SIGNAL COMMUNICATIONS IN WORLD WAR I

Résumé of Original Documents in the
Files of the Adjutant General Containing Data
Related to Signal Communications, A.E.F.

Prepared in

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by

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CHAPTER I - INTRODUCTION

1. Numerous original documents containing data relating to Signal Communications in the American Expeditionary Forces exist in the files of The Adjutant General. These documents include primarily various reports, records, special studies, and histories prepared by the Chief Signal Officer, American Expeditionary Forces, as well as the memoranda, rules or regulations, and reports of combat-unit signal officers and of the commanders of combat units.

The Annual Reports of the Chief Signal Officer, United States Army, for the years, 1917, 1918, 1919, contain information relating to the activities of the Signal Corps carried on in the United States, as well as material based upon reports received from the Chief Signal Officer and the Commanding General, American Expeditionary Forces. These volumes of annual reports, published by the Government Printing Office, in Washington, are available to War Department Offices, and afford useful bases for comparison and amplification, in some cases, of matter found in the original documents in the files of the Adjutant General.

2. Of particular importance among those documents in the files of the Adjutant General is one entitled "Detailed History of the Signal Corps in the American Expeditionary Forces," transmitted by the Chief Signal Officer, A.E.F., to the Commanding General, S.O.S. (Historical Section), under date of June 17, 1919. This History was prepared (in manuscript form) in six parts and seven volumes, with appendices. The subject matter is stated in the preface to have been taken from the following sources:

Monthly Reports of the Chief Signal Officer, A.E.F., to the Chief Signal Officer of the Army, in Washington.

Report of General John J. Pershing, cabled to the Secretary of War on Nomvember 20, 1918, and corrected January 16, 1919.

Histories of the Divisions of the Office of the Chief Signal Officer, A.E.F.

Battalion Histories.

Personnel narratives from Signal Corps Officiers, A.E.F.[1]

Another entitled "Appendix to Report of Commanding General, S.O.S. Chief Signal Officer" (A.E.F. Records, 318) and referred to in the matter of transmission (319. 1 C. in C. June 23, 1918) from the Office Chief Signal

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[1]All information found in this résumé has been taken from the sources mentioned in the bibliography, hence specific references have been made only in important matters.

Officer, as "The final copy of the Report of the Signal Corps, A.E.F."

(References, A, B, C, D, E, F, are to items listed and identified in the Bibliography.)

CHAPTER II. FUNCTIONS OF THE SIGNAL CORPS, AMERICAN EXPEDITIONARY FORCES.[2]

General Classification of Functions:

1. The functions of the Signal Corps, American Expeditionary Forces, are defined in General Orders 8 and 25, H.A.E.F., 1917, and in General Orders 30, 31, 48 and 152, GHQ,AEF, 1918. Its primary purpose is the transmission of Communications.

The work of the Signal Corps, A.E.F., in carrying out these orders covering its primary purpose or duties has been divided into two classes:

First: Construction, Operation, and Maintenance of the General System of Communication;

Second: Communication by every practicable means, with and between the Units of the Fighting Forces.

2. The first of these requirements made necessary the provision of a complete and self-contained network of lines of communications, in all places where units of the A.E.F. were located. This called for close liaison with French and English authorities, for the making of engineering studies and surveys for the construction, installation, maintenance and operation of telegraph, telephone, and radio systems analogous to the commercial systems of the United States.

The second requirement is concerned with the provision, equipment and training of Signal Troops and for their technical control in combat.

This function includes transmission of militiary information of all kinds, and especially communications with respect to the preparation for and conduct of active military operations at the front. It includes the interception of enemy communication, location of enemy radio stations whether on the ground or on airplanes.

3. Besides serving the entire American Expeditionary Forces with the communication system, the Signal Corps is responsible for the Meterological and Photographic Services of the Army.

4. ORGANIZATION:

The Signal Corps, A.E.F. was under the direction of the Chief Signal Officer, A.E.F., whose office located at Tours, Headquarters of the

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[2] D, pp 2-7

Services of Supply, included on November 11, 1918, the following administrative and technical divisions:

Executive	Supplies
Personnel	Radio
Records	Research and Inspection
Engineering	Photographic
Telegraph and Telephone	Special Service

The heads of these Divisions are directly under the Executive Officer. It is the duty of the Executive Officer to coordinate the work of the Divisions of the Office with each other and to act for the Chief Signal Officer in the absence of the latter.

The representative of the Chief Signal Officer at General Headquarters, American Expeditionary Forces, is known as the Assistant Chief Signal Officer.

The Chief Signal Officer has a representative in each Base Section, the Intermediate, and the Advance Section. This representative is known as the Signal Officer of his particular Section and is responsible for the construction and installation of approved telegraph and telephone lines; their maintjenance and operation under the regulations issued by the Chief Signal Officer, A.E.F.; as well as for the movement of Signal Corps supplies in his own Section.

Each Army, Corps, and Division has a Chief Signal Officer, whose duty is to carry out the technical directions of the Chief Signal Officer, A.E.F. and who is responsible for the technical function of the Signal Corps in his respective unit.

5. Units, Special Divisions, and Services:

Telegraph Battalions:

Telegraph battalions are employed under the Section Signal Officers of the Services of Supply in the construction and maintenance of telegraph and telephone lines. Two Telegraph Battalions are attached to each Army and one to each Corps for similar work in the Zone of the Advance.

A Telegraph Battalion consists of 10 officers and 212 soldiers divided into: a Headquarters and Supply detail of 3 officers and 14 soldiers; two companies each having 3 officers and 96 soldiers; and 1 officer and 6 soldiers of attached sanitary troops. It is furnished with motorcycles, trailers, and trucks and all implements and materials for constructing telegraph and telephone lines.

Since most of the personnel of these Battalions has been engaged on similar work in civil life, no very extensive or special training for them has been necessary, aside from that of a military character.

Field Signal Battalions:

Each Army, Army Corps, and Division, has attached to it a Field Signal Battalion, which functions under the supervision of the respective Army, Corps, or Division Signal Officer.

The Field Signal Battalion is especially charged with services at the front. It consists of: a Headquarters and Supply Section of 3 officers and 29 soldiers; a wire company of 3 officers and 75 soldiers; a Radio Company of 3 officers and 75 soldiers; an Outpost Company of 5 officers and 280 soldiers.

A total of 14 officers and 459 soldiers.

Pigeon Company:

An Army Pigeon Company was created by Par. 1, Cablegram 1181-S (War Dept. Table of Organization 348, June 18, 1918). Table authorized 9 officers and 324 soldiers. All the personnel previously engaged in this service were incorporated into the Company, which served both the First and the Second Armies; and after the Armistice has supplied service to the Third Army.

Owing to the special nature of this service, the personnel had to be very carefully selected from among civilian pigeon fanciers. The personnel had charge of the pigeons in actual use as message carriers and also carried on breeding and training of pigeons behind the lines.

Radio Section

The technical work of intercepting radio, telephone and T.P.S. (ground telegraphy) communication, securing bearings by which the location of enemy stations could be determined and of forwarding this data to the General Staff was performed by the Radio Section, Signal Corps.

Its organization received approval of the Commander-in-Chief July 1, 1918. By G.O. 152, Sec. III, G.H.Q., A.E.F., Sept 10, 1918, a radio section was to be provided as part of the army signal troops of each army.

Photographic Detachments:

The photographic work with the troops was carried on by detachments of one officer and six men attached with armies or army corps, and by detachments of one officer and two men with each division.

These detachments were sent out from the photographic laboratories of the Signal Corps at Paris and formed a apart of the Headquarters Section under the Chief Signal Officer of the unit to which they were attached.

Meteorological Section:

The meteorological work of the A.E.F. was done by a Meteorological Section, whose final authorized strength was 49 officers and 404 men. Most of this personnel was divided among the 33 forecasting and observation stations located at suitable points throughout the Zone of Advance and the S.O.S.

Units, Special Sections, and Services of the Signal Corps, A.E.F.

Signal Corps Service Companies:

All Signal Corps enlisted personnel not forming part of tactical organizations was formed into Service Companies, as first authorized by G.O. 25, Sec. II, Hq., S.O.S., June 24, 1918.

There were altogether 16 of these service companies, three of which were located in Paris, the others being at the Base Ports, Supply Depots, and Headquarters.

(Note. Earlier these organizations were designated as "Administrative Companies," four of them being formed March 30, 1918, pursuant to G.O. 7 Hq., S.O.S., They were converted June 24, 1918, into "Service Companies.")

6. SIGNAL CORPS TRAINING AND REPLACEMENT SERVICES.

Signal Corps Training:

Under supervision of the 5th Section, General Staff, signal schools were established as part of the Army Schools at Langres, Department of Haute Marne, France, pursuant to G.O. 46, Section III, G.H.Q., A.E.F., Oct. 10, 1917. The first course commenced December 1, 1917.

The Courses held were as follows:

(1)	School for personnel of mobile units	-7 courses
(2)	Radio Section Operators School	-6 courses
(3)	Candidates School	-5 courses
(4)	Special classes	-4 courses

Total attendance at these schools: 239 officers; 515 candidates; 718 enlisted men. Of the candidates, 365 graduated.

Owing to the Armistice, the successful candidates of the fifth and last course were recommended for commission instead of being commissioned.

In addition to the Army Signal Schools, Signal Schools were conducted at the I, II and III Corps Schools, at Gondrecourt, Chatillon-sur-Seine, and Clamecy, respectively.

Signal Corps Replacement Depot:

Pursuant to authority in a letter from the Commander-in-Chief to the Commanding General, S.O.S., a Signal Corps Replacement Depot was operated at St-Aignan (Noyers) beginning September 10th, 1918.

Previous to that date, the 116th Field Signal Battalion had been used as a reservoir for receiving and distributing Signal Corps troops.

On Sept. 25, 1918, The Commanding General, S.O.S. approved removal of the Depot from the 1st Depot Division and its establishment as an independent command with headquarters at Cour Cheverny (Loir-at-Cher), reporting directly to C.G., S.O.S. On Oct. 7, 1918, the Signal Corps Replacement Depot commenced operation at the new location.

The principal function of the Depot was the vocational classification of all Signal Corps personnel, commissioned and enlisted, which passed through the area. Very complete records were made of the qualifications of every man so as to facilitate the replacements of specialists at the front and in the Services of Supply.

Up to February 28, 1919, when the depot ceased to operate, 611 officers and 11,573 enlisted men were handled. Of the enlisted men, 4,043 were returned to the United States, the first group consisting of men of the Meteorological Service, leaving on December 11, 1918.

CHAPTER III. PRELIMINARY OR DEVELOPMENT PERIOD

1. PREPARATIONS PRIOR TO DEPARTURE FROM THE UNITED STATES

Studies Prior to Departure from the United States:

Early in May, 1917, General Pershing, in Washington proceeded with the preliminary organization of his staff for overseas service on May 17th, the Signal Officer reported.

An emergency estimate of the general conditions to be met involved the personnel problem and the supplies problem, these problems to be solved by May 28th, the day of embarkation.

Our first concern was to estimate the general permanent line installations required, then to determine what facilities existed in France and England.

Available information indicated French systems to be utterly inadequate for existing needs. Assumption was made to consider France devoid of everything telegraphically and telephonically needed; and the procedure decided upon, most fortunately as developments disclosed, was to install a complete American telegraph and telephone net.

It was learned where our probable locations in France would be;

French maps were studied, and it was decided that of ports controlled by the Americans, Brest, St-Nazaire, and Bordeaux must be our chief reliance. Our main axis was determined to be from St-Nazaire eastward along the Loire Valley and northward; cities selected included Nantes, Tours, Bourges, Nevers, Dijon; then Is-sur-Tille, Langres, Neufchateau. Auxiliary axis from Bourges or Nevers to Bordeaux, and from Tours to Paris, thence to Havre.

Principal centers requiring the larger installations had to be selected. Ten wires were assigned to the main axis, six to each of the others.

A round-number estimate of smaller telegraph and telephone stations was then made, and experts, from among the skilled technicians acquired from the great telephone and telegraph companies, were able to fill in the details as to supplies required. Their requisitions developed to be correct within 10 per cent.

This early solution of the main features of the basic problem provided firm foundations for the subsequent great expansions.

It was recognized that commercial production must be enormously expanded. We did doubt the ability of manufacturers to expand in time for prompt quantity production.

A preliminary review of the personnel situation was not encouraging. However, the Signal Corps was one of the earliest to appreciate the advantages to be gained in the Reserves, by organizing the excellent technicians of the great electrical industries of the country.

An important interview with the leading telephone, telegraph and cable officials in New York before our departure concerned our tltimate control of one or more Atlantic cables. We managed to take aboard the equipment for a large headquarters telephone central, which subsequently saved us a very embarrassing situation due to the delay in arrival of supplies.

En Route to England

The Chief Signal Officer A.E.F. Colonel (later Brigadier General) Edgar Russel had with him, when Headquarters Contingent sailed May 28, 1917, on the Steamship Baltic: 6 other officers; two clerks; six enlisзted men, of whom two were interpreters and two were chauffeurs.

Signal Corps property carried on the ship included two automobiles, two motorcycles, cameras, and photographic supplies, drafting material, a considerable quantity of equipment for the construction and operation of telephone lines; detailed plans had been worked out for the installation of a local telephone system at the port of debarkation in France and the Headquarters of the command.

Also carried were the detailed plans for the construction of the trunk line of about 300 miles in length for about 400 miles of other preliminary telegraph and telephone communication, way stations, through

long-distance telephone service, through quadruplex hand-operated telegraphy and high-speed, duplex printing telegraphy.

Colonel Benjamin Alvord, Adjutant General, had aboard a number of field clerks, but no officers or men of experience in the use of the War Department Code. Captain Parker Hitt, Assistant to the Chief Signal Officer was placed in charge of the Code Office, in addition to his other duties, and was assigned three field clerks (A.G.D.) who were to learn the use of the Code. One of the clerks was F. H. Schwartz, who later became a Major and was placed in charge of the Code Office at G.H.Q.

A complete set of all commercial codes acceptable to the censor was taken along; a cipher code and cipher having been arranged with the Washington Adjutant Generals Office for communications between that office and the Headquarters of the expedition.

Use of the radio being prohitibited no messages were sent from the Baltic while at sea.

Equipment for the Photographic Department (S.C.) included a motion picture camera.

2. IN ENGLAND (E n route to France)

Signal Corps Officers visited the large English Signal Depot at the Woolwich Arsenal noted that every piece of equipment or apparatus that went out to troops received a practical inspection to insure that it was actually in operating condition, and were impressed by the great development of appliances and designs under the stimulus of war experience and as a result of study and experimentation in the English Research establishment.

Orders were placed in England for machine tools and hand tools for the purpose of equipping a Signal Corps Repair Shop in France.

3. EARLY ACTIVITIES IN FRANCE

a. Studies and Plans: Visits of Inspection

Promptly after arrival in France, numerous conferences were held with French staff officers, particularly with French Liaison Officers attached to American Headquarters. Visits were made to French and British Signal Establishments and installations. Studies were made of the organization of our signal troops and of the suitability for use at the front of the Signal Corps equipment of our troops. Revised estimates of needs were prepared, and requisitions sent to the United States for large quantities of equipment.

Equipment brought over by our first Signal troops was found to be unsuitable for the character of warfare existing at the time. Evident that

large purchases of Signal Corps material from French markets would be necessary. A Supply Division was therefore established in the office in Paris of the Chief Signal Officer, A.E.F., with a Purchasing and Disbursing Section in it. The first Signal Corps Depot was established at Nevers, a suitable warehouse rented. Thereafter material arriving at Base Ports or purchased in France was sent there. Issues were made from Nevers upon requisitions sent through the Supply Division in Paris.

b. Re-Organization and Re-Orientation of Functions:

Upon arrival in France, General Pershing and his Staff began a reorganization of American units. For example, the division was changed from three brigades of three regiments each to two brigades of two regiments of infantry, and the size of the regiments was increased approximately 300 per cent. The need for increased facilities for Signal communications became at once evident. The extent and plan of the system of signal communication that must be supplied to serve a division is governed by the composition of the division. Any change in the number of units in the division changes the organization of its signal troops.

It was realized that the field signal battalions would make use of many appliances new to the American Army, and that so long as trench warfare continued, the Field Signal Battalions (Chapter II, Par. 5) would necessarily be divided into small detachments with special functions.

A basic principle had been that the work of the Signal Corps would extend down to the regiment. Within the regiment, signaling personnel was to be supplied by the line. In the French regiment were found as many as 240 men employed for messenger and telephone service and for the operation of other menas of signaling, such as lamp projectors (developed during the course of the war).

As a result of our studies, a tentative plan was drawn up in July, 1917, for supplying the increased personnel necessary in an infantry regiment, under conditions of trench warfare, by increasing the outpost company of the Field Signal Battalion; and a Memorandum was drawn up on Signal personnel requirements for a million-man army.

At the beginning of the war, the outpost company had consisted of 75 men (same strength as that of the Radio and Wire companies). The Signal Section of the Infantry Regiment consisted of one officer and 61 men. The outpost company, as the result of the stuides, was increased to 280 men, providing for a signal platoon of one officer and 65 signal soldiers for assignment to each regiment of infantry while it was engaged in trench warfare.

The idea was to withdraw these Signal Corps platoons from the Infantry regiments in the event of open warfare. No one foresaw clearly the difficulties of a mixed command of infantry and signal corps troops in the regiment. No one appreciated at that time that a division in open warfare requires just as much communications as a division in trench warfare, if not more.

No one saw clearly the artillery situation with regard to communications, nor the need for elaborate installations in charge of personnel at Brigade and Division Headquarters. The increase of the outpost company was the first expression of the needs of the American Forces for more signal communications.

It also appeared certain that a considerable increase would be necessary in the number of telegraph battalions at first decided upon. Estimating that the American Army would consist of 20 division and five Army Corps, it was considered that 25 Field Signal Battalions and 9 telegraph battalions would be required, two of the nine telegraph battalions to be used at Army Headquarters, two for constructing lines of communication in the interior zones in rear of the Army, the remaining five being distributed to the Army Corps.

After a comprehensive study of the staff organizations in the French and British Armies distribution of staff duties in the Headquarters of the A.E.F., were set forth in G.O. No. 8, H.A.E.F., July 5, 1917.

Functions of the Signal Corps were divided thus:

Radio, Visual, and Wire Communications; Message Receipt and Transmission; Radio Telephone and telegraph services; Pigeon service; Lines of Communication; Pyrotechnics[3]; Signal Corps Depots; Photography of Military Operations; Meteorological Services; American Codes and Ciphers; Dispatch Riders; Technical Inspection of Signal Organizations and Establishments.

Section 1 of G.O. No. 25, Aug. 23, 1917, slightly elaborated the foregoing:

The Chief Signal Officer, A.E.F., is charged with all that pertains to the technical handling and maintenance of the US. Military telegraph and telephone lines and radio stations of the American Army in France. He will exercise supervision over the duties of the Signal Corps in connection with the construction, operation, and maintenance of all telegraph, telephone, and radio installations of the system.

4 BEGINNINGS OF THE RESEARCH AND INSPECTION DIVISION

The Chief Signal Officer and his staff had been impressed in England by the operation and results of the British Research Establishment and the methods employed in inspecting and testing signal apparatus and special equipment evolving from the experience of the toops in the war. These impressions were renewed and emphasized by observation of the French activities of this nature. It became evident that the (American) Signal Corps would require in France a laboratory for the development of ideas fresh from the battle front, and for the study of apparatus to meet the needs of signaling as developed in the war.

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[3]On March 28, 18, by G.O. 48, G.H.Q., Pyrotechnics were transferred to the Ordance Department (A, p. 23)

It was also evident that factory inspection in the United States would not be sufficient to insure material getting to the troops in the proper operating condition.

To meet these two needs, plans were drawn up for the RESEARCH AND INSPECTIONS DIVISION.

We calbed for personnel and material for extensive American research establishments overseas. This research activity developed rapidly on the triple foundation of our overseas laboratories, our home laboratories, and the Field Signal Battalions for immediate test under service conditions.

However, it was realized that it would take some time to organize these activities and put them into operation, so it was decided to depend upon our Allies for such supplies for at least six months, and not to encourage quantity production of special equipment in the United States until the new patterns had been approved after actual tests in the field. It is believed that this policy did much to put us on a sound basis for supply of proper material.

5. DEVELOPING OUR TELEGRAPH AND TELEPHONE SYSTEM[4]

It was found that the American Expeditionary Forces would have to provide their own system of communications. It was decided that Signal Corps lines built according to American standards would be constructed along the main highways connecting important points of the American Expeditionary Forces and a base port.

The plan originally developed in the United States before sailing had included le Havre as the base port especially involved in the contemplated system. But because of the fact of our probable greater use of Brest and of the fact that construction from le Havre would pass through the English Zone and the large industrial sections west and northwest of Paris where the main highways and railroads were already paralledled by numerous communication and power lines le Havre was abandoned in the scheme of permanent Signal Corps lines.

The most advantageous route for the main line was determined to be St-Nazaire, Nantes, Angers, Tours, Bourges, Nevers, Beaune, Dijon, Langres, Chaumont, Neufchateau. Immeditaè arrangements were made for the beginning of construction between Gondrecourt, Neufchateau and Vittel; and between Vittel and Dijon. Material was arranged for with the French, as it was not yet available in quantity from the United States.

Nevers became an especially important point, it was destined to become a great center of the supply system. Private branch exchange telephone systems were installed at Cosne, Nevers, and Vierzon for the service of local American offices.

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[4]B, Vol. I, pp 16-18.

The first telegraph line to be leased from the French Government was that between Paris and Nevers. It was put in operation August 9, 1917; was the first telegraph line to be operated by American in France or Europe. A similar line was put in operation between Paris and Gondrecourt on August 16th, and between Paris and Chaumont on August 30, 1917.

The telegraph and telephone systems, as foreseen, were constantly being extended and developed; extensive wire networks grew up in every direction north and east of Neufchateau, and around each of the great depot centers, ports, training centers and schools. Our organizations of special installers that we dubbed our Signal Corps "Shock Troops" when thrown into a village in which it had suddenly been decided to place an Army or Corps Headquarters, could by working night and day have a complete telephone and telegraph system in full working order in an amazingly short time. This method of grouping specialists and sending them with equipment fitted to carry out these large emergency jobs relieved the combat signal organizations from work for which their light mobile equipment did not specially fit them, and assured the more satisfactory uniformity and continuity of service required.

In the Corps and Division combat areas, the telephone reigned superme, being continuously indispensable. In the open warfare of the last four months, the expednditure of supplies was enormous.

After the Armistice there was little cessation in the business over our American System for several months. There was the advance of our forces to the Rhine, calling for extended systems and adaptations or reconstruction of German circuits, heavy demands from the Peace Conference, special requirements for places like the President's residence in Paris.

6. EXPEDITIONARY FORCE MESSAGES-AND-CABLE SERVICE

One of the first actions taken by the Chief Signal Officer after his arrival in France was the organization of a cable service at reduced rates for the interchange of communications between members of the American Expeditionary Forces and their relatives and firends in America.

Official announcement of this service was made in a Memorandum, June 17, 1917, H.A.E.F., signed by Colonel Russel. These messageswere to be handled by the Western Union Company and the Signal Corps to points serving the American forces.

7. TRANS-CHANNEL CABLE AND ENGLISH LINES

By October, 1917, errors in transmission, and delays between London and our Headquarters became intolerable. An agreement was concluded with the British Post Office for establishing American telegraph and telephone lines from London to Southampton and Liverpool and our proposed camps.

Also a cable 80 miles long, with four conductors was purchased

and established between Beachy Head (near Southampton) and Cap d' Antifer (near Havre) in France. Four land wires were leased from Beachy Head to London, and four from Havre to Paris. One wire was turned over to the Navy. By April 1. 1918 multiplex printing telegraphy was installed, and Tours was added to the stations. Volume of business was large. The system was of great value during the great dirve toward Amines in a time of sore need. No part of our system perhaps met a more insistent need.

CHAPTER IV. PREPARING FOR COMBAT OPERATIONS BY AMERICAN ARMIES

1. The MOVE TO CHAUMONT

With the arrival of troops, the commencement of training programs, the location of supply bases and the passing from the stage of study and adaptation to one of functioning, amde necessary the removal of the Headquarters of the Expeditionary Forces to a point which would be a suitable center of operation against the enemy, and the grouping of the organizations of communication and supply in some center conveniently accessible to the French arteries of commerce.

Accordingly the various services of supply, communication, and sanitation in the rear of the areas which the armies were expected to occupy were brought under the control of the Line of Communications, American Expeditionary Forces, which was organized by General Orders No. 20, H.A.E.F., August 15, 1917.

The geographical limits of the Line of Communications extended from the sea to points where the delivery of supplies was made to field transportation of combatant field forces.

The Area of the Line of Communications was at first divided into three Base Sections; an Intermediate Section, and an Advance Section. Included within its organization was the Service of Military Railways, Military Police and Field Post Office.

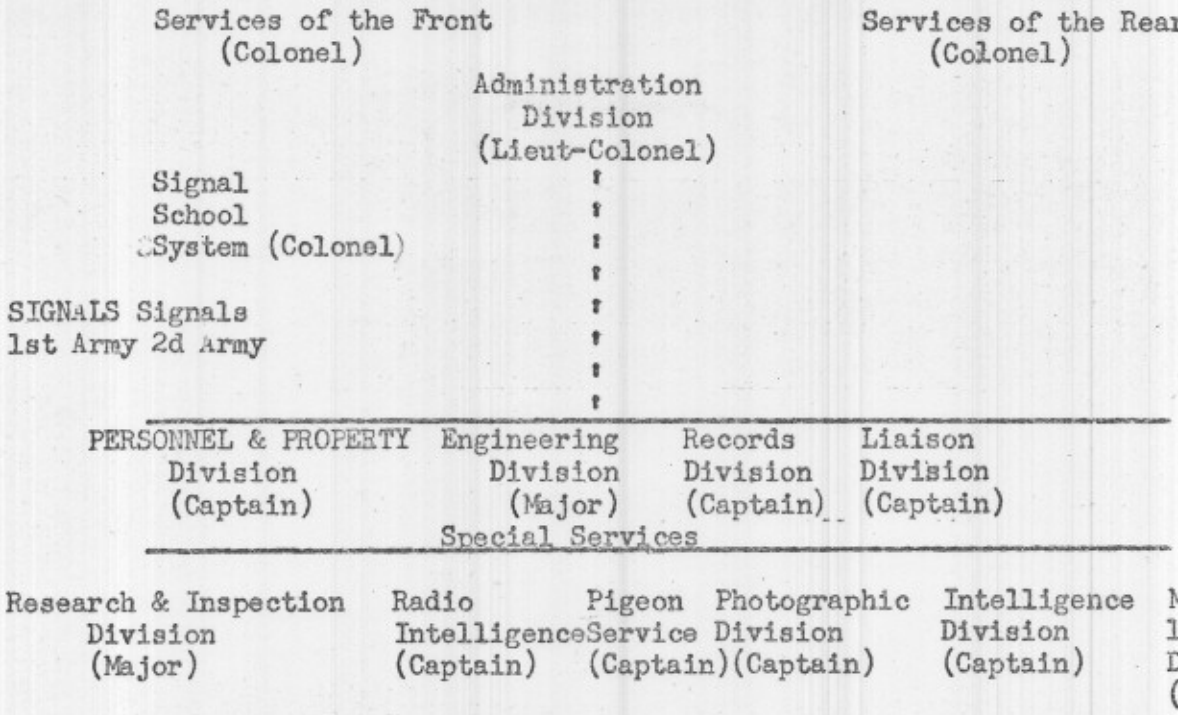
Paris was named as the Headquarters of the Line of Communications during the period of organization; but it was the intention that the headquarters should be ultimately located at Tours.

The Signal Office, Line of Communications, was established August 22, 1917. Colonel Russel carried on the duties of Chief Signal Officer, Line of Communications, in addition to his duties as Chief Signal Officer, A.E.F., until September 1, 1917, when 1st Lieutenant J. B. L. Hickerson assumed the duties as Acting Signal Officer, Line of Communications.

The members of Headquarters, American Expeditionary Forces, left Paris on a special train for Chaumont on September 1, 1917.

2. ORGANIZATION OF THE HEADQUARTERS OF THE CHIEF SIGNAL OFFICER: at Chaumont, GHQ, AEF

Directly under the Chief Signal Officer:



The Engineering Division made studies, plans and estimates for the installation of telegraph and telephone lines, and had supervision over the construction thereof.

The Radio Division rapidly expanded, operating the radio service for the Office and for the Air Service, and other purposes.

3. PREPARING FOR THE ARRIVAL OF THE AMERICAN TROOPS

The region assigned for the occupation of American troops during the training period was divided into Divisional Areas averaging 225 square miles each. These were also called Divisional Training Areas, and were numbered from 1 to 24.

The main heavy leads of the Signal Corps Telegraph and Telephone System passed directly through this region---south to north from Dijon to Toul, and east to west from Neufchateau via Chaumont and Troyes to Paris. It was expected that one division after another would occupy these areas. Each area was connected into the main system by both telephone and telegraph, and each was provided with an interior net-work connecting up the principal units scattered throughout its many villages. Thus, the arriving divisions were able to bwgin at once gathering themselves and their equipment together, and to get whatever supplies and assistance they needed. An advanced depot of signal supplies was located at Is-sur-Tille, on the southern border of this region, from which supplies could be delivered by short haul to the troops in the areas.

The big general supply had been placed at Nevers, and receiving depots were located at each of the base ports.

Most of the divisions as they arrived insisted upon telling how complete their equipment had been, about the motorcycles and light trucks they had nursed and cared for after a hard effort to get them, and how they had sent them across in charge of picked mechanics. What a blow it was to them to learn that all those motor vehicles, as well as all other equipment they thought they owned, they would never see again. As their equipment was not shipped in the same boat with them from the United States, perhaps not even landed at the same port, it became necessary to adopt the system of disregarding organizational equipment and property, and putting it into the general depot upon arrival, and of issuing entirely new equipment to organizations. This is an unfortunate way to handle organizations, but the Signal Corps could not influence it in any way, so had to accept it and make the best of it.

Meanwhile the Motor Transport Service had been created and the management of its own motor vehicles taken away from the Signal Corps. Throughout the entire progress of the war, the officers handling motor transport never did get it straightened out in their minds that Signal Corps combat motor vehicles used for laying wires and maintaining lines were technical instruments of that business, and not just so much truck tonnage. Even after the fighting had ceased, assignments of motor vehicles to Signal Troops were being made by the ton.

4. Development of Radio and Combat Signaling Services

Prompt comprehensive studies were made looking toward the organization of every line of activity with which the Signal Corps would likely be concerned. Officers studied the operation of ground telegraphy as carried on by the French; the installations of the French for sound-detection, acoustic direction finding, and the Seismomicrophone. Studies were made of radiogoniometric stations, and of the systems in use of signaling from ground to airplanes by means of panels. In September, radiogoniometric station were sent to the First Division for use in training. This was the beginning of an activity that later developed into the Radio Intelligence Service, which so brilliantly assisted the American Forces in the major operations.

Arrangements were made to secure flares, and recommendations were sent to the United States urging placing of orders for practically unlimited quantities of wire.

These and other studies and visits and conferences led to comprehensive recommendations on the signal equipment for the American Forces. The spirit of these recommendations was that the Signal Corps was to secure the best apparatus available for every type of signaling.

These recommendations took into account the extensive developments of the Allies to meet the conditions developed by the war; French manufactur-

ing capacity, as well as the possibilities of development and manufacture in the United States.

Figures were obtained on the consumption of material on the French front. The wastage of wire in the field operations was found to be almost inconceivable from the American point of view.

Special conferences were held to determine what material and personnel should be furnished by the Signal Corps for the Field Artillery. The questions of flash and sound ranging were studied. For the visual signal and radio equipment of the Field Artillery, it was decided to use the French system of flares and a system of communication by panels similar to that used by the English and French Armies.

5. THE RADIO INTELLIGENCE SECTION[5]

a. The work of our radio service for the Intelligence Section, General Staff (G-2) was most effective. From it resulted the Radio Intelligence Section, General Staff, of which the operating agreement would serve as a model for all subsequent similar situations.

The Signal Corps installed and operated the intercept, gonio or listening stations where, after oonsulatation with G-2, it seemed necessary; and all data and intercepted matter were turned over directly to G-2. The Signal Corps assumed the full technical responsibility G-2 had entire control of the output of these stations.

The work classified as follows:

(1) Location of enemy radio stations and their grouping into divisional, corps, army nets (largely by goniometric observation);
(2) Interception and decoding of enemy ground telegraph messages;
(3) Interception and report of enemy telephone conversations;
(4) Interception of radio signals from airplane ranging for artillery and location of the sending planes;
(5) Interception and decoding of enemy radio signals;
(6) Policing of our own telephone lines near our front for dangerous conversation.

This cooperation made possible prompt solving of new enemy codes. The necessity of copying all these code messages without error under most trying conditions, and the quick appreciation of the operation of the probable importance of what he had intercepted makes a fine tribute to the efficiency of the service.

b. INSTANCES OF WORK ACCOMPLISHED BY THE RADIO INTELLIGENCE SECTION:

The prompt decoding of a message in the St. Mihiel Sector, April 24, 1918, announcing a project raid by the enemy, permitted our troops to be ready to repel the raid.

On April 28, 1918, information of a projected raid was intercepted

5C, pp. 11- 4; D, pp. 11 and 58.

and sent to the troops concerned 30 minutes before the occurrence of the attack.

On June 24, 1919, a message announcing an attack on French troops was intercepted, and the French were warned in time.

Before our attack on St. Mihiel, there were strong indications that the enemy had withdrawn. Our goniometric stations discovered that the enemy was still active in his old locations, resulting in the decision to make the attack as planned, with strong artillery support.

Establishment by use of a false radio net on the Beaumont-Fresnes front and sending there from messages indicating a general offensive by our troops on that front, together with conversations over a bogus telephone net which we established on the same front, caused the enemy to retain at Metz, two divisions from the Meuse-Argonne operations.

6. TRANS-ATLANTIC ELECTRICAL COMMUNICATIONS

Because of the limited number and the menace to the Trans-Atlantic Cables, the construction of a huge radio station in France (at Croxi d' Hins; 20 miles west of Bordeaux) was started; and two radio stations under way in the United States (at Marion, Mass., and Annapolis, Md.) were expected toward completion with the purpose of supplementing existing communications.

7. METEOROLOGY:[6]

We found that our Allies had elaborate organizations for their meteorological services.

In cooperating with our Weather Bureau, we obtained skilled physicists, trained observers, and forecasters. In all 14 officers and 297 men were specialized in this duty.

Indispensable assistance was rendered to the artillery, the chemical warfare service, the sound-ranging, and the air services.

Weather forecasts data of the greatest value were given to Headquarters. The practical application of the physics and dynamics of gases to weather forecasting was first employed by the skilled scientists of our Meteorological Division in France.

The value of such service to the heavy artillery is evident when the fact is known that a shell from a gun spends half its time in the upper fourth of its trajectory. Departure from standard atmospheric conditions is such that correction of range up to 5 per cent is required for upper air conditions.

The meteorological stations in battle areas were generally equipped with radio sets. They were adjacent to Army and Corps Headquarters, and

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[6] C, pp. 36-38; D, pp 5; 12; 61-62.

were in connection therewith by telephone.

In October (1918) a station was established near Verdun, doing remarkable work in assisting our long-range railways artillery. All these stations were continually called upon for special forecasts and wind warnings. The Meteorological Headquarters in the field, near Colombey-les-Belles was issuing its general and special weather forecasts. These related to operations for each arm of the service, and gave wind direction and speed in upper and lower strata, cloud height, visibility, precipitation, fog, haze, temperature, and if favorable conditions existed for use of gas by the enemy.

The achievements of this service amply justified the trouble and expense of developing it, and gave satisfactory demonstration of its necessity in modern warfare.

CHAPTER V. REORGANIZATION OF MARCH, 1918. THE MOVE TO TOURS (S.O.S.)

1. Creation of the Service of Supply (S.O.S.): Zone of Advance

In March, 1918, as a result of studies and plans made by the Commander-in-Chief and his General Staff, the Line of Communications was reorganized and its name changed to The Services of Supply (S.O.S.). The reorganization was announced in General Orders No. 31, G.H.Q., Feb. 16, 1918.

Under this new arrangement, The Chief Signal Officer, A.E.F., in common with other chiefs of administrative and technical services, was directed to move to Tours, the Heddquarters of the Services of Supply, and thereafter to exericse all his functions in the matter of procurement, supply, transportation, and construction, under the direction of the Commanding General, S.O.S. His office was accordingly, on March 19, 1918, moved to Tours and there reorganized; and from there he handled the great expansion of activities which were to come and for which the foundations had already been laid.

The Organization Chart prepared at the end of March, 1918, grouped the activities of the Signal Corps under four main categories, all under The Chief Signal Officer, A.E.F. These activities were:

(a) Zone of the Advance: The Assistant Chief Signal Officer, A.E.F. representing the Chief Signal Officer with respect to Signal Activities;

(b) Service of Supply, comprising the Telephone and Telegraph Division and the Supplies Division, dividing functions formerly carried on by the Chief Signal Office, Line of Communications. These divisions were administered at Headquarters, S.O.S., at Tours;

(c) Technical Services, comprising divisions the activities of which were largely localized in the field, but which, in most cases, were represented by an administrative head, and in some cases by an office staff at Headquarters, S.O.S. These divisions were:

Engineering Division
Research and Inspection Division
Radio Division
S.C. Intelligence Division
Photographic Division
Meteorological Division
Pigeon Division

The Engineering, Radio, and Intelligence Divisions were administered at Tours; the Photographic, and the Research and Inspection Division were largely concentrated at Paris. The Meteorological Division had offices at Paris and at Langres (its Field Headquarters). The Pigeon Service, was administered largely at Langres.

2. The Advance Division, Signal Corps

The organization of the Office of the Chief Signal Officer at GHQ contemplated the establishment of a zone-of-Advance Division of the Signal Corps. This division was to coordinate all activities relating to Signal functions in the combat troops, including the training of signal troops.

Visits were made to the fronts, one of them being to the Third French Army at the time of the great offensive (late in October) at the Chemin des Dames. These visits afforded the opportunity for continuous and progressive study of Signal Corps activities. One impression gained was that the French everywhere seemed to have adaped themselves to the practice of Trench Warfare, whereas with the British there were some preparations maintained for possible open warfare.

3. The officer designated as Assistant Chief Signal Officer Zone of the Advance, was Colonel George S. Gibbs. His duties as stated to him in a letter from the Chief Signal Officer, March 14, 1918, were to be:

(a) To keep in touch with all Signal Troops in the Zone of the Armies, their condition as to personnel, equipment, working efficiency;
(b) To act as technical adviser in connection with the institution and installation of Signal Corps projects in the Zone of the Armies;
(c) To facilitate the coordination of the technical work of the Signal Liaison Officers (left with the General Staff Sections at GQH);
(d) To be a means of direct liaison with the Chief Signal Officer, with a view to expediting the business of the Signal Corps at G.H.Q., and in the Zone of the Armies.

4. The Code and Ciphers Division was left at Chaumont in the Office of the Assistant Chief Signal Officer, at GHQ, Zone of the Advance.

5. General Staff and Signal Corps Relationship in the Combat Zone

Under the General Staff Plan of organization which was embodied in General Orders 31, 1918, GHQ, AEF, it was intended that each of the five General Staff sections would have a Signal Corps Officer or group of officers capable of preparing action to be taken by the Chief of Section on any Signal Corps question that might come before him.

General Gibbs (Assistant Chief Signal Officer) in a summary of his activities (Monthly Report, December, 1918) thus describes the situation:

It is obvious that each Signal Officer performing such a function,

would in reality be giving directions to his Chief, directing the handling of supplies, ordering signal organizations about, ordering work done by signal organizations, formulating policies and giving directions without assuming any of the final responsibility for results that rests upon the Chief of the Signal Corps, and producing confusion. The Chief Signal Officer made these details. At the same time heleft at G.H.Q. the Assistant Chief Signal Officer as his deputy, with instructions to coordinate the work of the Signal Liaison Officers with the Section of the General Staff.

The Assistant Chief Signal Officer (at GHQ) kept himself informed of the policies of the Chief Signal Officer, of the state of supply, of conditions of personnel, kept in touch with Signal Corps organization with combat units; and was thus able to act directly on many matters referred to these headquarters.

Other matters were prepared and submitted to the Chief Signal Officer for his decision and action. By means of direct communication between the two offices quick decisions were obtained, and the business of the Signal Corps handled expeditiously.

The General Staff Sections soon found it expedient to refer all matters concerning oommunications and signal equipment and supplies to the office for action, and one by one the signal liaison officers were relieved from the sections.

The condition that seems not to have been realized by those who framed the General Staff organization is that the Signal Corps, in providing a general system of communications, serves all sections, all branches of the service, all bodies, all activities, and connects up with corresponding services in other armies and neighboring civil governments.

In the nature of things, no one Section of the General Staff can well undertake to direct these activities. As a matter of fact, all of them together have not included among their functions or assumed the responsibility for a very large portion of the things the Signal Corps has had to do.

By constant watchfulness, by propinquity, by pleasant relations and old friendships, the formation of units, the location of institutions and the progress of troop movements and operations has been ascertained or anticipated and the work of the Signal Corps planned and directed.

The representative of the Signal Corps has not sat in the council of the General Staff and participated in its deliberations. Nearly everything effecgs commuhications, and communications effect quite everything else. It is rather a compliment to the Signal Corps than otherwise that a vast communication system and a great service have been expected of it as a matter of course. Such position in the service and such relation to the Commander who is responsible for the results is, however, not logical.

The supreme authority of a General Staff is not questioned, but our present General Staff organization has radical faults. This is not the place to discuss that matter at length, but before leaving it, it should be said that the individual officers of the General Staff have always been ready and willing to give the Signal Corps such directions and assistance as lay within their power. There has been no disposition to neglect the Signal Corps. It just isn't included in the scheme of things in a borad and effective manner commensurate with the character and extent of the service which it furnishes, and the size and importance of its organization.

6. Operation of the Office of the Assistant Chief Signal Officer at G.H.Q.

The duties of the office of the Assistant Chief Signal Officer at G.H.Q., have been indicated in general terms in Paragraph 3, Chapter II (preceding), and the manner in which this officer exercised his relationship with the General Staff on the one hand and the Chief Signal Officer on the other, has indicated in the quotation cited in Paragraph 5, Chapter II.

The enormously wide scope of the activities of the Assistant Chief Signal Officer included;

For the Chief of Staff: Determination of communication requirements and installation of special service at indicated points:

For the Personnel Buereau, the promotion of Signal Officers, filling of vacancies in combat units and the selection of Signal Staff for new organizations;

For the Adjutant General, issue of orders, circulars and memoranda, Signal Corps traffic violations;

For G-1, organiztion replacements and organization and equipment tables:

For G-2, radio intercept service, preparation of codes, services for the Press Section, and relations with the Historical Section and with the Committee on Public Information;

For G-3, employment and assignment of Signal Corps organizations;

For G-4, matters affecting Signal depots, parks and dumps, transportation of supplies, communications for general supply system;

For G-5, selection of Signal Instructors and equipment for schools and selection of students for Candidates School.

Other services had need of assistance from the Signal Corps, and from time to time presented matters for action. Among these services may

be mentioned the Artillery, Anti-aircraft Artillery, Air Service, Chemical Warfare Service, Forestry Service, Light Railways, and Tank Corps.

7. Operation of the Office of the Chief Signal Officer at Tours, Headquarters, SOS.

a. The Administrative Officer. The Office of the Chief Signal Officer, A.E.F., had as originally organized, an Administrative Officer charged with the general oversight of the Office, acting for the Chief Signal Officer during his absence. When the Office was moved to Chaumont (Chapter IV, par. 1), an Administrative Division was organized, under the Administrative Officer, and it included a Liaison Section and an Office Records Section. These sections soon became separate divisions; but the Liaison Division was discontinued in March, 1918.

On removal of the Office to Tours, the Administrative Division was abolished and the position of Executive Officer created.

b. The Executive Officer was charged with the general oversight of the Office of the Chief Signal Officer, and with the coordination of the various division of the office. He acted for the Chief Signal Officer in the latter's absence.

c. The Information Section, Executive Division grew out of the earlier Signal Corps Intelligence Division and the Technical Information Section of the Research and Inspection Division. It was given the name Information Section, Executive Division and placed under the Executive, on November 11, 1918.

d. The Minor Changes in Organization. The reorganization of the Office at the time of the transfer of the Chief Signal Officer to Tours and the names of its major Divisions and Services have been stated in paragraph 1, Chapter V. Minor changes were made in names and functions of these divisions from time to time.

e. The Personnel Division furnished replacements through the operation of the Signal Corps Replacement Depot, controlled the promotions of Signal Corps Officers and of enlisted men in Signal Corps Service Companies, maintained a file of officers' qualifications to facilitate selections to fill vacancies, prepared all orders covering the movement of Signal Corps troops, organizations and individuals; maintained an accurate record of all Signal Corps Officers of the Expeditionary Forces, prepared estimates for the Chief Signal Officer of the Army for personnel for special duty in the A.E.F.; acted as censor in the office of the Chief Signal Officer, furnished French personnel to the Services of Supply.

This Division was established on January 22, 1918. (See paragraphs 5 and 6, Chapter V, above as to personnel functions of the Assistant Chief Signal Officer at G.H.Q., Zone of the Armies.)

f. Records Division:

Kept the necessary files of General Orders and Special Orders from Washington, from Headquarters A.E.F., and from Headquarters, S. O. S. Had charge of the mailing service and the keeping of correspondence files; furnished the necessary stenographic and clerical assistance to all Divisions of the Office.

g. Engineering Division:

Made surveys, prepared plans and estimates; had technical control of construction of telegraph and telephone lines and installations in the Services of Supply, advised and assisted the Zone of Advance with respect to construction and installation in that Zone.

The permanent and semipermanent lines and installations required along the Line of Communications and within the Zone of the Advance as well, are constructed and maintained by the Telegraph Battalions (See par. 5, Chapter II).

h. Telephone and Telegraph Division: (Established March 19, 1918)

It was responsible for the engineering of circuit and equipment requirements for the construction, operation, and maintenance of all telephone and telegraph lines and associated apparatus in the Services of Supply.

It also installed telephone and telegraph sector lines in the Services of Supply for the Railway Transportation Service of the Army. The officer in charge of this Division was known as the Director of Telephone and Telegraph Services.

Railway Telegraph and Telephone Services:

It was only after much discussion that the Director of Railway Transportation was induced to accept the services of the Signal Corps in installing the telegraph and telephone lines and offices and in supplying the necessary trained personnel for operating his dispatching and signal systems. The policy supported by the Signal Corps and in general covered by orders defining the duties of the Chief Signal Officer, was that many of these railway lines must be quite closely connected with the general communication system, and that independent installation would result in duplication and confusion. Also that it would be unwise to have competition between us for the very limited supply of operators; and that the Signal Corps, already having the bulk of trained men and supplies, should be made responsible for such operations in France. This was finally agreed to, and a railway section was organized in our Telegraph and Telephone Division. The organization of four telegraph battalions was asked for in the United States with men experienced particularly in railway telegraph systems. These began to arrive about February, 1918.

i. Research and Inspection Division:

Organized in September, 1917, Functions:

(a) Gathering information on all signaling apparatus, Allied as well as enemy apparatus and equipment.

(b) Dissemination of information obtained, through channels among Signal Corps units.

(c) Application, to existing and proposed Signal Corps practice, of devices already tested and found satisfactory by the various armies.

(d) Research along original lines, and development of new apparatus.

(e) Inspection of all Signal Corps apparatus arriving from the United States or through purchase in Europe, to insure that apparatus reaching the troops would be in serviceable condition.

(f) Constructive criticism of all apparatus used in the Signal Corps.

The organization was based on that of similar units in the Allied Armies. On November 11, 1918, the personnel was approximately 50 officers and 210 men.

The work of selecting the personnel and equipment was turned over to the Chief Engineer of the American Telephone and Telegraph Company about August 1, 1917. On account of the special nature of its proposed duties a very broad stand was taken in the selection, and as a result the staff included engineers, professors, and specialists in all branches of the art of communication. This foresight was fully justified.

The Officer in Charge of the Division was appointed American Representative on the Inter-Allied Board of Inventions, which held bi-monthly meetings in Paris; in this capacity, he was able to bring to the attention of the proper department many of the latest war inventions of our Allies.

Research: The Research Section included the following main groups: Radio; Telephone and Telegraph; Miscellaneous Signaling; Sound Direction Finding; the Model Shop;

The Division had a small but well equipped machine shop, and this allowed rapid construction of models in connection with research work. This shop was also utilized in constructing urgently needed special apparatus for the troops at the front. Thus, two very successful trailers, one for telegraph the other for telephone traffic were built for First Army Headquarters. Other developments which were in a trial stage at the close of hostilities were, a trench reel-carrier; a wire clip for rapid splicing of wires under shell fire; a redesigned camp telephone set, a redesigned 4-line Monocord switchboard; and an operator's set for use with the Monocord switchboard.

Owing to its unusual personnel and laboratories, this Division was also called upon to carry out important work in connection with three problems not directly connected with the Signal Corps. These were the

development of airplane sound-direction finding apparatus; research on the properties of the Chilowsky shell; the design and assembly of a gun-sight lighting device.

The Inspection Division:

Inspectors were stationed (in detachments) at each Signal Corps Depot or Warehouse, at Supply Depots of the French Government; and at the principal factories supplying the A.E.F.

The inspection was not merely a casual one to detect damage in transit. It consisted in trying out every piece of apparatus to insure that it was in operating condition. All apparatus requiring special testing facilities was inspected at the laboratories at the headquarters of the Division in Paris.

The effectiveness of the Signal Corps inspection is shown by the fact that very few complaints were received from the combatant troops as to the condition of their Signal equipment. Approximately 460 carloads of Signal Corps apparatus were rejected, indicating great saving in time, transportation, and often in lives of men who would have hand to handle the defective material. The cost of inspection was a little over one-half of one per cent of the value of the material inspected.

j. The Radio Division:

The Radio Division had charge of the administration and general guidance of the radio service. Its functions were to provide operating regulations, call letters, wave-length schedules; to disseminate information concerning use of apparatus; to decide questions of supply and maintenance of apparatus, and to suggest direction of development of new apparatus.

The Division had technical control of the activities of the Signal Corps Radio Section, which worked in cooperation with the Intelligence Section of the General Staff.

It was also placed in technical charge of the supervision of the Air Service Radio operations, equipment, and personnel; and was charged with the training of such personnel and the development and supply of equipment.

The Radio Division was divided into: An Operations or Radio Intelligence Section; a Training Section; an Air Service Section; a Coordination Section.

This Coordination Section studied the radio activities of our Allies; planned our own activities so as to cooperate with them as fully as possible. It checked all radio requisitions and supervised the development of such equipment as radio tractors, trailers and auxiliaries; cooperated with the Supplies Division in regard to Radio Supplies.

The Operations Section had technical supervision of radio operations

in the field through the Assistant Chief Signal Officer, A. E. F.

The Air Service Section, following an agreement between the Chief of Air Service and the Chief Signal Officer, A. E. F., absorbed the Air Service Radio Section, the Radio work of the Air Service was carried out in the Office of the Chief Signal Officer, A. E. F.

The Radio Training Section carried on training for operators of the radio intelligence service, for Air Service Radio Officers and Operators; for radio mechanics.

k. Photographic Division

In the World War, our field photograph was divided into Ground Photography and Aerial Photography. Its importance was not at first appreciated. When we begin to make up our reports and write history, we keenly feel the need of the invaluable pictorial records, so immeasurably improved by the use of modern apparatus and material. What will not future generations give to see the thrilling scenes of action portrayed with high-class apparatus by intrepid motion-picture photographers at the front?

The connection between photography and Signal work does not seem obvious, yet it might be considered as part of the duty allotted to the Chief Signal Officer in "collecting and transmitting information."

Each Corps and Army had assigned to it photographic units, and the demand for such units to be sent with each of the special services and for localities in the Services of Supply became very great.

Our experience has taught us some lessons that may well be heeded. The first is the indispensability of transportation for each unit in the field. Failure to appreciate the importance of the service frequently caused such transportation to be withheld, or to be withdrawn at critical times. Second, the lack of personnel and proper equipment prevented making use early in the war of portable developing and printing plants at Army field headquarters, preventing in turn our supplying prints of immediate value to staffs from negatives made by photo reconnaissance parties. Third, inadequate provision of measures to assure delivery of important prints and moving pictures. Remedy: Charge the Signal Corps with the distribution of the pictures, after censorship.

In May, 1918, a number of new activities were engaged in. Feature films showing the training of troops; a new weekly film for the Committee on Public Information; sets of propaganda latern slides. The Division also began the preparation of photographic requirements at base hospitals for the Medical Corps. A complete file of all still photographs, passed by the Censor, was prepared for propaganda purposes. Arrangements were made to take all identification pictures of personnel. The pictorial records of the various divisions at the front were brought up to date and

valuable and important moving picture films were prepared. News weeklies were prepared for the Y.M.C.A., and shown throughout the A.E.F.

The work of the Photographic Division increased after the Armistice; it covered the Occupation of German territory; the advent of the Peace Commission in Paris.

l. The Pigeon Service

Upon arrival of the A.E.F. in France, it was learned at once that pigeon service was an indispensable auxiliary means of communication in trench warfare.

We obtained some excellent birds from pigeon fanciers at home, and found some officers and men who had had much experience in handling carrier pigeons. An Army Pigeon Company was authorized (paragraph 1, Cablegram 11618, May 25, 1918, with strength of nine officers and 324 soldiers. On the date of the Armistice there were in the service seven officers and 265 soldiers, with 6000 pigeons and 50 mobile lofts in operation. The first detachment to reach France from home arrived at Brest on November 15, 1917; it consisted of one officer and six soldiers with 800 pigeons.

The general result was successful and the service proved valuable in trench warfare; also just as valuable in the early stages of deep advances. At the close of operations, the service promised to become increasingly useful in the more rapidly changing phases. Many remarkable message flights are of record; and the pigeon service has been highly commended by many organization commanders.

m. The Code and Cipher Section

The coding and decoding of messages became a function of the Signal Corps on the Voyage of the Headquarters American Expeditionary Forces aboard the Steamship "Baltic" from the United States to England at the beginning of the War. Existing War Department codes were used by the Adjutant General's Office until January, 1918, when the Code and Cipher Section, Office Chief Signal Officer, A.E.F., was organized for the production of new codes. The Section remained at G.H.Q., A.E.F., when the Office of the Chief Signal Officer was moved in March, 1918, to Tours.

Codes printed by the Section included:

A Trench Code (of 1600 words and phrases) published in Feb., 1918; a Front Line Code of 2000 words and phrases; a Staff Code containing 30,000 words and phrases.

In June, 1918, the first of the "River" series of trench codes (1700 expressions) was published. A "Lake" series was begun in October, 1918.

An emergency code of 50 commonly used expressions was also published.

In addition, casualty, telephone, radio and telegraph codes were published; a total of 80,000 code books and pamphlets being printed during the ten months of active operations.

n. The Special Service Division

Established on November 11, 1918, to handle for the Chief Signal Officer all matters concerning the Meterological, Pigeon, Code and Cipher, and Visual Signaling Services except in so far as these pertained to procurement and issue of supplies and other duties definitely assigned to other Divisions.

On February 1, 12, and 23, 1919 the functions of the Research and Inspection Division, The Radio and the Photographic Divisions, were assigned to the Special Service Division.

o. The Supplies Division

The Supplies Division had charge of the procurement, transportation, storage, and distribution of supplies in the Zone of the Services of Supply and in the Zone of the Advance to the extent that this was in keeping with the organization of the Zone of the Advance. It had charge of the Purchasing and Disbursing Section in Paris, which after the Armistice became the Sales and Disbursing Section. The subject of the operation of the Supply System in general is summarized more completely in Paragraph 9, following.

8. The Signal Corps Communications System7

As stated in paragraph 1, Chapter II, the basic purpose of the Signal Corps is the transmission of communications. The accomplishment of this purpose or mission involves first the provision, in the most appropriate locations of adequate means and facilities of transmission. The means most generally employed at the time were the telephone and the telegraph.

In the employment of large forces these means require the establishment of extensive more or less permanent installations, such as networks of wire, buildings for personnel, storage and distribution facilities for equipment and supplies. A primary concern of the Chief Signal Officer, therefore, as it was of the Commanding General of the Expeditionary Forces, was the determinations as quickly and as completely as possible, of the location of the area or zone of operations of the American Forces which were expected to begin arriving in large numbers in the near future, which ports they were to use, and their line of communications.

Fortunately this information was promptly made available by the French authorities, and the Chief Signal Officer was able to proceed with plans and preparations for the communications system.

The problem presented included: (1) Providing the high command with a properly organized and operating permanent set-up of means of communication throughout its zone of operations, its line of communications, including the ports assigned to it; (2) Providing the combat units with the necessary Signal equipment and supplies; (3) Providing a well-organized and well-administered supply system capable of meeting all needs for the maintenance, repair, and replacement of supplies and equipment; (4) a

7D: pp 36-42

system of liaison or channel of communications between the command and combat units.

The American system was designed to supplement and reinforce such facilities as could be made available from the French system. Extensions to the existing system were made on the basis of American standards throughout, employing items of equipment or apparatus which were standard in American practice and which would involve the least difficulty in manufacture and transportation.

The methods of liaison within the combat units of the French and the British armies were minutely studied, and standards of equipment and materials were decided upon which would be the most efficient from the point of view of the habits of the American Forces in the use of the telegraph and the telephone as a means of communication. These standards were continually revised to meet the ever-increasing difficulties and changes in conditions.

In the early stages the French telephone and telegraph system was used exclusively.

It was foreseen that available Signal personnel should be brought to France ahead of the combat units to which they would later be assigned. Requisitions were placed, and the first telegraph battalions arrived in France on August 20, 1917.

The first extension Signal Corps exchange was installed in France at the new General Headquarters of the A.E.F. at Chaumont. It was put in operation on September 1, 1917, and provided services to the various offices as rapidly as they were occupied. Combat divisions began to arrive in their divisional training areas in France in the latter part of December, 1917 (see paragraph 3, Chapter IV).

The completed telephone and telegraph system of the American Expeditionary Forces at the signing of the Armistice consisted of a means of liaison between all units of the A.E.F. It may be considered as divided into four parts; namely: (1) Net for the General Command, Administration, and Services of Supply; (2) Net for the Command, Administration, and Supply within the combat zone; (3) Special net for the Transportation (railway) Services; (4) Net for the United States Navy in France.

(1) The Net For the General Command, Administration and Service of Supply:

The meager wire plant available in the French system for use by the A.E.F. necessitated the construction of standard American pole and wire lines from General Headquarters at Chaumont to the Headquarters of the Services of Supply at Tours, to the training areas in the vicinity of Chaumont, to the Headquarters of the First Army at Souilly, and to the Second Army at Toul.

Also American built lines were necessary to connect the headquarters of the Services of Supply with the base ports at Brest, St. Nazaire, and

Bordeaux; and a second line from Tours to Chaumont by way of Paris. The connections between the S.O.S. and the headquarters of Base Sections Nos. 3, 4, 6 and 7 consisted of lines leased from the British and the French civil systems.

The Signal Corps lines were so planned and routed as to provide direct connections with the Signal Corps System for a large majority of the American units in France. In order to provide adequate service over the leased lines, it was necessary to take over from the French civil authorities the maintenance of these lines. The result of this operation was highly successful, but in spite of the careful attention to these lines it has been impossible to secure the high degree of efficiency secured from the American-constructed lines in France.

At all centers of activities in the American Expeditionary Forces except the very smallest, local telephone installations were made and telegraph offices were opened. For the very small units, connections were made with the French and British civil and military systems.

The plan covering the Signal Corps system in France has continually had as its basis and fundamental principle that whatever facility was put in, it should be of such a character as to provide the greatest amount of service commensurate with the expenditure of material and labor and tonnage required. To this end the lines constructed were so equipped, operated and maintained as to obtain a maxium efficiency. (See Paragraph 3, Chapter IV)

(2) Net For Command, Administration, and Supply in the Combat Zone

The telephone and telegraph net in the combat zone was maintained under the most severe conditions. Due to the American customs as to the use of the telephone service for administrative purposes, the nets in the different units had to be of considerable extent. They provided communication from the Army Headquarters to the Command and Administrative centers throughout the armies to the most advanced posts on the fighting front.

(3) Special Net for the Transportation System

Special telephone and telegraph lines were equipped and turned over to the Director General Transportation, A.E.F., for use in connection with the administration and operation of that department in moving A.E.F. personnel and freight over French railroads. These lines extended from the Headquarters of the S.O.S. to the principal Base Ports and up to the railheads in the combat zone. Special Signal Corps personnel was detailed to the operation and maintenance of these lines.

(4) Net For the Use of the U.S. Navy in France

For the Navy a special telephone and telegraph net was provided by the Signal Corps, U.S. Army, between London and the Navy stations along the coast of France. This was made possible by use of existing French lines where they could be secured by lease and throughout other sections by construction of standard American lines.

9. Supply System of the Signal Corps, A.E.F.[8]

a. American Signal Equipment unsuitable for Trench Warfare.

Upon arrival in France, it developed that the equipment brought over by the first American troops was not suitable for the type of warfare then existing; it was evidently necessary to make large purchases of Signal Corps material in French markets.

A Supply Division was therefore established in the Office of the Chief Signal Officer, in Paris. The Purchasing and Disbursing Section of that Division became of primary importance.

Further requisitions were placed in the United States.

b. First Signal Corps Depot.

The need having developed, the first Signal Corps Supply Depot was established at Nevers. This city of 30,000 people was centrally located, on the main railway line between base ports and our portable zone of operations; it had good terminal facilities, a favorable labor situation, and contained available buildings for use as warehouses.

Thereafter all materials arriving from base ports or purchased in France were sent to Nevers; issues were made from there upon requisitions approved by the Chief Signal Officer, in Paris.

When A.E.F. Headquarters were moved, in September, 1917, to Chaumont, the Supply Division moved also, but its Purchasing and Disbursing Section remained in Paris, left there because of the extensive dealings which had to be made with departments of the French Government in order to obtain the supplies purchased in French markets. Issues at Nevers were still controlled from the Supply Division after its removal to Chaumont.

But in January 1918, it was decided to concentrate the whole Supply Division at Nevers, leaving the Purchasing and Disbursing Section, however, still at Paris. In January an Advance Signal Corps Depot was established at Is-sur-Tille, providing a source of supply nearer to the organizations in training.

c. Organization at Tours, After the Creation of the S.O.S.

In March, 1918, the Signal Corps, along with other technical and supply establishments passed under the administration of the Service of Supply. In order to concentrate control of signal supply the organization formerly set up at the Depot at Nevers was moved to Tours. The Depot at Nevers thereafter made issues only upon direction of the Chief Signal Officer and was not responsible for maintaining stocks of supplies.

d. Requirement and Procurement Activities.

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[8] D: pp 18-29

The situation was such that no supply system could fulfill its functions except by foreseeing its requirements well in advance. In April, 1918, a careful study was made of requirements for organizational equipment, including replacement requirements. Estimates based upon requirements experience of our Allies were to small for our needs. After compiling all available data, two requisitions were forwarded by courier to the United States in May, 1918; one on a monthly basis; the other on a lump-requisition basis, expected to fill urgent existing needs and to provide a necessary reserve stock. Under this organization, the Officer in Charge of Purchasing and Disbursement, in Paris, became a part of the Requirement and Procurement Section of the Supply Division. He also became a member of the important General Purchasing Board created to eliminate competition between the various departments of the A.E.F. in their purchases made in Europe.

On account of the tonnage situation, it became necessary to search carefully for material, a great deal of which was under the control of the French Government. This resulted in considerable dealing with the French Ministry of War. We sent our own representatives through French manufacturing districts and that procedure helped to locate supplies which we were often subsequently authorized to purchase.

e. Depot Section Activities.

The Depot Section exercised control over the stock at all Signal Corps depots in France, and established a system of records showing the status of all inventories or stocks on hand, not only in the depots but also in the office of the Chief Signal Officer. Knowing the status of stocks in all depots, it was possible to direct issues from the place at which it was available. This system was found to have many advantages and received much favorable comment. Construction began in June upon a large project for a general storage plant at Gievres. In August, 1918, the remaining stock at Nevers was shipped to Gievres where the Intermediate Signal Corps Supply Depot No. 2 was established, and which became the main Signal Corps storage and issue depot in France.

In the summer of 1918, two Signal Corps Base Depots were established near St. Nazaire and at St. Sulpice (near Bordeaux). At these bases were stored material received through the ports, which could not be shipped promptly to interior depots.

Receipts and Issues at two of the principal Depots

	GIEVRES		1918	
	Sept.	Oct.	Nov.	Dec.
Carloads material received	392	279	300	312
Carloads material shipped	246	248	240	24
Less than carload shipments	1088	408	180	322
	Is-sur-Tille			
Carloads material received	121	130	136	89

Carloads material shipped	112	148	81	43
Less than carload shipments	200	224	98	7

Repair Shops and Salvage Operations

A Repair Shop was established at Nevers about January 1st, 1918. It was used principally for repairing material damaged in transit or for making modifications recommended by the Inspections Division. A larger Repair shop was established at Gievres. No shops were maintained at other depots. Small shops were maintained at Army Parks.

After the Armistice

Immediately following the Armistice, plans were laid for possible disposition of Signal Corps stocks in depots.

Arrangements were finally made for sales of $8,000,000 worth of material to the French. A considerable amount was returned to the United States.

10. Meeting Needs at the Front:[9]

The difficulties in railway transportation were so great, that a system of convoying all shipments had to be established. While critical operations were imminent, like those in the Chateau-Thierry sector in June and July, 1918, trucks were depended upon to rush shipments from our depots to points where needed.

Demands for wire were enormous. Although rapid growth in efficiency of our field radio sets will no doubt increase their range of application, our experience was that the adequate supply of field wire, telephones, and small switch boards solved perhaps 80 per cent of the combat signal corps material problems.

Signal Officers to facilitate activities and expedite movements, were stationed at Le Havre, Brest, St. Nazaire, Bordeaux, La Rochelle, Nantes, Marseille, and Cherbourg. Supply officers at ports were charged with the duties of supervising all incoming Signal Corps material, report its arrival, see to its proper forwarding.

The situation as regards supplies showed steady improvement, and at the time of the Armistice there was an adequate reserve in the Signal Corps depots to maintain and equip 40 fighting divisions, and the system had become so standardized as to be equal to all emergencies.

CHAPTER VI. THE SIGNAL CORPS IN COMBAT

1. Preparing Signal Corps Troops for Combat.[10]

Soon after arrival of the Headquarters of the American Expeditionary

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9 B: Vol. I pp 39-40; 67-69

10 D: pp 74-76.

Forces in France, conferences were held by the Chief Signal Officer and his assistants with the heads of the Signal Services of the French and British Armies, and visits were made to various fronts to adapt the work of the Signal Corps to the necessities developed by the war.

Beginning October 20th, each infantry battalion of the 1st Division, accompanied by its Signal personnel, went into the front lines for a tour of ten days. American battalions were commanded by their majors, but French Colonels, in turn, commanded the latter. The 101st Field Signal Battalion, 26th Division, went into the Chemin-des-Dames Sector north of Soissons; the 117th (42nd Division) to Luneville; and the 1st Field Signal Battalion accompanied its division, the 2d, into the Sommedieu sector north of Verdun. Thus by the middle of March, 1918, the four battalions were receiving instruction from the French and having their first practice in the construction and maintenance of lines under fire.

The development in those first sectors, and the lessons there learned, served as an excellent guide in arranging the work of the Signal Corps for the divisions that were to follow. As the armies and their corps were formed, a large development necessarily followed. The secrecy that veiled all plans of operations, the uncertainty that is a natural factor of a successful strategic movement, and the complications brought about by work with and under the French command made it very difficult to plan and build the lines essential to proper handling of the business of out fighting forces.

For training courses, a mass of information was being gathered regarding signal work in the British and French armies. Early in September a school was established at the headquarters of the 1st Division, to train Signal Corps officers. A signal course was opened at Horville under the direction of Captain Kissel, 8th Engineers, French Army. General training included the sending of wire sections to the infantry to assist in firing problems, both rifle and machine gun. After the return of details to Horville, the radio company was organized into small classes under officers or noncommissioned officers. Telegraphy and the use of the blinker were taught in addition to radio telegraphy. A period of field training in tactical problems of trench warfare was begun September 23d.

However, all signal units had to be utilized immediately upon arrival for various types of construction and installation of Signal apparatus. The increasing amount of line construction necessarily kept many men from school, yet results were obtained.

2. Effect of Policies as to Shipment and Issue of Equipment and Transportation

The radio and wire companies had arrived with no transportation whatever and it had been necessary to borrow vehicles to bring their equipment from the port to the training area. At this time, it would have been impossible for them to furnish communication under combat conditions.

Divisional Signal units were completely equipped in the United States but because the supplies usually were transported in a different ship it became necessary to adopt a system where by such organizational property was placed in a general depot upon arrival. Complete new equipment was then issued to the units from depots located near the training areas.

In accordance with General Order No. 74, G.H.Q., A.E.F., May 11, 1918, the motor vehicles of all services, including the Signal Corps, were placed under the control of the Motor Transport Service. Meanwhile the Motor Transport Service had been created and the management of its own motor vehicles taken away from the Signal Corps. Throughout the entire progress of the war, the officers handling Motor Transport never understood that Signal Corps combat motor vehicles used for laying wires and maintaining lines were technical instruments of that business, not just so much truck tonnage. The Signal Corps was handicapped by the lack of transportation. In some divisions all of the wire for deep advance was carried forward on men's backs. Some battalions went into battle with no training for the kind of work they were to do. Practically all battalions had been put into the line and those that were in training were not provided with transportation. It was many times the case after training maneuvers that Signal Troops remained in the field to gather up their lines and apparatus and carry them in on their backs, sometimes for several kilometers, long after the infantry had finished its exercises.

3. Signal Units given Glimpes of the Front.

After the first weeks of acclimatization, the signal troops were brought gradually into intensive schooling, thence to unit training in field maneuvers, and next to observation work in the front lines. In this second period of the preparatory work, the officers and men were to see with their own eyes; by observation details sent to the front lines, either to watch the French or to assist their own troops. Meantime, Colonel George S. Gibbs arrived October 15th at Chaumont and had been selected as Chief Signal Officer of the Advance, with the duties to inspect and study signaling methods of the Allies, to perfect and complete the equipment of both the Field Signal Battalion and the Infantry Signal Platoon, and finally to train Signal personnel. Plans were made for an Army School and for Corps Schools. The 1st Corps School was established Oct. 15th, at Gondrecourt, replacing the divisional school. (See paragraph 1, above)

By the end of March, the 1st, 2d, 101st, and 117th Field Signal Battalions were in the battle line with their divisions. The long line telephone and telegraph system meanwhile was increasing in number of circuits and advanced to provide arteries feeding into the wire nets of the combat units. As the armies and their corps were formed a large development necessarily followed. During the Cantigny operation of May 28th, 1918, which represented the first American offensive action, the Signal Corps rendered undeniably efficient service.

The months of June and July were perhaps the most critical in the history of the Signal Corps at the front. Battalions without any training

in France were going into the line with their divisions. Other Signal units were arriving overseas after their divisions so that not only were the latter handicapped by being without their communications during their training exercises but the training of the Signal Battalions inevitably was short. Burdens were laid upon Signal Corps personnel by the shortage of motor transportation so that the men had to carry Signal supplies upon their backs in addition to their personal equipment, and to lay wire with their hands.

In the Spring and early Summer, divisions were going into the line with Signal troops that had had no training at all in France. Other divisions were in training with all of the infantry regiments present, ready for regimental, brigade, and division exercises but without Signal troops. This was owing to the fact that Signal battalions were sent to France after the infantry instead of before, a practice producing a situation full of obvious dangers, retarding the training of the entire division on account of lack of communications to conduct exercises. Troops leaving the United States for France at this time were supplied with Signal equipment before embarkation. This equipment was packed and shipped as troop property but in most cases was loaded on other ships than those carrying the troops. Owing to the difficulty of identifying and delivering this property in France, the policy was adopted of seizing it at base ports and sending it directly to the Signal Corps General Supply Depot. New equipment was issued in the meantime from the depots to the troops. This causes a certain amount of duplication of issues of important equipment but was the only system which could be put into practice to supply troops with the necessary articles for training without serious delay. By the end of summer, the supply of signal equipment, in spite of tremendous demand, had become thoroughly satisfactory and in general the articles of equipment were of high quality. Among the serious difficulties was the shortage of motor transportation; this reached a very acute stage in the month of August, 1918, and was never during hostilities, satisfactory. Although 100 per cent of the required 1 and 1/2 ton trucks which the Field Signal Battalions were supposed to use as working tools had been bought by the Signal Corps and shipped to France, they were taken over by the Motor Transport Service and issued largely to other branches of the service. Transportation was assigned to the Signal Corps by the ton without regard to the fact that the small working truck was a working tool, the lack of which imposed heavy burdens upon Signal Corps personnel. Some of the resulting situations are dealt with in other parts of this history. (See also report by Colonel G.E. Mitchell to A.C. of S., G-5, June 30, 1918, on Inspection of Signal Battalions, copy included with Exhibit 2, Monthly Report for June, 1918).

4. Transition from Trench Warfare to Open Warfare Operations[11]

May 28, 1918, marked the change from trench fighting to open warfare. To the Signal Corps the Cantigny operation was to teach the three communication problems of offensive fighting. First was the preparation of

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[11] B: Vol, II, pp 84-94

the area; next was the Task of making connections during the advance; and lastly came the duty of Completing the net in the captured territory.

In anticipation of a change to fighting in the open the officers of the Signal Battalion mapped out a plan to meet the needs of either offensive or defensive action. The Axis of Liaison scheme was adopted for the first time, as a method of automatic communication during an advance. The outpost sections were recalled, schools were established and every officer and noncommissioned officer received definite instructions in the preparation and organization of the battalion for mobile warfare. The wire and outpost companies devised a new plan for construction of the telephone axis and this was improved after a divisional maneuver with wire carts. The men were trained to lay an axis of three, four or five lines, to connect brigades and regiments to it, to operate stations along the axis, to construct lines and to repair breaks under supposed shellfire and gas.

The plan for the Axis of Liaison, as at first evolved, provided for five circuits from the divisional Post of Command to a switchboard abreast of the light artillery regiments or artillery groups. One was for command; another for infantry; and a third, for artillery. Three lines were extended from this switchboard to the Advance Center of Information: one, as an extension of the command circuit; the second, for the infantry; and the third, to connect the artillery to the Advance Center of Information. From the Axis, a circuit was run to each regiment of light artillery and to each artillery group. From the Rear-Report center, at Division Headquarters, a line was strung to each Infantry Brigade; from each Infantry Brigade to its regiments, and from the Advance Report Center to the Division Obstruction Posts. Construction teams were organized by the Signal Battalion for the construction, operation, and maintenance of the system.

In the Divisional maneuver the new plan was tried out, the problem being to furnish communications during an advance of eight kilometers. Only the Signal Battalion and Staff officers participated. Outpost Company details reeled the light French twisted-pair wire from the bobins. From the Wire Company came the switchboard operators and installers who carried their equipment. A staff officer had charge of the Advanced Center of Information and gave the tactical directions to the signalment at that point.

For the employment of radio during the maneuver, communication was provided between regiments and brigades, brigades and division, division and Corps; all having lateral communications also. A sending and receiving set was provided for the Advance Center of Information.

T.P.S. (Ground Telegraphy) was prescribed down to battalions; and projectors and flags were used as far back as division headquarters.

Dispatch riders, runners, mounted messengers, rockets, flares, pigeons, and panels also were employed.

The maneuver proved successful, although the lessons of economy

and organization had to be learned from later experience.

The first requirement when the sector was taken over was the completion of telephone lines.

Each infantry regiment's Signal Platoon was reinforced by one officer and 65 men from the Outpost Company. An officer and 30 men, also from the Outpost Company were assigned to each brigade; and a detail from the Wire Company was left at the Advance Echelon of the Division.

A charging plant was opened for the distribution of storage batteries. No efforts were spared. Blinkers were installed at all headquarters and by means of relay points a complete visual system installed. When it became known that the Cantigny salient was to be reduced, the operation was rehearsed down to smallest detail several weeks before the attack. Maneuvers were held daily in the rear areas.

Laddered construction of telephone lines was adopted. This consisted of six lines for the regiment, to be laid in two sets of three wires each; with one set for each assault battalion. The term "laddered" was used to described the cross wires which at distances of 75 feet connected the three wires of each set laterally.

The Germans started a barrage. During the artillery duel, several men were stunned by shell explosions, the flares dropped by enemy aviators kept the signalmen under observation.

Mile upon mile of single wire was made into twisted pair by hand, so there could be no possibility of a shortage during the attack.

At 5:45 the morning of the 28th the American barrage began, an hour later the 28th regiment attacked. Abreast of the first wave went the signalment laying the laddered lines. First were the three carriers for each set of wires, each man having a tine bobbin on his back and unreeling the wire. Behind them were three other carriers, criss-crossing over the three wires to lay the laterals. Last came the splicers, stopping at joints to tape the wires together and all the while a mark for enemy machine guns and artillery.

The team using the heavy twisted pair reached its prearranged battalion P.C. and established station before the second wave of infantry arrived. The battation commander had telephonic communication with his colonel.

Meanwhile, the detail laying the cable <u>leger</u> (light twisted pair) had disappointing conditions. The tanks returning to the rear tore the wire so badly that it could not be used, so Lieutenant Cox and his detail took rifles and assisted the infantryment.

Seven counterattacks were made by the Germans to regain the heights.

All were repulsed but telephonic communications suffered severely. The radio antennae also were shot out frequently. Here the T.P.S. came into service, working constantly throughout the operation.

The lines from battalion to regiment and back to the brigade were kept in constant repair. At first the Signal Platoon (Infantry) did all the forward work but in a few days a Signal Corps Officer and a detail were assigned.

The battalion did not have sufficient transportation. Praise for the 2d Field Battalion because of its work at Cantgny cam from divisional headquarters, from the 10th Corps d'Armee and many other sources; a divisional order cited the entire battalion.

5. The Signal Corps in Some Important Combat Operations:[12]

The headquarters of the First Army was organized in accordance with General Order No. 120, G.H.Q., A.E.F., dated July 24, 1918. The Signal Corps Troops assigned to the First Army were making investigations and surveys in the region of La Ferte-sous-Jouarre, Chateau Thierry and the Vesle River. The first offensive action on a large scale had been planned for a long time against the St. Mihiel salient. On August 11th, the headquarters of the First Army was ordered to Neufchateau where the Signal Corps work was begun and pushed rapidly. Most elaborate and detailed preparations were made by the Chief Signal Officer of the First Army for the Signal Corps operations at St. Mihiel. The First Army operated Army Park "A" at Toul, and Army Park "C" at Souilly, and three advance army dumps were organized in the forwarded areas of the 1st, 4th, and 5th Corps. Particularly valuable work was done here in later operation by the Army Radio Section. The accurate location of all enemy radio stations by radiogoniometric bearings the night before the attach of September 12th was the determing factor in the decision of the Chief of Intelligence that the enemy had not already withdrawn. Through messages caught by out intercept stations, a counterattack was learned of as well as its strength, battalions to be used, and place it would occur, three hous before it developed.

The operation between the Meuse River and the Argonne Forest was a different matter. Owing to the congestion on the roads it was impossible after the first attack, September 26th, to maintain the three forward dumps and so 32 truckloads of Signal Corps supplies were place near the 1st corps headquarters in a dump that was convenient for distribution to divisions in the front line. American operators were placed at 16 exchanges and communication into the Souilly switchboards was given to all the American utilities, such as railheads, ammunitions dumps, hospitals, and parks, over lines consturcted by the Telegraph and Field Signal Battalions. The Signal corps had taken over the network of lines that had been installed for the 2d French Army during the four-year defense at the St. Mihiel salient. The system was so complete that only minor changes were necessary to convert

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D: pp 78-81

it to the needs of the coming American operation.

Telegraph service was handled by a telegraph trailer developed by the Research and Inspection Division. Telegraph traffic at one time ran up to 75,000 words per day, and averaged 40,000. The conduct of Signal Corps troops during this period and the quality of service rendered by them were made the subject of many letters of appreciation and commendatory orders by commanders

In the meantime, Signal Corps personnel of the II Corps and of it attached divisions operating with the British had surmounted extraordinary difficulties and had performed brilliant service particularly during the breaking of the Hindenburg Line. As the organization and equipment of British Signal Units was different from that in out army, which had been based upon the French practice, it had been necessary to solve many problems regarding supplies and functions. At all times, the Signal troops with 2d Corps organizations worked under the severest handicap as to motor transportation. With the resumption of the Meuse-Argonne operation on the first day of November, the task of the Signal Corps became extraordinarily difficult. Long and rapid advances were made over almost impassable roads with insufficient motor transportation, or none whatever, which sometimes was the case. Signal Corps soldiers in many instances carried supplies in addition to their personal equipment, and then without rest worked to establish and maintain communications.

6. Observations From Signal Corps Experiences:[13]

The attack itself, wherein speed was the main requisite of signal troops, brought out conditions peculiar to organizations, but also general suggestions for changes. In the 42d Division, it was found essential that a main axis of at least five circuits be maintained, though the number might be reduced to three beyond brigades and two beyond regiments, this whole construction task to be under the direction of one officer.

Test stations gave valuable assistance when exchanges were separated by four or five kilometers. It was found advisable to cut all circuits, except one through a switchboard at the test station, the extra one going to a drop so that the test operator might be reached at any time. The operator there would send out repair men and notify all exchanges when the connection was restored.

Six small carts, similar to those used by machine gun units, but fitted with a frame for laying wire, were recommended for each Field Signal Battalion, one for Division Headquarters, one for each Brigade, and three for work on the main axis.

As for the failure of line officers to give notice of intended changes of station[14], divisional orders to require a warning, were considered

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[13] 3B: Vol. II, pp 280 et seq.

[14] This refers to difficulties caused by officers failing to occupy or to remain at Command Posts previously designated; or to give warning of intended changes of plan.

the best solutions.

Pack mules were believed the best carrying agency for radio and T.P.S. equipment, the apparatus to be so arranged that the animals might be used for carrying wire when not moving wireless instruments.

Control by the Signal Corps of all message centers, even down to battalions, was advocated to overcome the habit of officers to use the telephone entirely. The choice of means of transmission thus would be left to the commissioned or noncommissioned officer in charge.

One of the factors responsible for the efficient operation of the communication system was the work of the Women Telephone Operators Unit, 1st Army, A.E.F. The women operators had an interest in their work the men never had shown; had an uncanny way of finding routes to strange places; refused to give up a call until the desired party had been located.

7. Proposed Organization, Assignment, and Functions of Signal Corps Units[15]

a. The Field Signal Battalion: Organization, and Employment.

When Organization Tables 1914 were prepared by the General Staff, they provided that the Field Company authorized in 1912 should be regarded as the peace cadre of the Field Battalion for service in war. This wartstrength battalion consisted on one Wire Company of four sections and one Radio Company of five sections. Divisional signal communications were to be furnished with wire lines down to Brigade Headquarters only, and with radio to the divisional and independent cavalry, flank columns or other detached forces. In spite of the determination made by the General Staff in 1910 as to the extent of divisional signal communications, there continued to be a strong protest in the Army that signal communications should be furnished within the brigade and extending down to regimental and battalion headquarters.

In the Fall of 1916, a third company, of the same strength as each of the other companies (75 men) and called the Outpost Company, was authorized by the War Department. The Signal Corps drill regulations prepared by a Board of Officers in the period February 1st to May 1st, 1917, worked out in detail the mission and procedure of the Outpost Company. No Outpost Companies were actually formed until the first American divisions began their preparations in the Spring of 1917 to sail for France.

Upon the arrival of General Pershing and his staff in France, in June, 1917, there began a reorganization of the American units. The division was changed from three brigades to two brigades of two regiments each, and the size of the regiments increased approximately 300 per cent. The need for increased facilities for signal communications within the regiments and the battalion became at once apparent. The plan adopted to provide this increase was cabled to the War Department, promptly approved

[15] B: Vol. II pp 6-11

and carried into effect throughout all organizations then training in the United States. This plan left the Wire and Radio Companies as they were and increased the strength of the Outpost Company from 75 to 280 men, this company having four sections of 65 men each for service with the four infantry regiments of the division.

Each infantry regiment also was given 61 men for signal work as an additional platoon of the Headquarters Company of the Regiments. This made a total of 126 men engaged in signal work for each infantry regiment. Even this increase was found insufficient and the strength of the Infantry Signal Platoon was increased from 61 to 72 men.

The transportation of the Field Battalion at the beginning of the war in 1917 provided for its being fully mounted and using an animal-drawn field and combat train. In October, 1917, a general revision was made of both the technical equipment and the transportation of the Field Signal Battalion. The battalion was completely mortorized except the small number of 26 combination riding and draft horses and four escort wagons with teams.

The nature of Signal Corps work is such that with a sufficient number of skilled technical men the work can and will be done without a fixed organization and with any kind of transportation. The extent and plan of the system of signal communication that must be supplied to serve a division is governed by the composition of the division.

From the experiences of this war, entirely aside from whatever changes may be made in the American division, it seems safe to predict that there will be considerable changes in the organization of the troops engaged in handling signal communications. These changes, it is believed, will accomplish two things: First, supply trained specialists from the Signal Corps to do all technical signal work; Second, add units of Signal Troops as permanent integral parts of all organizations requiring signal communications.

b. Service Battalions and Telegraph Battalions:

The theory of the employment of the Division Field Signal Battalion has firmly excluded its use for the construction and operation of permanent telephone and telegraph lines. Its role has been confined to that of tactical combat signal communications, and its form of organization and character of equipment have been fixed with that in view.

The permanent and semi-permanent lines and installations required along the Lines of Communications and within the Zone of the Advance as well, necessitate a different type of organization, using very different equipment and apparatus. In the period 1901-1912, work of that character was accomplished by detachments of Signal Corps men formed especially for each specific job as as it arose. An estimate was made of the number of men required to do the work in the time allowed, the tools needed, and the material necessary. There were no companies or other permanent organizations designed and equipped for this class of work.

The operations and maintenance of existing lines and installations was accomplished by widely scattered small detachments of Signal Corps men grouped for administrative purposes into companies with territorial boundaries. They were called, for want of a better name, "Depot" companies. Similar organizations in the American Expeditionary Forces have since been called "Administrative" Companies and afterwards "Service" companies. (See paragraph 3, Chapter II)

Previous to 1910 there had been some consideration of the proper organization of signal troops destined to install and operate the permanent and semi-permanent signal communications within the Army and Army Corps, and along the Line of Communications; but in the year 1910-1911, at the Army Signal School at Fort Leavenworth, a scientific and exhaustive study of this subject was made. The resulting organization was a company of 5 officers and 139 soldiers, with its composition of personnel, equipment, and transportation worked out in minute detail. This plan was adopted by the War Department, and the Telegraph Company was created by G.O. No. 55, W.D., 1913. During the year 1916, telegraph battalions, which had been authorized by the War Department, were formed. The Telegraph Battalion consisted of two companies of 3 officers and exactly 100 men each, and a Battalion headquarters. The strength of these companies was fixed arbitrarily. It was not based on a scientific analysis of the personnel in grades and numbers required to do certain work or to combine lesser units. The Board of Officers which was meeting at Fort Sam Houston from February to May, 1917, to write Signal Corps Regulations, perfected the detailed organization of the Telegraph Battalion and the units composing it, together with its prescribed equipment and transportation. It was upon this pattern that twelve Telegraph Battalions were organized in the first days of the war from the splendid men from the great commercial telephone and telegraph companies of the country, followed by other similar battalions as part of later quotas.

This organization has not been changed. It has been found useful in its present form, and has contained the technical elements to undertake almost any kind of line construction and operation. In France, these battalions were not assigned unaided to the management of all Signal Corps work within a given territory. This could have been done in many cases, but the plan was adopted early to man the general system with detached men selected and assigned on account of their qualifications of particular jobs.

When used on construction work exclusively, the battalion was found to have too many technicians and not enough ordinary laborers. The reverse would have been true if the battalion had been assigned to exclusive central office operation. This does not indicate that the Telegraph Battalion is faulty in organization, but simply that the Signal Corps as a corps must have a flexibility of organization to cover all phases of its work.

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Headquarters, 1st Division
American Expeditionary Forces
August 25, 1918.

MEMORANDUM:

(Extract)

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"SIGNAL PLATOONS AND COMMUNICATION IN COMBAT"

5. The Signal Platoon of twenty men and the Scout Platoon of one officer and forty men, provide for each battalion commander, must remain constantly and entirely with him, and they will not be taken by anyone for any other purposes whatever. The Signal Platoon is responsible for the equipment and the maintenance of every form of liaison. It will be kept fully equipped with telephones, wire, T. P. S., projectors, Very pistols, pyrotechnics, flares and panels. At every exercise and operation and platoon must function effectively. The use of runners is prohibited, except when no other form of liaison can be employed. It will be the duty of the platoon signal officer to see that the company signal details are provided with projectors, Very pistols, pyrotechnics, panels, etc., and to arrange code signals for use between the company commanders and the battalion commander. Bengal flares for use in marking the line in woods will be taken by the signal details of all companies.

These duties must be performed entirely by the signal details and the battalion commander and the company commander must be relieved as far as possible from personal attention to them. They will be held responsible, however, for the inspection of this equipment, for the instruction of the details, and for having them function in the proper manner. No runners will be used by company commanders unless all other means of communication fail.

6. The Scout Platoon for each battalion will be instructed and employed under the direction of the battalion commander. During every exercise and operation patrols from this platoon will be sent to the front to obtain and report constantly, information as to the location of the enemy and of our own front line. When there is no rolling barrage, the scout platoon will furnish a line of scouts at about twenty paces interval in front of the battalion. These scouts will advance resolutely and will be followed at from 200 to 500 meters by the front line. The scouts will warn the front line of enemy resistance. Other details will be made to establish observation posts in rear, from which the progress of the front line can be constantly observed. These observation posts will be changed from time to time, but the line should always be in sight of some post. Other members of this platoon may be assigned the duty of selecting successive observation posts for the battalion commander and the signal detail will advance the line so as to have the new observation posts always in readiness for the battalion commander when he moves forward. Other duties of this platoon will be in accordance with G.O. #40, these headquarters, which created it.

7. The battalion commander will always occupy a position from which he can observe the movements of the battalion except when he is hidden from such movements during his advance from one position to another. Every new post of the battalion commander will be an observation post. While it is proper to take such cover as may be found to exist, at no time will the battalion commander place himself where he cannot observe the terrain and his troops.

8. The battalion commander will reduce the number of officers and men accompanying him to the minimum. Persons attached to him in excess of this minimum will form a rear echelon of his headquarters from which he can replace casualties and secure details for unexpected purposes. As a rule, the following persons only will be permitted to remain in the vicinity of the battalion commander:

Battalion Adjutant
Battalion Scout Officer
Battalion Signal Officer
Liaison Officer from the Artillery.
Liaison Officer from the machine gun company
One runner for each company
One liaison agent from the artillery
One liaison agent from the machine gun company
One liaison agent from the Stokes mortars
One liaison agent from the 37m/m guns
One telephone operator
One signalman equipped with panels, Very pistol, cartridges and field codes.
One T. P. S. team will operate at the flank. .

This personnel with equipment will be dispersed in small groups of not exceeding four men each over an area within reach of the voice of the battalion commander's position. In advancing from observation post to observation post the battalion commander and his personnel will move by the safest practicable routes, and as rapidly as possible in order to conceal their movement, and to diminish losses. A telephone will be maintained at the rear echelon of the battalion headquarters and will be utilized to send messages to the machine guns, Stokes mortars, 37m/m guns and to the accompanying artillery.

9. At every drill, casualties will be designated among officers of all units and among platoon and squad leaders and the next in command will be required to continue the operation.

10. Due to the peculiar conditions that have prevailed in trench warfare, a misconception has arisen as to the employment of runners. While they are useful and precticable where communication trenches and other cover exists, they have little place on the modern battlefield. They are

slow and uncertain and the casualties among them are out of proportion to the service that they render. All persons are, therefore, enjoined to employ the scientific means placed in their hands for communication in field operations, and the use of runners is prohibited unless it can be shown conclusively that no other means exists and that runners are a last resort. Furthermore, the prodigal use of runners has resulted in taking so large a number of riflemen from the infantry companies as to seriously impair the fighting powers of our units. Such details must be discontinued except for a minimum number to be used only in emergencies. As a rule, the employment of a runner will be an evidence of failure to provide other suitable means of communication and will become the subject of adverse criticism.

* * * * * * *

C. P. SUMMERALL,
Major General, U.S.A.
Commanding.

FOR

INFANTRY SIGNAL DETACHMENTS

1st D. I. U. S.

Memorandum: (Extract)

Modification in the organization equipment, and tactical employment of the infantry signal detachments was demonstrated during our recent operations.

The principles herein set forth are prescribed for use within this division, and all previous conflicting instructions are revoked.

KARL TRUESDELL,
Major, Signal Corps.

Hdqrs. 1st Div., American E.F., August 23, 1918---To D. S. O., 1st Division.

1. Approved.

By command of Major General Summerall:

CAMPBELL KING,
Chief of Staff.

INTRODUCTION

1. During the forthcoming training period, the infantry (Consolidated Signal Corps and Infantry Signal Platoon) Signal Units will organize, equip and train themselves for employment in semi-open warfare.

2. The probable mission of this division will be that which falls to assault troops. This will involve an employment under the following possible contingencies;

(a) Rapid moving from training area or billets by marching, truck or train towards the front; brief reconnaissance followed by assault through tranch holding troops.

(b) Same as above---to continue the offensive or to counterattack.

(c) Same as above---to relieve other exhausted assault troops in combat.

3. For the remainder of this season the probable formation for assault of this division will be that known as the square formation, i.e., brigades in line, regiments in brigade side by side; battalions in column organized in depth. The possibilities of advance in this formation will be from 5 to 15 kilometers for the division, with a front of about two kilometers.

4. The tactical unit of attack is the battalion and the results to be expected of a division will be the sum of the efforts of each battalion. Intelligent and simultaneous manipulation of adjoining battalions quadruples the best operation of any such unit acting alone. Such control is only possible when efficient and continued liaison is available. The responsibility for proper liaison devolves upon the signal officers with or attached to the infantry. All available means will be provided for the troops whom they serve.

5. TRAINING

These officers will particularly study the following phases as they effect the liaisons of their units -

- during the movement to the assembly zone
- in the reconnaissance of the future area of operation
- between subordinate and higher units during the advance
- between adjacent units
- between the leading infantry battalions and the supporting 75's
- within the unit itself to include the organization of P. C. and message center.
- coordination in the movements of the P. C.'s within the unit and in its relation to the higher command.

6. The principles of liaison as prescribed in Memorandum G-3, No. 755, 1st Division, "Liaison in Semi-open Warfare" will be closely studied and adhered to. These rules are very general and leave much to the initiative of the responsible officers. Each operation and every combat will demand a separate solution. This feature must never be forgotten and the successful officer, he who provides his unit with unfailing means of communication at all times, who trains with and for his command, can only accomplish this when he, himself, and each individual under his charge is a master in his profession. Indifference, sloth, carelessness, are criminal---murderous. Only hard work, skillful leadership and the intelligent application of his own specialized training, as well as that of his men, will the Signal, Telephone or Radio Officer succeed. No detail of training will be omitted. The division depends upon its communications as well as upon its fighting elements, and the skillful maneuver of the latter is an impossibility without the former.

ORGANIZATION

7. To the infantry battalion will be permanently assigned a detachment of not less than twenty signallers from the regiment. This will provide all the usual means of communication to enable it to efficiently function -

- as an assault unit
- in holding a sector
- in reserve
- in billet

8. The battalion makes its communications as it advances, and assists in operating and maintaining same. This leaves to the regiment the organization and functioning of its own P.C., the improvement of the communications to its battalions, when necessary, and the replacement of men and material of these battalions. Not less than forty signallers with appropriate equipment are necessary for this purpose. A greater number would be advisable.

9. The basis for the personnel of this reorganization will be as follows (Signal Corps and Infantry, combined):

	Each Bn.	Regtl. P. C.	Total
Command:			
Officers	1#	2#	2
N. C. O.'s	1	1	4
Message Center:	-	2	2
T. S. F.:			
N. C. O.'s in charge		1	1
Operators		3	3
T. P. S.,			
N. C. O.'s in charge	1	1	4
Operators	3	3	12
Telephone:			
N. C. O.'s in charge	1	1	4
Operators, switchboard	3	3	12
Trouble shooters	4	10	22
Panels and Projectors:			
N. C. O.'s in charge	1*	1	4
Operators	2	4	10
Buzzerphone:			
Operators	3##		9
Pigeon Service:	1###	1	1
Motorcyclists:		1	1
Property N. C. O.:		1	1
Cooks:		1	1
Reserve:			
N. C. O.'s and soldiers	1	6	9
Aggregates:	20	40	100

#Officer detached from regimental P. C. to the advanced battalion.
* Battalions operate a simplified message center under the Sergeant.
Attached to T. P. S. team during semi-open warfare.
Detached from infantry companies during operations, not included in totals.

EQUIPMENT

10. Equipment will be reduced to the amounts hereinafter prescribed. Each item of equipment and material will be carefully and constantly maintained in serviceable condition. Responsible officers and non-commissioned officers will hold frequent inspections for this purpose, and prior to drill or combat will always make a personal check of the equipment in the possession of each individual.

11. SPECIAL EQUIPMENT---INDIVIDUALLY CARRIED

a. N. C. O. in charge battalion detail:
- 1 Case, map
- 1 Flashlight
- 1 Knife, electrician
- 1 Pliers, S. C., 6" pairs
- 1 Watch, wrist.

b. Panel, Pyrotechnic and Projector team:

(1) N. C. O. in charge:
- Codes---field, excerpts for all necessary purposes.
- 1 Glass, field, pair
- 1 Panel, ident., Inf., Bn.
- 3 Panels, inf., Rectangular

(2) Projector operators, each
- 1 Book, field message
- 1 Glass, field
- 1 Pencil, lead
- 1 Projector, 14 or 24 cm., w/blt. & bty., complete

c. Telephone team:

(1) N. C. O. in charge:
- 1 Compass, prismatic
- 1 Flashlight
- 1 Pencil, lead
- 1 Pliers, S. C., 6"

(2) Telephone orderlies (Nos. 3 and 6) each:
- 1 Book, field message
- 1 Ground rod, improvised
- 1 Pencil, lead
- 1 Pliers, S. C., 6"
- 1 Telephone, W. E., M-1375-B
- 1 Wire, reel, O. P., t.p., 1/4 km.

(3) Wiremen (Nos. 1, 2, 4, 5 and 7) each;
- 1 Knife, electrician
- 1 Pliers, S. C. 6", pr.
- 1 Tape, friction, roll
- 2 Wire, reels, O. P., t.p., 1/4 km. each:

NOTE: No. 1 carries in addition---one clamp, splicing
No. 2 " " " ---one hammer, claw, and one screwdriver
No. 4 " " " ---one hatchet, with handle
No. 5 " " " ---one saw, crosscut, 24"
No. 7 " " " ---one four-line switchboard in case.

d. T. P. S. team: (complete sending and receiving station)

(1) N.C.O. in charge: 5 lbs.
- 1 Compass, prismatic
- 1 Canvas case, carrying (French), Unit 2 with Rec. Set Com.
- 1 Flashlight
- 1 Pencil, lead
- 1 Pliers, S.C. 6", pr.

(2) Base line men (Nos. 1 and 2), each 20 lbs.
- 125 Cable, fld., 7 strand, wound on arm, meters
- 1 Carrier (sack) for pins and hammer
- 1 Hammer
- 6 Pins, ground (straight)
- 1 Pliers, S.C., 8"

(3) Operator, sending (No. 3) 26 lbs.
- 1 Box, transmitting, 2 bis, complete
- 1 Battery, 10 volt
- 1 Book, field message
- 1 Pencil, lead

(4) Operator, receiving (Nos. 4) 20 lbs.
- 1 Box, wooden, with amplifiers, etc., complete
- 1 Book, field message
- 1 Pencil, lead

(5) Battery carrier (No. 5) 21 lbs.
- 1 Battery, 4 volt

(6) Battery carrier (No. 6) 17.5 lbs.
- 1 Battery, 40 volt.

NOTE: When teams are equipped with combined sending and receiving sets, same is carried by No. 3. No. 4 will then carry the 4 volt battery.

12. Regimental P.C. Detail:
As individually assigned by the Signal Officer. To follow the scheme provided for the teams of the Battalion details as far as practicable.

RECAPITULATION

13. PIGEON EQUIPMENT

Article	Bn.	Regt.	Loft	Total	Remarks
Baskets, Infantry	1	1		4	
" rest			2	2	Complete
Cages, rat			2	2	
Covers			3	3	
Feed boxes			2	2	
Water troughs			4	4	
Message, books, blank	2	2	2	10	
" " sketch	1	1	1	5	
Holders, msg	4	4	3	50	
Baskets, assault	3		1	10	

INSTRUCTION

14. Troops under fire can be relied upon to do only, that which through drill and discipline has become to them a habit. The signal units with the infantry battalions will hereafter be subjected to the same conditions of battle training as is required of the troops with which they are working. These battalion units will be always retained at a maximum in strength and equipment. They will be carefully trained in technical details. The teams will then be worked as a unit, and with their combat troops, whenever possible.

15. Great care will be taken that formal drill does not carry with it a disregard of tactical principles, and that the rigidity of the diagram does not subtract from the leader's initiative on the battlefield.

16. Regiments and brigades will follow the methods herein prescribed for battalions, so far as same applies.

17. Attached hereto Plates I to III.

APPENDIX D
(C: Pp. 23-24)

SOME STATISTICS: Equipment Provided; Construction Performed:

1. Organizations equipped with Field Signal Supplies:
Two Armies; 12 Army Corps; 33 Divisions; and
45 Field Signal Battalions connected therewith

2. Equipped for Performance of Assigned duties;
Twenty-three Telegraph Battalions; of which eleven were outfitted to serve with Army and Corps Troops

3. Wire Lines, Constructed, by The Signal Corps, A.E.F.;
1990 miles of permanent pole lines, with
28,000 miles of wire;
3,230 miles of wire put up on French poles;
40,000 miles (approximately) of Combat Lines.

4. Lines leased from the French: 20,400 miles of wire.

5. Telegraph Offices on permanent lines, numbered 134;
Perhaps twice that number temporarily on field lines.

Telephone Exchanges on permanent lines, numbered 273;
Those in the Advance Section, 123.
The small temporary field installations were much more numerous.
Over 9000 telephones connected with the permanent lines.

6. Over 12,000,000 telegrams; about 1,600,000 long-distance telephone calls, and 47,000,000 local telephone calls handled over our military lines.

7. A force of 976 telegraph and multiplex operators were required on the permanent lines at the peak of our load, in November, 1918. These men included a large percentage of the artists of their profession, with high ideals regarding duty, and the quantit and quality of work they could perform.

The 233 young women telephone operators deserve tribute for their quiet and efficient performance of their duties.

APPENDIX E

THE SUPPLY DIVISION: (Personnel & Depot Capacity)
(D, p. 27)

Personnel
(Including those at Base Ports:
(Depots; Office, Chief Signal Officer; (S.O.S.)
(Disbursing & Purchasing Section at Paris)

74 Officers; 924 Enlisted Men; 13 Civilian Clerks

In addition: A considerable quantity of both enlisted and civilian labor, at depots, as required.

DEPOT CAPACITY

Depot	Storage Space (In Square Feet) Covered	Open
Signal Corps Advance Depot No. 1, Is-sur-Tille, Cote d'Or	70,000 Sq. Ft.	250,000 Sq. Ft
Signal Corps Intermediate Depot, No. 2, Gievres, Loire-el-Cher	100,000	600,000
Signal Corps Intermediate Depot No. 3, Montierchaume, Indre	25,000	0
Signal Corps Base Depot No. 4, Montoir, Loire Inferieure	50,000	75,000
Signal Corps Base Depot No. 5, St. Sulpice, Gironde	52,250	75,000
Signal Corps Photographic Depot No. 6, Paris, Frnace	6,200	0
Signal Corps Radio Depot No. 6, Orly Field, Paris	2,200	0
Army Park "A", Toul, Meurthe-et-Moselle	7,500	40,000
Army Park "B", Lieusaint, Seine-et-Marne	9,000	12,000
Army Park "C", Parois, Meuse	8,000	15,000
TOTAL COVERED STORAGE SPACE	330,150	
TOTAL OPEN STORAGE SPACE		1,067,000

SIGNAL CORPS
AMERICAN EXPEDITIONARY FORCES

Table showing personnel by Months

Month	Service of the Front		Services of Supply		Total A. E. F.		Number of Battalions in AEF.				Services Companies
	Officers	Soldiers	Officers	Soldiers	Officers	Soldiers	Field	Signal	Telegraph	Depot	
1917 June	No division of personnel before the				13	286		1/3	0	0	0
July	establishment of the Line of				24	310		1/3	0	0	0
Aug.	Communications.				43	746		1	2	0	0
Sept.	14	226	63	699	77	925		1	2	0	0
Oct.	27	469	90	915	117	1384		2	2	0	0
Nov.	40	697	152	1352	192	2049		3	3	0	0
Dec.	53	1394	176	1818	229	3212		4	5	1/2	0
1918 Jan.	66	1832	286	1839	352	3671		5	7	1/2	0
Feb.	95	2600	358	1974	453	4574		6	8	1	4
Mar.	134	3437	383	2107	517	5544		7	11	1	4
Apr.	188	4270	370	2945	558	7215		8	13	1	4
May	208	5440	370	3669	578	9109		11	14	1	4
June	404	11844	378	3916	782	15760		24	15	3	4
July	553	16702	400	4470	953	21172		32	18	3	13
Aug.	620	19087	472	5099	1092	24186		37	18	6	13
Sept.	748	21760	535	6399	1283	28159		43	21	9	13
Oct.	894	26967	568	6071	1462	33038		48	22	10	13
Nov.	943	25822	722	8384	1665	34206		48	26	11	15
Dec.	934	24374	647	8643	1581	33017		47	24	11	15
1919 Jan.	949	21025	406	6927	1355	27952		41	20	11	17
Feb.	655	18095	510	7067	1165	25162		36	19	11	18
Mar.	615	15124	422	5995	1037	21119		30	14	11	18
Apr.	469	8609	359	5759	828	14368		18	13	11	16
May	241	3940	320	4141	561	8081		7	9	11	14
June 20	172	3862	264	2737	436	6599		7	5	11	11

The figures given under "Service of the Front" represent the estimated strength of Signal Corps Personnel attached to Armies, Corps and Division.

The figures given under "Service of Supply" represent the estimated strength of all other Signal Corps personnel not included under "Service of the Front."

Depot Battalions were disbanded immediately upon arrival and were used to supply personnel for S. O. S. and S. O. F. replacements. The number given is the total number which have arrived in the A. E. F.

SIGNAL CORPS POLE AND WIRE PLANT, AS OF OCTOBER 31, 1918

Pole Lines erected:

(a) Long line	3,200	km.
(b) Local	300	"
	3,500	km.

Wire plant:

(a) Long Line system:

(1) Wire on poles built by Signal Corps	45,000	km.
(2) Wire strung by Signal Corps on French pole lines	5,200	"
(3) Wire leased from French ~~Corps~~ operated by Signal Corps	32,800	"
	83,000	km.

(b) Combat lines largely on Signal Corps pole lines and buried system	62,500	km.
(c) Local lines and cable system	57,000	"
Grand Total	202,500	

PAYMENTS	LOCAL	LONG DISTANCE
Prior to and July, 1917	38,750	1,800
August "	77,500	3,200
September "	112,500	4,500
October "	186,000	13,230
November "	270,000	16,980
December "	388,000	25,800
January 1918	482,000	29,790
February "	482,000	32,200
March "	535,000	39,800
April "	660,000	42,500
May "	990,000	44,750
June "	1,080,000	48,732
July "	1,865,000	62,220
August "	2,601,800	74,780
September "	2,952,850	78,200
October "	4,288,000	126,485
November "	4,389,000	118,621
December "	4,205,300	106,611
January 1919	4,089,750	122,745
February "	3,781,650	114,869
March "	4,170,975	116,430
April "	3,837,600	119,989
May "	2,769,800	106,905
To June 19th"	1,534,500	44,010
Total	45,788,775	1,495,147

Telegraph Traffic by Months

Below is given statement of total numbe of telegrams handled monthly and the percentage of increase or decrease from month to month.

October	1917	13,166		
November	"	38,367	199%	Increase
December	"	39,467	3%	"
January	1918	122,921	211%	"
February	"	162,669	32%	"
March	"	219,076	35%	"
April	"	236,086	8%	"
May	"	324,192	37%	"
June	"	465,798	44%	"
July	"	558,988	20%	"
August	"	885,635	58%	"
September	"	983,389	11%	"
October	"	1,255,916	28%	"
November	"	1,150,286	8%	Decrease
December	"	1,145,591	4%	"
January	1919	1,084,413	5%	"
February	"	994,738	16%	"
March	"	942,500	5%	"
April	"	847,973	10%	"
May	"	780,701	8%	"
To June 19	"	292,411	45%	"
		12,144,283		

MAIN LINES IN OCCUPIED AREAS, AS OF MARCH 1, 1919

	KM. U.S.Wire	KM. French Wire	KM. German Wire
General Command Net for Interallied Command:			
(a) Battle Line to French frontier		928	
(b) French frontier to Bridgehead		1240	
U. S. Army Occupation Circuits:			
(a) Battle line to French frontier	210	807	4091
(b) French frontier to Bridgehead			8910
	210	2975	12001

Grand Total.....16,186 km.