugin and the French artillery command were delighted with the work of the guns, for when working with the map only and without aeroplane observation the shots in nearly all cases were effective hits, and where aeroplane spotting had been possible and the corrections applied on subsequent shots they had been perfectly placed.
>
> The effect on the railroads leading out of Laon was all that could be desired. One hit from the 14-inch naval guns was sufficient to wreck a railroad line of three tracks for a distance of at least 100 feet, tearing the rails up, shattering the ties, and blowing an enormous crater in the roadbed. Although the Germans would repair at night the damage done by the guns and thus maintain some communication, the interruption must have caused them serious concern, both when holding their ground before Laon and also during their retreat.
>
> In the way of concrete evidence regarding the punishment inflicted upon the Germans, Admiral Plunkett learned that one projectile had struck a German moving picture theater during a performance, killing 40 outright and severely

mangling at least 60 others. Two other shells struck this same moving picture theater and it was completely demolished, together with several surrounding buildings. One freight train on a siding had been struck and one car was completely lifted from the track and thrown a distance of about 30 feet.

It is easy to appreciate the effect on the morale of the enemy by an occurrence of this kind, when a whole audience, enjoying in apparently complete security a harmless picture show, is suddenly wiped out by a new and hitherto unsuspected engine of destruction.[29]

After the signing of the armistice on November 11, Montmédy, Longuyon, Mangiennes, Louppy, and Remoiville were visited, and some of the results of the firing were obtained from observation and from questioning the civilian population that remained. The guns apparently were firing a few hundred yards beyond the ranges, calculated from the range table, but the damage to both material and morale was considerable. The targets were struck frequently, and the traffic was stopped completely, not only during the actual firing but from 6 to 10 hours each day after the firing had ceased. As the railroad running through Longuyon and Montmédy was the only line by which troops could be brought to Sedan other than a railroad running far to the north through Luxemburg, the cutting of this line was a strategical victory of great importance. Gen. Pershing in his report states in his description of the last phase of the Meuse-Argonne offensive: "Our large-caliber guns had advanced and were skillfully brought into position to fire upon the important lines at Montmédy, Longuyon, and Conflans—the strategical goal which was our highest hope was gained. We had cut the enemy's main line of communications and nothing but surrender or an armistice could save his army from complete disaster."

Under date of November 7, 1918, Vice Admiral Sims reported to the Chief of Naval Operations as follows:

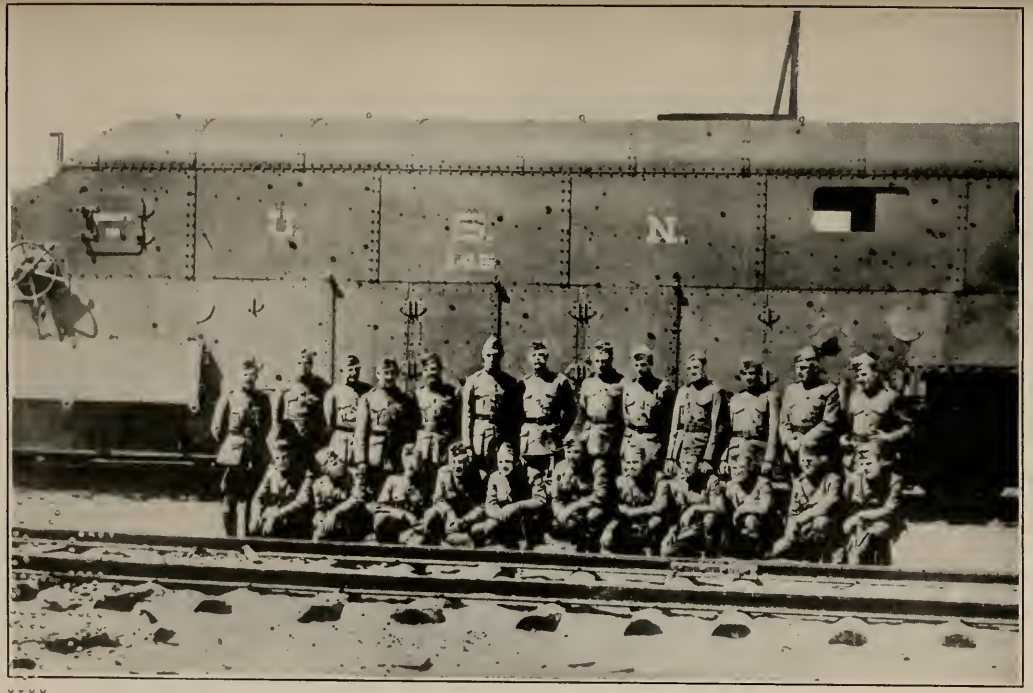
The 14-inch 50-caliber United States naval railway guns have done very excellent and valuable work, particularly in the recent pushes. Three of these guns have been in the sector opposite Mezières, and have had the railways to and from that place under effective gunfire for some time.

The accuracy of these guns have proved greater than was expected. With a gun that had fired 150 rounds 24 observed rounds were fired at a range of 35,800 yards. The mean dispersion obtained was plus or minus 151 yards in range, and plus or minus 51 yards in deflection. The ballistic correction in this case was about 2,800 yards. The shots were fired about 5 minutes apart.

Considering the relation of the total pattern size to mean dispersion in a salvo, it is estimated that these results would work out, in the case of a 12-gun salvo, to a pattern of about 650 yards in range and about 220 yards in deflection at 35,800, the guns being all considered as having fired about 150 times since proof. A careful analysis of the results obtained under existing conditions appears to indicate that a gun may shoot accurately while both muzzle erosion and considerable coppering exists.

Had the war not ended when it did the vicinity of Metz would have been the scene of an offensive such as even this great war had not seen. A tremendous force of soldiery, aided by an accumulation of mobile and heavy artillery of unprecedented strength and number,

[29] See Pt. II, Effects of the firing.



OFFICERS OF NAVAL RAILWAY BATTERIES.

Front Row, Left to Right, Sitting,

Ensign L. J. Linhard, U. S. N. R. F.
Lieut. J. A. Martin (T), U. S. N.
Lieut. J. R. Hayden, U. S. N. R. F.
Lieut. Wm. G. Smith (T), U. S. N.
Lieut. Laird M. Morris (MC), U. S. N.
Ensign A. K. Primean, U. S. N. R. F.
Ensign F. L. Gaffney (SC), U. S. N. R. F.
Ensign A. J. Cook, U. S. N. R. F.
Ensign C. S. Warner, U. S. N. R. F.
Pay Clerk Oscar E. Anderson, U. S. N. R. F.
Ensign George Cheffey, U. S. N. R. F.

Back Row, Standing,

Lieut. Edmund D. Duckett (T), U. S. N.
Lieut. Commander D. C. Buell, U. S. N. R. F.
Lieut. Commander. C. S. Stephenson (MC), U. S. N.
Ensign Roger Allen, U. S. N. R. F.
Lieut. R. S. Savin (T), U. S. N.
Commander Garrett L. Schuyler, U. S. N.
Rear Admiral C. P. Plunkett, U. S. N.
Lieut. Commander. Frank Baldwin (SC), U. S. N.
Lieut. Commander. Joel W. Bunkley, U. S. N.
Ensign P. L. Davis, U. S. N. R. F.
Ensign Humphrey M. K. Grylls, U. S. N. R. F.
Ensign Philip T. Raymond, U. S. N. R. F.

INSPECTION AT MONTOIR BY ASST. SECRETARY F. D. ROOSEVELT AND REAR ADMIRAL PLUNKETT.

with our naval guns holding places of honor, would have started a movement that would have soon left Metz, the key of the Rhine, in the hands of the Allies.

CASUALTIES.

While the railway batteries usually operated at some distance behind the lines, they in no manner enjoyed immunity from danger, being repeatedly shelled and bombed, as, for example, at Soissons. At one time three American engineers, not members of the naval personnel, were killed during one of these artillery attacks, and five soldiers were killed at Charny; while one shell that killed two and injured several others fell within 50 feet of the battery telephone control station. On another occasion the headquarters cars and a berthing car were derailed. Danger always threatened and the men, who habitually carried gas masks, remained in dugouts when off duty.

On October 28 the following men of Battery No. 4 were wounded by enemy shell fire:

Guthrie, K.W., S.F. 2c, U.S.N., wounded on left leg.
Sharpe, A.P., S.F. 1c, U.S.N.R.F., wounded on left leg.
Burdett, A.J., S.F. 2c, U.S.N., wounded on face.

Two other men received slight wounds; Sharpe died on October 29 while in the hospital at Glorieux, near Verdun.

THE END OF HOSTILITIES.

Hostilities came to an end on the morning of November 11, 1918, by order of Marshal Foch.[30]

The last shot from the United States naval railway batteries was fired by Battery No. 4, from its position at Charny. This shot was fired at 10.59 a. m., into Longuyon by James A. Kaffka, S.F., first class, United States Navy, who energized the firing key and caused the primer to function. This primer is now in the possession of Rear Admiral Earle, Chief of Bureau of Ordnance.

On November 23, 1918, the commanding officer of the naval railway batteries in France, Rear Admiral C. P. Plunkett, made an informal address to the assembled personnel, which he ended with the following words:

. I want to add here that there never will come again in my mind any question in regard to the American manhood meeting any situation. When we started out on this thing, the Navy Department told us that we could not have any of the Regular Navy people. They said: If you are going to put this thing through, you are to make it with people that you make yourself and that you can find somewhere, and I must admit that I had some misgiving at one time;

[30] See Pt. II, "The order that ended the war."

but after we had finished the "Battle of St. Nazaire"[31] I was satisfied that this outfit would go to Berlin and there was nothing that could stop them. But there has been something to stop them—the Boche has given in, and now we are going to return home, and I feel with you and know that you feel that every minute and every hour which you have given to the naval railway batteries has been given in the best possible way for the defense of your country, and, with that in your minds, you can go back and face any community at any time and they can only take off their hats to you.

In all our joys and gayeties, in connection with this performance here (meaning in the cinema, Haussimont), we must not forget those men of this force who started out just as full of this as we did, but who, in the performance of their duties, have fallen by the wayside. It is not practicable nor possible for a bunch of people to tackle all the things that we have tackled without somebody getting hurt. But I am happy to say that all three of these men were hurt directly in the line of duty. The men I refer to are:

C. J. Russell, whom we lost in Philadelphia.

Thos. E. Price, who died over here at Mailly (Aube) from walking typhoid. (This boy was from Centerville, Md.)

A. P. Sharpe, who was killed at Thierville by the explosion of a German shell.

I ask you all to rise and sing with me that famous old hymn, "Abide with Me."

All of the naval railway batteries were ordered back to the R. A. R. base at Haussimont a few days after the armistice took effect, arriving there on November 22. On November 28 the staff train left Haussimont for St. Nazaire, via Paris, and the other trains followed, one per day, on the succeeding days. By December 11 all batteries had arrived at St. Nazaire. On the same day a draft of 150 men and six officers left for the United States through Brest. On December 13 and 17 the remainder of the personnel left St. Nazaire for the United States, via Brest, with the exception of one officer and 20 men, who were detailed to remain with the guns with orders to disassemble and ship them home at the earliest opportunity. Rear Admiral C. P. Plunkett, United States Navy; Lieut. Commander J. W. Bunkley, United States Navy, his executive officer while commanding the United States naval railway batteries, and a majority of the personnel of the railway batteries arrived in New York on Christmas Eve, 1918, and the entire expedition would have been home before New Year's except that two or three officers and a number of men were so unfortunate as to be delayed when the *Northern Pacific*, on which they took passage, ran aground on Fire Island.

[31] The whimsical designation of a series of annoying difficulties overcome by the naval batteries personnel during the disembarkation and setting up at St. Nazaire.

Part II.

NOTES AND ADDENDA.

PERSONNEL OF THE BUREAU OF ORDNANCE.

The following personnel, under the Bureau of Ordnance, had most to do with the design and construction of the 14-inch naval railway batteries used on the battle front in France:

Design and construction: Rear Admiral Ralph Earle, United States Navy, chief of bureau. Capt. T. A. Kearney, United States Navy, assistant to chief of bureau. Lieut. Commander L. B. Bye, United States Navy, chief of turret mount section in the Bureau of Ordnance.

Design and preparation of plans: Capt. A. L. Willard, United States Navy, superintendent of naval gun factory. Commander Harvey Delano, United States Navy, design officer, naval gun factory. Mr. Geo. A. Chadwick, ordnance draftsman, naval gun factory.

Construction (inspection): Commander A. L. Norton, United States Navy, general inspector of ordnance. Lieut. Commander D. C. Buell, United States Naval Reserve Force, inspector of ordnance, Baldwin Locomotive Works. Lieut. Commander G. T. Ladd, United States Naval Reserve Force, inspector of ordnance, Baldwin Locomotive Works. Mr. Frank Burns, assistant inspector of ordnance, Baldwin Locomotive Works.

Besides these there was a large force of officers, draftsmen, yeomen, clerks, and others who are also entitled to great credit.

For a complete list of the entire personnel of the bureau during the period of the World War, consult the official publication of the Bureau of Ordnance, Naval Ordnance Activities, World War, Washington, 1920.

DESCRIPTION OF GUN AND MOUNT.

[From L. B. Bye's article in "United States Naval Institute Proceedings" for June, 1919.]

Fundamentally each battery consisted of a 14-inch 50-caliber naval rifle carried on a special railway mount, together with ammunition cars and auxiliary cars. The gun, with a muzzle velocity of 2,800 foot-seconds, had a maximum range of 42,000 yards. Firing could be effected between angles of zero to 43° elevation. At angles of elevation ranging from zero to 15° the gun could be fired with no support other than the trucks. For firing at any angle within the range of 15° to 43° elevation, it was necessary to place the gun car over

a suitable pit foundation to allow clearance for the 44-inch recoil of the gun. When on this foundation the mount was fixed, and its position remained the same for successive shots, while, when firing at the lower angles upon the track, the energy of recoil was absorbed by the car, which traveled backward on the rails against the resistance of tightened brakes.

The railway battery was designed to provide utmost freedom from difficulties associated with auxiliary power-driven accessories and from dependence upon a supply base. With exception of a small, combined air compressor and winch, driven by a single gas engine, the mechanical functions of the battery were performed solely by hand power. Compressed air was used in operating the breech mechanism and in the counterrecoil cylinders. Each battery train was provided with ample supplies and spare parts, augmented by stores and equipment carried on the staff train. The cars of the battery train provided facilities for foundation erection, repairs and quarters for the officers and crew. The scope of the battery is indicated by the following list of cars which made up a single battery train:

1 locomotive.
1 gun car.
1 construction car.
1 construction car with crane.
1 sand and log car.
1 fuel car.
1 battery kitchen car.
2 ammunition cars.
3 berthing cars.
1 battery headquarters car.
1 battery headquarters kitchen car.
1 workshop car.

The locomotives and all the cars were designed to conform to the regulations of the French state railways. Exclusive of the gun car, the various cars were standard flat cars, gondolas, and box cars similar to those supplied to the American Expeditionary Forces in France, and they could be used in conjunction with the French railway equipment. The fittings of the battery headquarters, berthing, and commissary cars, such as bunks, stoves, and other appurtenances, were, for the most part, standard naval fittings which could be replenished at any naval base.

While in France the guns were never fired from the rails at low angles of elevation. In all cases the firings were conducted from the pit foundation and at ranges near the maximum. There was never any criticism due to the necessity for installation of the pit foundation. Ample material was provided for the construction of as many as 12 pits, and there was always sufficient time to prepare a firing position in advance of the time set for moving up the gun. In the preparation of a site for firing the construction cars were brought to the point selected and were used to handle the timbers and steel framework employed in the foundation. The gun car was pushed over the completed foundation, the truck wheels were locked by brakes, and the weight of the car was transferred to the founda-

tion by means of jacks and lifting screws. In this position a traversing gear provided for 2½° train on either side of the center line of the foundation. During action an ammunition car was brought to the rear of the gun car. Ammunition was conveyed to the breech of the gun by a monorail crane in the ammunition car and a shell tray mounted on a track in the gun car. The personnel of each battery was sufficient to insure satisfactory individual operation. In addition to the officers and crew necessary for the operation of the staff train, its complement included medical and engineer officers and a crew detailed to transportation work among the various batteries as circumstances required. The staff train was made up of the following cars:

1 locomotive.
1 staff quarters car.
1 staff kitchen and dispensary car.
1 spare parts car.
1 staff construction car.
1 staff workshop car.
1 staff commissary car.
1 staff berthing car.

For information concerning the details of the gun car the following brief description is given:

The gun car consists essentially of two longitudinal girders, fabricated of steel plates and structural shapes, and provided with suitable transverse stiffeners. The car is run on two front and two rear six-wheel trucks. A housing in the form of an inverted U is provided at each end of the girders for the forward and rear jacking beams used for raising the gun car off from the trucks and placing the car upon the pit foundation. Beneath the jacking beam a center pin casting serves as a socket for the center pin of the car truck. A little forward of the center of the car is a transom casting, against which the transom bed plate bears when the car is jacked up on the pit foundation. Cast integrally with the transom is the pin which engages the transom bed plate of the foundation and the lugs that support the oscillating bearing of the elevating mechanism. The transom is rigidly fixed to the gun girders and is designed to transmit stresses incident to firing to the foundation through the transom bed plate, secured to the inboard side of the girders immediately above the transom by the two deck lugs that support the gun.

Each truck has three axles turning in 9 by 12 inch brass journals; the wheels are 36 inches in diameter. The incorporation of the 14-inch gun into the gun car was done in such a way that navy standard fittings could be used as much as possible and the gun, gun slide, breech mechanism, and deck lugs were of standard navy design, except that slight modifications were necessary in order to provide for elevations up to 43°. The entire arrangement may be likened to a navy turret installation for a single gun of the *Mississippi* class, mounted on a railway car in such a manner that it may be transported over railways, and when placed on its foundation, fired re-

peatedly at elevations from 15° to 43° and with a maximum angle of train of 2½° on either side of the center line of the foundation.

The counterrecoil mechanism as used in these railway mounts is of interest; for, as originally designed, it was not intended that it would function at angles greater than 30°. In order to provide the increased energy necessary to return the gun to battery at the higher angles of elevation, the counterrecoil spring cylinders were modified so that the action of the springs could be augmented by a pneumatic system designed to act with the springs in returning the guns to battery. Air was furnished by the air compressor for this system of counterrecoil as well as for the gas ejector system, and it proved highly efficient even during continuous firing when charged to an initial pressure of about 125 pounds.

The gun was laid in elevation, for firing, by means of a gunner's quadrant ,and for azimuth by a surveyor's transit mounted on a sight support, which extended out from the trunnion and projected through the side of the car. Except in a very few cases, all firings in France were conducted without observation, and the accuracy with which the guns could be laid in azimuth and in elevation for map firing and indirect firing proved to be as precise as necessary.

The total weight of the gun car complete is in the neighborhood of 535,000 pounds, distributed as follows:

	Pounds.
Gun, breech mechanism and yoke	192,500
Slide, complete	50,700
Elevating gear (screw)	650
Elevating gear (nut)	2,930
Elevating gear details	1,860
Deck lugs (2)	10,200
Transom casting	10,000
Cab	12,400
Shell-loading device	1,290
Girders, including the braces (2)	135,830
Trucks (4)	80,000
Truck beams (2)	33,000
Compressor, winch and engine	1,800

The pit excavation and gun-car foundation were designed to meet every contingency that might arise in the field. At the same time it was realized that numerous problems of construction and operation impossible to forecast would have to be solved in practice by the personnel. Approximately 103 cubic yards of earth had to be removed for installing the foundation. The pit had to be dug, and then by means of a crane car the timberwork and structural steel girders were put in place. The transom bedplate casting by which the firing reactions were transmitted to the foundations was required to be approximately level, and the pit had to be installed so that the axis of this casting or the center line of the foundation was in the approximate line of fire.

It was at first thought that the necessity for this pit arrangement might be a severe handicap for the operation of the guns in France, for it was known that considerable time would be necessary for its installation. It proved, however, that this means of taking up the reactions of the gun while firing was decidedly superior to other methods in use, where the gun car recoiled for some distance along the track after each shot. The installation of the pit required from 30 to 36 hours, while the gun could be placed over it in from one hour to one hour and a half. When the gun car was once locked on its foundation, the entire mechanism was stable and properly lined up for continuous and rapid shooting.[1]

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[1] Navy Ordnance Activities, World War, p. 183, says: To enable the gun to fire at angles of elevation greater than 15°, arrangements for a pit and foundation, as mentioned above, were provided. Immediately below the elevating gear, and securely fastened to the girder webs and flanges, is a heavy steel casting called the transom bedplate casting. A similar casting is provided in the foundation. The entire foundation is prepared in advance, it usually taking about 20 hours to get it ready. It is, of course, prepared in advance of the arrival of the gun car at any point at which the gun is to operate. The pit is dug, and, by means of the crane car provided, the timber work backing and the structural steel girders are put in place. The foundation bedplate casting is then put into position, and the girders, designed to carry the rails and the weight of the gun car when it is rolled into position over the foundation, are placed.

To prepare the gun for firing from the pit foundation is then a matter of but a few minutes. The car is run over the foundation until the transom bedplate casting of the gun car is directly over the bedplate casting of the foundation. One hundred ton ball bearing jacks are then placed under the corners of the H beams at each end of the gun girder, and the entire gun car is lifted from the trucks a distance of about 4 inches. By means of screw jacks, provided in the bedplate casting of the foundation, it is brought up until it engages with the transom bedplate casting of the gun car and the load of the car rests upon it. The girders, carrying the railroad track, are then moved to either side of the center line of the track, leaving a clear space in which the gun may recoil. Screw jacks are placed under the heels of the girder to prevent side sway and the 100-ton jacks are removed from the forward jacking beams, allowing the entire weight of the gun car to rest on the foundation and rear jacks. The gun is now ready to fire.

Accurate aim, when firing from the rails, is obtained by firing from a curved track, a change in position of the gun car along the track causing a corresponding change in the azimuth of the gun. When firing from the pit, however, this is not possible. Accurate aim of the gun on the foundation is secured through a traversing gear, which permits the entire gun girder to be swung about the forward transom bedplate pivot through a horizontal angle of 5°, 2½° on each side of the center line of the tracks. As this angle of traverse represents a deflection on either side of the center line of 500 yards at a range of 23,000 yards, corresponding to an elevation of 15°, and correspondingly greater deflections at greater elevations, it is evident that this angle of traverse is ample for all purposes.

The traversing gear is simply a worm shaft turning in a bearing, cast integral with the rear H jacking beam, and operating against the girder. It is operated by ratchet wrenches, and it has worked with entire satisfaction.

The loading of the gun is accomplished with an ingenious device consisting of a roller-bearing trolley car mounted on an inclined I beam, the lower end of which is placed level with the breech of the gun when the gun is in loading position, level. The 1,400-pound projectile is brought from the ammunition car on a monorail hoist and placed on this trolley. The loading crew then grasp handles at the sides of the trolley and run the length of the car with it. The car is brought to rest against hydraulic buffers at the end of the I beam, while the momentum of the shell is sufficient to carry it the length of the powder chamber and into the bore of the gun, where it is brought to rest by the forcing of the copper rotating band into the rifling of the gun.

The entire gun car is sheathed in one-quarter-inch armor plate. A small combination gas-engine driven air compressor and winch is placed on the forward truck of the gun car.

AWARD OF THE CONTRACTS.

The leading men of concerns in the United States for building railway cars, steam locomotives, and constructing bridges were called together in Washington. The importance of the project was explained to them to make them realize the necessity for breaking all previous records of war production if they should undertake the work and complete their part in time to enable the guns to participate in the great offensives that were to take place in France during the summer of 1918. To obtain satisfactory bids for this vast amount of work it was necessary in placing the contracts to avoid interference with other important war supplies for the United States Army, the United States Navy, and the Allied Governments.

It appeared at first as though the bureau was demanding the fulfillment of impossible conditions. The engineers representing these large manufacturing concerns were thrilled with its extent and appreciated its possibilities; but the task appeared to them impossible, until, during the second conference, Mr. Samuel M. Vauclain, chairman of the Munitions Committee of the War Industries Board, assured the Bureau of Ordnance that the Baldwin Locomotive Works would build the gun cars with the assistance of the American Bridge Co. in from 100 to 120 days. The president of the Standard Steel Car Co., Mr. J. M. Hansen, was so stirred by Mr. Vauclain's enthusiasm and patriotism that he also came forward and promised to deliver the entire number of auxiliary cars in the same time. The first step in the actual building of the mounts, therefore, was to award to the Baldwin Locomotive Works the building of the six necessary locomotives and the five gun cars, and to the Standard Steel Car Co. the construction of the 72 auxiliary cars.

COMPLETION OF THE MOUNTS.

From the moment that the bids were accepted and contracts awarded the fabrication of the material moved rapidly forward. The construction of the girders by the American Bridge Co. progressed so rapidly that they were delivered to the Eddystone shops of the Baldwin Locomotive Works in less time than had been thought possible. When they were delivered, the shop superintendent was fully prepared to assemble. The trucks, air compressors, winches, castings, and other fittings had been obtained in some manner and assembled at Eddystone, so that when the girders came in, no time was lost in attaching the deck lugs, fitting the elevating mechanisms, placing the girder on its trucks, adjusting the gun slide and putting the gun in place. The Naval Gun Factory furnished for each mount all of the strictly ordnance parts; i. e., the gun, slide, deck lugs, elevating gear,

breech mechanism, loading device, etc. And in performing this vast amount of work they were always a few days ahead of time. The first mount was scheduled for delivery on May 15, 1918. Mr. S. M. Vauclain, senior vice president of the Baldwin Locomotive Works, made the schedule out himself only to have it broken, for the first mount was completed at the Eddystone plant of the Baldwin Locomotive Works on the morning of April 25, 1918. The last mount was scheduled for June 15, but was completed on May 25.

There were no changes in the design to delay construction. Plates for the girders were rolled at Pittsburgh and rushed in special cars to the American Bridge Co.'s fabricating plant at Pencoyd, Pa. The material furnished by the Washington Naval Gun Factory was sent to Eddystone by motor trucks, and, in fact, every conceivable method of transportation was used in seeing that the material reached the Baldwin Locomotive Works shops on time. Notwithstanding bad traffic conditions and some of the coldest weather and heaviest snowfalls that the Eastern States had experienced in many years, the material reached there, and on time.

While one end of the Baldwin Locomotive Works shop was engaged in erecting the gun cars, the other end was erecting the locomotives for the expedition. At the plants of the Standard Steel Car Co. located in various parts of the country, the building of the auxiliary cars was pushed so that they too were finished in advance of the delivery schedule. In spite of a serious fire and a severe storm which destroyed a considerable portion of the Hammond, Ind., shops the auxiliary cars were completed by June 1.

CONGRATULATIONS ON THE SUCCESS OF THE TESTS.

AMBASSADE DE FRANCE, ATTACHÉ NAVAL,
Washington, May 2, 1918.

MY DEAR ADMIRAL EARLE: The two French artillery officers sent to Sandy Hook to witness the trials of the 14-inch guns on rails, at which I was unhappily unable to assist on account of Admiral Crasset's presence in Washington, have reported to me the complete success with which they have met. They consider that the Bureau of Ordnance has accomplished a marvelous feat in the rapid construction of these trucks and that the trials have been entirely satisfactory; there is no doubt that they mark a considerable progress and will prove to be a most remarkable weapon for long-range bombardments.

Will you accept my best thanks for having allowed us to be present at these interesting experiments and also for the courtesies extended to the French officers?

Believe me, my dear Admiral Earle,

Yours, very sincerely, B. A. BLAUPRÉ.

BRITISH WAR MISSION, MUNSEY BUILDING,
Washington, D. C., May 1, 1918.

DEAR EARLE: I wonder if you have got a spare copy of the particulars (two blue prints) of the 14-inch mounting, which you showed me yesterday, that you could let me have?

I am sure my people in England would be immensely interested, and I should like to send them as much information as I could with my reports of the trials yesterday. If you have drawings showing the general arrangements of the elevating, traversing, and recoil arrangements separately, they would also be much appreciated.

I must again congratulate you and your department most warmly not only on the complete success of the trials, but on the extraordinary quick time in which you have got these mountings out—not to mention the excellence of your arrangements for the comfort of the spectators.

Yours, very sincerely,

JOHN HEADLAM.

Rear Admiral EARLE,
Chief of Naval Ordnance,
State, War, and Navy Building, Washington, D. C.

THE BALDWIN LOCOMOTIVE WORKS, PHILADELPHIA, PA.,
Washington, May 13, 1918.

Rear Admiral RALPH EARLE,
United States Navy, Chief, Bureau of Ordnance,
Navy Department, Washington, D. C.

MY DEAR ADMIRAL EARLE: I spent yesterday (Sunday) morning in the Baldwin Locomotive Works at Eddystone, Pa., and am glad to advise you that the five large gun mounts will be finished complete in every respect ready for shipment Saturday, May 18, or about two weeks ahead of time originally contemplated.

Our people at the works are most enthusiastic over the standard of workmanship on the parts furnished by the Washington Navy Yard to go on these mounts. The last piece arrived at 6.40 Saturday evening last.

This has been a most delightful task. The designs were thoroughly worked out beforehand. Your department knew exactly what it wanted. The parts furnished by the navy yard came through on time and in the best possible shape. Not a single difficulty was experienced and I trust that the service rendered by the Baldwin Locomotive Works may prove satisfactory.

Work has been begun on the three additional mounts and a schedule of delivery will be sent you at an early date.

Very truly, yours,

S. M. VAUCLAIN,
Senior Vice President, Baldwin Locomotive Works.

ARRANGEMENTS FOR TRANSPORTATION.

REPORT OF REAR ADMIRAL PLUNKETT.

MAY 23, 1918.

To: The Bureau of Ordnance.

1. In accordance with cablegram, War Department, copy of which has been handed Lieut. Commander Bye this date, instructions have been issued by the Navy to ship material for the 14-inch naval railway battery by the first available naval transport.

2. It is expected that part of this material will be loaded on the U. S. S. *Bath*, sailing for St. Nazaire direct; also other shipments on the U. S. S. *Newport News*, and on the U. S. S. *Texel*, sailing direct.

Top: Lieut. Commander Garrett L. Schuyler, U. S. N.
Left: Lieut. Commander, J. W. Bunkley, U. S. N.
Right: Lieut. Commander Frank Baldwin, S. C., U. S. N.

Lieut. Commander C. S. Stephenson, M. C.

Left to right: Ensign C. Davis, U. S. N. R. F.; Ensign C. S. Warner, U. S. N. R. F.; Ensign Geo. Cheffey, U. S. N. R. F.; Ensign A. L. Cook, U. S. N. R. F.; Lieut. W. G Smith, U. S. N.; Lieut. Commander J. W. Bunkley, U. S. N.; Lieut. J. L. Rodgers, U. S. N.; Lieut. J. R. Hayden, U. S. N. R. F.; Ensign P. L. Davis, U. S. N. R. F.; Lieut. R. S. Savin, U. S. N.

3. It is requested that the bureau issue any instructions which they may consider necessary to safeguard the handling and shipment of this material to the Bureau of Supplies and Accounts, with a request that they immediately inform their representatives at Philadelphia to exercise proper precautions in the loading of these vessels.

4. It is also requested that the allowance of ammunition be divided among the above-named vessels and shipped at the same time as the material.

5. A large part of the personnel will precede the material with instructions to make all necessary arrangements for the proper reception and erection of the bureau's material on the other side and for such temporary or permanent storage of the ammunition allowance and reserve as may be determined from time to time.

6. Any suggestions which the bureau may have to make in regard to the handling of this whole situation are earnestly requested, in order that no stone may be left unturned to insure the safety of this material from the time of departure until active operations begin, and as far as possible thereafter.

C. P. PLUNKETT.

DANGERS OF VOYAGE.

Besides the usual difficulties connected with the shipment of such heavy material the journey to France at this particular time was extremely dangerous. It was during this same interval that German seagoing submarines were operating off our coast, laying mines, and sinking numerous vessels by gunfire. Everyone will recall how persistent these pirates of the sea were in their activities; how they appeared one morning so close inshore off Cape Cod that, while sinking a number of innocent barges by gunfire, the shells actually fell on the beach. The *San Diego* was sunk by a mine from one of these submarines, and even the U. S. S. *Texel*, which had been designated to carry a cargo of material for the naval railway batteries, was sunk on June 2 while nearing port, so that another vessel had to be substituted.

DIFFICULTIES OF ASSEMBLY WORK.

The manner in which Rear Admiral Plunkett and his men overcame all the difficulties of the complex assembly work did credit to the best Navy traditions. "Seamen all, they worked till they dropped exhausted, and their night and long day hours of labor were continuous until the guns left for the front."

Extract from Lieut. Commander Buell's letter to Capt. Kearney, dated August 28, 1918:

We have had no construction difficulties of any kind other than lack of material when we needed it. The ships were all loaded upside down, and we were not able to get started on the construction job until the last of the stuff on the second ship was unloaded and on the ground in the yard. From that time on we have made good speed * * *.

In the selection of men I was very fortunate. There has been only one thing in the whole project that we were not able to find a competent man to

handle, and that was the job of putting the lagging on locomotive boilers. We borrowed a man from the Army and made out all right. I thought I was out of luck for a man to do lettering and stenciling of cars, but on combing the outfit I found three experienced lettering and sign painting men and had no further trouble on that score.

START OF THE FIRST GUNS.

Extract from Rear Admiral Plunkett's letter to commander United States naval forces operating in European waters, dated August 27, 1918:

Both guns arrived at Helles-Mouchy ready for action, but upon arrival a change in the original plan for the guns was made by the chief of French reserve artillery, and I was requested to take one of the guns to Haussimont, the A. E. F. reserve artillery base (and the base to which the remaining guns will be sent in accordance with request from commanding general A. E. F.). The situation, then, is that we have one gun at Helles-Mouchy which can be used for operation in the original sector as contemplated by the French, and the other gun at Haussimont, which will conduct some trial firing at Mailly and then be available for service as may be requested by reserve artillery command. I shall proceed to St. Nazaire at the end of the week ending August 31 for the purpose of conducting the movement of the remaining guns, together with the supplies and material, to Haussimont.

It has been a matter of great satisfaction that we have fully demonstrated to the French authorities that these guns and mounts can be moved over the standard railway tracks and bridges at speeds which are safe and without damage to the right of way. I was always of the opinion that would be the case, but in some unaccountable manner, before my arrival in France, this question of the safe transportation of the guns, as mounted, over the French railroads had become a matter of official correspondence between our Army and the French military and railway authorities. As soon as I could locate all the threads of the matter I personally took the matter up with the French authorities, and, as a result, have succeeded in carrying out movement of two guns to a designated position 350 miles from St. Nazaire and have further transported one gun immediately from behind the allied line from Creil to Chateau-Thierry and along the Marne to Epernay and thence to reserve artillery base, A. E. F., Haussimont. It has been a most valuable experience for our personnel and has given us an opportunity to breath the atmosphere surrounding that part of the front where our own naval forces made their famous stand, and also to move over lines which were once destroyed and since rebuilt. In fact, as I write this report the movement of the train is held up pending the ceasing of enemy operations, either by gunfire or bombing, in the immediate vicinity of the train. All of this is of the greatest value in preparing young material for active work, and I shall endeavor to take the remaining guns over the same route as the first gun in order to give them the same opportunity of observation and experience.

THE GUNS WELCOMED BY THE PEOPLE.

This first trip in France was a memorable occasion, for many French cities, including Paris, were passed through, and the French people, on seeing that large American engines of war were actually

in France, were happy and encouraged. When passing many troop trains loaded with American soldiers cheer after cheer was given. On all occasions as soon as the gun was seen crowds gathered and went wild with excitement. Word of its coming was flashed ahead of the train, so that at many stations people had gathered in curiosity and many had come with flowers and wreaths to decorate the big weapon. Many were surprised and agreeably startled when they found that the wreaths were too small for this gun and would not pass over the muzzle. Information concerning the guns spread over France, and undoubtedly reached the Germans, for when Battery No. 1 arrived at Helles-Mouchy at 8.30 p. m., August 23, and Battery No. 2 on August 24, the German long-range gun had been withdrawn. "The bird had flown." The bombardments of Paris had ceased before the naval guns had taken position to fire a single shot against them.

THE FIRST TEST IN FRANCE.

The proving ground test of Battery No. 1 at Nuisemont was most encouraging. The pit was installed in time so that on September 2 four rounds at reduced velocity and four rounds with full charges were fired. The territory available was not sufficient to allow firing the naval guns at their maximum elevation. The gun was laid for a range of 29,000 yards. The shots actually fell at 29,000, 29,300, 29,000, and 28,900 respectively. It is needless to say that the French were very much pleased with this firing, for the low dispersion was declared by them to be most remarkable, and they refused to allow further expenditure of ammunition for demonstration purposes. They concluded that the guns were perfect in all respects, and that the proper place to conduct future firings for demonstration or other purposes was at the front, smashing German positions.

Meanwhile Battery No. 2 had laid track and prepared the firing position at Rethondes under direction of the Tenth French Army. On September 6, 1918, after firing only one shot, orders were received to cease firing, for the Allies had captured the village of Tergnier.[2] By a peculiar coincidence it happened that Battery No.

[2] Extract from Schuyler's letter of Sept. 24, 1918:

"Finally we were all ready to fire at Tergnier, and the spotting plane was up, but could not observe and failed to give us one signal, and then ran out of gasoline, and anyhow the French troops at the time were capturing the town. As the gun was loaded, however, they let us fire it. The sand packing behind the back timbers had not been very well done in this pit, so it came back one-half inch. This would not have been serious, but we profited by it in subsequent installations. We never learned where the shot fell, but I think it was its 41,000 yards all right, and that it was the longest-range shot that had so far been fired at the Germans.

"Then they moved us up the track at night to a place called Fontenoy. They have lots of air raids and bomb the tracks, so that at least every 100 yards has at some time been hit and repaired. There was an air raid just before we started which cut all the

2, when firing this shot from the naval railway battery in France against the Germans, occupied the same position as occupied by the train carrying Gen. Foch and his staff at the time the armistice was signed later on, November 11, 1918.

GENERAL FIRING ORDERS OF THE FRENCH GENERAL STAFF.

The following is a translation of a general firing order issued to the commanding officer of United States Naval Railway Battery No. 2, similar orders having been received from time to time by the other naval batteries.

[First Army Artillery, General Staff. No. 3442.]

GRAND HEADQUARTERS,
October 10, 1918.

FIRING ORDER.

The 14-inch gun manned by the American Duckett unit will fire as directed below:

1. Demolition fire on the Mortiers railway station—40 rounds—observed by airplane.

2. Demolition fire on the Pouilly branch line to Serre (2 km. west of Crécy)—20 rounds—observed by airplane.

3. Interdiction fire on the Mortiers railway station and the Pouilly branch line (without observation).

A. The demolition fire under 1 and 2 will begin on the morning of October 11, and be carried out as rapidly as the conditions of observation will permit.

B. The interdiction fire will be executed at the rate of 10 shots per period of 24 hours, firing irregularly on each objective.

C. The aeronautic section of the Eighth C.A. will make the necessary observation of the firing designated under 1 and 2.

Gen. FOURNIER,
Commander of Artillery of the First Army.

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telephone lines, and we had to crawl along slowly to see whether the track had been cut and to get permission from each station to proceed to the next. Fontenoy was in the hands of the Germans during the last push. Our target there was an ammunition dump at about 38,600 yards. The first time we fired we got off two rounds, but the plane could not see them. There were woods near the target, so we changed the range of the second 1,000 yards to get it out in the open. Still the aviator could not see it and he ran out of gasoline. We had to wait for another occasion because of bad weather, but then got hurry-up orders to fire 10 rounds without observation. We do not know how we came out on this, but they could hear us all over the front. Four of the observation balloons in front of us were burned down in two days. They could not have seen our shots anyway, however.

"The next day we tried an observation shot again and could pick up nothing for the first two rounds. The aviator spotted from a height of 6,000 meters and had a gale of about 90 kilometers an hour blowing him toward the German line. He got his hand and his face frozen. On the third round he saw our burst about 1,000 yards to the left. I had jacked over about 600 yards when we got the signal to fire again, so let it go at that, and was given O. K. in direction but 1,300 yards over. We were firing purposely 1,000 yards beyond to register in a clear spot, if possible. On the next round, I brought it down 1,300 yards and left the direction unchanged. He reported that he could not see the bursts well at all from this height, but is sure that we hit some ammunition on the third round. We were told to finish out our 10 rounds, so we shot the last seven rapidly. We know we were on in direction and were 1,300 yards over while intending to be 1,000 over, so we felt quite pleased with the probable accuracy of the estimated range of the remainder. The last seven shots (six intervals) we got off in 25 minutes."

SIGNALS BETWEEN AIRPLANES AND THE NAVAL BATTERIES.

The following is a specimen of the signals arranged for between the naval batteries and the airplanes "spotting" for them.

POSTAL SECTOR 51, *October 9, 1918.*

CONGENTIONAL SIGNALS BETWEEN ESCADRILLE 262 AND THE DUCKETT UNIT FOR ADJUSTING THE 14-INCH GUN ON THE MORTIERS CROSSING.

Adjusting point.—Intersection of roads at $\begin{cases}207.410\\329.320.\end{cases}$

Method of firing.—At the signal "Fire" from the airplane, the gun will fire three shots at intervals of five minutes. The airplane will send the corrections for the three points of fall in a single message.

Special conventions regarding radio signals.—The airplane will send its call signal. The identification panel will be put in place.

The airplane will send—06—(Is the battery ready?).

The panel will indicate *battery ready.*

The airplane will then send the signal 25 (I am going to observe the firing ordered), after which it will wait five minutes and then send the signal "Fire."

The battery will fire three shots at intervals of five minutes, the *first* shot within the 30 seconds following the signal "Fire."

The airplane will send the corrections and then begin over again, following the same procedure, to wit, 06—25—(five minutes)—Fire—etc.

The corrections will be sent in the form 101 to the left—151 over—etc.

Capt. GUERIN,
Commanding Escadrille Sal. 262.

EFFECTS OF THE FIRING.

The following notes by Rear Admiral Plunkett's yeoman, while quite unofficial, throw light on the effects of the fire from the naval guns and reflect the excellent spirit of the command:

An examination of the various targets fired upon by these 14-inch guns, after the Germans evacuated, has disclosed that the damage wrought by these weapons of destruction was terrible and their accuracy marvelous. From an interrogation also of Russians and other prisoners recently released by Germany, after cessation of hostilities, we are informed that the moral effect of our guns on the Germans was far greater than that which the "Big Bertha" had on the French, and, furthermore, that the Germans were in great awe of and, in fact, regarded with fear and superstition shells the size of a box car sounding like an express train coming through the air, which landed with fearful havoc so far behind the lines that it was inconceivable to them how a gun could be built that could hurl them such a distance. Also, from the mobility of the guns, they were led to believe that the Allies had hundreds of these guns with which they were destroying their vital supply railroads and main lines of communication, simply demoralizing them; and this belief was further impressed upon them from the fact that each gun belched forth a ton of solid destruction every three minutes. Could you blame them?

An interesting phenomenon was noticed in a 10-acre turnip field far behind the lines. A projectile landing in the middle of the field uprooted practically

every turnip in the lot, leaving them clear of earth. This should also furnish some idea as to the destructive charge with which these shells were loaded.

At Laon, where Battery No. 1 fired many rounds, the French inhabitants who remained after the Germans evacuated stated that one shell landed in a German cinema while a moving picture was going on. All that could be found of 40 of the Germans who were present was their identification tags, while the balance, 60, were all terribly mangled. There was, of course, nothing left of the cinema.

Also, in the same town one projectile landed on a supply train in motion, derailing it and lifting a couple of box-cars up bodily and depositing one of them on the storehouse platform near by, of course smashing up both cars.

Another shell landed in Montmédy right in Gen. Gallowitz's headquarters, across from the staff headquarters of the German crown prince. Needless to say, their quarters were immediately removed from that vicinity, and it is understood that about 70 Germans were killed or wounded by the explosion.

It can be readily seen from the above few instances of the many wonderful things done by these giant guns and also from the fact, which is now history, that these guns cut up the German main supply railroads and lines of communication, terribly congesting their traffic, that the moral effect of these guns on the Germans must have been by no means a small factor in the unaccountably rapid collapse of the German organization, and our American spirit makes us pity them for having the temerity to pit themselves against American ingenuity.

In addition to the moral effect these guns had on the Germans, anyone who ever saw the monstrous trucks necessary to carry these giant guns on wheels, which latter must necessarily be as numerous as the legs of a spider, can fully appreciate the effect that the sight of these guns traveling up to the front must have had on those French people who were so fortunate as to have seen them. The inhabitants of all the towns through which the guns passed greeted us with flowers, shouting "Finis la Guerre" and every other indication of which they were capable of making that they fully believed it to be the beginning of the end. Even they thought, due again to the mobility of the guns, that there were many more of them in France than really was the case, as, in traveling from front to front they, of necessity, saw the same guns a couple of times.

THE GUNS AT MEUSE-ARGONNE.

The following letter to the editor of the Army and Navy Journal from Commander H. F. Leary, United States Navy, of the Bureau of Ordnance, explains itself:

In your issue of October 11, you quoted from an article in Liaison of September 20 by Col. M. H. Barry, Coast Artillery Corps, on "Observations of a Coast Artillery Officer in France," in which he mentions some good, heavy artillery work opened east of the Meuse. Speaking of the destruction in this sector, he says: "The destruction of this stronghold called for the most scientific adjustment of fire and in my opinion it is one of the best samples of our artillery efficiency that I have seen in my travels over here."

As he was unable to identify any of the heavy guns on this mission, it may be of general interest to note that, during the Meuse-Argonne offensive, this sector was under constant fire, day and night, from four units of the 14-inch naval railway batteries, each unit mounting one 14-inch 50 caliber naval gun, manned and operated by naval personnel. Two of these guns were in position near Verdun and two near Charny, north of Verdun. Their principal mission was the enemy's main line of communication—the immensely important double-

tracked railroad from Montmédy to Metz. This task of cutting and keeping open this line was not a difficult one for guns having the accuracy at long range that these guns had. As only a few 14-inch rounds a day were necessary to stop all traffic on this line, it was not uncommon to spend some of their spare time firing on large ammunition dumps and points at which there was a congested condition of traffic or material. It is probable that the above-quoted tribute to the heavy guns in this sector was inspired by the colonel visiting some of these latter targets.

THE ORDER THAT ENDED THE WAR.

VIII Army, General Staff, Third Bureau. No. 8272.

MAIN HEADQUARTERS, *November 11, 1918.*

[Service message.]

Marshal Foch telegraphs as follows:

Marshal Foch to commanders in chief.

"1. Hostilities will cease over the entire front on November 11, eleven a. m. (French time).

"2. The allied troops will not pass beyond the line reached on that date and at that hour until further orders."

A true copy published for execution.

By order of the chief of the general staff.

DOUCHY.

VIII Army, Artillery, R. G. A. No. 6122.

Reported to American Naval Battery No. 2, November 11, 1918.

——— ——— (signature),

The General in Command of Artillery.

By order of the chief of squadron, R. G. A.

R—04212.

E. D. Duckett, Lieut., U. S. Navy, confirming phone message of 1011.

E. D. D.

NATURE OF THE GUNNERY WORK DONE BY THE UNITED STATES NAVAL RAILWAY BATTERY IN FRANCE.

By Commander G. L. SCHUYLER, United States Navy.

A brief description of the gunnery work of the United States naval railway battery in France follows. It would be out of place in such an article to cover short artillery work in general, or to include much narrative. The scope of the article had better be restricted so as simply to give those familiar with naval gunnery something of an insight into the peculiar differences in gunnery work on shore, which, in this particular instance, were encountered by naval officers serving with the United States naval railway battery. This description would not be either necessary nor interesting if work of this nature were thoroughly standardized and well explained in available artillery literature or if the matériel of the railway battery closely resembled the usual Army matériel.

Neither of these things was the case, however. There were no "courses" available which would have been of much benefit and, if there had been, there was no time available to take them. It was a matter of getting general artillery ideas, learning the conditions under which the work would be done, working up our own methods to meet requirements, and training the personnel in these methods while assembling the guns and en route to the front.

GENERAL PURPOSE OF RAILWAY ARTILLERY WORK, NATURE OF TARGETS, ETC.

At the beginning of the war practically all the artillery belonged to the different subdivisions of the armies and therefore was normally restricted to use in their particular sectors. As the war progressed and various offensives were undertaken, the desirability was seen of concentrating the heavy artillery at places where the offensive was to be made, even if in doing this it necessitated thinning out the artillery on other parts of the front. This, of course, could be done by temporarily borrowing or dislocating artillery units from other commands. In order to concentrate the control of heavy artillery under a single command, however, and so that its use could be better coordinated, the French evolved the idea of a "general artillery reserve." Thus all the heavy artillery did not really belong to the troops of particular sectors but, with the operating personnel, was only lent to them when occasions warranted it. To meet any particular requirement such as a set offensive it was, under the new organization, easy to get a temporary general concentration of heavy artillery from the whole French front. And it arrived at the point where it was to be concentrated, manned, and operated by officers who had worked together before and who had their own organization. Other armies followed this idea, but hardly elaborated it to the same extent.

The French general artillery reserve worked very efficiently and gradually increased the number of extremely large guns on railway mountings. For an offensive they would concentrate artillery from all parts of the front, reducing the heavy artillery elsewhere to an absolute minimum. This had to be done gradually so as not to cause railway congestion. Guns which had to come the longest distance would be started ahead of the others and guns which required a long time to install would arrive in time to permit it. Guns of the naval railway battery were in three such offensives—one near Soissons, one at the extreme northern end of the French line, and, finally, in the American push called the "Meuse-Argonne offensive." The declaration of the armistice found some of them ready to fire in another intended offensive into Alsace-Lorraine.

Artillery preparation before going over the top, the neutralizing of the fire of the enemy's heavy artillery behind the lines, and firing at roads behind the offensive, etc., was done by artillery not of the largest caliber. The particular function of the railway artillery was to fire at freight yards and railway centers a considerable distance behind the lines. In most cases the fire was withheld until several hours after the actual attack (usually at daylight) was made. If the guns had been fired during the night before they would usually have found the freight yards well behind the lines deserted and would have interfered with very little traffic. If they had fired at the beginning of the offensive they would have immediately advertised to the enemy the serious nature of the preparations for it and would have shown just which lines of communication they covered. In this case the enemy could route his trains around another way. It was better to wait until reserves and ammunition were being rushed up to support the attack and when hospital trains were going back and then make the attack on the railway centers at a time when they were full of traffic.

The foregoing is more or less of a digression and is hardly an authoritative statement of the purpose of railway artillery. But it is an accurate enough description based on what the officers of the railway battery read and what their experience led them to believe. At any rate, it should serve to make clear that in general railway guns are not fired haphazardly, nor all the time, nor on short notice. Also, that their targets will in general be railway centers. They will travel from one offensive to another and get there ahead of time. Sometimes they will not fire for weeks. The enemy is (unlike in naval warfare) always within range ready to be fired at, but regardless of impatience, the fire must be withheld till just the proper time. Firing between times just "for good measure" is not simply wasteful. (If that were its only disadvantage one might indulge in it.) But it is calculated to help the enemy, and may at times prove disastrous. It has to be prohibited. Naturally it is difficult at first for the personnel to appreciate the higher wisdom of this.

The fact that it took a couple of days to dig the pit and make our 14-inch railway guns ready for firing was not at all the handicap which it was expected at first it might be. All particulars of the target are, in general, known perhaps a week in advance. Everything can be worked out ahead of time in utmost detail and arranged in the most convenient form so that during actual firing there is nothing to deal with except spotting corrections.

MAP WORK AND FIRING FROM MAPS.

The map work is bound to come easy for those with any navigational experience. On the British front, firing of this kind was done

generally by taking a large scale map and determining the line of fire graphically just as one might pick off a navigational course and distance. The great difficulty, however, is that with such great ranges as we use the length of the largest convenient drawing board and ruler would limit one to maps of so small a scale that the target and gun positions and the surrounding landmarks were not shown with sufficient accuracy. On the French front, however, and in the American Expeditionary Forces, calculation was the general practice. We came to prefer calculation. The problem was simply a dead reckoning course and distance calculation. One could take only a small map on large scale showing the vicinity of the gun position and a similar one showing the immediate vicinity of the target position. These two would be on such a large scale that, if all intermediate maps had been laid out on a table, the complete series showing the ground along the whole line of fire would have filled up a large-sized room. By using a simple dead-reckoning calculation, we could have the largest possible scale of map for the gun position and its surroundings and for the point of fall and its surroundings and suppress all the unnecessary details of ground which was being fired over.

The French maps are all in metric units. The X coordinates run across the map and the Y coordinates run up and down the map. Z coordinates are vertical heights but, in our firing, we had little or nothing to do with them because the ground was generally so flat. The X and Y coordinates are simply meters from the point of origin of the system of maps. As the numbers run consecutively, the difference in the X coordinates and the difference in the Y coordinates of two points are obtained by two simple subtractions of the figures which represent them. For instance, the gun might be located at X 178740, Y 296090, and the target at X 201280, Y 316320. $\triangle$ X would be 22540 and $\triangle$ Y 20230. The range would be the hypotenuse of this right triangle; and the line of fire measured from north would be the angle whose tangent was $\triangle$ X divided by $\triangle$ Y. This angle is usually named "U." We can either multiply $\triangle$ X csc U or $\triangle$ Y by sec U. Actually we would do it both ways as a check and, at the same time, introduce a multiplier to put the results from meters into yards, because the range tables were in yards. The following illustrates the usual form of the work:

TAR X 201280 Y 316320				.03887		.03887
GUN X 178740 Y 296090						
$\triangle$X 22540		log 4.35295	log	4.35295		
	Y 20230	col 5.69186			log	4.30814
U 47–57		tan U .0441	csc.	.12927	sec.	.17407
R 33196 yds				4.52109		4.52108

COMMANDING OFFICERS OF THE NAVAL BATTERIES, U. S. N.

1. Lieut. J. A. Martin, U. S. N., Battery No. 1; 2. Lieut. (j. g.) E. D. Duckett, U. S. N., Battery No. 2; 3. Lieut. W. G. Smith, U. S. N., Battery No. 3; 4. Lieut. J. R. Hayden, U. S. N. R. F., Battery No. 4; 5. Lieut. J. L. Rodgers, U. S. N., Battery No. 5.

NAVAL GUN AT SOISSONS, FIRING.

CORRECTIONS FOR THE INCLINATION OF THE MERIDIANS IN THE LAMBERT PROJECTION AS COMPARED WITH THE TRUE MERIDIANS.

It is obviously impossible to represent a spherical surface on a system of rectangular coordinates so that all the lines of the coordinates will intersect each other in perfect squares, and so that the series of maps will fit together, and so that the lines of the Y coordinates run straight north and south on every map. To overcome this difficulty a projection called the "Lambert Projection" is used. Without going into details it may be said that the farther one gets away from the origin of the system of maps (X O, Y O) the more the Lambert meridians are inclined to the true meridians. It is a simple linear correction easily worked out by formula, but most readily taken from a table in the Ephemeris and azimuth tables published for the American Expeditionary Forces by Maj. Birdseye.

This correction is applied to the astronomical observations in order to convert reference lines from "true" to "Lambert" bearings. All the work for the firing is finally converted into the Lambert system. The French use the expression "gisement" for Lambert bearings, the angles being measured from north in clockwise direction.

ORIENTATION.

It is very easy to calculate the distance and the Lambert bearing or "gisement" of the line of fire, but this is not sufficient to shoot with unless we know which direction on the ground is "Lambert north." From the map one could pick out or could calculate the direction of a line between two landmarks. But this would not, in general, be accurate enough. Astronomical observations of the sun or stars, or an observation of polaris by theodolite, are considered necessary. The theodolite is put over a stake and zeroed on some other object to obtain the true azimuth of a reference line by astronomical means. By applying the correction described above, the bearing of this reference line is converted from "true" bearing to "Lambert" bearing. If we have an accurate "Lambert" bearing of any reference line obtained in this way, it is simply a matter of running a traverse over to the gun sight to orient the gun according to the Lambert system with all the accuracy which astronomical observation will give. Orientation work is therefore simply the taking of azimuth sights (true) and correcting these to convert to the Lambert system, and applying this information to the gun so that it is given the desired orientation in the Lambert system, which then makes everything agree on the map.

Solar observations, which were the ones most frequently used, are the only ones which will be described here. The theodolite is pointed

at the sun and a card held a few inches behind the eyepiece. With a little adjustment, a very clear image of the sun's disk and the two cross wires is obtainable on the card. The altitude, and azimuth, and GMT are read with the image of the sun's disk tangent to the two crosslines in each of the four quadrants which they form. The average of the reading with the sun's disk in these four positions thus eliminates the semidiameter and gives the time, the altitude, and the azimuth reading of the sun's center. According to the theory of the instrument, one should further read and similarly averaged after reversing the telescope in order to eliminate instrumental errors, but this is not necessary with a good instrument. Torpedo-boat watches keeping Greenwich mean time were supplied to all batteries.

The cos $\frac{Z}{2}$ formula was used, as it was shorter than the tan $\frac{Z}{2}$ formula used by the French and the American Expeditionary Forces.

BORE SIGHTING.

Shore artillery sights are panoramic sights, i. e., in indirect fire the sight is not pointed in the direction of the line of fire, but on some aiming point usually well off to the side or in rear. One knows the Lambert bearing from the sight to the aiming point. He knows the Lambert bearing of the desired line of fire. The difference is the "aiming angle" and this is set on the sight. The gun is then adjusted by training slightly until the sight bears on the aiming point.

The guns of the naval railway battery had no artillery sights. Some British sights were ordered but could not be obtained in time. Special sights could never have been manufactured in time, but the theodolites fulfilled the purpose perfectly. On each side of the gun carriage and attached to the deck lug was an arm carrying a square surface with two dowel pins in it. The theodolite was screwed on a small square brass plate with two holes in it and, for laying the gun, it was put in its place on the arm so that the dowel pins fitted in the holes in the plate. It had to be taken off each time to fire the gun, but after some drill and practice this caused no loss of time because the gun was generally laid in azimuth and the sight removed before it was loaded, laid in elevation, and ready to fire again.

The difficulty was to insure that on each round the zero of the sight was pointed in the direction parallel to the axis at the bore. The axis of the right sight was found by drawing and by careful measurement to be $63\frac{3}{4}$ inches from the axis of the piece. The gun was bore sighted by battens at a distance of several hundred yards. The sight was then swung to the left until the vertical wire was tangent with the muzzle of the gun. On one gun the reading on the scale was 354° 8′. A very fine punch mark on the after end of the

gun carriage was made and usually kept filled with white chalk to make it visible. Swinging round to this, the reading was 182° 5′.

It will be seen that these two reference marks on the gun and mounting were at a long distance from the sight itself and were only 6° or 8° from the line of fire. One was in front and one was behind the sight. If the angle between them did not come out right we would split the difference. When one studies the distances and goes into the matter very thoroughly, assuming a reasonable amount of inaccuracy in the operation and that other errors may be introduced by the effect of sunlight on the gun bending the muzzle, the scheme compares most favorably with any other possible one.

When certain French artillery officers first examined the gun they were rather surprised by the improvised appearance of this sighting arrangement. It was explained that the mount had been built so rapidly that the conventional form of sight could not be manufactured, but that we were satisfied with the accuracy of the arrangement. They were invited to make a personal test by sighting on an aiming mark, taking the sight off, putting it on again by our reference marks, and then laying the telescope on the original aiming point. The first officer who tried it checked within something less than one minute of arc, and became very enthusiastic about the idea as being a remarkably simple and accurate arrangement. All artillerists in France who examined the sight thoroughly were rather impressed with it.

BALLISTIC CORRECTIONS, ETC.

Meteorological reports for the use of artillery were sent out by radio at short intervals of time from numerous stations along the front. These came simply as groups of numbers and, without going into the details of the code, it may be said that the information included the barometric pressure, temperature, the force of the ballistic wind in meters per second, its direction and height of observing station. The wind direction at different altitude was obtained at the meteorological stations by observing the drift of small free balloons as they rose and drifted. For nightwork, a series of balloons, each carrying a small explosive charge, was released at regular intervals. By means of sound-ranging methods, the positions in the air of the different balloons of the series were determined. They were set to explode at different heights. The same method was used in very cloudy weather. The wind velocity and wind direction sent out for artillery purposes are the "ballistic" ones. Wind velocity and direction are sent out for trajectories up to each 1,000 meters of maximum ordinate. We would look up from the range table what the maximum ordinate was. Perhaps it would be about 5,000 meters. We would then select from the report the ballistic data

for the ballistic wind tabulated as corresponding to a trajectory of 5,000 meters maximum ordinate. This would take into account the various conditions in the different strata, giving each one an appropriate weight, so that the figure given would be the proper one to apply to the whole trajectory of which the maximum ordinate was 5,000 meters. Usually the reports ran up to only 5,000 meters. Sometimes our maximum ordinate was 10,000 meters. Then we would have to exterpolate or, on occasions, obtain the special data on request.

CORRECTION FOR BAROMETER.

Our range table standard was 750 mm. (29.53 inches). We would find the difference between this and the barometric height reported by the meteorological radiogram. A further correction of about 1 mm. per 11 meters difference in level between the observing station and the gun was also made. The difference between the actual barometer and the standard, converted to inches, is multiplied by the "change of range due to difference in the barometer" given in the range tables.

CORRECTION FOR VELOCITY LOSS.

This is composed of two factors. One is the erosion loss estimated as on shipboard, while the other is the correction for the powder being at a temperature less than 90° F. Using the rule given in the range tables of 2 foot-seconds velocity loss per degree F., we added together the velocity losses from both erosion and powder temperature, and had only to multiply this by the appropriate column of the range table. Powder temperature was very low at times. Often to get the desired range it was necessary to improvise steam heaters to warm up the powder till the temperature was more nearly standard. Armies have a much lower standard temperature than the United States Navy.

CORRECTION FOR TRUNNION TILT.

Most artillery sights allow for this by cross leveling. Not having that sort of sight involves no disadvantage, however, as it is easy to measure by clinometer how the trunnions are tilted and, by a simple correction, allow for this in the effect of changing the line of fire. The effect on range is negligible. The effect in deflection measured in minutes numerically equals the elevation in degrees—times the tilt measured in degrees. This is a sufficiently accurate formula well known to artillerists, which need not be deduced here.

WIND CORRECTIONS.

The ballistic wind is resolved into two components, one along the line of fire and one across it. With these two components it is

only necessary to multiply by the appropriate figures from the columns of the range table in order to get the effect on the range and on the deflection. The deflection for a lateral wind was given in the range tables in degrees and minutes and not in knots per hour, as in the ordinary range tables.

As the wind velocity is given in meters per second, and the range table is made for velocities in wind of feet per second, there was a complication of units. Also the French give the wind directions in a peculiar way by means of series of numbers from 0 to 40. North is 0, east is 10, south is 20, and west is 30, and the subdivisions are all equal. It is a good way to designate the wind direction but is troublesome for our units. Our sights, unlike practically all other artillery on the western front, were graduated in degrees (theodolites being generally marked that way). To facilitate rapid conversion and resolution of the wind into its two components, and in order to make these come out in feet per second, a simple "wind resolver" was improvised.

There was an outer circle called the wind circle with the wind direction numbers on it. North was at the top of the card. There was a revolving inner circle called the gun circle (with a rough sketch of a gun on it) graduated in degrees around the edge. This was rotated so that the gun and meridian were shown in proper relative positions. The wind scale was pivoted in the center. This pointer could be turned to its proper direction by the numbers on the wind circle. Its scale was graduated so that wind in "meters per second" could be properly measured off in the appropriate direction from the center of the gun circle. The gun circle had squared section paper so that the longitudinal and transverse wind could be resolved graphically. The units on the wind scale were of such length as to effect the change from "meters per second" to "feet per second" in resolving the wind. This device worked very satisfactorily in not only resolving the two components rapidly and with little chance of error but in making the conversion to the desired units at the same time.

DRIFT CORRECTIONS.

The drift was tabulated in our range tables in degrees and minutes instead of in yards, as that was the form in which it was used on the sights. As the gun could be trained through only a very small arc, the pit was always installed with its axis not in the exact line from gun to target, but pointed slightly to the left to allow for the drift and so that there would be an equal amount of training adjustment on both sides during the firing. Sometimes we would also add, as a further refinement, another correction for the average value of

the prevailing cross wind, but this was only possible after considerable experience in the particular sector.

GRAPHS TO FACILITATE CALCULATION OF THE CORRECTIONS FOR BAROMETER, VELOCITY LOSS, TEMPERATURE CORRECTION, TILT, CROSS WIND, AND LONGITUDINAL WIND.

It would perhaps seem from the foregoing that we had reduced calculations so that only a small amount of multiplication or slide-rule work remained to be done. It was found that errors were unfortunately very liable to creep in. Furthermore, the corrections might be applied with the wrong sign. Therefore it was decided to plot the values so that they could be picked off of curves. These curves would also convert into the proper units. Whether the point picked off the curve was above or below the X coordinate would show whether the correction was to be added or subtracted.

The first thought was to make a sort of universal chart, but the different scales and different lines on it were so thick that they were confusing and almost as many errors could be made by the plotted curves as would have been made by multiplying out. It was therefore decided to plot each one of these corrections on a separate sheet.

Even when this was done there were a large number of sheets, and on each was a network of curves corresponding to the different effects at different ranges. As can be realized from their nature, these curves were simply straight lines. In each case there was one point of the standard conditions which did not require calculation. To make a curve, one need only perform one multiplication operation, plot that point and draw a straight line through it and through the point representing standard conditions. But, as said before, if there were several curves on each sheet it was not absolutely certain that the right one would be picked out in a hurry. The process was therefore carried one step further. On each of the correction sheets there was only one curve drawn, and that was for the particular range at which it was intended to fire. This would at first sight appear to be a great waste of paper, but in the long run it paid. As it took several days to put in the pit, it was not requiring too much labor to insist that, for each firing, a complete set of curves should be worked out good for that range and for no other range. With these before us and all old sheets put away, one was absolutely certain that what was picked out was correct and was not for some other conditions. The curves were marked with the name of the town where the firing position was. Their manufacture could be delegated to people with very little mathematical training. For example, the curve barometer correction was given in yards on the Y axis and the height of the barometer in millimeters on the X axis.

It is believed that many small errors were avoided by using the curves of this extremely simple form, each sheet good only for the particular gun position and each sheet containing only one kind of curve. Others were seen who were interested in making all sorts of computers and series of universal curves. Their great objection to our method was that it was not universal. One could readily have made universal curves if desired, but it was preferred not to do so.

AIMING POINTS, ETC.

When it is intended to send a railway gun to any part of the front to undertake firing at a certain target, a suitable firing position is roughly selected by those designating the target. Toward the end of the war there were on practically all parts of the front curved spurs or "épis" from which railway guns were ordinarily fired. Sometimes the guns of the naval railway battery used these, but in one or two instances they had to put in the tracks themselves. In the latter case only a short spur was built off from the main line. Where there was a curved track already in place it was necessary to determine by means of a theodolite, the particular point on the track where the tangent was pointed in the desired line of fire. This was the part of the track where the gun was located for firing. A correction was made to allow for the fact that the pivot was not exactly midway between the two bogies on the ends of the mount. But this is a detail of putting in the mount best understood from studying the drawings of the mount itself. Usually the old French firing positions were well surveyed and the tracks marked to show the direction of the target at intervals along the rails. It was always advisable, however, to check this up.

Aiming points of various natures were selected. Almost everywhere in France there were prominent steeples on churches which served admirably for aiming points. These could not be seen at night, however, and in some ways it was always more convenient to set out a small stake a couple of hundred yards away from the gun. For night work a small light could be put on it. When in the woods the aiming mark was usually quite close. As the mounting might settle back a considerable number of inches during firing, it was better to have the aiming point well behind the gun and fairly in line with it rather than off too near to 90° on the side.

The gun was first put in on the pit with approximate accuracy. By means of astronomical observations, previously described, the Lambert direction of some fixed base line was determined. From a position on one end of this base line, the theodolite was sighted first along the line, and then swung over to the aiming stake and the angle read. The theodolite was then set up over the aiming stake and

pointed at the place on the gun where the sight would go. From the position on the aiming stake, the angle was measured between the end of the base line previously occupied and the sight on the gun. By means of this sort of traverse, the Lambert direction between the sight on the gun and the aiming point was determined. One had then only to set on the sight the difference between the Lambert direction in which we were to fire and the Lambert direction of the aiming point.

COMMUNICATIONS.

All calculations were made in a control station which generally was either in a dugout, if one was convenient, or an unused house or a simple wooden booth constructed and set up in the field one or two hundred yards from the gun. On occasions it was very convenient to use an old railway car as a battery control station. Duplicate telephone lines ran to the gun. There was a telephone operator alongside the gun in a very small wooden booth. This was located as close as possible to the sight. Elevations and aiming angles were repeated back as a check. The gun layer wrote them down in chalk in large numbers on the side of the mount as he heard them repeated back to the battery control station. The telephone operator would watch to see that they were properly written, and correct them if they were not. Other telephone lines ran to the gun train, which was perhaps half a mile away, and connected up with the lines running to artillery headquarters.

The spotting plane was communicated with in three ways, (1) by radio, (2) by laying out large strips of cloth or "panels" on the ground arranged in various fashions, and (3) by searchlight signals.

It was usually most convenient to have the radio operator in the control station so that as he got the spotting correction from the plane, one could look over his shoulder and see him write it down. In positions in the woods where the antennæ could not be set up among the trees, it was necessary to have him in the open and communicate by telephone.

Wherever the ground was sufficiently clear to permit it, the panel squad operated out in front of the control station so that the word could be passed to them direct and their work seen. Quite often, however, the panel squad also had to be at a distance, as for instance, on the side of a hill where their signals would be more visible. In this case they were connected with the battery-control station by telephone, their telephone operator being sheltered by a small wooden booth in the field.

The searchlight signals were operated by French personnel, who brought their searchlight with them on an automobile. The motor of the automobile generated the power. The searchlight was kept

sighted toward the spotting plane and signals were flashed to it. Usually the searchlight car was put near the battery-control station, but it was not always a good idea, as the generator might interfere with the wireless receiving meteorological reports.

When several guns were to be fired at once, each would have its own battery-control station, and the officer controlling the group of guns would have a station communicating with all the battery-control stations. In this he would work out ballistic corrections and give spotting corrections, etc., which the different battery control individual stations converted into terms of their own aiming angles and gun elevations.

As a matter of fact, the wireless was the only one of these three methods worth much. Signal panels on the ground could not be seen unless the plane came a long way back to look at them. The same was true of the searchlights. Both searchlights and panels were methods previously developed for spotting at much shorter ranges where the plane, from its position over the target, could simply look back and see the signals. But in firing at 35,000 or 40,000 yards conditions were quite different, and these two methods of signaling were important only as auxiliaries in case the wireless broke down, and probably even in that case they would be unsatisfactory.

FIRING PROCEDURE, ETC.

Even when not firing, the weather signals were received and recorded and, from time to time, ballistic corrections were worked out for practice and so that fire could be opened without much delay. The gun was generally left laid at the normal aiming angle. When it was intended to fire, the ballistic corrections were applied to the map range and the corresponding elevation from the range table was picked out and telephoned to the gun with the corrected aiming angle. Signals were sent by radio, by the panels, and by the searchlight to tell the spotting plane when the battery was ready to fire and when each shot was fired. The spotting plane would indicate by radio when it was ready to observe, etc., using a special abbreviated code.

In the battery control station there was a spotting chart showing on a large scale the vicinity of the target. It was marked with a series of numbered lines for each 100 yards over or short. Plotting any reported point of fall, one could see at a glance the correction required to correct to the center of the target. There were similar lines showing the angular correction which had to be applied to the aiming angle to make the deflection corrections. The direction of the line of fire was drawn through the target.

Spots were received in meters over and short and right and left. The spotting chart was a map in metric units. By means of a pair of dividers the reported point of fall would be plotted on the spotting chart. The series of lines on this chart would show what corrections in yards of range and in aiming angle were necessary. The new corrected aiming angle would be transmitted to the gun first because the gun could be traversed during loading. The elevation followed, as it could not be used until the gun was reloaded and run up in elevation.

The hand elevating gear required considerable effort and sometimes fresh relays to work it were necessary. It was the time required for leveling and elevating which practically determined the firing interval. This was between three and five minutes for continuous firing, but often the firing, particularly if without observation, was ordered to be proceeded with at longer and irregular intervals. At extreme range the time of flight was about a minute and a half.

In firing at a fixed target it is not theoretically correct to apply the full spotting correction each time, because even when the center of impact is properly placed the individual shots will fall irregularly about it and if the range is corrected each time it will only result in unnecessarily distributing the mean point of impact from round to round. If, for instance, we have got on the target with 19 rounds, spotting each time, and then fire the 20th round, the information which this 20th round supplies is not entitled to full weight, for this, by implication, would be assuming that all the previous 19 rounds were worthless data. It is only one round in a series of 20 and is entitled to a weight of about one-twentieth as indicating what correction should be made to properly locate the center of impact. Thus there is a common rule in artillery to apply the full correction on round 1, half the spot on round 2, one-third on round 3, and one-twentieth of the observed spot on round 20, etc. This is based upon the assumption that each shot in itself is as good evidence as any other in the series.

The rule of dividing the spot by the number of the round before applying it is much better than applying the full correction, but still there are certain objections to carrying this to the extreme. If we fired 100 rounds, according to this rule, toward the end we would be dividing the spots by such large numbers (100, etc.) that we would be getting practically no corrections at all. If ballistic conditions had changed very much—for instance, suppose a strong wind suddenly sprang up—corrections of this nature would never get us back to the target in time. They would tend, of course, to work our center of impact toward the target, but at a very slow rate. Perhaps before the process had moved the center of impact of the gun very

CAMOUFLAGING GUN AFTER FIRING.

14-INCH SHELLS; WEIGHT 1,400 POUNDS EACH.

far in the proper direction the wind effect might increase faster than the corrections being applied or the wind might change again in direction. A strict adherence to this sort of rule, while ballistic conditions altered rapidly, could not give very good results. There is a limit to which this dividing rule can be carried. The slower we fire and the more changeable the conditions are the sooner we must stop increasing the size of the divisor.

For guns of this character very few advocate carrying the process beyond a divisor of 6. On 5-minute intervals this means that rounds fired more than a half an hour previously are more or less "ancient history" and the more recent rounds, though fewer in number, are the ones entitled to the greater weight because they are based on fresher ballistic data. Some would not carry the divisor over about 3.

When the sizes of probable errors, the transmission intervals for spots, and the details of maneuvering and signaling from the spotting plane are all carefully studied a very conclusive case can be made to prove that better results are obtainable by firing the guns of this nature three rounds at a time at fixed intervals and spotting afterwards from the mean of the group of three shots. The spotting plane frequently misses a spot, but it should always get something out of a series of three, especially as it knows better where to look for the shots when all three are fired at the same elevation and deflection. Advantages and disadvantages of the system of spotting by groups of three could not be explained here without going into an undesirable amount of detail, but we were convinced that it was by far the most satisfactory plan for observed fire and generally adopted it. Firing this way, in groups of threes, and each time working with the mean spot of the group, one should not employ such large divisors as when spotting individual rounds, because each spot, of course, represents three rounds fired.

In passing it may be well to suggest that "free spotting" in naval gunnery is not an exception to the principle of using a divisor before applying the spot. It is more properly described as a special case where a divisor of unity is employed because of there being so many shots in a salvo and because the rate of change of range varies rapidly and is in a way difficult to predict with accuracy.

AIRCRAFT OBSERVATIONS.

For gunnery work at extreme range it is always endeavored to fire with aircraft observation. To do this, however, conditions must be almost ideal. The spotting is ordinarily done from a height of 5,000 or 6,000 meters, and so is impossible when the clouds are lower. Often from the ground the weather conditions look ideal and clouds are sufficiently high and plenty of sun. But there may be a very

light low-lying mist which is not apparent to observers on the ground, particularly as they look upward. It is much like looking out of a window through a thin flimsy window curtain. One can see the street perfectly, but passers-by can not see into the house. So a very thin low-lying mist may be unnoticeable to those on the ground and yet prevent spotting from aircraft. Time after time the spotting plane will signal back "observation impossible" till those who are prepared to fire find it difficult or impossible to believe. Firing is required in connection with offensive, yet when an offensive is planned so many other things are involved that it is not always possible to select the particular kind of weather specially suited for this sort of spotting. The air is full of all sorts of radio interference, and the spotting planes are particularly actively opposed by the enemy guns and aircraft. Spotting is ideal for long-range gunnery work, but in the heat of an offensive conditions are far from ideal for spotting. So it results that, while railway artillerists are taught and told that they will normally shoot with observation, when the time comes they find at the last moment to their disappointment that they must get along without it. Perhaps 5 or 10 per cent of the firing is all that is possible to have aircraft observation for.

From the nature of these circumstances, it results that most instructions and courses tell lots about firing with observation and have little to say about firing at the longest ranges without it. Firing with observations is after all, a relatively very simple matter. Firing without observation is the actual condition in the vast majority of cases. It involves some of the most complicated parts of the theory of probability, and the application of it to the work has been very poorly worked out. Strangely enough, then, this most important phase of the use of railway artillery has received but relatively little attention. Instruction books dismiss it with a paragraph or so to the effect that some sort of zone fire should be used and that, "for these very unsatisfactory conditions," one should just endeavor to do the best he can. It would seem more logical to devote the greater part of our study to this most important kind of gunnery. To illustrate this point, and to explain the subject better, an example of methods used by the Naval Railway Battery in such work will be given.

EXAMPLE OF FIRING WITHOUT OBSERVATION.

We must start by clearly understanding the kind of errors introduced when one fires without observation. We can separate two entirely different kinds. One is the error of fire control and the other is the dispersion of the gun itself.

One may understand by the fire-control error the error arising from inaccuracies in orientation, map work, determining the exact

location of the target by reconnaissance, and most particularly the error due to imperfectly determining the ballistic conditions and calculating and applying corrections. From these causes we may, in general, expect the center of impact, without spotting, to lie not on the target, but at a distance from it. The best evidence of what this error in calculating the ballistic range and deflection corrections amounts to is the records of previous firings which were spotted. After a considerable amount of firing, it was tentatively estimated in a Railway Battery memorandum of October 27 that the mean error in range would be 193 meters and the mean error in deflection would be about 104 meters for the distance between the target and the center of impact as it would be placed by calculation. This, at longe range, is the degree of accuracy with which it could be expected, on the basis of previous results, that the ballistic calculation would be made.

We could not, in other words, count on getting the center of impact closer than within about four times these distances from the target. The center of impact would come somewhere within an ellipse 772 meters long and 416 meters wide, drawn around the target. To state it rather more approximately, the center of impact would fall not more than 400 meters from the target in range and not more than about 200 meters from it in deflection.

The other error which we have to contend with is the well-known dispersion error of the gun. In the Proceedings of the Naval Institute of June, 1919, page 953, as the result of 24 observed rounds fired by the Naval Railway Battery at over 35,000 yards, the range error averaged 151 yards and the deflection error 51 yards. One typical target to be fired at was a freight yard, or "garage," composed of parallel tracks about 10 in number and about 1,000 meters long. There were probably a lot of freight cars on it, and the idea was to destroy these and to cut up the tracks. The longer dimension of the freight yard ran at right angles across the line of fire. The problem was how best to scatter the shots in firing without observation so as to insure the maximum damage. There is much more to this problem than simply to pick out the center of the target and fire all shots at it without change of range or deflection. We knew from the preceding data that the center of impact might be anything up to 400 meters from the target; in which case there would be but little chance of much damage being done. If the center of impact were in the extreme unfavorable position, only one corner of the pattern would lie across the tracks and it was quite likely that the tracks might not be cut.

One tentative scheme was to fire the intended 20 shots across the middle of the track at ranges differing by about 40 meters so that the whole 800 yards would be swept by a sort of ladder, commencing perhaps at the shortest range and increasing range regularly. In other

words, the shots would be fired evenly spaced in range over a distance great enough to insure that the ladder would cross the track. This did not look so very good, as we were sweeping in range with an average density of only about one shot per 40 meters and had little hope of counting on more than one shot in the tracks.

It was considered desirable, if we were going to do this sort of firing, not to start at one end and work toward the other because it would give the enemy more time to remove rolling stock if the shooting approached the tracks regularly from one direction. It would be better to start in the middle and work both ways alternately.

Another objection was that it was hardly possible to miss the target in deflection, yet we were failing to take advantage of this fact in order to spread the damage out as much as possible.

As far as was known, one end of the target was as good to hit as the other. The railway cars might be scattered all over any part of the tracks. It would thus be better to incline this ladder so that it would cross the target diagonally. On other firing we had noted the damage done at a distance by fragments from projectiles which did not make actual hits but which landed near the target. Telegraph poles were cut by fragments. Fragments had gone through sides of buildings and through railway cars. A good number of the shots would be misses. If the ladder were diagonally disposed, each miss might be within striking distance of some of the hitherto untouched cars along the track, i. e., within striking distance from them as far as the effect of the fragments was concerned. It would be an advantage to do this along the whole length of the freight yard, which was about a kilometer long, instead of only standing chances of doing distant damage only in one particular place. In fact, if we failed to sweep in deflection we might be working along only one end of the freight yard while all the cars were in the other end, whereas it was just as easy to cover the whole length.

Considering it a little further, and studying it along the same lines, it seemed that, instead of shooting 20 shots in a sort of diagonal ladder to sweep across the track in range, it might be better to put the shots on the two diagonals with 10 shots in each diagonal. We would not place the ends of the diagonals quite as far to left or right as the ends of the target, because we might in the extreme shots miss the target completely due to the chances of making something up to 200 meters error in deflection in the ballistic calculations. The idea was to keep clear of the extreme ends by about this 200 meters and to use a rectangle this much narrower than the target and about 800 meters in range, space the shots evenly along the two diagonals, and start at the middle and work out toward the edges. While we were at it, we might as well work around in a spiral fashion, in shooting successive rounds.

There were still certain objections to this procedure. One was that the shots would, of course, not go exactly where they were calculated to go, but would scatter somewhat because of the dispersion of the gun. This would have the effect of tending to persuade us to make our rectangle which was to be swept somewhat shorter in range than the full size of the 800-meter ellipse previously described. The dispersion in deflection tended to persuade us to narrow the area we were sweeping in order to reduce the chances of wasting any shots beyond the edges of the target.

Another thing is that the target itself was not merely a line of no width, but had an appreciable width. If this were 50 meters, we might well subtract that figure from the 800 meters and sweep up to perhaps 375 meters over and 375 meters short.

Another consideration is that it does not look like doing the most efficient thing to sweep the whole area with the same density of fire. The target is more likely to be found in the middle than it is on the edges of the area which is being swept. There ought to be some law enabling us to group the shots more densely in the middle and thin them out somewhat toward the edges. As the deduction of any such law was beyond our mathematical ability, we contented ourselves with guessing at it by eye.

Although it appeared, as explained above, that because of dispersion there might be objections to sweeping quite so large an area as that described above, it was thought that our data as regards accuracy of making the ballistic calculations might be somewhat over-optimistic. Allowing for this, it was concluded that it was fairly safe to sweep the rectangle 800 meters long and 400 meters narrower than the track and run around in a spiral form in firing, using the greater density in the middle.

As a digression, it may be pointed out that we have now enough data to understand and to formulate what the general problem of firing without observation is. The target is an area of any shape. We have a mean error with which the center of impact will be brought onto the point where it is intended to put it. We have the mean error with which the accuracy of the gun will place individual shots in reference to the center of impact. We have the hypothesis that all parts of the target are equally vulnerable. We have the condition that it is preferable to have impacts scattered over the target area rather than all to land in the same hole. If flying fragments will do some damage from a distance, it is better to have the misses distributed around on all sides, so that all sides of the target will get some hits from fragments rather than have them all come from the same side. It is better to have a system which will not sweep gradually all in one direction, as that would facilitate the

enemy's escape or enable him to more readily remove material. With this information given, the problem is to find the law which will enable one to do the greatest amount of destruction in the firing.

This is a difficult problem, in which some qualified mathematician might well interest himself. Everyone seemed to approach matters of this kind differently. A surprisingly large percentage of artillerists seemed to have no special ideas on the subject, and the ideas that the others had were usually conflicting. Many would make no endeavor at all to do anything but fire all shots at the middle of the target. Certainly some sort of standard procedure would result in improving the efficiency of this very important kind of firing. A thorough investigation could not fail to pay for itself, because if the efficiency of this sort of firing were increased by, say, 2 per cent over what it would be by haphazard methods, the total improvement would be tremendous in a war.

Returning again to a description of what the naval railway battery actually did, it may be stated that, in general, we marked off about 400 meters beyond the near edge of the target and marked off about 400 meters in front of the far edge of the target. We would draw a line about 200 meters to the left of the right edge of the target and a similar line following the left edge of the target, but displaced about 200 meters to the right. The irregular area thus defined or something of that shape, but somewhat smaller, would be marked on the map and a spiral going around a couple of times would be drawn by eye. Points equal to the number of rounds to be fired would be marked off on this. They would be placed by the eye somewhat thicker in the middle than on the outside. In firing without observation the rounds would be calculated to strike in these places.

RESULTS.

There was perhaps not so much extreme range firing done by guns other than those of the railway battery as might be imagined. Although their time on the front was not so very long, actual firing experience was accumulated at a comparatively rapid rate, and, as is well known, the ranges fired at were the longest of any allied artillery.

The appended drawing gives the actual results of several firings, some without observation and some with observation.

EXTRACTS FROM THE LOG OF THE UNITED STATES NAVAL RAILWAY BATTERIES.

[Prepared by the Bureau of Ordnance.]

The following copious extracts from the logs of the five naval batteries are given to show details of their movements and operation. The logs previous to the departure from St. Nazaire, comprising the preparatory period, are not given, with the exception of a note on the arrival of the first contingent, showing the daily routine and a report by Lieut. Commander G. L. Schuyler, which sheds light on the difficulties encountered in unloading the ships and handling the material, as well as the lack of preparation for so considerable an enterprise.

ST. NAZAIRE, FRANCE, *June 10, 1918.*

First men of the United States naval railway batteries arrived in St. Nazaire, France, at 9 a. m., totaling 9 officers and 250 men. Were transported in United States Army trucks to Army camp No. 1, base section No. 1, and placed in barracks until suitable barracks could be constructed at camp No. 9.

The following daily routine was put in effect:

6.00 a. m. Reveille.
6.45 a. m. Breakfast.
7.30 a. m. Policing of grounds and barracks.
8.00 a. m. Assembly for muster. All working details to be assigned immediately after muster.
8.00 a. m. Sick call.
8.30 a. m. Quarters inspected by the officer of the day.
11.30 a. m. Recall.
12.00 noon. Dinner.
1.00 p. m. Assembly for muster. All working details to be assigned immediately after muster.
4.30 p. m. Recall.
4.45 p. m. Mess gear.
5.00 p. m. Supper. Liberty parties from 5 p. m. to 7 p. m. every half hour when liberty is granted.
9.45 p. m. Tattoo.
10.00 p. m. Taps. All lights out. Master at arms to report to officer of the day all absentees. Liberty parties on Sunday at 1 p. m., when liberty is granted.

Lieut. Commander Garret L. Schuyler, United States Navy, temporarily in command until the arrival of Capt. C. P. Plunkett, United States Navy.

ST. NAZAIRE, FRANCE, *June 18, 1918.*

The following report made by Lieut. Commander Garrett L. Schuyler, United States Navy, is inserted in the log, and shows the arrange-

ments made for handling the unloading of ships and the storage of supplies and spares, etc., upon arrival:

Dock No. 14 with a 150-ton crane has been designated for unloading the guns and heavy lifts. The gun mounts will be put together under this crane. A French company owns the crane. Port facilities will not permit all of the light material to be taken off at this dock. Ships will be sent to some other dock which at the time is empty and move down to the crane only when the time comes for the gun and mounts. The French commandant has been informed, but thinks it is not yet time to enter into any negotiations. The yard is somewhat congested and may have to be cleared. There is a large crane in the locomotive shop which it is believed will lift the guns and may be convenient for such jobs, but the difficulty is to get the guns and mounts under it, and unless the weather is very bad or the docks become too congested assembling on the dock seems wise. There is so much congestion that the trucks for the gun mount had probably better be prepared in the locomotive shop and only brought down to the dock when they are ready for the final assembly. Possibly this could be done on some of the open track space off the dock.

Car erecting tracks.—It is proposed to use the space on either side of the erecting tracks for parking trucks and sections of the cars and to put these together by means of the locomotive cranes running on the opposite track. There is similar car-erecting work going on near there all the time. If track space does not permit, this work can be done on the sidings near the Montoire storehouses. There is more room there, but fewer cranes and other facilities. The original plan calls for a switch at the far end of the erecting track, so that all cars can be moved off in that direction. This it is not believed will be necessary, the idea being to erect the sides of the car, etc., on these trucks and as soon as possible to move them out to the Montoire storehouses, where the whole battery train can be assembled and where the work of setting up the smaller parts inside of the cars can be more satisfactorily done. There is no room to do this on the erecting tracks.

Storehouses at Montoire.—These are excellent storehouses, but were filled with potatoes when assigned to our use. The depot quartermaster has charge of these potatoes and is clearing out the far end of it for us. It appears that the floor under the potatoes has sagged in many places, so that rather than repair it it may be simpler to use another part of the floor. It was at first intended to quarter the men in one end of this storehouse, but conditions did not seem very sanitary, with rotting potatoes under the storehouses and stables, colored and Chinese labor very close. It is believed that an office for the paymaster should be built in this building, or else the very small barracks just across the road cleared of potatoes and put to this use. Some of our people will have to stay here nights, as there is much loss of stores in this part of the warehouse. When the sleeping cars are assembled it would be most convenient to have these moved down near this storehouse.

From the Battery Logs.

August 14, 1918.

Battery No. 1.—St. Nazaire, France: Received crew on board at 6 p. m., with bags and hammocks. Lieut. James A. Martin, U. S. N., commanding; Ensign Roger Allen, U. S. N. R. F., assistant to commanding officer; and Ensign L. J. Linhard, U. S. N. R. F., assistant to commanding officer.

GUN FIRING; THIERVILLE.

58—1

GUN FIRING; THIERVILLE. ANOTHER VIEW.

58—2

AUGUST 15, 1918.

Battery No. 1.—All hands engaged in preparations for leaving St. Nazaire—getting stores aboard, etc. Commander G. L. Schuyler, U. S. N., and Lieut. L. M. Morris, M. C., U. S. N., came on board for temporary duty. At 2 p. m. left St. Nazaire for freight yards at Montoire, arriving at this place 4 p. m., and awaited further orders. Liberty to men at 5.30 p. m.

AUGUST 16, 1918.

Battery No. 1.—All hands engaged in taking on stores, shifting ammunition, straightening up, and filling water tanks. Had gas-mask drill. Paymaster G. Eubanks reported on board for duty with No. 1 and No. 2 Batteries. Liberty to men at 6.

Battery No. 2.—Battery, with 38 men, left St. Nazaire and stopped at Montoire yards with Battery No. 1.

AUGUST 17, 1918.

Battery No. 1.—All hands continued with preparations for departure; overhauling guns, etc.

Battery No. 2.—All hands making preparations for departure for front. Assistant Secretary of the Navy (Roosevelt) made an official visit to the batteries at Montoire yard.

AUGUST 18, 1918.

Battery No. 1.—Commander Schuyler left train 1 for train 2 at 7 a. m., and at 7.30 a. m. Rear Admiral Plunkett came aboard. Left Montoire yard at 8.22 a. m. Arrived Bouvron at 1.30 p. m. Left Bouvron at 3.22 p. m. Arrived Blain at 3.44 p. m. Stopped here, having hot boxes, and had gas and first-aid drill. Crew, accompanied by an officer, for exercise walked around town. Left Blain at 5.55 p. m. Arrived Nozay at 6.50 p. m. Left Nozay at 7.03 p. m. Arrived St. Vincent-des-Landes at 7.55 p. m. Left at 8.06 p. m. Arrived Château Briant at 8.55 p. m. Remained here all night. Hot boxes delayed the train greatly. Every opportunity was taken advantage of to allow boxes to cool down and to repack them.

AUGUST 19, 1918.

Battery No. 1.—Left Château Briant at 9.32 a. m., having been delayed due to the fact that the engine was put in a French round-house overnight, and, the French having worked on it, it was necessary to fix up leaking flues. Arrived Pounace at 10.31 a. m. Left Pounace at 10.43 a. m. Arrived Combrée at 11.21 a. m. Left Combrée at 2.20 p. m. Arrived Segré at 3.03 p. m. Left Segré at 4.50 p. m. Stopped en route to next station on account of journal trouble. Left here at 6.10 p. m. Arrived Château Gontier at 6.50 p. m. Remained over night. Journals still continued to run hot.

Battery No. 2.—Left Montoire at 8.40 a. m.

AUGUST 20, 1918.

Battery No. 1.—Arrived at Sablé 9.19 a. m. Left Sablé at 1.26 p. m. Arrived Avoise 2.02 p. m. Left Avoise 2.12 p. m. Arrived Noyen 2.45 p. m. Left Noyon 2.55 p. m. Arrived La Suze 3.30 p. m. Left La Suze 3.39 p. m. Arrived Le Mans

4.35 p. m., having done about 70 miles. Remained all night. Journals red hot. Liberty at 5.30 p. m. Received from French railroad at Le Mans barrel of oil and grease, also coal for engine.

AUGUST 21, 1918.

Battery No. 1.—Left Le Mans at 5.37 a. m. Arrived Connerré-Beillé 6.50 a. m. Left Connerré-Beillé 7.35 a. m. Arrived Laferte Bernard 8.42 a. m. Left Laferte Bernard 9.04 a. m. Arrived Nogent le Rotrou 10.02 a. m. Left Nogent le Rotrou 10.33 a. m. Arrived La Louppe 12.05 p. m. Left La Louppe 1.32 p. m. Arrived Courville 2.35 p. m. Left Courville 2.45 p. m. Arrived Chartres 3.40 p. m. Left Chartres 4.45 p. m. Arrived Maintenon 5.48 p. m. Left Maintenon 7.17 p. m. Stopped at siding above Maintenon awaiting passing train. Arrived Rambouillet at 9.15 p. m. Remained here all night. Took all old packing out of boxes and repacked. Journals running very hot.

AUGUST 22, 1918.

Battery No. 1.—Left Rambouillet at 8.13 a. m. Delayed 10 minutes awaiting passing trains. Arrived Versailles at 10.46 a. m. Left Versailles at 10.52 a. m. Air raid in Paris just occurred while here and were able to see barrage. Arrived Paris 12 m. Capt. Jackson, United States naval headquarters, came aboard and had lunch. He furnished us with fresh provisions. Delayed until 5.48 p. m. in Paris yard, due to faulty switching, etc., on part of French railway. Left Paris yard at 5.48 p. m., gun running backward. Arrived Louvres at 6.59 p. m. Left Louvres at 7.05 p. m. Arrived Chantilly at 7.15 p. m. Remained here all night. Mr. Buell's train, with extra trucks, caught up with us here, Admiral Plunkett having wired that these trucks be sent up to replace a set, the axles of which required a smooth surface. No lights were allowed to show. Alert sounded twice for German air raid. Worked as usual on packing journal boxes, cooling journals, etc. Mr. Buell, by the way, had No. 6 engine with him.

AUGUST 23, 1918.

Battery No. 1.—Left Chantilly at 7.33 a. m. Arrived Creil at 8.15 a. m. This town badly shot up. Put in new trucks in front on gun car. While this work was being done shrapnel from antiaircraft guns landed few yards from where men were working on gun. Pieces of the shrapnel were later picked up, some sticking into the ties, although at the time the men were ordered to cover. German plane had been observing operations below, and the French insisted on covering the gun up with a great piece of tarpaulin to act as camouflage. Admiral left train to proceed via auto to Helles Mouchy. Left Creil at 4 p. m. Arrived Mello at 4.49 p. m. Backed into siding to let four engines pass. Left Mello at 5.42 p. m. Arrived Mouy Bury at 6.04 p. m. Left Mouy Bury at 6.12 p. m. Arrived Helles Mouchy at 6.30 p. m. Backed into siding here alongside French naval railway battery train, which siding was located in a wood.

AUGUST 24, 1918.

Battery No. 1.—Helles Mouchy: Engaged in policing camp, building latrine, cleaning gun, and other routine work. At 5.30 p. m. crew given liberty until 9 p. m. Admiral Plunkett left battery for Paris.

Battery No. 2.—Arrived at Helles Mouchy at 8.30 p. m.

AUGUST 25, 1918.

Battery No. 1.—Engaged in scrubbing clothes, checking up all parts of gun, filling tanks, overhauling journal boxes on gun car. At 3.30 p. m. received tele-

gram from Admiral Plunkett to be ready to leave at 4 a. m., August 26, 1918, for Haussimont. Preparations for departure immediately started. Admiral Plunkett returned at 10 p. m.

AUGUST 26, 1918.

Battery No. 1.—Reveille at 4 a. m. Preparations made for leaving. In shifting a car of projectiles the Chef de Gare forgot the derailer and the car was derailed. French train crew came on board at 5.30. Left Helles Mouchy at 6, arriving at Creil 9 a. m. Arrived at Crépy 12 m., thence through Mareuil, Lizy-sur-Ourcq, arriving at La Ferte sous Jouarre 9 p. m. Remained on siding overnight.

AUGUST 27, 1918.

Battery No. 1.—Left La Ferte at 7.15 a. m., passing through Nogent, Château Thierry, Nozay, Dormans, Epernay, Mareuil, and other historical places, arriving at Haussimont (R. A. R. base) at 7.30 p. m.

Battery No. 2.—Left Helles Mouchy for Rethondes, in forest of Compiègne. Arrived at Rethondes at 4 p. m.

AUGUST 28, 1918.

Battery No. 1.—Shifting powder from box car to Navy standard ammunition car. In afternoon shifted projectiles. Left Haussimont about 4 p. m. for Nuisement (French proving ground), arriving at Nuisement 7.30 p. m. Began preparations for working on gun pit for next day.

AUGUST 29, 1918.

Battery No. 1.—Checked up angles on end of Épi, finding them wrong as given by the French. Attention of French was called to error and proper gisement determined. French were much impressed with our transit. They had a very accurate instrument, but in lieu of a plumb bob and a stake they used a bunch of keys for the bob and marked the location with their fingers in a very careless manner, offsetting any accuracy their instrument might possess. At 2 p. m. began excavating for pit. Soil was pure chalk, and therefore it was extremely hard digging.

Battery No. 2.—Commenced digging pit.

AUGUST 30, 1918.

Battery No. 1.—Continued work on pit. German planes came over frequently, necessitating antiaircraft guns in vicinity throwing up barrages. Set up a spotting glass and also broke out a machine gun, setting it up. Checked up bore sighting and worked on pit till 7 p. m.

AUGUST 31, 1918.

Battery No. 1.—Continued work on pit. At 3 p. m. put in transom bedplate, but found that it would not fit. Had to burn off flange with oxy-acetylene. Ran out of gas, so sent to Haussimont for same. Lined up pit, checking with transit. Lieut. Commander Schuyler reported on board to observe firing.

SEPTEMBER 1, 1918.

Battery No. 1.—Continued work on pit, commencing at 7 a. m.

Battery No. 2.—Twenty-two men, crane car, ammunition car, kitchen car, H. A. car, and equipment for another pit arrived.

SEPTEMBER 2, 1918.

Battery No. 1.—Continued work on pit, finishing at noon. Placed gun on pit. About 2 p. m. commenced firing. Fired four reduced charges (2,100 F. S.) and four full charges (2,800 F. S.). Balloon observation. While firing was taking place a German plane (observation) was seen flying directly above the gun, and at first it was feared that it was his intention to drop a bomb on the gun, this belief occasioning the Army officers who were witnessing the shooting to scatter. However, as he dropped nothing it was assumed that he was just observing. Antiaircraft guns in the vicinity kept firing at him, but, as in all such firing, the German planes appeared not to be worried in the least, the object of the firing being merely to keep them up in the air. However, this being an exceptionally clear day, he undoubtedly obtained any pictures he might desire. Upon completion of firing gun was removed from pit and preparations made for departing. Assistant Paymaster Eubank reported on board.

Battery No. 2.—Crane capsized with transom bedplate.

SEPTEMBER 3, 1918.

Battery No. 1.—Began removing pit at 7 a. m. Admiral Plunkett, Commander Schuyler, and Paymaster Eubank left train, proceeding via automobile for No. 2 Battery. Ensign Linhard went to Haussimont to look after stores. Lieut. Commander Buell reported on board, having brought cars and material from St. Nazaire. He then returned to Haussimont.

Battery No. 2.—Crane back on track; proceeding with pit.

SEPTEMBER 4, 1918.

Battery No. 1.—Finished loading all pit material by noon; in accordance with verbal orders left by Admiral Plunkett, endeavored to get orders issued to allow battery to return to Haussimont. At 3 p. m. left proving ground and pulled into siding at Nuisement. Unable to get ordre de transport. Had gas drill.

SEPTEMBER 5, 1918.

Battery No. 1.—Lieut. Martin left for Haussimont at 8 a. m. via motor cycle to visit French mission at Haussimont in connection with expediting ordre de transport for movement of train. Arrangements made for movement and for French crew. Had gas and first-aid drill. Gave liberty until 5 p. m. French crew reported aboard, and left at 6.25 p. m., arriving at Haussimont 9 p. m.

Battery No. 2.—Pit completed and gun placed in position. All hands had a swim in the Aisne. Crane base broke while placing base plate.

SEPTEMBER 6, 1918.

Battery No. 1.—Arranged train, adding battery headquarters (at Haussimont), also adding staff headquarters and an ammunition car, leaving USA 50296 and French box car (key to which latter was turned over to adjutant at Haussimont) on storage track. Awaited orders, which were received at above 9 p. m. to move. In the meantime, however, tanks were filled, telephone outfit procured from R. A. R., Mailly, also commissary and miscellaneous material obtained.

Battery No. 2.—Fired first shot at Tergnier. As enemy was evacuating city, no more shots were fired.

SEPTEMBER 7, 1918.

Battery No. 1.—At Haussimont: Disposed of mail at Army post office, requesting that Army censor stamp be placed thereon. Received orders to proceed to Noisy-le-sec, near Paris. Left Haussimont at 10.47 a. m. Arrived Sézanne at 1.24 p. m. Left Sézanne at 2 p. m. Arrived Esternay at 3.10 p. m. Left Esterney at 3.35 p. m. Arrived Lescherolles at 5.20 p. m. Left Lescherolles at 5.25 p. m. Arrived Laferte at 5.40 p. m. Left Laferte at 6.17 p. m. Arrived Coulommiers at 8.15 p. m. Remained overnight. French railroad inspector came aboard and stated that orders had been received from Paris to hold train until the road over which we had gone that day could be inspected, inspection to start at once.

Battery No. 2.—Left Rethondes at 12.30 a. m., arriving at Fontenoy-Ambleny at 5.30 a. m. Started pit at 9 a. m. Left first pit at Rethondes.

SEPTEMBER 8, 1918.

Battery No. 1.—Wired Commissare of Railroads at Paris for permission to proceed. No answer. Wired again, and received word to wait. At 3 p. m. received orders from Commissare Militare, Paris, to proceed by way of Fere Champenoise to Château-Thierry, which meant that we were to return over the route we had already traveled. French were afraid of three bridges between Coulommiers and Paris. Left Coulommiers at 3 p. m. Journals still running hot. Arrived at Esternay at 7.15 p. m. Remained overnight. Liberty for men.

Battery No. 2.—Continued work on pit.

SEPTEMBER 9, 1918.

Battery No. 1.—Left Esternay at 12.08 p. m. Delayed on account of a wreck ahead of us on track. Working party of 12 men, with Mr. Allen and Chief Hartmann, sent up to assist in relieving congestion. Arrived at Sézanne 1.28 p. m. Left Sézanne 2.01 p. m. Arrived Connaitre at 3.07 p. m. Left Connaitre at 3.12 p. m. Arrived Oiry-Mareuil at 6.05 p. m. Left Oiry-Mareuil at 6.10 p. m. Arrived Épernay at 7.30 p. m. Orders were awaiting us to proceed to Château Thierry, but, owing to rain, darkness, and heavy load over a roadbed that was not in the best of condition, Lieut. Martin insisted on remaining overnight. Gave liberty to men, making preparations also to leave at 4 a. m. the next morning.

SEPTEMBER 10, 1918.

Battery No. 1.—Left Epernay at 5 a. m. Arrived Château Thierry at 8.55 a. m. Coaled engine. Left Château Thierry at 9.40 a. m. Arrived Nanteuil at 11.20 a. m. Left Nanteuil at 12 m. Arrived Lizy-sur-Ourcq at 1.33 p. m. Left Lizy-sur-Ourcq at 1.52 p. m. Arrived Oisy-sur-Marne at 2.45 p. m. Left Oisy-sur-Marne at 3.20 p. m. Arrived Verberie at 6.03 p. m. Left Verberie at 6.33 p. m. Arrived Compeigne at 7.20 p. m. Were then put on a siding at Rethondes, in the Compiègne Forest. Lieut. Martin went to station, calling up R. G. A. at Coyolles. He got in touch with Commander Schuyler, and orders were issued to proceed to Fontenoy-Ambleny. Had to wait for a "brigade" (which is the term used by the French for train crew) from Creil. Left Rethondes at 1 a. m., arriving at garage just west of Fontenoy at about 4 a. m. Reported to Admiral Plunkett, who was on board No. 2 Battery, at Fontenoy-Ambleny 8 a. m.

Battery No. 2.—Gun on pit ready to fire.

SEPTEMBER 11, 1918.

Battery No. 1.—Switched staff headquarters car from gun train No. 1 to gun train No. 2, which latter train was stationed at Fontenoy-Ambleny, and the gun being in place on an epi below the station. Commander Furlong, of the Bureau of Ordnance, was with No. 2 Battery. Men and tools went to Cemetery of St. Christophe, near Soissons, to put in pit.

Battery No. 2.—Ensign Primeau, with 17 men, the remainder of this battery, arrived from St. Nazaire. Awaiting proper weather conditions for avions to spot shots; poor weather, rainy, cloudy, etc.

Battery No. 1 (continued).—The Cemetery of St. Christophe was located about 9 kilometers from Fontenoy-Ambleny, and men were transported via camion. Excavating commenced, and men returned to Fontenoy at 5.30 p. m.

SEPTEMBER 12, 1918.

Battery No. 1.—Working party left for St. Christophe at 6 a. m., continuing work on the pit. Ran telephone line from Fontenoy-Ambleny to cemetery of St. Christophe. Completed excavation and began putting in pit timbers. Shells from German artillery fell about 1 kilometer short of the gun position.

Battery No. 2.—Still awaiting suitable weather conditions for avions to spot. Cloudy, however. Lieut. Commander Bunkley, Lieut. Hayden, Lieut. Smith, and Ensigns P. L. Davis, W. C. Davis, Cook, and Savin arrived from St. Nazaire. At about 9 p. m. started switching all of train No. 2, with the exception of the workshop and ammunition cars, and hauled them up to where gun train No. 1 was located.

Batteries Nos. 3 and 4.—Entrained at 6 p. m. in the St. Nazaire yard. Laid in yard all night.

SEPTEMBER 13, 1918.

Battery No. 1.—Continued work on pit and telephone lines. At 2 p. m. left garage at Fontenoy-Ambleny with gun car and two crane cars for Y at Rethondes to turn gun and cars around, in order that when they arrived in Soissons they would be in proper position to fire. Arrived at Rethondes at about 3.30. In going around the Y the pipe to the blow-off cock on locomotive caught in a heavy wire and was broken off, allowing the steam to escape. Hauled fires and phoned for engine from No. 2 Battery, which arrived about 3 a. m. Air raid occurred while waiting.

Battery No. 2.—Awaiting observation.

Batteries Nos. 3 and 4.—At 8 a. m. went to Montoire yards. During day loaded remaining supplies.

SEPTEMBER 14, 1918.

Battery No. 1.—Left Rethondes at 3 a. m., arriving at garage near Fontenoy at 6 a. m. Heavy artillery action on front during night. Made preparations to move battery to St. Christophe. At 10.30 left garage for St. Christophe, moving very slowly, as the roadbed and rails were in bad condition, it being necessary in some places to tamp it up, due to shell fire having undermined it in many places. Arrived at St. Christophe at 1 p. m. Began putting in steelwork on pit, established a telephone central in an old French homestead alongside the tracks, and also headquarters were established there for plotting, directing of fire, etc. Ran telephone line to Pommiers, with which connection was had with R. G. A. headquarters at Chevaux and station at Vic-sur-Aisne. At night took an observation of eastern elongation of Polaris and checked gisement

(angle of firing line). Enemy was shelling military road near Soissons, about three-fourths of a kilometer away.

Battery No. 2.—Without waiting for avions longer, fired 10 shots at an ammunition dump in Bény-Loisy.

Batteries Nos. 3 and 4.—Policed garage. Working parties detailed to Montoire storehouse between 1 and 2 p. m. Gas drill for all hands.

Battery No. 5.—Left for Montoire yard.

SEPTEMBER 15, 1918.

Battery No. 1.—Finished pit at 3 p. m. Ran gun on pit. Leveled gun, checked bore sighting, filled recoil cylinders, and everything ready to fire. At night Commander Schuyler gave lecture and instructed battery officers, at headquarters of Battery No. 2 in Fontenoy-Ambleny, in range finding, plotting, keeping of notebooks, etc. Enemy artillery firing on Soissons and road back of St. Christophe. Also, enemy airplanes busy above and antiaircraft guns all round firing on them.

Battery No. 2.—Fired two shots in a. m. with observation and 10 shots in afternoon without observation, all on Bény-Loisy ammunition dump.

Batteries Nos. 3 and 4.—Left Montoire for Sommesous. Crews engaged in fixing up berthing cars.

Staff train.—Left St. Nazaire.

SEPTEMBER 16, 1918.

Battery No. 1.—Went over gun, checking everything up thoroughly, including aiming angles. Had gun drill in morning and afternoon. Officers at work on sondage calculations. Commander Schuyler, Lieut. Commander Bunkley, Lieut. Smith, Ensigns Savin and P. L. Davis, and Lieut. Hayden visiting battery. Crew engaged also in policing camp, etc. Airplanes very active. Two observation balloons shot down near the front, and were plainly visible from gun position. Antiaircraft guns going at frequent intervals during the day and night.

Battery No. 2.—Sent party up to Rethondes to take up pit.

Battery No. 3.—Left Montoire at 8 p. m. Lieut. Commander Buell went as far as Savenay. Very slow speed. Trucks held up fine. Arrived at Nantes 4 p. m. Trucks in good shape. Held at Nantes all night. Liberty, all hands, from 5 p. m. to 9.30 p. m. All hands returned on time.

SEPTEMBER 17, 1918.

Battery No. 1.—Commander Schuyler, Lieut. Commander Bunkley, Lieut. Smith, Ensign Savin, Ensign P. L. Davis, and Lieut. Hayden visited battery again. Gun drill in morning and afternoon. Crew engaged in putting bunks in cars, filling water tanks, and altering trenches occupied by Germans and French as shelter against airplanes. Sun observation with transit; in the evening took observation of polaris. Shelling of Soissons continued at night. Enemy airplanes very active—observation planes by day and bombing planes by night, bombing on Soissons and Pommiers. Crew paid.

Battery No. 2.—Miscellaneous drills.

Battery No. 3.—Laid at Nantes all day awaiting orders to proceed. Wired Admiral Plunkett as to location at 6 p. m. Liberty from 5.30 p. m. to 9.30 p. m. for men.

Battery No. 5.—Left Montoire yard.

SEPTEMBER 18, 1918.

Battery No. 1.—Same officers visited battery again in connection with gun signal, gun casualty and personnel casualty, first aid, and stretcher drills. Crew

engaged in completing berthing cars, policing, filling tanks, digging shelter trenches near guns, etc. Officers working on plotting, working out sondages, taking observations for polaris, etc. Liberty for crew from 6.30 to 9.30 p. m.

Battery No. 2.—Sent party up to take out pit at Rethondes. Took pit out.

Battery No. 3.—Policed track during morning. Left Nantes at noon. Arrived at Angers 11.30 p. m. Wired Admiral Plunkett as to location, and also that one journal on gun car was rather hot.

Staff train.—Left Montoire at 1.20 p. m. for Sommesous (i. e., Camp Haussimont), via Nantes, Juvisy, etc.

SEPTEMBER 19, 1918.

Battery No. 1.—Miscellaneous drills. Continued work on trenches. Awaiting orders to commence firing. Delayed on account of lack of observation due to weather conditions. Liberty for gun crew at 6.30 till 9.30 p. m. Planes still active but no shelling.

Battery No. 3.—Left Angers at 6.30 a. m. Men wore gas masks in cars in order to accustom them to their use while at work. Arrived Le Mans 4.30 p. m. Liberty 5.30 to 9.30 p. m. Wired Admiral Plunkett.

SEPTEMBER 20, 1918.

Battery No. 1.—Aired bedding. Gun, casualty, and other drills in a. m. In afternoon officers engaged in plotting, etc. Lieut. Commander Bunkley and Lieut. A. V. Genini, liaison officer for French artillery, came on board. Liberty for crew at 6.30.

Battery No. 2.—Made preliminary reconnoissance of new position at Flavy-le-Martel.

Battery No. 3.—Left Le Mans at 7.30 a. m. Stopped at La Louppe to repack boxes. Mascot of the battery, a dog named "Cognac," killed here by train. Arrived at Chartres 8 p. m. Wired Admiral Plunkett as to progress, behavior of journals, etc.

SEPTEMBER 21, 1918.

Battery No. 1.—Morning and afternoon drills. Filled water tanks. Made windows for cars. Routine camp work. Still awaiting orders to fire. Liberty for crew from 1.30 p. m.

Battery No. 2.—On account of bombs dropping near gun, moved it off pit and up in woods. Sent Cook, G. T., to hospital with broken arm.

Battery No. 3.—Left Chartres at 8 a. m. Journals run fine. Arrived Pantin, near Paris, at 6.30. Lieut. Smith and Ensign W. C. Davis, who had been up with Batteries 1 and 2, joined train at Versailles at 4 p. m. At Pantin picked up staff headquarters car and remained all night.

Battery No. 4.—Train arrived at Batignolles Station, Paris, at 11.30 a. m. Joined here by Commander Schuyler, Lieut. Hayden, and Ensign P. L. Davis. These officers had been up with Batteries 1 and 2. Left Batignolles at 2 p. m. Arrived Gogny at 7 p. m.

SEPTEMBER 22, 1918.

Battery No. 1.—Standing by, but did not fire. All work, except necessary work, stopped for day. Crew engaged in writing letters and scrubbing clothes. Enemy planes bombing Soissons and Pommiers. Are very active at night, as moon out bright.

Battery No. 3.—Admiral Plunkett came aboard, also Paymaster Eubank and C. Y. Cunningham, at 1.30 a. m. Left Pantin at 10.30 a. m. Arrived about 15 kilometers southwest of Epernay at 8 p. m. Boxes very hot. At one station where we stopped for mess we had a 20-minute gas drill.

Battery No. 4.—Left Gogny at 6.30 a. m. Dr. Stephenson and Lieut. McCormick swam the Marne at 9.30.

Staff train.—Arrived Haussimont.

SEPTEMBER 23, 1918.

Battery No. 1.—Gun drill, aero signal drill, and casualty drill. No order for firing yet. Proceeded with routine work. Officers engaged in drill, working out sondages, etc. After supper took observation of Polaris. Enemy planes very busy. They arrived just as moon came up, about 9.30. Three bombs were dropped one-half kilometer below us, setting off ammunition dump. Four more bombs were then dropped, exploding other dumps near the first. Called all the crew out and took shelter in trenches. Violent explosions occurred with no intervals until about 2 a. m. Kept men in trenches. An occasional fragment of shell would come near. Many enemy planes overhead. At 2 a. m. ran train out on main line. Got crew on board and ran up the track, stopping at St. Christophe Station, about one-half mile away. Remained for the night. Explosions after 3 were only desultory.

Battery No. 3.—Left garage at 7 a. m. Arrived at Sommesous at noon. Crew busy getting equipment adjusted.

Battery No. 4.—Left Gogny at 8 a. m. Arrived Château-Thierry 2.20 p. m. Crew given liberty until 3.30 p. m. Left Château-Thierry at 4.30 p. m.

SEPTEMBER 24, 1918.

Battery No. 1.—At 7 a. m. moved back to garage. Received orders to stand by to fire. Mustered crew at quarters. Did not fire. Aired bedding. Put up rifle racks in three cars. Filled water tanks. Standing by to fire nearly all day. Went down to ammunition dump where explosions occurred, which was a dump of French 75's. Inspected dump and located a gas shell. After supper—that is, at 6 p. m.—gave crew liberty. Enemy airplanes very busy, flying low. Went into trenches for half an hour. Bombs were dropped at Soissons and Pommiers. Enemy continued to fire on road near Soissons. There seemed to be but one or two guns firing, the firing usually commencing about 9.30, lasting a half hour, then again about 1 o'clock, and then about 6 a. m.

Battery No. 3.—Construction crew, under Ensign P. L. Davis and Ensign G. Cheffy, turned to on building of warehouse. Gun crew engaged in repairing journals on gun car.

Battery No. 4.—Arrived at Haussimont.

SEPTEMBER 25, 1918.

Battery No. 1.—Quarters; muster at 8 a. m. Routine drills morning and afternoon. Aired bedding. Received coal for engine.

Battery No. 3.—Construction crew continued work on warehouse. Gun crew worked on trucks and gun.

SEPTEMBER 26, 1918.

Battery No. 1.—Gun, air, and signal drills. Remodeled old trenches. Enemy shelled Soissons and road near guns.

Battery No. 3.—Construction crew continued work on warehouse. Gun crew and mechanics worked on gun car and journals.

Battery No. 5.—Arrived at Haussimont.

SEPTEMBER 27, 1918.

Battery No. 1.—Reveille 6 a. m. Enemy shelling road near gun, shells bursting over gun. Fragments of shell struck gun cab roof. Made preparations to get crew farther away when shelling stopped. Quarters for muster in a. m. Continued work on trenches. Routine work about train. No afternoon drill.

Battery No. 3.—Continued work on warehouse. Gun car trucks nearing completion of repairs.

SEPTEMBER 28, 1918.

Battery No. 1.—Gun drill in morning. Aired bedding. Received order to fire without observation on railway entering from west of Laon, crossroad and railroad. Commenced fire at 1.51. Fire continued all afternoon. At 5.30 stopped, having fired 37 rounds. Continued fire after supper. At 7.22 received orders from R. G. A. to cease firing, having fired a total of 47 rounds. Secured gun, cleaned same out, etc. Enemy planes not so active, due to the late rising of moon.

Battery No. 3.—Continued work on warehouse. Loaded ammunition into ammunition cars. Bore-sighted gun. Finished repairing trucks.

SEPTEMBER 29, 1918.

Battery No. 1.—Stood by to fire, filling ammunition cars. At about 12.30 received orders to make reconnoissance for direct observation point at Fort Malmaison, situated where the Chemin des Dames crosses the main military road between Laon and Paris. Left about 1.30 accompanied by Dr. Morris, Ensign Allen, Asst. Pay. Eubank, and liaison officer of French R. G. A. Left Soissons by the military road connecting Soissons, Laon, and Paris. Stopped at a joint where Vaurains farm once was. This part of the front was in enemy's territory few days before. The road was under fire, and shells were striking beyond on the left and behind us on the right of road. About quarter of mile back passed a French marine dead by the roadside who had been recently struck by shell. The ground in this vicinity had been plowed and replowed by barrage fire precious to allies' advance. A French officer told us we could not reach Malmaison by this route as the road was under fire, directing us to turn off to the right just before reaching the Chemin des Dames, which we did. Dead horses were lying near the roadside.

Battery No. 3.—Warehouse having been finished, No. 3 Battery men no longer required on this work. Gun drill in morning and afternoon.

SEPTEMBER 30, 1918.

Battery No. 1.—Assembly at 8 a. m. Routine drills. At 11.30 a. m. received orders to commence firing, so fired 30 shots at same coordinates west Laon. Began an irregular fire at 11.57. Fired five rounds at 12.16. Stopped for dinner. At 2.36 resumed firing and at 6.27 fired the last round. At 3 p. m. Commander Schuyler reported on board for temporary duty. Repaired track on garage so train could be run back farther if enemy shelled gun. Enemy's observation planes had been over, locating our exact position. Admiral Plunkett visited train. Arrived at 12. Left at 2 p. m. Ran train back after dark about one-half kilometer.

Battery No. 3.—Batteries 3 and 5, under Ensign Cheffy, started building carpenter shop. Gun drill morning and afternoon.

OCTOBER 1, 1918.

Battery No. 1.—Assembly at 8 a. m. Routine drills. Finished railroad track in afternoon. No firing. Crew engaged in filling tanks, salvaging lumber, and carrying out routine work. Enemy artillery shelling road at apex of triangle road and St. Christophe cemetery where road enters Soissons. * * *

Battery No. 3.—Continued work on carpenter shop. Finished all but few odd jobs. Gun drill morning and afternoon. Men detailed to unload stores at warehouse.

OCTOBER 2, 1918.

Battery No. 1.—Standing by to fire. Held mass at 9.30. * * * At 10 a. m., received order from R. G. A. to fire 30 rounds at Laon west railroad. Began firing at 11.46. Fired five shots. Knocked off at 12.12. At 1.33 p. m., resumed firing until 5 p. m., when 30 rounds had been fired. Secured and sponged gun. During day ran telephone line to Soissons, connecting with observation balloon. Took gun off pit and ran train back on garage. Sent ammunition cars back of Soissons.

Battery No. 3.—Details to warehouse. Ensign Le Blanc and staff train. Gun drill morning and afternoon.

Battery No. 5.—Gun drill a. m. and p. m. Working party of 20 men reported at warehouse to Ensign Le Blanc and to staff train. Berthing cars inspected. Began rigging telephone booths for gun drill. Putting in additional bunks in berthing cars. Filled tanks of galley car.

OCTOBER 3, 1918.

Battery No. 1.—Assembly at 8 a. m. Put gun on pit and stood by for firing. Filled water tanks. Completed r. r., loading empty powder tanks in box car, overhauling journal boxes on engine and ammunition cars. Began firing with aero observation. Fired 10 shots, 6 of which were observed, 2 shots taking effect on left of target, striking on military railroad. One fell a little short of target. The other 3 were the first fired, landing beyond and to the right. Stopped firing at 6.30 p. m., having fired a total of 19 rounds. Removed gun from pit. Enemy guns active at night.

Battery No. 3.—Details to warehouse and to Ensign LeBlanc. Gun drill morning and afternoon. Made rammer for gun. Started changes in kitchen car and staff car.

Battery No. 5.—Crew under Mr. Warner reported to Ensign LeBlanc. Berthing cars inspected.

OCTOBER 4, 1918.

Battery No. 1.—Put gun on pit. No firing due to weather conditions. Assembly at 8 a. m. Gun, aero signal, casualty, and gas-mask drill. Loaded up ammunition cars, shipping two cars of empty powder tanks to Brest and two empty ammunition cars to Haussimont, also two cars of projectiles and one car of powder to No. 2 Battery, located at Fontenoy. Filled water tanks, removed ammunition cars from Epi, and sent them up the track back of Soissons to get them out of the way of enemy fire. Left gun on pit, as there was no choice of a better position. Working on car windows and other routine work. Enemy guns firing between us and Soissons. Set clocks back one hour.

Battery No. 3.—Gun drill morning and afternoon. Usual routine. Police parties detailed and working parties sent out.

Battery No. 5.—Men assembled with surplus baggage at 7.30 a. m., ready to stow it in storehouse. Baggage stowed. Assembly at 8.15. Ammunition working party sent out under Gunner's Mate Gardiner. Remaining men sent to Ensign LeBlanc under Ensign Warner. Berthing cars inspected. Working party under Chief Turret Captain Woolwine sent to check up ammunition.

October 5, 1918.

Battery No. 1.—Assembly at 8 a. m. Gun and aero signal drill. No firing, due to unsuitable weather conditions. Aired bedding, scrubbed clothes, mattress covers, etc. Left ammunition cars at Soissons. About 4.30 enemy shell burst overhead, followed by three other high bursts. This means was employed to get our range. Called the men out of gun car and up to train. The high bursts were followed by regular fire, shells falling over train to the left and in road. One shell struck 16 feet from gun. Parts of shell struck side plates on left side of gun, cutting train air line on gun, piercing plate at left elevating wheel, and striking support of gas engine and breaking one piece of casting but doing no injury to the engine. Sent the men back along the railway track for a distance of about a quarter of a mile where they were out of danger. Shelling stopped about 5.30 p. m. At this time, unable to move train as the engine had gone for water, returning about 5.20. I then had train moved back to limit of garage, about a quarter of a mile. About 8.45 p. m., shelling began again, falling to right of gun looking along the line of enemy fire, striking also about 100 yards to the left on ground used as ammunition dump. One shell struck 75 feet from where train ordinarily stood. Firing stopped about 9.30. No damage had been done.

Battery No. 3.—Carried out routine. Gun drill morning and afternoon. Policed grounds.

Battery No. 5.—Ammunition loading cars, radio men and working party dispatched. Drill with gas masks. Inspection of berthing cars.

October 6, 1918.

Battery No. 1.—Lieut. Gamier, French artillery, reported on board for duty. Assembly at 8 a. m. All hands engaged in digging dugouts near gun. During night Commander Schuyler and Lieut. Gamier left for duty with No. 2 battery. R. G. A. said they would counterbattery the enemy's gun that was firing on us. About 11 a. m. No. 6 engine arrived from Haussimont to relieve No. 5 engine. Crews were shifted over at 11.15. Cadillac car attached to headquarters arrived from Paris with Commander Roberts at 1 p. m. Enemy's gun quiet. At 6 p. m. sent No. 5 engine to Haussimont.

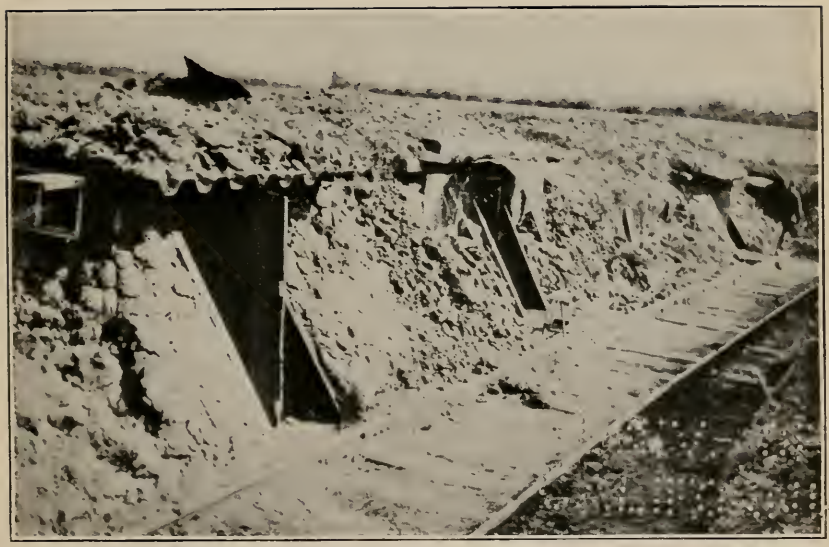
Battery No. 2.—Left Fontenoy at 1.40 a. m. for Flavy-le-Martel.

Battery No. 3.—None but necessary work done. At 11 a. m. all hands marched to staff headquarters and given a talk by Admiral Plunkett.

Battery No. 5.—Berthing car inspection. Men marched to staff headquarters as per orders, where Admiral Plunkett addressed them. Party sent out under Gunner's Mate Gardiner to cover up ammunition. Liberty at 1 p. m. for all men wishing it. Guards posted.

October 7, 1918.

Battery No. 1.—Assembly at 8 a. m. Continued work on dugouts. No firing from enemy's gun.



DUGOUTS USED BY NAVAL BATTERY CREWS.

70—1

RESULT OF SHOT FROM BATTERY NO. 1, ON GERMANY STRATEGIC RAILWAY AT LAON.

70—2

Battery No. 3.—Work carried on as usual. Gun drill morning and afternoon. All available men detailed to Ensign LeBlanc.

Battery No. 5.—Working party of 31 men to Ensign LeBlanc. Shelter trench dug for crew. Berthing car inspection. Continuation of regular routine.

OCTOBER 8, 1918.

Battery No. 1.—Assembly at 8 a. m. Continued on and finished dugouts, one on each side of gun, to hold 50 men. Filled tanks. Admiral Plunkett arrived with Commander Roberts.

Battery No. 2.—Arrived at Flavy-le-Martel. Started digging pit. Worked night shift.

Battery No. 3.—Gun drill morning and afternoon. All available men repiling lumber and cleaning grounds all day.

Battery No. 5.—Gun drill in morning. All available men repiling lumber and cleaning grounds.

OCTOBER 9, 1918.

Battery No. 1.—Assembly at 8 a. m. At 10.45 a. m. commenced firing. Fired 10 observed shots in morning. Only 5 were seen by observer. Shot No. 2 striking near railway track over and to left of target; No. 4 on back of railroad about 100 yards short and to right; No. 5 striking on railroad at target; No. 6 on edge of military road, about 150 yards over and to the left; No. 7 a little over and left. In the afternoon observation was not possible. Fired 15 unobserved rounds. Fired the last round at 4.55 p. m. Removed gun from pit in 25 minutes. Admiral C. P. Plunkett, United States Navy, left for Battery No. 2.

Battery No. 3.—Preparing to leave. Bore sighting of gun checked by elevating and bore sighting. This checked with previous bore sighting.

Battery No. 5.—Gun drill with gas masks. Preparing to leave.

OCTOBER 10, 1918.

Battery No. 1.—Began firing in morning without observation. Began at 11.22. Fired three rounds. Stopped at noon for dinner. At 3 p. m. began firing with observation. Fired 15 rounds, 12 of which were observed. One struck railroad to left of target. Ceased firing at 4.47 p. m. Admiral C. P. Plunkett, United States Navy, left train to return to the base.

Battery No. 3.—Rifles, ammunition (small arms), pistols, and canteens turned into storehouse. Gun drill held in morning and afternoon.

Battery No. 4.—Received orders from executive officer to prepare battery to move and then stand by. Filled water tanks and secured.

Battery No. 5.—Received orders to prepare for departure. Everything secured.

OCTOBER 11, 1918.

Battery No. 1.—Assembly at 8 a. m. At 10.41 a. m. began firing. Fired 5 unobserved shots. Stopped for dinner. Fired 10 rounds in afternoon. Took up telephone lines.

Battery No. 2.—Fired three shots at Mortiers.

Battery No. 3.—Supplies drawn and preparations made to shove off for the front. Left garage at 5.30 p. m. Stayed in upper yard all night.

Battery No. 4.—Everything secured ready for movement. Moved up to Sommesous and stood by awaiting pilot and schedule.

Battery No. 5.—Left R. A. R. base at 8 p. m. Spent night in Sommesous awaiting pilot and schedule.

OCTOBER 12, 1918.

Battery No. 1.—Fired 5 rounds in morning and 5 in afternoon. At 6 p. m. received orders from R. G. A. to remove gun pit, as the French were entering Laon. Fired from this pit 199 rounds, full charges.

Battery No. 2.—Fired 25 rounds at Mortiers.

Battery No. 3.—Left Haussimont at 8.30 a. m. Arrived at Nixeville at 11 p. m. Boxes ran warm but not injured. * * *

Battery No. 4.—Left Sommesous at 9.30 a. m. Ordre de transport read to Nixéville via Sommeil, but French pilot and schedule called for Chalons, St. Hilaire, etc. Arrived at Nuisemont, 18 kilometers. One box on gun car was hot, the same one that heated en route from St. Nazaire to Haussimont. Repacked. Heavy grades and sharp curves. Arrived at Chalons at 12.15 p. m. Took water. Left Chalons at 12.40 p. m. Stopped at * * * 1.25 p. m. to examine box. Still hot, but not smoking. Left * * * at 1.30 p. m. Arrived at St. Menehould at 5.05 p. m. Left St. Menehould at 8.35 p. m. in charge American pilot. Arrived at Claremont. Considerable discussion with R. T. O. and with French as to whether to send train back to St. Menehould to turn gun or to proceed and turn elsewhere to-morrow. French stated that it would be necessary to turn gun. Left St. Menehould for Nixeville at 10.10 p. m. Arrived at Doumbelle and found that Nixeville garage was filled up. Proceeded to Blercourt, accompanied by Capt. Horton, Thirteenth Engineers, U. S. A., R. T. O. officer in charge of routeways of this district. American pilot and French pusher from St. Menehould.

Battery No. 5.—Left Sommesous at 10.30 p. m. At 12.30 p. m. hot box discovered on gun. Stopped to repair temporarily. Arrived at Chalons at 1.30 p. m. Delayed two hours to repack journal box. Arrived at 7.30 p. m. at Somme Tourbe. Journal box again repacked. Left Somme Tourbe at midnight.

OCTOBER 13, 1918.

Battery No. 1.—All hands engaged in removing gun pit, overhauling gun, loading ammunition in ammunition cars, taking up telephone wire between this place and Fontenay, getting train ready for moving. Lieut. Commander G. L. Schuyler arrived en route to base at Haussimont. Received from base two cars containing powder, shoes, mail, etc.

Battery No. 2.—Fired 10 rounds at Mortiers.

Battery No. 3.—At 12.45 p. m. had gas drill. Left Nixéville at 3.30 p. m. Arrived at Thierville at 11.30 p. m. Billeted men in Jardin Fontaine.

Battery No. 4.—Secured in garage near Blercourt at 2 a. m. Engine sent back toward Nixeville with French pilot for water. French pusher dismissed. Engine returned at 5 a. m. The run was finished with all boxes on gun running good. The gun was run with after end of mount forward. Commanding officer proceeded to Nixeville garage by motor cycle, looking for executive officer, U. S. naval railway batteries. Not finding him, and after consulting with Lieut. Smith, C. O. Battery No. 3, reported by telephone to Col. Rose, said by Army officers attached to A. L. G. P. gun in garage to be R. A. R. commanding officer for district. Also completed arrangements with Capt. Horton to have gun turned at Souilly.

Returned to Battery No. 4. Ordered by Lieut. Commander Bunkley to make the following cars into a train to be hauled to firing position. Crane, shop, galley, headquarters, and two flat cars carrying one pit. Complied with this order. Also ordered by Lieut. Commander Bunkley to report to P. C. McMillan by telephone, which was done from French central Blercourt, and received

orders to send cars designated to firing point with our engine and French pilot and to move when directed by the French. The gun and remainder of cars to be sent to Dugne, the gun turned and all returned to Nixéville. At noon received from Admiral Punkett written orders from P. C. McMillan as above. Later ordered by Lieut. Commander Bunkley to send gun to Lieut. Smith to be turned and then returned to Nixéville, to take about 60 men with train for firing position, the remainder of the men to stay with gun and berthing and powder cars. These last named orders complied with, gun leaving at 6 p. m. Left Blercourt at 9.30 p. m. Arrived at Thierville at 11 p. m. Billeted men in Caserne Jardin du Fontaine, about one-half mile distant.

Battery No. 5.—Arrived at Aubréville at 6 a. m. Left Aubréville at 8 a. m. (traffic delay). Arrive at Blercourt at 10 a. m. Left Blercourt at 8.30 p. m. Arrived at Thierville at 11 p. m. Men billeted in Caserne Jardin du Fontaine for night.

October 14, 1918.

Battery No. 1.—Continued work on removing pit. Finished in evening. Removed telephone line from battery to Soissons and water tank.

Battery No. 3.—Started excavating for pit on position No. 964, Thierville. Established telephone connection with P. C. McMillan through dugout central.

Battery No. 4.—Commenced excavation for pit, unloaded timber and steel. Intermittant shelling, the detonations being about one-quarter to one-half mile in direction of Verdun. Established telephone connection with P. C. McMillan, and set up firing lines. Dug on pit all night. Excavation completed and upper timbers placed.

Battery No. 5.—Commenced excavating pit. Pit construction continued throughout the night in three reliefs. Completed excavation and upper level timbers laid.

October 15, 1918.

Battery No. 1.—Admiral Plunkett arrived with Paymaster Eubanks. Crew was paid off. Issued boots and other shoes. Sent construction gang to Fontenay to remove Battery No. 2 pit. Admiral Plunkett, commanding officer Battery No. 1, and Ensign Allen went to Laon to examine targets on which this battery was firing. One target on which we had practically no observation was not seriously damaged, shells striking within a few feet of it. Another target had been hit a number of times. A flat freight car in siding had been struck and blown off track upon causeway. Three shells had destroyed a building used as storehouse for electrical material. Found fragmentation excellent.

Battery No. 3.—Work on pit continued.

Battery No. 4.—Continued work on it. Side plates went in easily, as did all members except transom bedplate and transom bedplate support. Both of these were cut by oxy-acetylene. Work until 2 a .m. (16th). Assigned crew dugout space.

Battery No. 5.—Continued work on pit. Slope timbers laid. Commenced laying of steel. Gun car arrived. Continued work through night. Continuous rain through the night.

October 16, 1918.

Battery No. 1.—Crew left at 5.30 a. m. and completed taking up Battery No. 2 pit at Fontenay. Putting coal in sand and log car.

Battery No. 3.—Gun over pit and ready to fire at 3 p. m. Established day and night aiming angles. Checked angles all O. K.

Battery No. 4.—Completed pit and ran gun over at 12 noon. Gun reported ready at 4 p. m. At 4.30 p. m. ordered to secure. Great difficulty experienced in elevating and depressing gun between 21° and 43°. Thought to be in part due to the fact that this was the first time gun had been elevated more than 21 degrees. After reporting gun ready Chief Turret Captain Sullivan turned air into counter-recoil cylinders and discovered leak in pipe line. Sent S. C. Fischer, P. & F., as assistant and ordered leak repaired at once. Between 6 and 7 p. m. numerous shells fell in village beyond gun. Transferred 50 cans powder to bombproof to left of gun.

Battery No. 5.—Transom bedplate lowered into position at 9 a. m. Fifty hours' continuous work to complete pit. At 11 a. m. gun put into position. At 4 p. m. gun ready to fire.

October 17, 1918.

Battery No. 1.—Recreation. Half of crew left train at 9 a. m.; party to Soissons with officer in charge. Afternoon the other half of crew left for recreation. Sent to naval base, Brest, one car of powder tanks (136); sent to Haussimont two U. S. Army flat cars.

Battery No. 3.—Checked up angles of gun pit and gun. Established new aiming point 50° 55′ for day and night firing.

Battery No. 4.—Leak in air line referred to above reported repaired. Tested and found no leakage at 140 pounds pressure.

Transferred 50 cans of powder from ammunition car to bombproof to left of gun. Filled tanks under galley and two berthing cars. Rechecked gun position and found same to be within eight minutes of line of fire assigned.

Battery No. 5.—Gun drill morning and afternoon. Weather conditions unfavorable for firing. Powder stowed in dugouts.

October 18, 1918.

Battery No. 1.—Recreation until noon. Filled water tanks. Putting bunks in No. 3 box car. Getting everything ready to leave.

Battery No. 2.—Took up pit. Made preliminary reconnoissance of new position at Essigny le Petit.

Battery No. 3.—At 8 a. m. sent construction crew in charge of Ensign Davis with tool car, crane car, two foundation flat cars, and engine to new pit at Charny to put in foundation and steel. At 11.45 a. m. enemy plane flew over position of garage and then turned back. Gun drill at 1 p. m., with entire crew in action as when firing.

Battery No. 4.—Gun drill in morning. About noon German plane flew over position. Fired on by antiaircraft guns and returned to German lines. Gun drill in afternoon. Construction crew under Ensign P. L. Davis left at 7 a. m. to put in pit at Charny.

Battery No. 5.—Gun drill morning and afternoon. Weather unfavorable for firing. German plane flew over position at noon.

October 19, 1918.

Battery No. 1.—Assembly at 8 a. m. Crew engaged in making telephone booth, filling water tanks, etc. Afternoon recreation.

Battery No. 3.—Gun drill morning and afternoon. Construction crew returned from pit at Charny. Pit completed. Paymaster arrived and paid crew. Transferred all powder from ammunition cars to dugout.

Battery No. 4.—Gun drill morning and afternoon. Regular routine at Thierville. Construction force at Charny returned at 6.30 p. m., having worked continuously on pit, which was completed.

Battery No. 5.—Gun drill morning and afternoon.

OCTOBER 20, 1918.

Battery No. 1.—Raining; no work. Recreation party in afternoon. Admiral Plunkett arrived in afternoon. Left for Battery No. 2, returning at night.

Battery No. 2.—Made preliminary reconnoissance of new position at Wassigny. Admiral Plunkett arrived in afternoon. W. B. Goodwyn broke his arm.

Battery No. 3.—Usual routine. Aired bedding.

Battery No. 4.—Gun drill morning and afternoon. Returned 40 tanks of powder from bombproof to car. Construction force of 12 men to Charny to complete and camouflage pit. Lieut. Commander Stephenson and Engineer 2c. injured in Buda car collision.

Battery No. 5.—Gun drill in morning and afternoon. Germans shell arsenal 2,000 yards distance at intervals of 15 minutes.

OCTOBER 21, 1918.

Battery No. 1.—Admiral Plunkett left train for base. Shoes issued to men. Making portable house for telephone central. Sent engine to Vic to fill water tanks. Carrying out routine work.

Battery No. 2.—Raining hard. Routine.

Battery No. 3.—At 12.22 p. m. fired one shot. Unable to get observation. Six German planes came over at 1.30 p. m. Seven shells fired at our position about 4.30 p. m. No damage done. At 7.30 p. m. ordered by Army to be ready to leave pit on account of enemy shelling position. Gun on trucks ready to move at 8.45 p. m.

Battery No. 4.—Gun drill morning and afternoon. Telephone casualty drill during afternoon drill.

Battery No. 5.—Gun drill morning and afternoon.

OCTOBER 22, 1918.

Battery No. 1.—Assembly at 8 a. m. Raining. Continued work on portable house. Filling water tanks. The water situation is bad. Engine has to go to Vic-Sur-Aisne for water, a distance of about 12 kilometers. This water can not be used for either cooking or drinking purposes. Cooking and wash water is used from well which had to be cleaned out. Drinking water is obtained from a spring about one-half mile away. Making windows for car. Carmen cleaning up gun trucks. Making wood and coal boxes to put under cars. At 2 p. m. knocked off work and scrubbed clothes.

Battery No. 2.—Still raining. Ensign Primeau, three French officers, and the commanding officer made another reconnoissance for a position near Wassigny. Two positions were tentatively chosen, one just beyond Wassigny, putting us in range of Hirson, and another about 4 kilometers west of Wassigny to fire on Avesnes. The idea being to use the latter first as the first position is within 2 kilometers of the line, and the track has been most thoroughly mined. As soon as the rail is ready we would move up to the first position. Had luncheon with some of the liberated inhabitants of Bohain.

Battery No. 3.—Gun drill in morning and afternoon.

Battery No. 4.—Gun drill in morning and afternoon.

Battery No. 5.—Gun drill in morning and afternoon. Germans continue shelling arsenal at varying intervals. At 8 p. m. two shells dropped behind gun position.

October 23, 1918.

Battery No. 1.—Assembly at 8 a. m. Crew engaged in filling water tanks, making car windows, cleaning gun, making heater for ammunition car. Exercised at preliminary work in firing from rails. Aired bedding. At 2 p. m. received preparatory orders to get under way for Haussimont. Took up telephone line and made up train for leaving, getting everything on board at 10.15 p. m. Received orders from R. G. A. to leave at 8 a. m., October 24.

Battery No. 2.—Clear. Held general field day in forenoon with full-dress inspection of train and crew, followed by 8-mile hike under arms in afternoon.

Battery No. 3.—Gun drill in morning and afternoon.

Battery No. 4.—Gun drill at 8 a. m. Ordered to be ready to fire by 10.30 a. m., and to put 12 rounds powder in magazine car. Gun reported ready to load at 10.45 a. m. Fired one round at 12.19 p. m. Reloaded; new aiming angle and angle of elevation received from headquarters. At about 12.30 p. m., ordered to cease firing. Ordered primers removed. At 12.45 p. m. ordered to secure and return powder to tank. After mess stood by from 2 p. m. until 4.30 p. m. About 4.30 p. m. ordered to secure. While securing at about 4.50 p. m., a shell fell and exploded about 100 yards north of gun, another about 50 yards from bombproof, and another near No. 3 gun, and several others in vicinity. Men were ordered to bombproof. It was then found that six had left their gas masks at gun. All had been ordered to take their masks to bombproof with them. The masks were procured and put on. After about half an hour the usual tests reporting no gas present the gas masks were ordered off, and the men to finish securing and then go to supper.

At 6.40 p. m., under orders from Lieut. Commander Bunkley gun was lowered on to trucks and 11 cans of powder transferred from magazines to bombproof. Gun on track at 9.45 p. m.

The pit was carefully inspected after firing and was found to have functioned normally and properly in all respects. There was little pit recoil, and the pit returned practically to its original position.

Battery No. 5.—One shot fired at 12.22 p. m. At 5 o'clock p. m. six shells fell in vicinity of gun No. 2 forward of No. 5 and abaft of No. 4, others unknown. One shell failed to explode. Gun placed on trucks for immediate removal should position be fired upon at 9 p. m.

October 24, 1918.

Battery No. 1.—At 7.45 a. m. left garage; 7.50 a. m. left St. Christophe (Soissons). Received orders to proceed to Creil via Compiégne. Passed through Compiégne at 10.43 p. m. Arrived at Creil at 1.45 p. m. Had dinner, sent engine to coal. Received new orders to go to Noisy-le-Sec. Left Creil at 2.31 p. m., passing through Chantilly and arriving at Pantin at 9 p. m. Remained at Pantin for the night. Gave liberty. Made all preparations to leave at 6 a. m.

Battery No. 2.—Left Flavy le Martel at 8 a. m., en route to Haussimont. Train running very well.

Battery No. 3.—Drill morning and afternoon. Gun off trucks ready to fire. All Battery No. 3 stationed in dugouts in case of further shelling.

Battery No. 4.—All hands 5.30 a. m. Breakfast 6 a. m. Powder crew and others of gun crew shifted 11 rounds and 2 spare cans back from bombproof to

magazine car. Construction crew and remainder of gun crew raised gun from trucks and prepared for firing. Scrubbed clothes in afternoon. Considerable shelling of adjacent villages and roads.

Battery No. 5.—Gun placed in position for firing. Gun drill in afternoon. Germans shelled Belleville and Verdun throughout the day.

October 25, 1918.

Battery No. 1.—Left Pantin at 6.53 a. m. New brigade consisting of chef des train, pilot, and brakeman arriving at 6.45 a. m. A representative of the Est Railroad also came on board. Passed through Château Thierry, arriving at Épernay at 9.30 p. m. Went in garage for the night. Had to run slowly during the day due to journals heating.

Battery No. 2.—Arrived Pantin. Owing to traffic engine took from 4 p. m. to 7 p. m. to get coal. Left for Haussimont at 7 p. m.

Battery No. 3.—Gun drill morning and afternoon. Ensign Cheffy and 15 men cleared track at Verdun in morning with Battery No. 4 crane. Gun crew building shelter trenches on each side of gun position.

Battery No. 4.—Drill morning and afternoon. Men ordered to scrub clothes. Part of construction crew filled water tanks in morning and afternoon. During day an intermittent fire was kept up on Jardin Fontaine. High bursts were watched and preparations made to get men into bombproofs in case it appeared that the enemy was ranging on our position.

Battery No. 5.—Gun drill morning and afternoon. German shelling during day. High bursts frequently overhead.

October 26, 1918.

Battery No. 1.—Left Épernay at 5.55 a. m. Arriving at Oisy at 6.27 a. m. Took water and left at 6.45 a. m. Left the main line at Nuisemont. Noticed journal smoking and gave the signal to stop, but French pilot would not let engineer do so. Arrived at Sommesous at 10 a. m. Oiled bearing and backed in garage, arriving there at 10.30 a. m. Reported to Lieut. Commander Schuyler and received preparatory orders to leave. Commenced taking on stores, water, provisions, and transferred crew in the regular berthing cars, leaving Army box cars at base. Transferred crew's bags to storehouse. Turned over No. 6 engine and received No. 5. Transferred to base for hospital H. O. Larsen, C. M. 3c. Received the following man on board: Louis Cruz, M. Att. 3c.

Battery No. 2.—Arrived Chalons-sur-Marne at 2 p. m. After taking water proceeded on way. Stalled on hill about 6 miles from Sommesous, broke train and took it to next station in sections. Arrived Sommesous at 6 p. m., and moved into naval battery garage.

Battery No. 3.—Gun drill postponed in morning, but held in afternoon. Finished shelter trenches at gun position.

Battery No. 4.—Gun drill in morning and afternoon.

Battery No. 5.—Gun drill in afternoon.

October 27, 1918.

Battery No. 1.—At 6 a. m., Commander Schuyler reported on board. At 6.30 a. m., received orders from Commander Schuyler originating from R. A. R. to proceed to Sartelles (Meuse). Brigade (French), consisting of chef des train, pilot and brakeman came on board at 6.15 a. m. At 7.10 a. m., arrived in garage at Sommesous. At 7.45 a. m., backed out of garage and left for Sar-

telles via Chalons, St. Menehould, Claremont, Somilly. After leaving Sommesous and before reaching Bussy engine could not pull train up the grade, rails were wet and slippery. Phoned to Sommesous for another engine, which went with us to Bussy. At Chalons picked up another French engine to help us over grades which went as far as Suippes. Arrived at St. Menehould at 5 p. m.; held in block until 6.30 p. m. French "brigade" left. American pilot came on board. Due to congested road and waiting for extra engine to help up grades, progress was very slow. All journals in good shape.

Battery No. 2.—Received one new berthing car in place of Army box car. Loaded commissary and G. S. K. stores and drew small stores. Filled all water tanks. Turned in great part of machine guns, rifles, and pistols, including ammunition. Everything ready to leave in the morning.

Battery No. 3.—Loaded 25 rounds of powder in ammunition car. Gun drill in morning. Standing by to fire. Weather unfavorable. Secured shortly after noon.

Battery No. 4.—Gun drill in morning. At 10.45 a. m., ordered to prepare for firing, to put 4 rounds of powder in ammunition car and to stand by. Dinner served at gun. At 12.35 p. m., ordered to secure and remain at train within call. At about 10 a. m. it was reported that a German plane which was seen overhead had dropped bombs on hill to southwest of gun killing a number of horses and one man and injuring two other men. Fire by German guns upon Belleville and the Belleville bridge was resumed about 9.30 a. m. and continued intermittently throughout the day. Some bursts were near enough to the berthing cars to throw fragments within 20 or 30 feet of them. A number of such fragments were brought in, still hot. During night firing continued intermittently, many bursts being near enough to shake the berthing cars. Very heavy firing heard from both German and allied batteries about daybreak.

Battery No. 5.—Germans shell Verdun and near-by towns. Airplane apparently spotting. Airplane dropped four bombs. At 11.30 a. m. received orders to stand by to fire. Owing to weather, no firing.

OCTOBER 28, 1918.

Battery No. 1.—Arrived at garage No. 55, Blercourt. At 5.30 a. m. was directed to remain there until garage No. 58 was empty. Assembly at 8 a. m. Gas drill. Crew engaged in cleaning up cars and routine work.

Battery No. 2.—Left base at 8.30 a. m. for Nixeville. Arrived at Chalons at 12.15 p. m. Turned gun around at St. Hilaire at 3.30 p. m., as directed by telegram received at Chalons. Arrived at Suippes at 5 p. m. Arrived at St. Menehould at 9 p. m., took coal, and got first American pilot.

Battery No. 3.—Gun drill in morning. At about 11.30 a. m. six enemy shells, about 9-inch caliber, fell around gun positions. R. E. Elliott, Battery No. 3, struck by shell fragment and the skin of chest broken; shirt torn. Aired bedding.

Battery No. 4.—Received 80 pair hip boots for issue. Jack bent while being used on left end of forward jacking beam returned to Haussimont. At about 11.35 shells began to burst near the bridge over the Meuse, about 1,000 yards northeast of gun positions. Shortly afterwards shell struck the ground and burst within a short distance of Nos. 4 and 5 guns. Three men of Battery No. 5 were wounded. No. 4 gun was spattered with flying earth and fragments of shell, one of the latter shearing off a bolt in the aftersection of the cab. At about 12.40 p. m. a number of other shells burst in the meadow between the train of berthing cars and the Meuse. Men of No. 4 Battery were ordered to

put on helmets and carry gas masks at the alert position, and then were ordered into the bombproofs alongside train. Lieut. Orr was then left in charge at the train, the commanding officer proceeding to the gun. At about 1.20 p. m., no shells having fallen near by for about half an hour, men were allowed to leave the immediate vicinity of the bombproofs and dinner was served. Boots issued at 1 p. m.

Battery No. 5.—Germans shelling throughout the night. At 9.30 a. m., put men to work on ammunition car to put in steam line, and at 11.25 a. m., the enemy began shelling around the gun, and the following men were wounded: Guthrie, K. W., S. F. 2c., wounded left leg; Sharpe, A. P., S. F. 1c., wounded in left leg; Burdette, A. J., S. F. 2c., wounded in the face. The above named men were transferred to U. S. Army Field Hospital at Glorieux, France.

OCTOBER 29, 1918.

Battery No. 1.—Left garage 55 at 7 a. m. Arrived at garage No. 58 at 8.10 a. m. (Nixéville). Found Battery No. 2 here. Had assembly. Ran telephone line to Nixéville. Engaged in making camp. Filled galley tanks. Making radiator for ammunition car. Gas and first aid drill. Crew engaged in scrubbing clothes. Admiral Plunkett with Commander Bingham stopped en route to base at Haussimont. Transferred to No. 2 Battery Louis Cruz, M. Att. 3c. Commander Schuyler and Lieut. Genini, French liaison officer, moved their quarters to Battery No. 2.

Battery No. 2.—Arrived at Nixéville at 5 a. m. Left with gun, ammunition, and berthing cars at 7 p. m., leaving remainder of train.

Battery No. 3.—Starting firing at 1.30 p. m. Objective, Mangiennes. Fired 10 rounds. Pit in good condition. Gun functioned O. K.

Battery No. 4.—Commanding officer, Ensign P. L. Davis, and Ensign W. C. Davis with 10 men proceeded to position near Charny to check up pit put in by Battery No. 3, which Battery No. 4 had been ordered to occupy. Checked pit position and line of fire by railroad tangent through Charny. Also examined dugouts for crew's quarters. At 8.30 a. m., informed by Lieut. Commander Bunkley that Battery No. 4 would fire from Thierville position at 11.30 a. m. Party returned to Thierville at 9.30 arriving at 9.40 a. m. Ordered to prepare gun for movement to Charny position. Shifted to ball-bearing jacks aft and lowered away forward and aft. At 10.20 a. m., ordered to prepare gun for firing from present position at 11.30 a. m. Gun reported ready to fire with 10 rounds of powder in ammunition car. Fired first round at 1.07 p. m., second at 1.14 p. m. When ordered to prepare for firing, had asked for instruction whether or not to shift back to screw jacks and was directed not to shift. After second round it was observed that jacks were bending. Shifted to screw jacks. Remaining shots fired at 1.53, 2.02, 2.06, 2.10, 2.14, 2.21, 2.35, and 2.39 p. m. Aiming angle varied from 20–19 to 21–18, elevation 20–19 to 19–31. Afterwards was informed that target was Mangiennes. A heavy counterrecoil was observed to jump the cab and to give the entire mount more rocking than seemed necessary. Therefore the air pressure was reduced from 140 lbs. to 65 lbs. Results were satisfactory. After firing, the gun was swabbed out and prepared for removal. Work was begun at 3 p. m., and completed at 5.15 p. m. Necessary switching was done and clearance secured from Verdun. At 8.15 p. m., with French pilot left for Charny. Took gun car, tool car, French caboose, three berthing cars, galley car, and battery headquarters car. Arrived at siding below Charny about 9.15 p. m. Found that switch point had been removed and that siding was occupied by a French construction train and two French berthing cars. Found switch point and put it in. French insisted

that we could not use siding. Proceeded to pit, and spotted gun car. Then found that French had again removed switch point. Secured permission from office of chef de gare at Verdun, found point, replaced it and spotted all cars.

Battery No. 5.—Gun drill in morning. Started firing at 1.20 p. m. Fired 10 rounds. Firing delayed 40 minutes due to slipping of jacks. Ceased firing at 2.20 p. m.

October 30, 1918.

Battery No. 1.—Assembly at 8 a. m. Gas drill. Routine clearing work. Making heater, car windows. Lieut. T. S. Fields, Medical Corps, U. S. N., reported on board for duty.

Battery No. 2.—Arrived at Charny, just north of Verdun, at 2.30 a. m. Called all hands and placed gun on pit installed for us by Battery No. 4. Fired six rounds at Montmedy—37,382 yards. First shot fired at 12.04 p. m.; last shot fired at 12.29 p. m. Enemy shelling crossroads between gun and berthing cars during day. Killed three American engineers working on track near by. Derailed headquarters and one berthing car on garage; replaced without damage.

Battery No. 3.—Gun drill in morning. At 12.30 p. m., fired six shots. Objective, Longuyon for adjustment. Failed to get photographs.

Battery No. 4.—Worked until 4.30 a. m., served coffee, meat, and bread in galley car and resumed work at 5 a. m. Breakfast at 7.30 a. m. Gun ready at 10 a. m. One of Battery No. 2 ammunition cars spotted in rear of gun car. Fired six rounds, 12 noon, 12.06, 1.08, 1.13, 1.20, and 1.23. Target, railroad tunnel, Montmédy. After second round raised afterpost of gun carriage on small jacks and realigned screw jacks, which did not move back with gun and pit, and hence were cocked to rear. Pit was put in on edge of railroad fill and steadily sank at forward end. During the day five men were reported killed and others injured by enemy shells which fell near crossing of railroad and wagon road at Charny. One shell, which killed two and injured several others. U. S. A. engineers fell within 50 feet of P. C. Schuyler, telephone control. During afternoon jacked up forward end of gun car, leveled gun, and did other work on pit, also put bunks in bombproofs near train for those men wishing to use them. Capt. Wayne Gilmore, U. S. A., was attached to Battery No. 4 as observer.

Battery No. 5.—At 7 a. m., quarters all gun crew to posts. Special details to posts. Gun crew put to work on preparing for firing. At 11.55 orders received to fire. At 12.30 p. m. began firing. Fired six rounds. At 2 p. m. working parties set to work on transferring shell and powder.

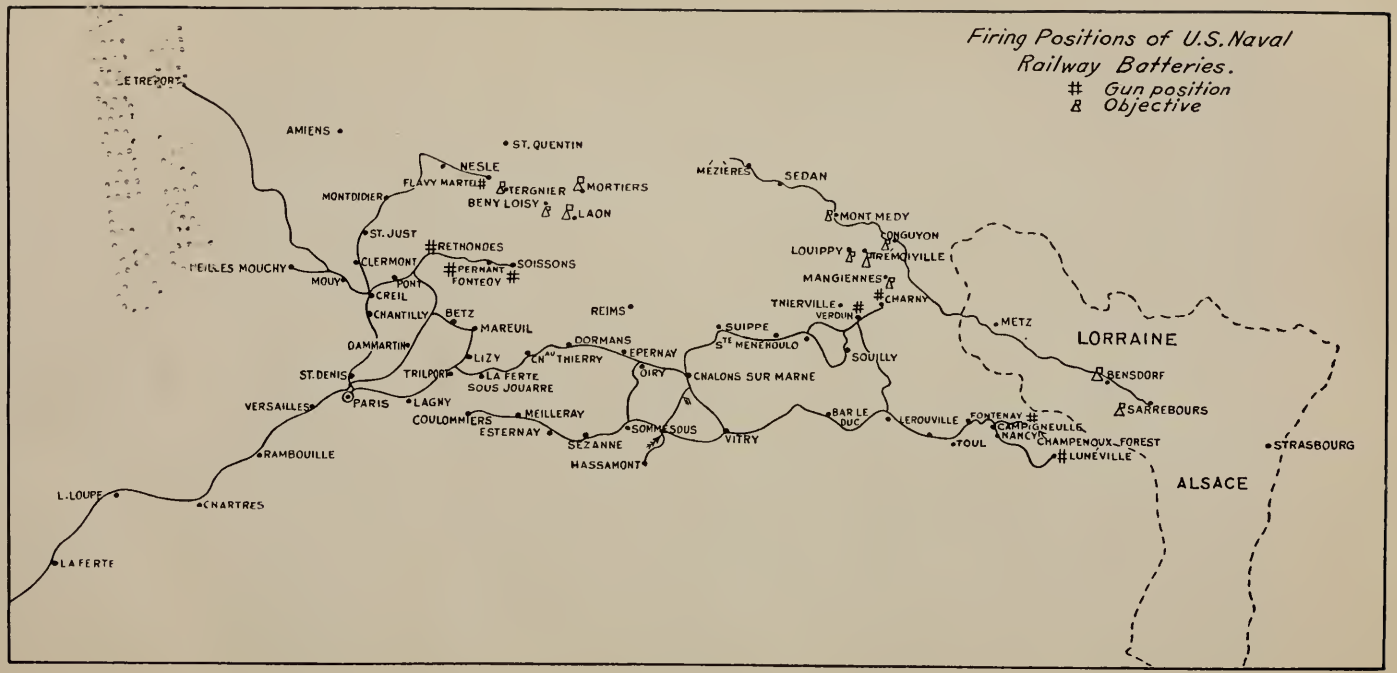
October 31, 1918.

Battery No. 1.—Assembly at 8 a. m. At 8.30 a. m. had gun, airplane signal, and gas and casualty drills. Stationed the crew at fire quarters. At 9.30 a. m. aired bedding. Continued work filling galley tanks, putting heating system in ammunition cars, making wood boxes under cars, cleaning up construction cars, overhauling trucks, and routine work. At 3.30 a. m. E. J. Sullivan, G. M. 3c., was transferred to the base on account of sickness.

Battery No. 2.—Shelling continued throughout the night. Several falling near gun. All of crew in dugouts. All powder in dugouts. Fired six rounds at Montmédy—37,382 yards. First round at 1.07 p. m., last round at 1.31 p. m. Sent working party to Verdun for ammunition. One Frenchman killed near crossing.

AIRPLANE VIEW OF RAILWAY JUNCTION AND AMMUNITION DUMPS AT MORTIERS; TARGET OF U. S. NAVAL BATTERY.

80—1


Firing Positions of U.S. Naval Railway Batteries.
Gun position
& Objective
LE TREPORT
AMIENS
ST. QUENTIN
NESLE
FLAVY MARTEL
ETERNIER
MORTIERS
BENY LOISY
LAON
MONTDIDIER
ST. JUST
RETHONDES
CLERMONT
PERNANT
SOISSONS
FONTEOY
MEILLES MOUCHY
MOUY
PONT
CREIL
CHANTILLY
BETZ
MAREUIL
DAMMARTIN
LIZY
DORMANS
EPERNAY
REIMS
ST. DENIS
TRILPORT
LA FERTE SOUS JOUARRE
CH au THIERRY
DIRY
CHALONS SUR MARNE
VERSAILLES
PARIS
LAGNY
COULOMMIERS
MEILLERAY
ESTERNAY
SEZANNE
SOMMESOUS
VITRY
HASSAMONT
RAMBOUILLE
L. LOUPE
CHARTRES
LA FERTE
MEZIERES
SEDAN
MONT MEDY
LONGUYON
LOUPPY
TREMONVILLE
MANGIENNES
CHARNY
THIERVILLE
VERDUN
SUIPPE
STE MENEHOULD
SOUILLY
BAR LE DUC
LEROUVILLE
TOUL
FONTENAY
CAMP GNEULLE
NANCY
CHAMPENOUX FOREST
LUNEVILLE
METZ
LORRAINE
BENSDORF
SARREBOURS
STRASBOURG
ALSACE

Battery No. 3.—Gun drill in morning. Fired six shots, starting at 12 noon. Objective, Longuyon, for adjustment. Failed to get photographs. Gun and pit in good condition.

Battery No. 4.—Discovered that during night the distance between pivot under forward end of gun car and socket on forward trucks had decreased from about 3″ to about ¾″. Rigged beams with wedges between tie-rod blocks and rear jacking platforms. Fired six shots between 12.58 and 1.32 a. m. Same target as yesterday. Pit did not sink farther and behaved normally. Lieut. Orr and 20 men (10 from Battery No. 4 and 10 from Battery No. 2) proceeded to Thierville early in morning with engine and returned late in afternoon with two cars containing 24 rounds for Battery No. 4 and 31 rounds for Battery No. 2.

Battery No. 5.—All hands sent to gun stations at 7.15 a. m. Held loading drill at 8 a. m. At 12 noon started firing and completed at 12.18 after firing six shots on special target. After ceasing firing sent working party to load ammunition; shifted ammunition from French flat car and crane car to our ammunition car.

NOVEMBER 1, 1918.

Battery No. 1.—Assembly at 8 a. m. At 5 a. m. received telephone order from executive officer of naval batteries to send part of breech mechanism to No. 3 Battery. This disabled the gun of this battery. At 8.30 a. m. gas drill. First-aid instruction. Finished heating system for ammunition car. Making tool boxes. Cutting ammunition-car doors to fit track for shell. Instructing radio operators. Filling galley tanks. Let fire die out in engine. Afternoon, recreation for men. Football games, etc.

Battery No. 2.—All hands at 4 a. m. Stood by. Gun fired 13 rounds at Montmédy; first round at 7.21 a. m., last round at 8.18 a. m. Had considerable difficulty starting air compressor. Shell struck 15 feet in front of dugout that crew was using. One man stunned. Two soldiers killed in town, and shell exploded against railroad bank exactly in front of dugout we were using for B. C. station, but fortunately we were all out for dinner.

Battery No. 3.—At 4.06 a. m. opened fire. Objective, Longuyon. Breech plug jammed after first shot—out of commission, with bent crank shaft. Received new one from Battery No. 1. Gun ready to fire at 1.30 p. m. Accident caused by either a sliver of brass from shell tray getting into crank-pin bearing or too much castor oil on plug and screw-box threads.

Battery No. 4.—At 3.45 a. m., received orders from Commander Schuyler to man guns and prepare to fire. Reported gun ready at 5.30 a. m. Between 5.55 a. m. and 8.30 a. m. fired 23 rounds at Montmédy garage, range 37,236 yards. Pit and gun functioned normally. Gas-check pad slightly scored and was shifted after firing completed. Put 44 cans of ammunition in dugout. At about 3.30 p. m. Lieut. Orr left for Thierville with working party of 10 men to transfer ammunition from box and flat cars to magazine cars. Returned at 8 p. m., having rigged magazine-car extension gear, spotted cars for shift, and shifted 15 tanks of powder. At 9.30 p. m. received orders to be ready to fire 50 rounds at 5.30 a. m. Made arrangements for executing order.

Battery No. 5.—At 3.15 a. m. all hands made preparations for firing. Commenced firing at 4.05 a. m. Ceased firing at 8.35 a. m., after firing 44 rounds at Longuyon garage. Batteries Nos. 3 and 5 received 75 rounds of ammunition from Vaubecourt. Spent remainder of day loading ammunition and making preparations to renew firing.

NOVEMBER 2, 1918.

Battery No. 1.—Assembly at 8 a. m. Gas and first-aid instruction at 8.30 a. m. Received parts of breech mechanism and got gun ready to fire. Cleaned up engine. Filled tanks with fresh water. Sponged out gun.

Battery No. 2.—Turned out at 2.30 a. m. and stood by gun. Fired 30 rounds at Montmedy, first round at 3.48 a. m., last round at 7.27 a. m. Sent to Verdun for more ammunition. Stood by all day.

Battery No. 3.—Started firing at 3.40 a. m. Fired 25 rounds. Objective, Longuyon. Finished firing at 7.30 a. m. Gun functioned O. K. Pit in good condition.

Battery No. 4.—At 1.05 a. m. ordered to be ready to fire at 3.30 a. m. At 2 a. m. Lieut. Orr and 10 men from each battery called to proceed to Thierville after ammunition. At 2.15 a. m. C. O. and Ensign Davis called and at 2.20 a. m. crew. Between 3.56 a. m. and 7.16 a. m. fired 20 rounds. At 10.30 a. m. Lieut. Orr returned with two cars containing 50 rounds of shell and powder, 25 for each battery.

Battery No. 5.—Called all hands at 2.40 a. m. Commenced firing at 3.40 a. m. At 7.30 a. m. ceased firing. Twenty-five shots fired at Longuyon garage. Spent forenoon and afternoon loading empty tanks for shipment and reloading ammunition car.

NOVEMBER 3, 1918.

Battery No. 1.—On garage at Nixéville making preparations to leave. Assembly at 10 a. m. for inspection. Inspected crew and train. Recreation in the afternoon. At 5 p. m. sent engine to Thierville for coal; about 8 p. m. Battery No. 2 came in the garage. Commander Schuyler, group commander, on board about 10 p. m. Train of ammunition came on garage. Received orders from R. A. R. for this battery to leave at 8 a. m., November 4, for Compignelle, taking 100 rounds of ammunition with us.

Battery No. 2.—Took gun off pit preparatory to leaving position. Ammunition car went off rails near crossroads that had been under fire for so long. Delayed two hours. Left Charny for Nixéville at 6.30 p. m. Stopped at Thierville for provisions from P. C. Bunkley. Arrived at Nixeville at 1.30 a. m. Ordered to stand by to move over to French front.

Battery No. 3.—Routine work cleaning gun and sponging bore. At 3.15 p. m. Boche plane overhead for 30 minutes. Started taking gun off pit at Thierville, preparing to go to Charny at 10.30 p. m.

Battery No. 4.—At 2.30 p. m. informed by Commander Schuyler that all ammunition would be taken away with Battery No. 2, which was almost ready to proceed to another position (near Nancy). At about 3 p. m. received orders to prepare at once to fire 50 rounds on Remoiville. Between 4.30 p. m. and 7.11 p. m. fired 12 rounds on Remoiville and 13 rounds on garage between Remoiville and Louppy. No observation. Previous to and during firing enemy planes flew over position at height estimated at about 3,000 meters. Between 9.30 and 11.30 p. m. 8 or 10 shells, probably 210's, burst along railroad track and on hillside between gun and garage. This distance is about 1,200 yards. One projective burst on narrow-gauge track about 200 yards above garage. Fragments or stone thrown up by burst struck headquarters car.

Battery No. 5.—All hands at 6 a. m. Spent day transferring coal to fuel car.

NOVEMBER 4, 1918.

Battery No. 1.—Awaiting orders to leave. Routine work, drill, and recreation.

Battery No. 2.—Arrived at Nixéville at 1.30 a. m. Awaiting orders to leave.

Battery No. 3.—At 2 a. m. left for Charny. Gun was over the pit at Charny at 10 a. m. Fired 50 shots at upper and lower garage and tunnel at Montmédy. Fired six shots at 4 p. m. at upper garage, Montmédy. Reported that lower garage, Montmédy, was afire. Gun position was shelled during the day, closest shell hitting 75 yards to rear. Target No. 1, 27 shots; target No. 2, 17 shots; target No. 3, 12 shots. Ensign Davis checked aiming angles. Reported them O. K.

Battery No. 4.—Between 1.30 and 3.50 a. m. fired six shots at Montmédy. During firing, pit kept setting back and sinking. Forward part of girders rested on forward trucks. Pit went back so far that it was necessary to jack up forward end of gun car and run trucks back, this to keep pivot partially over socket in trucks and to prevent air-hose connection between gas engine and gun car from being torn. A tilt of 43′ right high was taken out after jacking beam. Previously to the 1.30 firing it was reported to P. C. McMillan that pit was in such condition that firing was dangerous. After arrival of Lieut. Commander Bunkley, about 2.30 a. m., this report was made again. At about 5 a. m. orders were received to cease firing and to take gun off pit after breakfast. No. 3 gun came up from Thierville at about 2.30 a. m. and went into position on pit above Charny vacated by Battery No. 2. Commanding officer Battery No. 4 had reported to P. C. McMillan that a day probably would be required to get No. 4 gun off pit. Turned to at 9 a. m. to sponge out, take gun from pit, and repair garage track where Battery No. 2 had derailed two cars. About 10.30 p. m., November 3, had sent C. M. M. Boswick and 10 men to repair track at pit so that No. 3 gun could get by in safety. Commander Schuyler and Lieut. Commander Bunkley have been repeatedly notified that unless additional bulbs for electric torches are secured it will soon be impossible to fire at night. The commanding officer of this battery has made every effort to procure these blubs by request to executive officer before and since leaving Haussimont. Capt. Gilmore and detail of 15 men from Battery No. 4 worked from 3.30 until 10 a. m. in rerailing an ammunition car derailed by Battery No. 3 as it was being hauled to No. 3 gun. At about 10 a. m., finding that all officers and men of No. 3 Battery had turned in immediately after mess, commanding officer of Battery No. 4 notified commanding officer of Battery No. 3 that car would be on in about one-half hour, but that it could not be moved until track had been realigned. Upon arriving at car it was found that Battery No. 3 jacks were defective and that final rerailing would be somewhat delayed. Commanding officer of Battery No. 3 was notified and detail of Battery No. 4 men taken off. At about 4.15 a. m. commanding officer of group ordered Battery No. 4 to complete rerailment. Battery No. 3 had left car stand as it was and had made no effort to put it on the rails. The order was complied with. During afternoon and evening work of moving gun from platform was continued, and at 9 p. m. gun was taken to Thierville. At about 4 p. m. gun was heavily shelled, six or seven projectiles falling within a hundred yards of it. There had been some shelling earlier in the day. Cover was taken until firing seemed to have ceased. G. F. Burke, C. M. 2c., was struck in the forearm by a shrapnel ball shortly after noon. The wound required medical attention.

Battery No. 5.—Turned over ammunition car containing 25 rounds to Battery No. 3. Followed general routine.

NOVEMBER 5, 1918.

Battery No. 1.—Left garage at Nixéville at 7.45 a. m. Pulled out on the main line at 8.15 a. m. Coupled up three French ammunition cars to train contain-

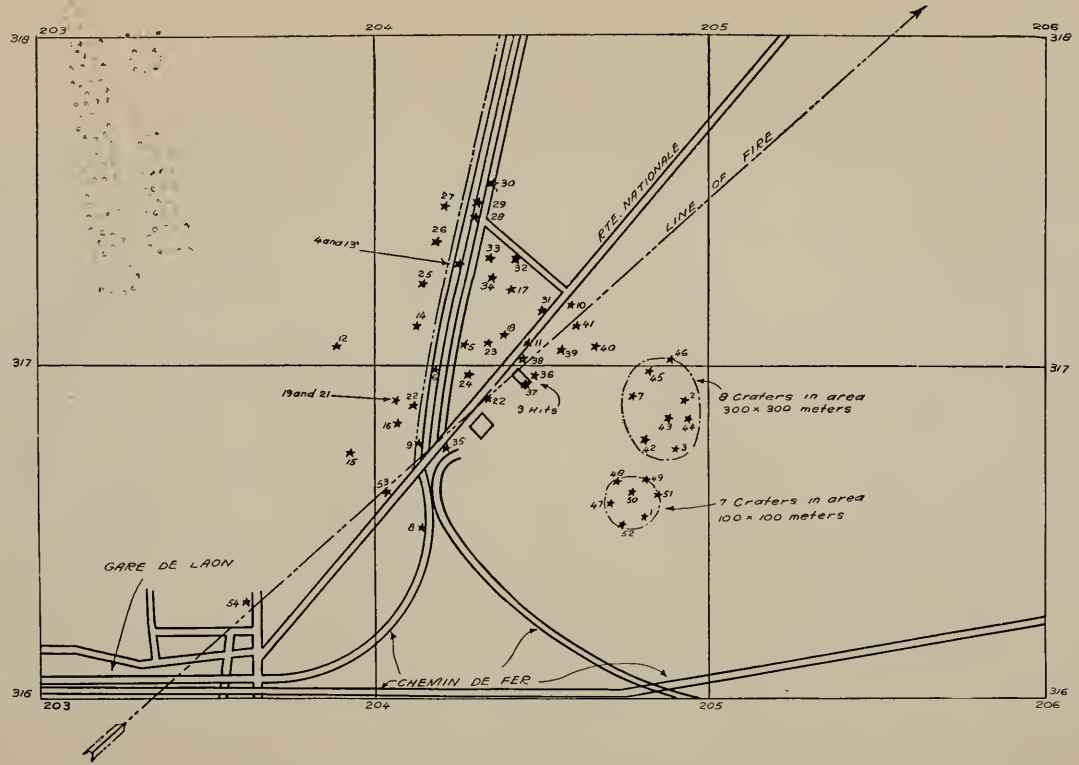
ing 36 complete rounds of 14'' 50-caliber ammunition and left Nixéville for Champignelle. Twenty cars in train. Have nothing but verbal orders to travel on. At 9.15 a. m. arrived at Balecourt. Pilot came on board. Another engine coupled on to us to help pull over grades. At 9.40 a. m. arrived at Verdun. Changed head of train in entering Verdun. Gun in passing over rail that had been weakened by shell broke rail. At 10.10 a. m. left Verdun. Two engines attached to train. Pilot on board with orders to Ancrevourt. Arrived at Dugny at 10.55 a. m. Left at 11.08 a. m. Engine took water. Extra engine uncoupled and went back. Arrived at Ancrevourt at 12.10 p. m. Stopped for dinner. Pilot left. At Ancrevourt no pilot available. Passing through Villiers at 1.11 p. m. Left at 1.50 p. m. Had to wait for train to pass. Arrived at St. Mihiel at 3.06 p. m. Arrived at Laronville at 5.11 p. m. Engine took water. Brigade came on board. Connected up French brake car P. L. M. 18597. Commissioner Militaire asked for Ordre de Transport. None had been given me. I am not allowed to make one out where there is an R. T. O. There being one at this place, made out Ordre de Transport. I was then allowed to leave. Left at 6.54 p. m. Arrived at Toul at 9.04 p. m. Coaled engine. Was held there until 11.42 p. m., when left for Champignelle.

Battery No. 2.—Loading 100 rounds of ammunition in forenoon. Left for Moncel les Lunéville at 12.45 p. m. Arrived at Verdun at 2 p. m. Arrived at Dugny at 3.30 p. m. Ancemont, 6 p. m.; American pilot left us. No French pilot available without waiting all night, so proceeded to St. Mihiel without one, arriving at 10.30 p. m. Took on French pilot and proceeded.

Battery No. 3.—All hands called to gun at 3 a. m. Started firing at 5.05 a. m. Finished at 4.43 p. m. Target No. 3, Montmédy, 11 shots; target No. 4, Montmédy, 39 shots. Shells hit in vicinity of train, about 200 yards. This occurred about 11 a. m. All men sent to dugouts. New York Herald, Paris edition, dated November 4, told of heavy shelling on Montmédy and Longuyon aiding the American and French Armies.

Battery No. 4.—Commanding officer examined proposed new position near Cumières with Lieut. Cohin, Engineer Corps, U. S. A. The latter established pit line and set level stakes. Many dugouts were found in hill near position, but all were occupied. Tentative arrangements for use of garage for berthing cars were made with Capt. Drew, railway engineers. Shortly before noon the berthing and other cars of Batteries Nos. 3 and 4 were hauled down to garage, about three-quarters mile south of first garage below Charny, to escape enemy shell fire. Shells fell on hillside just above and beyond train, which was struck by many fragments of mud, rock, and shell. Returned to upper garage at about 1.30 p. m. Paymaster Baldwin paid off crew. Work on removal of pit material continued until dark. Discontinued work at dark for accommodation of U. S. A. Engineer captain in charge of the division of track. He did not want main line blocked just then. Also, it was desired to avoid night work with exhausted men. Lieut. Malcolm, U. S. A., an aviator who was forced to land near by after having had his gas tank punctured by a German machine-gun bullet, had dinner in ward rooms mess. Lieut. Malcolm was shot down while bombing Montmédy, November 4, from 3,000 meters. During afternoon work on removing pit crew was forced to take shelter from enemy shell fire. In the morning the gun position was shelled. No one injured.

Battery No. 5.—Transferred 18 rounds of ammunition to Battery No. 3. Scraped journal of No. 2 left wheel of forward truck gun car. Paymaster paid crew. The following-named men reported for duty from the base: R. W. Fiedler, F. 3c.; J. Bonteko, sea.; J. K. Seitz, M. M. 1c.



SKETCH OF TARGET NE. OF LAON, SHOWING FALL OF SHOTS ON OCT. 3, 9, 10, AND 11, 1918.

NOVEMBER 6, 1918.

Battery No. 1.—Arrived at Champigneulle at 3 a. m. Went on garage. Tried to report to some one, but could not locate R. G. A. of Eighth French Army. At 8.30 a. m. Commander Schuyler came on board, having been in touch with R. G. A. At 2 p. m. commandant of R. G. A., Eighth French Army, came on board and left at 2.30 p. m. Brought orders to proceed to Champenous garage in the forest of Velaine. Filled water tanks. Left at 5.05 p. m. Arrived at 6.58.

Battery No. 2.—Arrived at Leronville at 9 a. m. Picked up civilian pilot (Est.). Coaled, watered, and left at 10 a. m. Arrived at Toul 12 noon. Arrived at Nancy at 6 p. m. Passed Battery No. 1 at Champigneulle, just above Nancy. Having trouble with locomotive journal, so put engine in roundhouse; took out, ground down, repacked, and replaced collar. Left Nancy at 9 p. m.

Battery No. 3.—Stood by all day to fire on tunnel in Montmédy. Powder too cold to reach target. Fire of November 4, 1918, officially credited to naval guns by P. C. McMillan reports.

Battery No. 4.—Stood by for orders on removal of more pit material. Scrubbed and washed clothes. Work commenced on pit at new position near Cumieres, digging being done by an Army unit.

Battery No. 5.—Nine cars arrived, containing 48 shells and 98 tanks of powder and one carload of punchings. Loaded one car for Battery No. 3, finish at 4.30 a. m. At 8 a. m. turned to and loaded another car for Battery No. 3, finishing at 11 a. m. Received one 100-ton ball-bearing jack and one 100-ton red jack from base. Released 12 empty cars, 4 cars loaded with 548 empty powder tanks and one car of punchings. Empty tanks sent to naval base at Brest and punchings sent to base at Haussimont.

NOVEMBER 7, 1918.

Battery No. 1.—Assembly at 8 a. m. Making camp, locating water, running telephone line to connect to R. G. A. At 10.30 a. m. Commander Schuyler arrived. At 1 p. m. left train with him to make survey of firing position. At 2 p. m. left with Commander Schuyler to visit commandant of R. G. A.. Received orders from him to take guns to garage about 1½ miles back of firing position. Sent Ensign Linhard with engine to bring gun up. About 5 p. m. Admiral Plunkett and Paymaster Baldwin arrived at battery. Paid crew off. Admiral Plunkett and Paymaster Baldwin left at 6 p. m.

Battery No. 2.—Arrived at Lunéville at 1.40 a. m. Spent day waiting for orders.

Battery No. 3.—During the entire day we fired at irregular intervals at railroad bridge in Montmédy. Aiming angle checked after firing by Ensign W. C. Davis and reported O. K.

Battery No. 4.—Finished removal of pit material, except timbers under after jacks. P. C. McMillan changed proposed target to be fired on from position near Cumières, necessitating the digging of a new pit. This was staked out by Lieut. Eakin and work commenced.

Battery No. 5.—Engine left for Fleury for cleaning. Two engines (Nos. 734 and 836) arrived for temporary assignment.

NOVEMBER 8, 1918.

Battery No. 1.—Assembly at 8 a. m. Sent Ensign Allen with party to survey firing position and work with French engineer in locating guisement. Completed at noon. Began clearing off ground, locating site for dugouts and battery headquarters. About 1.30 p. m. enemy began shelling near train. Sent men to

dugouts, and firing-point men have been assigned dugouts. Ran telephone line to gun and firing position. At 4.30 p. m. enemy began shelling again, shells going over and to right of head of train.

Battery No. 2.—Left Lunéville at 2 p. m. for Moncel les Lunéville, arriving at 3 p. m. On garage for night.

Battery No. 3.—Fired six shots on No. 3 target at Montmédy. One per hour.

Battery No. 4.—Work continued on new position.

Battery No. 5.—Engine returned from Fleury.

NOVEMBER 9, 1918.

Battery No. 1.—Crew engaged in making excavation for gun pit. Left train at 6.45 a. m.; returned at 4.30 p. m. Received on train fresh provisions from French Army. Ran traverse and obtained coordinates of gun position. Sent engine for water.

Battery No. 2.—Moved up near position at 3 p. m. Made reconnoissance. Admiral Plunkett reported for inspection of position. Laid out pit and broke ground.

Battery No. 3.—Twenty men and Ensign Cheffy called at 12 midnight to go to Thierville to load ammunition in car No. 102. No. 102 jumped track at Thierville garage, but we were able to start firing at 9 a. m. by sending French cars loaded with ammunition to Charny. Fired 25 rounds at target No. 3, Montmédy.

Battery No. 4.—At 12.05 a. m. ordered to have gun at Thierville ready to shoot from Thierville position at 9 a. m. Proceeded to Thierville with entire train. Put gun on platform ready to fire at 9 a. m. Battery No. 3 ammunition car, empty, derailed between main line and cross roads. Ammunition arrived about 5 a. m. and was held up outside of derail until 9 a. m., when track was cleared. Between 10 a. m. and 12 noon fired 10 rounds at Longuyon garage. Between 8.15 p. m. and 9.15 p. m. fired 10 rounds at Mangiennes. Boche plane was flying overhead during last four or five shots.

Battery No. 5.—Received 25 rounds of ammunition. Repaired track and put back ammunition car No. 102 on track. At 10.10 a. m. commenced firing at Longuyon. Fired five rounds and ceased at 11.30 a. m. At 7.20 p. m. commenced firing on Mangiennes, firing 10 rounds and ending at 9.50 p. m.

NOVEMBER 10, 1918.

Battery No. 1.—Crew engaged in excavating for E. P. I. Received fresh provisions. Sent engine for water.

Battery No. 2.—Started digging pit at daylight; continued throughout day. French engineers moving track over in line for us. This position is in a beautiful forest, which seems exceptionally well organized as an artillery center, there being a great many epis. It is known as the Forêt de Mondon.

Battery No. 3.—Ensign Cheffy and 20 men sent to Thierville to get ammunition at 3 a. m. Unable to reach target.

Battery No. 4.—Received ammunition, train arriving at 6.50 a. m. Ordered to fire at 9 a.m. at Longuyon garage, but temperature of powder, atmospheric conditions, and loss of velocity from erosion made it impossible to reach target. Stood by all day, but no firing.

Battery No. 5.—Received 15 shells and 25 charges of powder.

NOVEMBER 11, 1918.

Battery No. 1.—Received word over telephone from R. G. A. that the armistice was signed, and to stop work on gun position. Commander Schuyler and Lieut. Commander Bell visited battery. Sent engine for coal and water.

Battery No. 2.—Continued work on pit until received word at 9.40 a. m. from R. G. A. by phone that armistice had been signed and that we were to stop preparing position and load out material. "Finis la guerre." Loaded material and secured everything for moving.

Battery No. 3.—Stood by to fire, but unable to reach target. Heard the armistice was signed at 11 a. m.

Battery No. 4.—Gun ready to load at 9 a. m. Between 10.05 a. m. and 10.58 a. m. fired five rounds at railway garage, Longuyon. Last shot fired by J. A. Kaffka, S. F. 2c., U. S. N. Primer turned over to Lieut. Commander Bunkley for Gen. Barnes. Sponged out and secured. One-third of men given liberty in afternoon.

Battery No. 5.—Commenced firing on Longuyon at 10 a. m., firing five rounds; stopping at 10.56 a. m. Armistice went into effect at 11 a. m.

NOVEMBER 12, 1918.

Battery No. 2.—Gave liberty from 10 a. m. to 6 p. m. to Lunéville. About 15 kilo. away, party going and arriving on permissionaire train from St. Clement Station.

Battery No. 3.—Cleaned up gun and about train. Crew washed clothes and swabbed down berthing cars.

Battery No. 4.—Twenty-four men, shop, crane, and two flat cars of material sent to Cumieres to put in new pit foundation. Party ready to leave at 9.30 a. m., but owing to refusal of U. S. Engineers to allow engine to take water promptly did not shove off until 12.45 p. m. Twenty men granted liberty at 12.45 p. m.

Battery No. 5.—Day uneventful. Received two cars of coal.

NOVEMBER 13, 1918.

Battery No. 1.—Setting-up exercises at 8 a. m. Going ahead with routine work. Granted crew usual liberty.

Battery No. 2.—Locomotive No. 6 arrived to relieve No. 4. Lieut. Commander Schuyler left with Mr. Bell and Lieut. Genini to join Battery No. 1.

Battery No. 3.—Gun crew sent to gun to begin getting in order for traveling.

Battery No. 4.—Continued work on pit. Commanding officer went in Cadillac with Lieut. Commander Bunkley and Maj. Hayden, U. S. A., adjutant of P. C. McMillan, to Remoiville and Louppy to discover effects of our fire on garage and roads near those points. Fourteen shell holes were found. Two in the ammunition dump near garage, between the two towns, one about 10 feet from road between this dump and Romoiville, two about 100 yards beyond bridge below chateau and church at Remoiville, and the remainder beyond and farther to the left of this bridge. The holes were about 33 feet in diameter and about 8 to 11 feet deep.

Battery No. 5.—Uneventful.

NOVEMBER 14, 1918.

Battery No. 1.—Assembly at 8 a. m. Setting-up exercise, routine work. Commandant Blot, R. G. A., Tenth French Army, visited the battery.

Battery No. 2.—Liberty and routine.

Battery No. 3.—Took out firing jacks and replaced them with ball-bearing jacks. Other preparations made for coming off pit.

Battery No. 4.—Work on pit completed.

NOVEMBER 15, 1918.

Battery No. 3.—Orders received to take up pit at Thierville. Ensign W. C. Davis, with 50 men, went to Thierville at 8 a. m. and started to take up pit. Ensign Davis returned with men at 10 p. m. Pit over half up. Orders received at noon to take up al pits.

Battery No. 4.—Preparations made to proceed to Cumières with all hands and entire train and to go into position there. Orders received from P. C. McMillan to take out pit here. The crane being at Cumieres, an attempt was made to use No. 5 crane. This being found to lack one pair of tongs to grab rail, and a friction brake, it was decided to send gun to Cumières, and bring back our own crane. Gun left at 1 p. m. in charge of Lieut. Orr. Shortly afterwards orders were received from P. C. McMillan to prepare to leave for Haussimont with all equipment. The gun was stopped at Charny and returned to Thierville. Ensign Davis then proceeded to Cumières with a party to take out pit, and returned with pit at 4 a. m., November 16.

Battery No. 5.—Commenced taking up pit and preparing to get under way.

NOVEMBER 16, 1918.

Battery No. 1.—Admiral C. P. Plunkett, accompanied by Paymaster Baldwin and Pay Clerk Anderson, inspected battery. The men, who had not been previously paid, received monthly money.

Battery No. 3.—Ensign Davis took 50 men to Thierville to continue taking up pit. Ensign Cheffy, with 10 men, fixed 50 shell boxes for packing shells. Lieut. Smith took remaining men to gun and prepared gun for coming off the pit. All officers and men returned from Thierville at 2.30 p. m. Ensign Davis and all men started taking up Charny pit at 3.30 p. m.

Battery No. 4.—Took out Thierville pit, turning to at 1 p. m., and finishing loading at 11 p. m.

Battery No. 5.—Finished taking up pit. All preparations made for leaving. Sent engine to Dugny to turn around.

NOVEMBER 17, 1918.

Battery No. 1.—Assembly at 8 a. m. Granted crew liberty until 5 p. m. Lieut. V. Genini, French Army liaison officer, left battery on 10 days' leave.

Battery No. 3.—Finished loading all material at 4 a. m. Called all hands at 7 a. m. Made up train. Went to Thierville at 2.30 p. m. with train ready to go farther.

Battery No. 4.—Standing by under orders to be ready to proceed to Haussimont.

Battery No. 5.—Standing by awaiting orders. Received three cars of coal.

NOVEMBER 18, 1918.

Battery No. 1.—Assembly at 8 a. m. Sent liberty party ashore until 5 p. m. Received 20 tons of coal.

Battery No. 3.—Stood by awaiting orders to go to Sommesous. Filled kitchen car with water. Fixed lashing on foundations cars.

NOVEMBER 19, 1918.

All standing by awaiting orders.

NOVEMBER 20, 1918.

All standing by awaiting orders.

NOVEMBER 21, 1918.

Battery No. 1.—Left for Haussimont at 6.20 a. m.

Battery No. 2.—Left for Haussimont at 8 a. m.

Battery No. 3.—Stood by in morning awaiting to depart. At 12.30 p. m. pilot arrived. At 3.45 p. m. got out of Verdun. Ran all night.

Battery No. 4.—Left Thierville at 8.50 a. m. Arrived at St. Menehould at 5.50 p. m., having had supper at small town, about 5 miles back, where we were held for clearance from 4.15 p. m. to 5.10 p. m. Box being very hot, remained at St. Menehould for night. Coaled engine.

Battery No. 5.—Left Thierville at 5.50 a. m. Arrived at Charlons at 8.30 p. m.

NOVEMBER 22, 1918.

Battery No. 1.—Arrived at Haussimont at 2.52 p. m. and reported to commanding officer.

Battery No. 2.—Arrived at Haussimont at 4 p. m.

Battery No. 3.—Arrived at Sommesous at 10.30 a. m. Immediately men turned to on gun, washing and cleaning tracks. Boxes on gun car repacked. Berthing car doors cleaned. Gangways made to lead from one car to another.

Battery No. 4.—Left St. Menehould at 8.15 a. m. Arrived at Haussimont at 10.50 p. m.

Battery No. 5.—Arrived at Haussimont at 8.30 a. m. Received orders to be prepared to leave for Paris, Sunday, November 24. Spent remainder of day cleaning train, overhauling engine and gun car. Turned in all Army telephone gear.

NOVEMBER 23, 1918.

All batteries preparing to leave for St. Nazaire, via Paris. Packing stores and turning over all material.

Admiral Plunkett gave speech in the evening in cinema at camp No. 2, R. A. R. Everybody attended.

NOVEMBER 24, 1918.

All batteries preparing to leave for St. Nazaire.

NOVEMBER 25, 1918.

Continued preparations to leave for St. Nazaire.

NOVEMBER 26, 1918.

All batteries standing by awaiting orders.

NOVEMBER 27, 1918.

All batteries standing by awaiting orders.

NOVEMBER 28, 1918.

All batteries standing by awaiting orders.

NOVEMBER 29, 1918.

Battery No. 1.—Left for Paris at 7.15 a. m. Arrived in Paris at 10 p. m. Admiral Plunkett and Commander Schuyler came on board and by direction of Admiral granted crew liberty until 8 a. m. December 2, 1918. All other batteries standing by.

NOVEMBER 30, 1918.

Battery No. 2 left for St. Nazaire at 8 a. m.

DECEMBER 1, 1918.

Battery No. 3 left for Paris at 7.55 a. m.

DECEMBER 2, 1918.

Battery No. 1 left Paris for St. Nazaire at 10 a. m.
Battery No. 2 arrived in Paris at 10 a. m. Gave all hands 48 hours' liberty.
Battery No. 3 arrived in Paris at 3.30 p. m.
Battery No. 5 left Haussimont at 1 p. m.

DECEMBER 3, 1918.

Battery No. 4 left Haussimont at 8.20 a. m.
Battery No. 5 arrived at Paris at 10.45 p. m.

DECEMBER 4, 1918.

Battery No. 2 left Paris at 10 a. m.
Battery No. 4 arrived in Paris at 5.30 a. m.

DECEMBER 5, 1918.

Battery No. 3 left Paris at 10.30 a. m.

DECEMBER 6, 1918.

Battery No. 1 arrived at St. Nazaire at 3.16 a. m.
Battery No. 2 arrived at St. Nazaire at 7.30 p. m.
Battery No. 5 left Paris at 10.30 a. m.

DECEMBER 7, 1918.

Battery No. 4 left Paris at 10.30 a. m.
Battery No. 3 arrived at St. Nazaire at 6 p. m.

DECEMBER 10, 1918.

Battery No. 5 arrived at St. Nazaire at 1 a. m.
Battery No. 4 arrived at Montoire at 9.30 p. m.

During the period after the arrival at St. Nazaire all batteries started work on the transfer of property to the U. S. Army quartermaster depot. On December 16, 1918, receipts were secured for all material and practically all the men were transferred to the United States via Brest.

Lieut. E. D. Duckett, U. S. N., and 21 men were left in St. Nazaire to take charge of the guns and dismount them as soon as cranes could be secured.

On December 17, 1918, last draft left St. Nazaire, France, for Brest.

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