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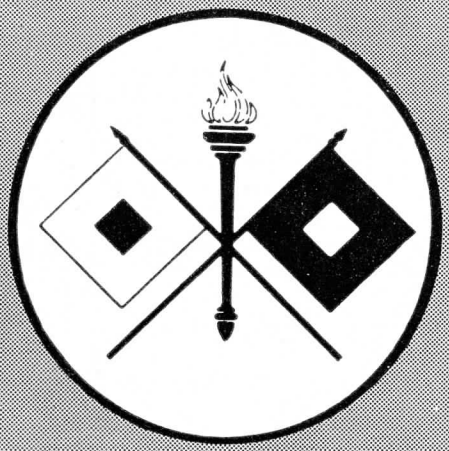
SIGNAL CORPS
Technical Information Letter

MAY · 1945

ARMY SERVICE FORCES · OFFICE OF THE CHIEF SIGNAL OFFICER



SIGNAL CORPS

TECHNICAL INFORMATION LETTER

PURPOSE THE SIGNAL CORPS Technical Information Letter is a monthly publication designed to keep Signal Corps personnel and other military personnel using Signal Corps equipment informed on Signal Corps matters. It provides means for the dissemination and interchange of information of a widely varied nature, both technical and tactical.

SOURCE THE LETTER is compiled mainly from information available in the divisions and branches of the Office of the Chief Signal Officer. Signal Corps and other communications personnel are invited to submit, through channels, material of general interest. Information on problems encountered and overcome by combat and service communications troops is desired. Such items should reach the Chief Signal Officer (SPSAY) not later than the 15th of each month for inclusion in the letter for the following month.

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Within the continental limits of the United States the Letter is distributed to Signal and other Ground and Service Forces units and installations by the Chief Signal Officer (SPSAY), Washington 25, D. C. Distribution to Army Air Forces units and installations in the continental United States is made by the Commanding General, Army Air Forces (AFMPB), Gravelly Point, Virginia.

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WARNING THIS publication is issued solely to give proper and speedy dissemination to timely, useful information concerning pertinent trends and developments. Nothing herein is to be construed as necessarily coinciding with United States Army doctrine. Changes in official doctrine, as they become necessary, will be officially published as such by the War Department.

Publication approved by Bureau of the Budget, Executive Office of the President.

CONTENTS

SIGNAL COMMUNICATIONS
IN THE
CAMPAIGN OF NORTHERN BURMA

American Signalmen Worked with Chinese Troops to Clear Route of Ledo Road

THIS IS an outline of signal communications in the Campaign of Northern Burma from the latter part of 1943 when our forces entered Burma until August of 1944 when the Japanese stronghold of Myitkyina fell. While this paper is intended principally to present the requirements, problems, and difficulties of signal communications in the jungles together with the action and expedients taken to provide such communications, and while a complete story of the campaign is inappropriate here, a brief sketch of the initial situation, the terrain, and the ensuing action is presented to provide a background for appreciation of the problems involved.

BACKGROUND

In the fall of 1943 the Japanese were occupying all of northern Burma and threatening with invasion eastern India from the Arakan north to Assam. The occupied territory included the Hukawng and Mogaung Valleys vital to the construction of the Ledo Road. The only existing road of any consequence between Ledo and Mogaung was the old refugee trail over which the population had fled in escaping the Jap advance in 1942. The country is rugged, mountainous and blanketed with a jungle as nearly impenetrable as any in the world. Established systems of signal communication were nonexistent in the area except for a stretch of crude temporary pole line between Kamaing and Mogaung and a three-pair bracket line along the Mogaung-Myitkyina railway. Both of these circuits, of course, were in the hands of the enemy.

Between October 1942 and October 1943 a provisional Chinese Army was undergoing training at Ramgarh, near Calcutta in India. Among these troops were the 1111th and 2222d Divisions.[1]

Training for the 1st and 2d Regiments of the latter Division was short, however, for they were needed to garrison outposts guarding the approaches to Assam. During this period, these regiments with intervals of relief remained on outpost and patrol duty in the vicinity of Tagap Ga, Hkalak Ga and Hpachet Hi. When headquarters of the Chinese Army in India (CAI) was established near Ledo, Assam, American personnel taken from the *A* Signal Service Company and Signal Platoon, Chinese Training and Combat Command, were detailed to establish radio links to provide close liaison between that headquarters and the Chinese divisions.

In the summer of 1943 the *B* Signal Operations Company (Spl) was constituted and activated from signal, air corps, ordnance, quartermaster, and medical personnel already in the theater at Ramgarh, and absorbed the personnel on duty in the Ledo area. A short training period was given to the new personnel before being assigned to radio liaison teams while the old personnel continued operations.

Toward the end of October 1943, patrolling became more aggressive and the 1st Regiment advanced south through Shingbwiyang, Ningam Sakan, Yupbang Ga, Sharaw Ga and Njagatzup.

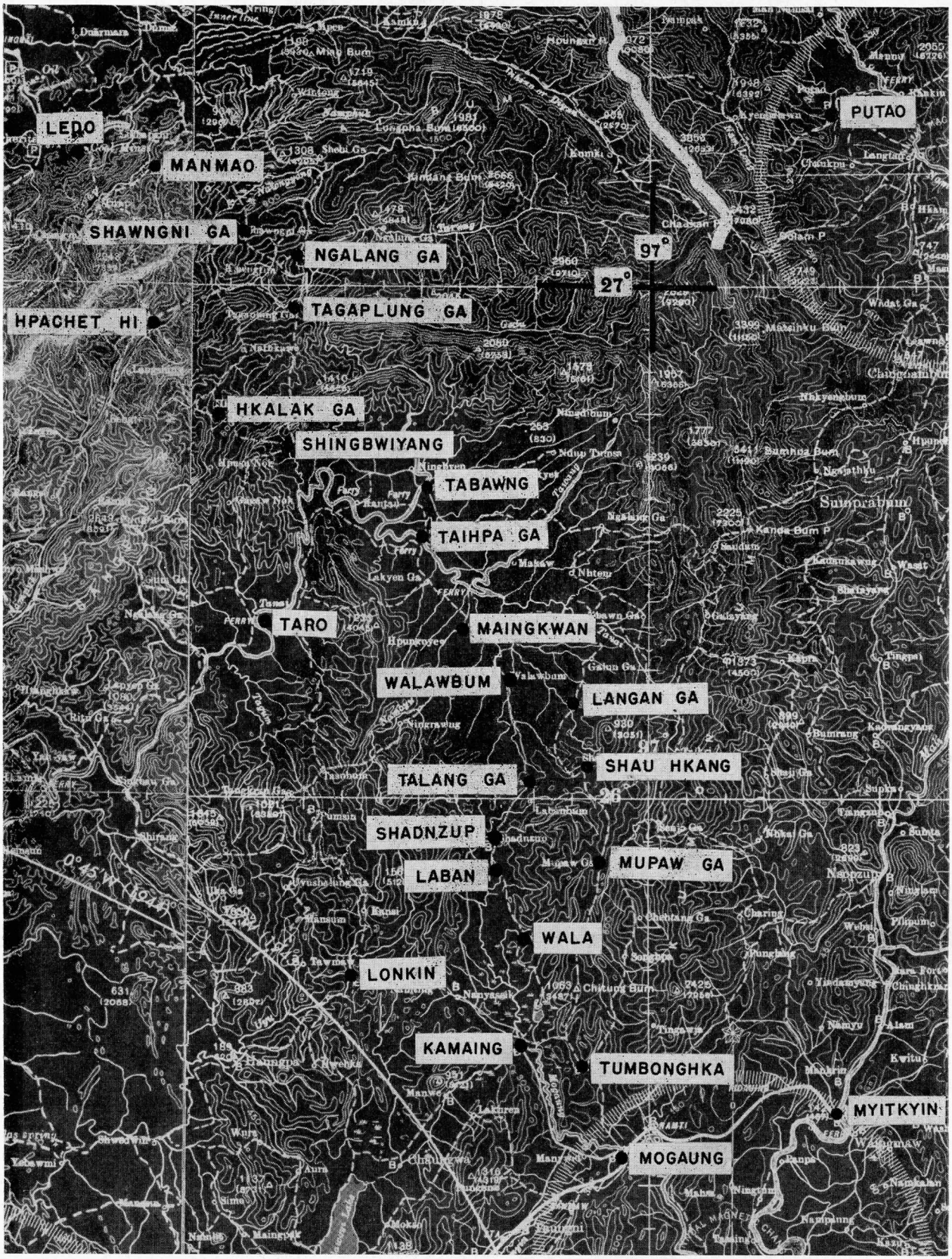
In November of 1943 the 2d Regiment closed in Shingbwiyang with the 3d following in December. Attached to each regimental headquarters and each battalion headquarters were radio and code teams from the *B* Signal Operations Company (Spl).

In the late fall of 1943, the 2222d Division headquarters opened at Tagap Ga and later moved to Ningam Sakan and Nchaw Ga, following a track which was to become the Ledo Road.

The middle of January 1944 found the forward echelon of Chinese Army in India established at Shingbwiyang where communications were installed, operated, and maintained by elements of the *B* Signal Operations Company (Spl). Radio links forward to the 2222d Division and 1111th Division elements were in operation; field wire was constructed forward to the CP's of the two Chinese divisions, and a messenger service was being operated to elements along the road.

The 1111th Division had closed in Shingbwiyang

[1] All unit designations in this article have been changed to random numbers and letters in view of security classification of original.


LEDO
MANMAO
SHAWNGNI GA
NGALANG GA
TAGAPLUNG GA
HPACHET HI
HKALAK GA
SHINGBWIYANG
TABAWNG
TAIHPA GA
TARO
MAINGKWAN
WALAWBUM
LANGAN GA
SHAU HKANG
TALANG GA
SHADNZUP
MUPAW GA
LABAN
WALA
LONKIN
KAMAING
TUMBONGHKA
MYITKYIN
MOGAUNG
PUTAO
97°
27°
0°45' W TOTAL

prior to the movement of CAI and regiments from this division were employed to clear the Japs from Taro Valley and assist the advance of the 2222d Division down the Hukawng Valley.

Again the *B* Signal Operations Company (Spl) assigned teams to division headquarters, regimental headquarters, and battalion headquarters of the 1111th Division. By this time the entire company was functioning either as American signal personnel or attached to Chinese units, serving as liaison personnel.

In February, the forward echelon headquarters, CAI, moved forward to Taipha Ga. In the meantime, the 2222d Division moved forward occupying first Taipha Ga and finally, moving to the left flank of the advancing Chinese-American Army, occupied Laawnga, Ugaga, and continued to move to the south toward Maingkwan and Walabum.

While at Taipha Ga, the 999th Provisional Tank Group joined the task force and radio teams from the *B* Signal Operations Company (Spl) were attached to this unit.

The 1111th Division had not been idle. The 4th Regiment moving over jungle trails had driven the Japs from the Taro Valley, and the 5th and 6th Regiments had advanced south on the west of the 2222d Division clearing out isolated pockets of the once famed Japanese —th Division.

During this time Merrill's *Mauraders* had entered the fight, and the 3d Chinese Regiment was assigned to follow this American infantry organization in a wide envelopment of Walawbum and Jambu Bum.

The 7th Regiment was taken from the 3333d Chinese Division, which had been undergoing training at Ramgarh, and moved out to Pabum to secure the left flank of the CAI.

Going back to the fall of 1943, the *B* Signal Operations Company (Spl) had sent a radio team to Fort Hertz and had supplied 25 radiomen to the *V-Forces*, the eyes of CAI.

The rapid progress continued. Maingkwan was outflanked by the 1111th Division in March; and the *Marauders*, with the help of the tanks and 3d Regiment, cut the Japs to pieces at Walawbum.

The 1111th Division occupied successively Munkwan, Maingkwan, Shingban, and had assisted the envelopment of Walawbum.

The 2222d Division moved through jungle trails to Ugaga, Wesu Ga, Walawbum, took to the main road behind the 1111th Division, and then assisted in the capture of Jambu Bum Pass, Tingkawk Sakan, and Shaduzup. The Japs were retreating south along the Mogaung Valley trails through Laban, Warazup, Malakawang, with elements of both Chinese divisions continuing the attack.

With both divisions abreast—the 2222d division on the left—the advance down the valley continued. Warazup fell to the 1111th Division, and Kamaing followed late in June. The 2222d Division occupied Laban, Tingring, Tumbongka, and the 1st Regiment clamped a road block at Seton, below Kamaing. The 4th Regiment had moved south out of the Taro Valley and had secured the right flank of the CAI. It cleared and occupied Lonkin in June.

Following the encirclement of Kamaing, the 3d Regiment, nearly worn out from its extensive marchings through difficult jungle terrain, moved to the left to secure the advance of the Indian Division; and the 2222d Division, on Mogaung. The Chindits, or Indian Division, first under Wingate and then Lentaigne, had been airborne into the lower Mogaung Valley to execute a brilliant vertical envelopment. This reinforced division moved north, cutting up Jap elements fleeing before the Chinese advance; and, in conjunction with the 1st and 2d Regiments, laid siege to Mogaung. Kamaing and Mogaung fell almost simultaneously, and the road to Mandalay lay before our troops.

Late in March 1944, two Chinese divisions, the 4444th and 5555th were flown into Ledo and Burma from China. The 4444th, consisting of the 8th, 9th, and 10th Regiments, closed at once in the vicinity of Maingkwan while the 5555th concentrated in the Ledo area.

After the fall of Walawbum, the *Marauders* again took to the trails in their famous march to capture the airfield at Myitkyina. The 10th Regiment followed and the 7th joined the force at Pabum. Moving by ground and air, the task force slowly closed a ring around Myitkyina. The 11th Regiment (3333d Division) and the 1st (5555th Division) were airborne to the fight. At this time the *Marauders* were placed under direct control of CAI.

On August 5, Myitkyina fell and by this time the 6666th Division was beginning to relieve the

Indian Division. A half year of strenuous, difficult fighting had ended. Stillwell's Army stood poised for the advance toward Bhamo, and the completion of the Ledo Road.

AMERICAN SIGNAL UNITS IN CAI

With the great increase in the size of the CAI additional signal personnel were needed. Closer and more certain control was necessary to coordinate the action of the divisions. Up until early April, the *B* Signal Operations Company (Spl) bore the full weight of all signal communication needs. They were spread thin between Army headquarters and five divisions, plus intelligence and tank groups. To meet the increasing requirements the *C* Signal Battalion was assigned to CAI and started to join the force during the middle of April. They assumed responsibility for installation, operation, and maintenance of the Army headquarters signal network and attached division headquarters teams (radio, wire, and message center) to the 1111, 2222, and 4444 Divisions. In addition, they carried on construction and maintenance of open wire and spiral-four cable between Ledo and Shaduzup.

Additional personnel for repair and operation of the administrative radio stations were also needed. To satisfy these needs a repair team from the *D* Signal Repair Company was attached to CAI, and a 1-kw. radio team from the *E* Signal Service Battalion was also attached. As increments of the *B* Signal Operations Company (Spl) were relieved from other duties they were assigned either to radio liaison work or operating the signal installations of the Myitkyina task force, while the *C* assumed the functions of a normal army corps signal battalion. The *E* Signal Service Detachment at this time took over signal operations at the rear echelon headquarters near Ledo with a small detachment at forward echelon at Shaduzup operating the 1-kw. long range radio station.

The requirements for signal communications in this campaign were exacting and beyond those normally demanded by a small army or independent corps. Maintenance, on a 24-hour basis, of telephone, teletype, radio, and messenger service between army rear and forward, echelons; establishment and maintenance of radio, telephone, telegraph, and messenger service to divisions, as well as provision for radio links with adjacent forces and outlying headquarters including the British *XXX* Army, the Fort Hertz group, the *Y* forces on the Salaween, the headquarters at Chungking, and finally theater headquarters at New Delhi was attempted. The necessity for rapid handling of traffic to the Delhi station was such in the later part of the operation that radio teletype was used to provide greater speed of operation. This was probably the first time that such equipment had been employed by a mobile field army, over such a distance.

In addition to the normal circuits, the American signal elements of the CAI were called upon to establish and operate several special circuits and communication systems. These included communications to the 1st Provisional Tank Group, corps artillery, special task forces, and attached liaison squadrons.

The jungles offered many obstacles to successful communications, including the difficulties of clearing paths to permit the installations and maintenance of both open wire and cable, the high level of water and the adverse weather encountered during the monsoon period. Low ground conductivity, and the high absorption of radio signals by the heavy growth and masking terrain were also among the factors adversely effecting signal communication.

Signal communication between the tank group commander and his subordinate elements was often unsatisfactory using the standard FM, SCR–500 series sets because of the masking effect of the jungles and the rugged terrain. To supplement these sets, the normal commercial radio equipment of an L–5 liaison plane was used in an early phase of the operation to work to an SCR–245 on the ground. This, unfortunately, was not wholly successful and failed at critical times. Later trials were made using a stripped down SCR–528 in the airplane to communicate with the 500 series sets in the tanks. This proved highly successful but was installed too late in the campaign to be of much value. The only objection to this set was its excessive weight.

In attempting to use the standard radio equipment of the L–5 liaison airplane and the SCR–284 or V–100 for reporting artillery fire, the same trouble was encountered as in the case of the tank group. The remedy was to use the Radio Set SCR–300 for this purpose. While designed as an infantry pack set, it proved nearly ideal for

application to artillery fire spotting from a plane and provided communications comparable to a high grade telephone circuit.

Some improvement was later made in the liaison aircraft equipment by fitting both receivers and transmitters with locally ground crystals. In at least one instance a liaison plane, equipped with both an SCR–300 and its standard equipment so improved, directed the simultaneous attack of artillery and fighter bombers on enemy medium artillery, which resulted in several Jap field pieces being knocked out.

In general the long range signal communications of this group (*Marauders*) depended entirely upon radio. Because of difficulty with circuits of the order of 25 to 50 miles a relay point was established at the *Marauder* rear echelon near Dinjan, and transmissions from forward elements were relayed through that station to the command post of this unit which was generally near that of the army commander. Since elements of the organization were used in both wide ground envelopments and vertical envelopments it was common practice to carry an SCR–300 radio set which, in the event of failure of other radio links, would provide line-of-sight communication with an airplane equipped with a similar set.

Throughout the campaign two separate communications systems were required within each division. The first of these systems included the normal Chinese command nets functioning in the same manner as those of an American division except on a somewhat less elaborate scale. The second system was that of the American liaison personnel.

The Chinese nets employed both wire and radio equipment. Chinese wiremen constructed, maintained, and operated normal division, regimental and battalion wire nets using both W–110B and W–130 type field wire. Generally, wire circuits were terminated in BD–72 or BD–71 switchboards and EE–8( ) telephones. This wire system formed the primary means of communication within the division.

The native intelligence of Chinese wiremen together with their energetic and tireless efforts to maintain their lines resulted in very effective wire circuits.

To direct fire within the rifle and heavy weapons companies a large number of observation posts were maintained and communication provided by EE–108 and TS–10 sound powered instruments. These proved quite satisfactory.

The radio sets principally used within the division were the SCR–284, the V–100, the SCR–195, and the British 48 set. The first two of these sets were the most nearly satisfactory but were subject to failure due to moisture and break-down of circuit components and in addition proved too bulky and heavy for their power output. Restricted frequency range proved another major fault of this apparatus. In some instances the British 48 set was used with some success, but the power output of its transmitter was found insufficient for most applications. The Radio Set SCR–195 was most unsatisfactory and of very little use except for the shortest distances.

In the field of visual communications the use of pyrotechnics was limited to signalling by means of flares to supply planes. Panels were used successfully by all elements down to and including the battalion and in some cases by companies to establish identification, mark the distance and direction of front lines and to designate areas for supply drop.

The second system of communications within the division was set up for the use of American liaison officers assigned to the Chinese units. Generally, at division headquarters the signal section consisted of an American signal liaison officer with 1 or 2 junior Signal Corps officers and about 30 enlisted men. Ordinarily the wire and switchboard personnel, as well as the radio operators and code clerks working the equipment in the corps net, were taken from the *C* Signal Battalion, while radio and code personnel operating forward of division were from the *B* Signal Operation Co. (Spl). There was no hard and fast distinction made, however, between men of the 2 organizations, and adjustments were made to suit the capabilities and physical condition of individuals.

In addition to the signal section at the division headquarters, each regiment was provided with

SCTIL No. 30, May 1944, carried an article on **Signal Communication—Burma** *which dealt with the early phases of the campaign under discussion. It was based on information then available in the War Department.*

two American radio and code teams of four or five men each. This allowed one team to work in the division net while the other was ordinarily assigned to one of the battalions. The standard equipment of the American team at division headquarters consisted of a Radio Set SCR–188, an SCR–193 and a BD–72 switchboard with associated equipment. Besides this, carrier equipment and repeater stations were sometimes operated by the teams at division.

The equipment of the regimental and battalion teams was generally an SCR–284 or V–100 set. American operators experienced the same difficulty as the Chinese with these sets and found them too heavy and cumbersome when it was necessary to man pack them through miles of jungles. The physical exhaustion of the men after such exertion was a major contribution to down grading signal communications.

When they could be made available SCR–300 sets were also carried by liaison radio teams to provide emergency communications with aircraft similarly equipped and previously described.

The comparatively great separation between the forward and rear echelons of the CAI contributed to many of the difficulties in constructing and maintaining signal communications. During a major portion of the campaign a good many stretches of the 180 odd miles of road between Ledo and Shaduzup were impassable except by foot, and in some cases the use of boats was necessary to reach pole lines in the flooded areas.

Our general plan of construction of trunk lines from Ledo to Warazup was to augment the facilities of SOS by assisting in building a 10-pin, 128-mil copper circuit, bringing the wirehead as far forward into the combat zone as road construction would permit. Circuits so established were allocated to combat headquarters, the air force, and to SOS. Initially straight voice frequency was used, but was later supplemented by installation of *CF*, *C* and *H* carrier systems. From the wirehead forward, spiral-four cable was installed. Ordinarily this was first laid on the ground, next placed above the ground using bamboo poles and existing trees for support, and finally was strung on the poles of the semipermanent pole line using GI wire as messenger strand to relieve the cable of mechanical strain.

From Warazup foward the Ledo Road was not expected to follow the trace of the old combat road and consequently the construction of a 10-pin copper circuit would have been extravagant. As a compromise measure construction of a 4-pin open wire line using 109 GI wire and British hardware was begun from Warazup to Mogaung. Construction of this line was handicapped first by stubborn resistance of the Japanese below Warazup and then by the ensuing monsoon with its accompanying transportation and supply difficulties. In order to push this line to completion, construction teams from the *C* Signal Battalion as well as a platoon of the *F* Chinese Signal Battalion were distributed along the trace and supplied by boats operating on the Mogaung River, by air drop, and by locally rehabilitated motor vehicles.

Construction of this line was further handicapped to some extent by having to maintain simultaneously spiral-four cable and carrier equipment along the route to provide circuits of immediate importance between combat headquarters and Mogaung. A great deal of the trace adjacent to the cable was marshy or flooded and the teams maintaining it worked under the most difficult and trying conditions.

On the restoration of the open wire circuit from Myitkyina to Mogaung, many of the steel telephone poles along the railroad were found still standing and many spans of existing wire were intact in spite of the heavy pounding which this area had received from the air. Transportation here was also less of a problem, for the railroad between Mogaung and Myitkyina was in our hands and a *jeep train* had been placed in operation before the fall of the latter city. Consequently, supplies flown into Myitkyina could be distributed along the line with comparative ease. This resulted in our being able to have in operation one circuit between Myitkyina and Mogaung on 31 July 1944, to place H–1 carrier on the circuits shortly thereafter, and to restore another circuit with very little delay.

To summarize the *long lines* requirements of CAI on 4 August 1944, nearly 1,000 circuit miles of open wire had been constructed or restored by the *C* Signal Battalion as well as 251 miles of spiral-four cable, 54 miles of which had been established as a semipermanent system, with the cable supported by messenger strand.

This construction was accomplished over terrain including the area of the rugged Naga hills which rise to heights above 5,000 feet and drop

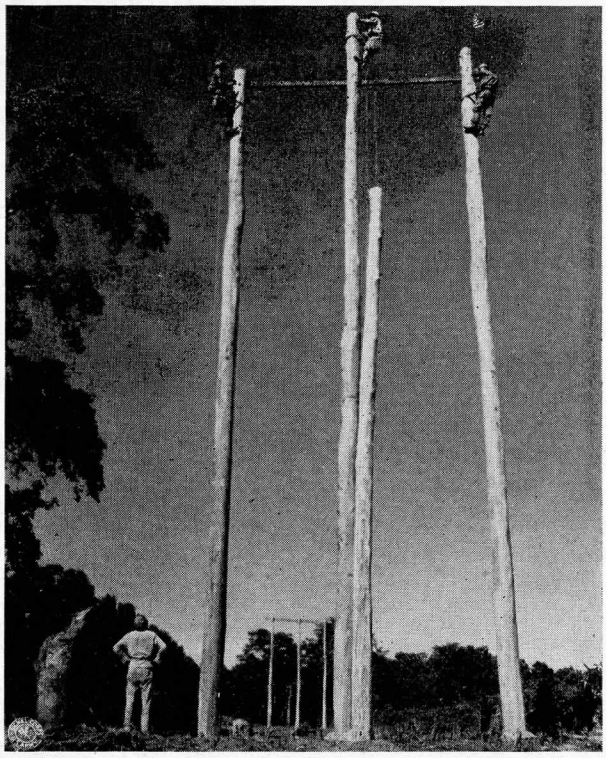
into deep gorges which necessitated the construction of 10 spans in excess of 400 feet, one of which was 1,800 feet. The territory included as well the flooded steaming swamps of the valley between Warazup and Kamaing where poles had to be man-carried across areas in mud waist deep. As the result of these conditions poles were generally cut and trimmed as near as possible to the point where they were to be used. Fortunately, good timber was usually available.

Between April and August of 1944 signal installations within the command post grew from a compact group clustered about a combined message center and radio operating room which included 3 radio sets, a TC–12 and a 20-drop monocord switchboard, to a widely dispersed installation with a separate message center, a teletype room with 2 BD–100 boards, 2 model 19 and 2 EE–97 teletypewriters, 2 radio operating rooms with provision for remote control of 11 radio transmitters including the radio teletype link; and a telephone exchange consisting of 2 nonmultipled WE–551 switchboards, 2 CF–1, and CF–2 terminal sets with associated ringing auxiliary equipment and an improvised test board.

The message center was located between the principal road and the staff sections of the headquarters and was fairly well at the center of the other signal installations. At first many difficulties were encountered in the number of garbled messages, delay in handling messages, faulty use of codes and from the other ailments common to all new signal operating organizations. As operations continued, however, and personnel became more experienced, these troubles gradually lessened.

One of the principal deviations from the approved solution, in procedure, was the practice of transcribing messages into something approaching readable English by extracting the internal addressor and addressee and placing them in the heading of the message, as well as by changing the words *comma, period,* etc., to corresponding punctuation marks, and replacing the spelled out numbers by Arabic numerals. While this may have placed some added responsibility upon message center personnel, it proved a great convenience to a very busy staff.

In operating the large number of radio transmitters required by this command it was considered desirable to isolate them from the CP by a distance of at least 1 mile. The most suitable



WORKING ON THESE H–FIXTURES ARE MEN OF COMPANY C, C SIGNAL BATTALION. THIS IS THE ANCHOR AT ONE END OF THE LONGEST WIRE SPAN IN THE INDIA-BURMA THEATER. IT CROSSES THE IRRAWADDY RIVER NEAR MYITKYINA.

area proved to be about 4 miles north of the CP where there was room to locate the transmitters into three groups providing some dispersion and still allowing the economy of multiple use of power equipment.

Transmission of radio teletype to New Delhi was accomplished through use of a 1-kw. BC–339 transmitter which was mounted in a truck to provide mobility, and used in conjunction with a considerably less mobile rhombic antenna.

The remainder of the radio circuits were terminated with Radio Sets SCR–299 or 399, most of the antenna circuits of which were modified to permit operation into a 600-ohm line feeding in turn either a delta matched doublet or a rhombic antenna. Thus the notoriously low radiation efficiency of the whip type antenna with which these sets are normally equipped was avoided.

All transmitters were keyed through W–110–B field wire. This wire was grouped into 2 cables of 12 pairs each which were run along separate routes to provide alternate keying circuits. The cables were terminated in Terminal Strips TL–184 and tie-lines were provided between the extremes to

permit rapid switching of any transmitter to any keying line. Telephone communication between a central point near the transmitters was provided from the CP switchboard, while keying lines were made use of to provide direct telephone communication between each transmitter and the corresponding operating position.

As a result of frequent blocks on the 180 miles of road lying between Ledo and the forward echelon of CAI, it was necessary to use the supply section of the *C* Signal Battalion to establish a signal supply dump at Shaduzup. This involved a great deal of guesswork on items to be stocked and levels to be maintained, for no adequate experience data were available upon which to base such values. However, T/E's and T/BA's of units were available and from these an initial stock was set up.

The SOP of the Northern Combat Area Command and CAI required a 10-day stock level to be maintained but this proved inadequate because of shipping difficulties and the consequent delay in getting supplies from base. It was found, however, that items available at Base Section 3 could ordinarily be procured within 30 days of the date of requisition and so the level was finally increased to meet this figure. On items back ordered, there was sometimes considerable delay, and some parts which were badly needed never arrived.

The most difficult problem of the supply system, however, was not that of *getting equipment to the right place at the right time*, but that of keeping books to properly account for SOS and Chinese Defense Supply (CDS). When an American liaison officer forward in combat sent in an urgent request for supplies there was no time to question whether they were to be used ultimately by Americans or Chinese or both, and in many cases the eventual user was not even known to the officer making the request. When the stock was first set up it was drawn from CDS with the understanding that American units would carry in company supply, sufficient quantities of expendables for their own use. Soon, however, it was found necessary to issue to United States units, because of the difficulties which they were experiencing in getting replacements. A gradual adjustment had to be made and finally stocks were requisitioned out of both SOS and CDS. Even so, it was not always possible to issue to Americans or Chinese in the exact proportion that materials were drawn from base. This called for a series of adjustments and the system now being used is to requisition all expendable stock from CDS. When issues are made to American units from this advance CDS stock, like items are requisitioned from SOS for replacement.

GENERAL ORDERS
No. 26

WAR DEPARTMENT
Washington 25, D. C., 9 April 1945

EXTRACT

* * * * *

Company C, 835th Signal Service Battalion, is cited for outstanding performance of duty in action during the period 20 April to 31 August 1944. Called upon to serve unusually long periods in desert and jungle under conditions of monsoon and disease, which critically hampered and at times entirely halted all other operations, this organization assisted in providing highly efficient communications between the following locations: Loglai, Tagap, Shingbwiyang, Warazup, Yupbang, Maingkwan, Tingkawk Sakan, Myitkyina, Tawang River, Nrith Ga, and Shadazup. *Company "C"* saw prolonged service with combat units in Burma, serving side by side with the 5307th Composite Unit (Prov.). It maintained and operated wire and radio systems along the entire length of the Ledo Road, up to and including the entry into Myitkyina, where installation was made under intense shell fire. *Company C, 835th Signal Service Battalion's* record of achievement is worthy of the highest traditions of the military service of the United States.

* * * * *

BY ORDER OF THE SECRETARY OF WAR:

OFFICIAL:
J. A. ULIO
Major General
The Adjutant General

G. C. MARSHALL
Chief of Staff

Because of limited transportation facilities using units could not wait while equipment was sent in, repaired and returned. The solution was to have serviceable equipment on hand in supply—ready for immediate issue while the unserviceable was brought in, repaired and placed in stock for reissue. Certain losses were sustained because some using units were unable to turn in unserviceable equipment, but the advantage of keeping communications in far outweighed such losses.

Another unusual problem in signal supply was the necessity of delivering. Units spread out over many square miles, some of them in almost inaccessible places could not come to the dump for supplies. Signal men at the dump accepted, therefore, the responsibility of placing required material and equipment in their hands. This

developed into a major undertaking as the signal supply officer had to keep up with the movement and location of all units, know whether they could be reached by vehicle and what transport or liaison planes could land at each air strip, or whether supplies had to be air-dropped. In some instances supplies were even delivered by man or animal pack. The condition of roads and bridges, the condition of air strips also presented an ever changing aspect. Later river boats were added as a means of delivery.

This added burden of shipping meant that the men had to be sent to air strips and boat landings to handle shipments, and when there was much activity men had to be stationed at these points to push supplies. During one period in which the roads both forward and rear were closed, cutting the dump off from Warazup and Tingkawk Sakan air strips, temporary auxiliary signal dumps were established. Manpower became a major problem and resources were never sufficient.

Air drop in itself presented many problems. No facilities were available at the air strips here for wrapping and attaching parachutes. Consequently equipment which was too heavy for liaison planes or which could not be free-dropped or landed had to be sent from rear echelon. Where no air strips were available to using units some supplies had to be free-dropped from liaison plane. It was found that message center supplies, dry-cell batteries, flashlights, tools, and other durable items could be free-dropped from these slow planes if properly wrapped and padded. Coils of wire were also successfully free-dropped but wire on reels had to be landed by plane or parachute the same as other fragile equipment.

In addition to materials free-dropped, complete radio sets and telephone equipment were successfully dropped using parachutes. Among these were Radio Sets SCR–177, 284, V–100, and 610. Attempts to drop spiral-four cable proved unsatisfactory, however, even when chutes were used, and faults continually developed in cable so handled.

An innovation in the supply system was the grinding of quartz crystals in the forward area. It was found that failure of radio communication could at times be attributed to off-frequency operation, and since it was impractical either to carry an adequate stock of finished crystals or to obtain them quickly enough from the communication zone to meet operational needs, a small crystal grinding section was built up around a master sergeant of the supply section who had been an optician in civilian life.

The first crystals were ground on a piece of broken windshield glass with valve-grinding compound. Successively, metal polish, and dust removed from emery paper were used as abrasives until finally an adequate stock of optical quality material was supplied by theater headquarters.

In its final form the *crystal lab* included an SCR–211 frequency meter, an SCR–342 radio receiver, a pierce oscillator, abrasives, plate glass grinding flats, a micrometer, a stock of blank crystals, and a crystal bank.

While grinding crystals in the field was precedent breaking and unorthodox, the speed and ease with which crystals could be finished with the meager equipment previously listed proved highly advantageous and materially increased the stability of our circuits.

12TH ARMY GROUP BATTLE EXPERIENCES

* * * * * * *

WE GAVE a Radio Set SCR–300 to the attached tank destroyer battalion and to the artillery liaison officer. The battalion and rifle companies and the tank destroyers were on the same channel. In a recent tank attack, the forward companies adjusted fire of the tank destroyers while the artillery officer, listening in, brought in artillery fire on the same targets. Twenty-four out of 27 enemy tanks were destroyed.

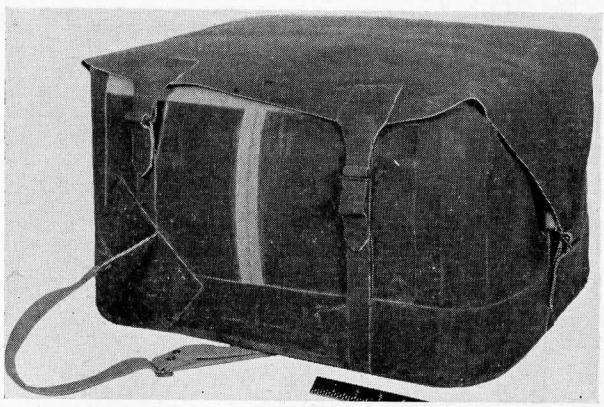
From — Bn. CO, 134th Infantry Regiment

WATERPROOF BAGS AND COVERS
FOR
COMMUNICATION EQUIPMENT

THE SIGNAL Corps Ground Signal Agency has developed six types of waterproof bags which are to be used specifically for the protection of signal equipment used in amphibious landing operations or in operations under adverse climatic conditions. Five of this group are designed to protect the equipment while it is being carried from ship to shore. One bag is designed to provide this protection and, in addition, permit the set to be operated while it is sealed in the bag.

The bags are constructed of synthetic rubber compound coated duck, and the corners and bottom are reinforced. The bags are equipped with a roll-type lip closure consisting of a pliable throat and interlocking lip, which is rolled to the bag and the overlapping ends folded toward the sides. This, in turn, is protected by a cover flap which is fastened with strap and buckles. Web straps are attached to facilitate carrying.

The bags are constructed of duck, coated with synthetic rubber compound, and are designed to protect the equipment under the most adverse conditions of sea or weather and will withstand handling occasioned by Army field use. They are simple to open and close and have no gadgets which will get out of order. They are waterproof to the extent that when submerged they will protect the equipment for a reasonable period of time without leaking. In fact, when these bags are loaded with the equipment they will all float and have sufficient buoyancy to support a soldier in the water. The larger bags, loaded, possess sufficient buoyancy to support two to four men.



WATERPROOF COLLAPSIBLE BAG, SIZE 4, USED TO PROTECT TRANSMITTER AND RECEIVER OF RADIO SET SCR–284.

Five of these bags were previously designated as BG–159, 160, 161, 164, and 169. The sixth has been added to permit operation while the equipment is inclosed. This nomenclature has been changed officially to the following:

Size 1. Bag Waterproof Special Purpose
7½″ long x 7½″ wide x 12″ high
(QM Stock No. 24–B–1263–200)

Size 2. Bag Waterproof Special Purpose
12″ long x 9″ wide x 18″ high
(QM Stock No. 24–B–1263–500)

Size 3. Bag Waterproof Special Purpose
16½″ long x 15½″ wide x 27″ high
(QM Stock No. 24–B–1264–150)

Size 4. Bag Waterproof Special Purpose
20½″ long x 16½″ wide x 11¼″ high
(QM Stock No. 24–B–1264–400)

Size 5. Bag Waterproof Special Purpose with Backstrap
12″ long x 7″ wide x 16″ high
(QM Stock No. 24–B–1265–250)

Size 6. Bag Waterproof Special Purpose
21″ long x 15″ wide x 14″ high
(QM Stock No. 24–B–1264–450)

These bags are procured, stored, and issued by the Quartermaster on requisition from theater commanders.

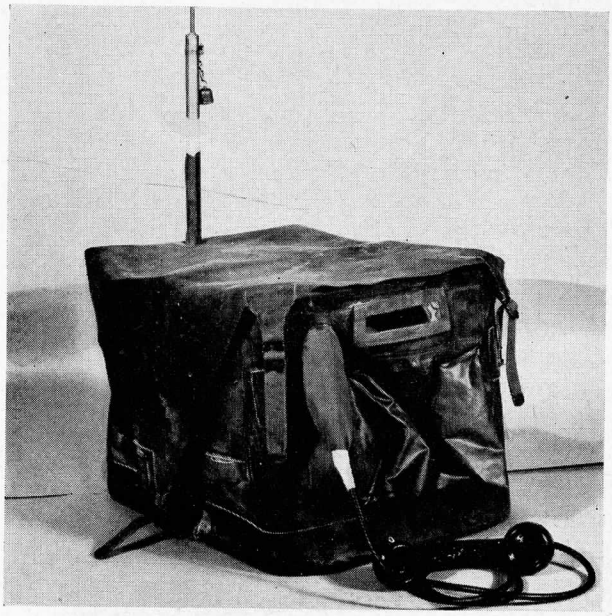
The bags will house any of the following communications equipment:

Size 1. Generator GN–45–( )
Converter M–209–( )
Telegraph Set TG–5

Size 2. Accessories for Radio Set SCR–284–( )
Radio Set SCR–194
Radio Set SCR–195
Detector Set SCR–625–( )
Four Telephone EE–8–A
Frequency Meter Set SCR–211–( )
Power Unit for Radio Set SCR–244
Signal Lamp Equipment EE–84
Trans. Tuning Unit TU–8–( )
Radio Set AN/VRC–3 ( )

Size 3. Switchboard BD–72
Radio Set SCR–244
Radio Transmitter BC–696–A
Oscilloscope BC–799–( )

Size 4. Radio Receiver & Transmitter BC–654–( ) of Radio Set SCR–284–( )



SIZE 6 SPECIAL PURPOSE WATERPROOF BAG FOR RADIO SET SCR–509/510 AND SCR–609/610.

Switchboard BD–71
Radio Receiver BC–792–( )
Radio Set SCR–607–( )
Radio Receiver BC–1269–( )
Power Supply Unit RA–61–( )

Size 5. Radio Set SCR–536–( ) plus spare batteries (4 sets)
Radio Set SCR–593–( )
Chest Unit T–39–( )

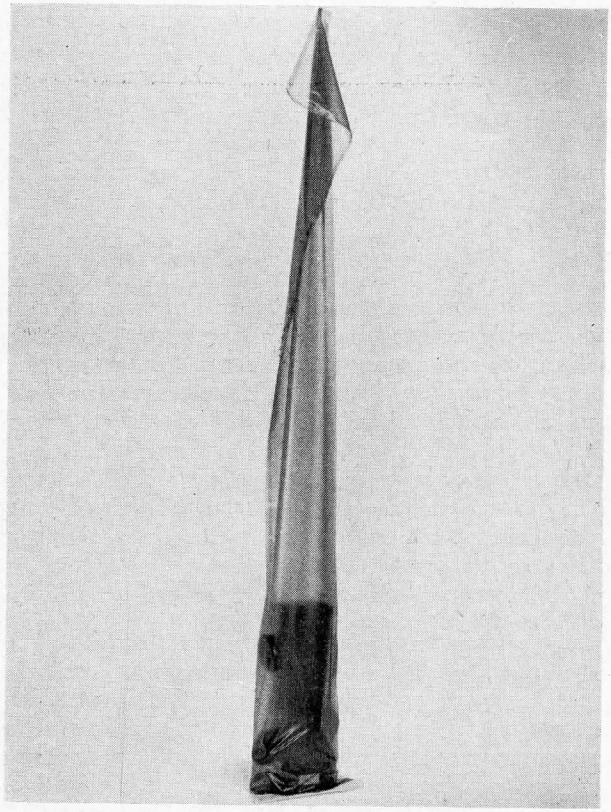
Size 6. Radio Sets SCR–509–( ), SCR–510–( ), SCR–609–( ), SCR–610–( )

The last item on the above list, size 6, was designed to protect Radio Sets SCR–509–( ), 510–( ), 609–( ), and 610–( ). This bag is constructed in the same manner as the first 5 with the addition that this bag will permit operating the set while it is sealed in the bag. It is provided with suitable outlets for cables and antenna. A roll of pressure sensitive adhesive tape to seal the outlet ports around the cable or antenna, is also provided with each bag. Bag is provided with a flexible panel through which the switches can be controlled. When the set is enclosed within this bag it can be operated in most adverse weather without attenuation or interference with operation.

The bag, size 6, can be used in field operation or in vehicular installation, when the transmitter and receiver unit and the power unit are mounted together, on the same mounting foot. The mounting foot enclosed in the bag can be secured by bolting it fast through the bag to the mounting platform. Then the power unit and the receiver and transmitter unit can be placed on the mounting foot, the antenna and handset cable and power cable passed through the appropriate port, and the bag closed and sealed. When the bag is used for man pack field operation it is used with Packboard, Plywood, Stock No. 74–P–27–30 and bracket attachment, Packboard, Plywood, Stock No. 74–A–33–30.

Paulins, Waterproof, Special Purpose, 10 feet long by 8 feet wide (QM Stock No. 24–P–47–200) is used for Radio Transmitter BC–610–( ) and Power Unit PE–95–( ) of Radio Set SCR–299–( ).

In addition to the coated fabric bags, four film-type covers are also available for the protection of signal equipment while it is operated in a very damp atmosphere or rainfall. These covers are made of pliable and flexible plastic film, equipped with suitable cable outlets. Each cover is provided with a roll of pressure sensitive adhesive tape to seal the opening and the cable outlet. These bags are used to protect Radio Set SCR–536–( ) and SCR–511–( ). A fifth



FILM TYPE COVER FOR INCASING RADIO SET SCR–536 WITH EXTENDED ANTENNA. THIS SET CAN BE OPERATED WHILE IT IS PROTECTED FROM SPRAY AND DAMPNESS.

film comes as a sheet and must be fabricated into a cover by the user. These five are:

1. Cover, Waterproof, Special Purpose, 18 inches long by 15 inches wide—91 by 4 inches section (QM Stock No. 24–C–7075), for covering Radio Receiver and Transmitter BC–745–( ) (SCR–511–( )).

2. Cover, Waterproof, Special Purpose, 20 inches long by 15 inches wide (QM Stock No. 24–C–7160), for covering Chest Unit T–39–( ) (SCR–511–( )).

3. Cover, Waterproof, Special Purpose (QM Stock No. 24–C–7050), for covering the case of Radio Set SCR–536–( ). (If the above item is not available, Cover, Waterproof, Pistol (QM Stock No. 74–C–310–38) can be used. This cover is exactly the same size.)

4. Cover, Waterproof, Special Purpose (QM Stock No. 24–C–7300), for covering Radio Set SCR–536–( ) and extended antenna, and for covering headsets, microphones, and handsets. (If the above item is not available, Cover, Rifle or Carbine (QM Stock No. 74–C–310–41) can be used. This cover is exactly the same size.)

5. Waterproof Film: Vinylite flexible film 0.008 thick, 40 or 48 inches wide and pressure sensitive waterproof adhesive tape, 1½ or 2 inches wide with instructions, are used to fabricate waterproof cover for vehicular installations of the Radio Set SCR–193, SCR–245–( ), SCR–508–( ), SCR–528–( ), SCR–538–( ), SCR–608–( ), SCR–628–( ). This film together with instructions may be requisitioned from the Quartermaster.

At present, there are a number of bags being prepared for the protection of signal equipments which are installed in vehicles. The bags will accommodate the Receiver Unit BC–312–( ), Transmitter Unit BC–191, Tuning Unit TU–5–B, Dynamotor BD–77–( ), Loudspeaker LS–3, and spare parts (normally carried in Box BX–21) of the Radio Set SCR–193; Radio Set SCR–506–( ), SCR–608–( ) series; Radio Receiver and Transmitter BC–654–( ) and Power Unit PE–103–A of the Radio Set SCR–284–( ); the Radio Sets SCR–509–( ), 510–( ), 609–( ), 610–( ), when the receiver and transmitter unit and the power unit are mounted separately on separate mounting feet. These bags will also permit the operation of the set while it is covered and protected from adverse weather conditions and in amphibious landing operations. These bags will also be procured, stored, and issued by the Quartermaster.

For additional protection, half-pound bags of silica gel have been furnished by the Signal Corps to be inclosed with the equipments in these bags and covers to prevent *sweating*. When in use, equipment may be stored in sealed bags or covers with silica gel. This will prevent the absorption of moisture by the equipment. Silica gel can be reactivated by heating in ovens to approximately 300° F. for a period of 2 hours. Upon activation silica gel should be kept in sealed containers or sealed bags with equipment, since it will absorb moisture from atmosphere if exposed.

IMPROVISED INSULATORS

IN THE article appearing in SCTIL No. 40, March 1945, under the title, *Improvised VHF Antennas,* it was stated, in part, * * * *the transmission lines employs two conductors * * * separated 2 inches apart by wood blocks at about 2-foot intervals. (If available, a better insulation material than wood should be used.)* The following offers several suggestions of such *better insulation* improvised from materials often available:

Transmission lines.—(1) Trim the tops of the line supporter stakes and place an inverted bottle over the top of the stake. If the transmission line is twisted pair such as W–110–( ), spread the conductors and slip over the top of the bottle (the Coca-Cola type is excellent due to the flared sides); secure the 2 conductors on either side of the bottle with waxed or oiled cord. If the line is made up of 2 parallel conductors, place one on each side of the bottle and secure with a clove hitch tie of waxed or oiled cord. The supporters for the parallel line must be closer together than for the twisted pair type, in order to maintain spacing; or, (2) trim ends of tree branches or tops of saplings to permit placing the bottle over the end (a clove hitch about the neck of the bottle with cord or wire will allow it to be tied to the support), attach the line as in (1) above; or, (3) on a rocky or frozen surface, cross 2 poles to form an X frame, with their tops spread to the desired line spacing (the crossing of the 2 poles will be at a point on each, approximately the same distance down from the top as the line spacing. The poles can be held together by lashing with cord, vines, or wire). Use bottles for insulators as above or use telephone pin insulators if available. Guy the frame with rope, wire, or vines or use a third pole as a brace. This type of supporter is especially useful where an open wire line with 6- to 12-inch spacing is required for medium power transmitters. Low voltage power feeders can be insulated in the above manner.

Antennas.—(1) For improvising antenna strain insulators, tie a clove hitch about the neck of a bottle with the antenna and about the bottom end with the halyard or next antenna section (plug the mouth of the bottle to prevent rain entering). (One lead can be retained by tying to a nail or stick and lodging it against the inside shoulder of the neck.)

NEAR FIRENZUOLA IN ITALY A SIGNAL CORPS SOLDIER STRINGS WIRE ON AN ITALIAN H–FIXTURE. THE MOUNTAINOUS BACKGROUND INDICATES THE TYPE OF TERRAIN IN WHICH THE BATTLE AGAINST THE GOTHIC LINE WAS FOUGHT.

GOTHIC LINE COMMUNICATIONS

Mountain Warfare by the 85th Infantry Division Called for Special Practices

This report is consolidated from observation and reports of unit communication officers throughout the 85th Infantry Division, and is based on activities during the assault of the Gothic Line. The weather and terrain presented unusual problems for these units and it is believed their comments will be of interest.

ALL UNITS reported wire communication highly satisfactory. This was possibly due to use of additional personnel and equipment and constant hard work by all. The establishment of forward switching centrals was the solution to a number of problems and they were used in all infantry and artillery wire units. The forward switching centrals were used only when the axis of advance was definitely established. The forward switch as used in this division gave control and flexibility to the wire system and provided a base of operation and supply for the numerous test points that had to be established.

Test stations permanently manned were established along all important circuits. Due to road conditions and other terrain difficulties, most wire maintenance was footwork and these test stations reduced maintenance time and prevented serious lengthy interruptions. One infantry regiment had a total of six test stations and one forward switch in operation, all permanently manned.

Very little wire was laid by mules. The terrain at times was too steep and rugged for mules and they soon became exhausted. One regiment reported that more than 50 percent of the wire was laid by hand. Mules were used extensively to pack wire, radios, and other supplies to the point of operation.

An unusual amount of trouble was experienced due to road maintenance and construction. Constant patrols were necessary to determine when roads were being widened and rerouted. In some sectors there were few roads and trails and the wire lines were used by mule teams and troops as a guide line. This was particularly true at night and caused considerable trouble. One regiment reported that troops actually used the wire lines to pull themselves up some of the

FIFTH ARMY SITUATION

THE ASSAULT on the German Gothic Line, running from south of La Spezia through the Futa Pass to the neighborhood south of Rimini, began on 12 September 1944.

One week after the attack began, Fifth Army cut a 6-mile gap in the Gothic Line and exploited the breach south of Firenzuola, a key junction city 25 miles northeast of Florence. Troops overran Mount Castel Guerrino and La Croce. On 24 September, the Fifth and Eighth Armies caved in the entire eastern half of the 115-mile German defense line, and by the next day were beyond the core of the enemy defenses trying to cut the Bologna-Rimini highway, main escape route for German forces. On the 26 September, Fifth Army staggered under the impact of three heavy counterattacks on the route to Bologna, and shortly thereafter the advance stopped.

mountains. The only solution to this was the education of squad leaders and other noncoms in the importance of the wire.

The supply of assault Wire W–130 was limited throughout the operation and close supervision was necessary in order that troops would have any at all. The statement of one communication officer is worth while and herewith quoted, *In the majority of instances in this regiment, battalions have found it possible to initially lay W–110.* The fact that light field wire *only* can be laid in some cases was appreciated and when it was *only* used in these spots there was plenty for all.

Radio proved essential to operations. It was used pending the establishment of wire circuits, where wire circuits had been interrupted, and as an auxiliary means when wire circuits were operated. In mountainous country, because of the difficulty of laying and maintaining wire, radio assumed great importance. This was especially true in the case of smaller units which normally use W–130 wire, the supply of which was curtailed. At the same time, mountainous country has an unfavorable effect upon radio performance. Radio was made to work through effort and experimentation on the part of communications personnel. Relay stations were used extensively.

Radio Set SCR–284, though its operation was satisfactory, was not suitable for mountain operations because of its weight. To hand-carry the set was an exhausting task. Mules were needed to transport the sets, and were used often. The use of mules, however, was limited. They were sometimes difficult to obtain, they presented a profitable target, and they had to be given sufficient rest. Radio Set SCR–300 was the most satisfactory set issued to the infantry. It was used throughout the lower units. At least one regiment used the SCR–300 as high as its regimental command net. To do this, two sets were kept at regimental headquarters. One set maintained continuous watch on the regimental channel, enabling any battalion to call the regiment. If regiment desired to call a battalion, it did so on the second set, using the battalion channel.

Radio Set SCR–193 and SCR–284 operated satisfactorily in artillery units, the SCR–193 being generally preferred. These sets were used by battalions for communication to Division Artillery and to supported regiments. The 600-series radios often afforded the only means of communication to forward observers. The greatest objection to these radios was voiced by forward observers who found Radio Set SCR–609 heavy to carry by hand. Where intervening hill masses prevented direct communication by 600–series radio, it was found that the use of relay stations overcame this difficulty.

Road conditions at times were such that motor messengers were not able to get through. In these cases the Division messengers arranged a rendezvous with unit messengers. The cooperation of all enabled deliveries to be made to all units at least once each day; however, in some cases it required 10 or 12 hours. Three-quarter ton vehicles were able to get through in some cases better than ¼-ton vehicles, due to deep ruts.

In order to maintain the wire systems with any degree of satisfaction, all units had to supplement their wire personnel. Extra men were required from the division signal company right on through to infantry and artillery battalions. These men were used to man test stations, switching centrals and as constant wire patrols.

Prior to the operation some additional equipment was issued to infantry and artillery units. Extra Axle RL–27 was necessary for laying wire by hand across the mountains. Extra SCR–300

FIFTH ARMY—NOVEMBER 1944

*In Italy during most of the last month the worst kind of weather developed—heavy, continued rain, making swollen rivers and deep mud. Operations were practically brought to a standstill * * *. American troops of the Fifth Army have engaged in local fighting, opposed by determined German troops who will not yeild their good mountain positions on the last ridges in front of the Po Plains without a fierce and effective defense * * *. American troops of the Fifth Army in positions below Bologna have repulsed a number of strong enemy raids * * *. There has been relative quiet on the Fifth Army front * * *.*

Press accounts for the month of November.

SIGNAL CORPS units operating under Fifth Army were issued 1,007 tons of signal supplies during the month of November, including 5,800 miles of field Wire W–110–B, 570 miles of assault Wire W–130–( ) and 100 miles of spiral-four cable. At the end of the month there was a total of 2,013 tons of signal supplies on hand in Army depots. An average of 260 civilians, together with depot personnel, repaired approximately 500 miles of field wire and 545 miles of spiral-four cable during the month.

The comparatively static tactical situation limited the construction of open wire along the main Army axis as well as the axis of the Corps. Construction was pushed as far forward as the location of the front line would permit and at the end of the period 2 open-wire circuits were completed to Castel del Rio, 2 to Porretta Terme and 2 circuits to a point north of Viareggio. In addition to the circuits previously in use from Fifth Army CP rearward, 10 circuits going forward from the CP were made available to Fifth Army and were utilized to provide additional circuits from CP switchboards to major subordinate units in the Loiano area. All available wire personnel was used in an intensive campaign to recover abandoned wire and cable in the Army area and to police circuits still in use.

Message Center traffic increased slightly from that handled during the month of October. An average of 475 messages and 3,000 packets were handled daily, with the messages involving approximately 26,000 groups of which 19,000 groups were handled by United States personnel and the remainder by British teams. Weather conditions seriously hampered air messenger service during the month. ADLS messengers flew an average of 516 miles per day, carrying an average load of 274 pounds per flight. Despite the adverse weather conditions and muddy landing fields, 75 percent of all scheduled flights were completed.

A *snow warning* system was installed during the month in cooperation with the Army engineer section, a radio teleprinter circuit was established between Fifth Army CP and rear echelon utilizing terminals that were designed and constructed by units within Fifth Army Signal Service. All other nets remained normal during the month.

A total of 436 messages were carried by pigeons during the month, which represents an increase of 25 percent over the previous month.

The traffic of several Fifth Army units was analyzed during the month but relatively few violations of security were found.

Unfavorable weather conditions and relative inactivity along the front kept combat photography to a minimum during the month of November. Motion and still pictures of the mud conditions, the swollen streams, the floods, the fight for bridges, and the generally bitter weather conditions were obtained. Motion picture coverage amounted to 33,100 feet of film exposed and shipped to the War Department. Still camera work included 1,400 numbered negatives of all sizes developed and 28,500 contact and enlargement prints made. A training film library was established and was ready for operation on 12 November.

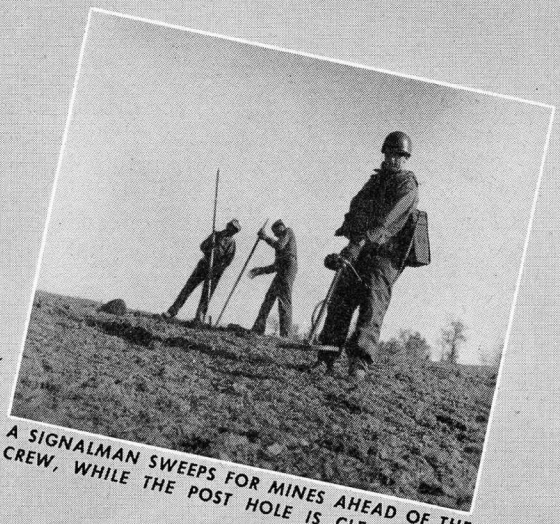
Approximately 230 students from units within Fifth Army were sent to the signal school to attend courses in message center procedure, radio operation, radio maintenance, teletypewriter operation, telephone and telegraph carrier equipment, teletypewriter maintenance, and wire construction and maintenance.

radios were issued the infantry and were used constantly to provide relay stations and for communication with tanks.

All echelons of supply cooperated 100 percent, which resulted in a smooth flow of necessary supplies and replacement equipment. Units were handicapped by the weather, terrain, and condition of roads, but this was overcome by use of all transportation facilities, including mules and hand packing.

Approximately 175 tons of wire and 252 radios were included in the supplies issued during the 10 weeks covered by this report. The division repair section repaired 714 radios, 34 switchboards, and numerous minor items.

Communications problems presented by mountain operations such as experienced here were overcome by (1) full cooperation by all echelons of operation, supply and staffs, (2) allowing more time for initial installations, (3) providing additional equipment and personnel, (4) use of radio relay stations and wire test stations, (5) constant care and maintenance of equipment, (6) exercise of initiative, fortitude and alertness by individuals.



A SIGNALMAN SWEEPS FOR MINES AHEAD OF THE CREW, WHILE THE POST HOLE IS CLEANED OUT

A CREW MANHANDLES A POLE INTO THE PROPER POSITION

OPEN WIRE

LATE IN February 1945, the Fifth Army's 63d Signal Battalion was given the job of constructing a 15-mile open wire pole line in the Gabbiano area of Italy. These pictures show how Company A of that battalion put up the line. The series, which begins on the left, continues clockwise around the page.

Nothing unusual was encountered during the course of this construction; it was just another

A BUTT HOLE IS BLASTED ON THE SIDE OF A SLOPE ALONG THE POLE LINE RIGHT-OF-WAY

THIS OVER-ALL VIEW OF THE CONSTRUCTION SHOWS CREWMEN AND TRANSPORTATION SPOTTED ALONG THE RIGHT-OF-WAY

BARE COPPER WIRES GLEAM IN THE SUN AS A WIREMAN POSITIONS A LINE ON THE CROSSARM

PIKESTAFFS HOLD THE POLE UPRIGHT WHILE

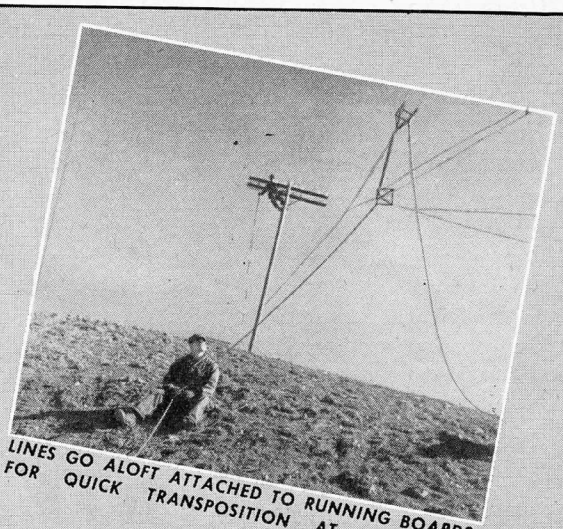
. . . MEN FILL THE HOLE AND TAMP DOWN THE EARTH

E POLE LINE

installation put up by a Signal Corps outfit in the field. The pictures do illustrate, however, what such a job means.

Pole lines of this type have gone up all around the globe—in Italy and in France, Germany, New Guinea, the Philippines, wherever Signal Corps troops are stationed. Wire continues to carry the ball in communications, and the Army looks to the men who wear the crossed flags for this service.

A CROSSARM IS BOLTED INTO PLACE, WHILE THE SECOND ARM IS HOISTED TO A LINEMAN



LINES GO ALOFT ATTACHED TO RUNNING BOARDS FOR QUICK TRANSPOSITION AT CROSSARMS

COPPER WIRES ARE FED OFF SPOOLS, THUS MAINTAINING AN EVEN FLOW AND KEEPING CONSTRUCTION MOVING

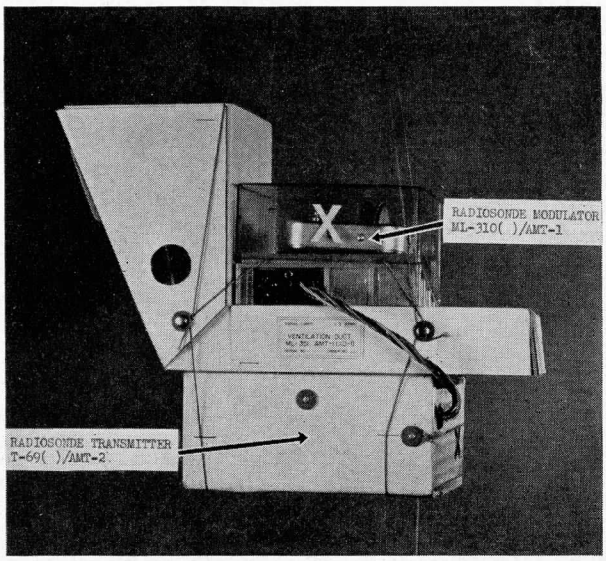
UPPER-AIR OBSERVATIONS

Direction Finder Permits Radiosonde Tracking Without Regard to Visibility

THE KNOWLEDGE of meteorological conditions of the upper atmosphere, particularly wind direction and velocity, and temperature and humidity conditions, is essential to the planning of most military operations. This information is used by the AAF in the preparation of both their short and long range forecasts and also by the AGF in the preparation of ballistic correction for heavy artillery fire.

Until recently, all upper wind data were obtained by the use of pilot balloons which were visually tracked with theodolites. The limitations of visibility, however, usually restricted the use of visual tracking of balloons by theodolites to altitudes of approximately 25,000 feet, even during periods of excellent visibility. Under conditions of low clouds and fog, the determination of upper wind data was practically impossible.

Radio Set SCR–658, a meteorological radio direction finding equipment, which overcomes these limitations has been developed and placed in production. With the use of this set and associated flight equipment, upper wind data may now be obtained to elevations of 50,000 to 60,000 feet and higher, regardless of visibility conditions. Provision is also included for radio-sonde reception, obviating the need for special radiosonde receiving equipment.

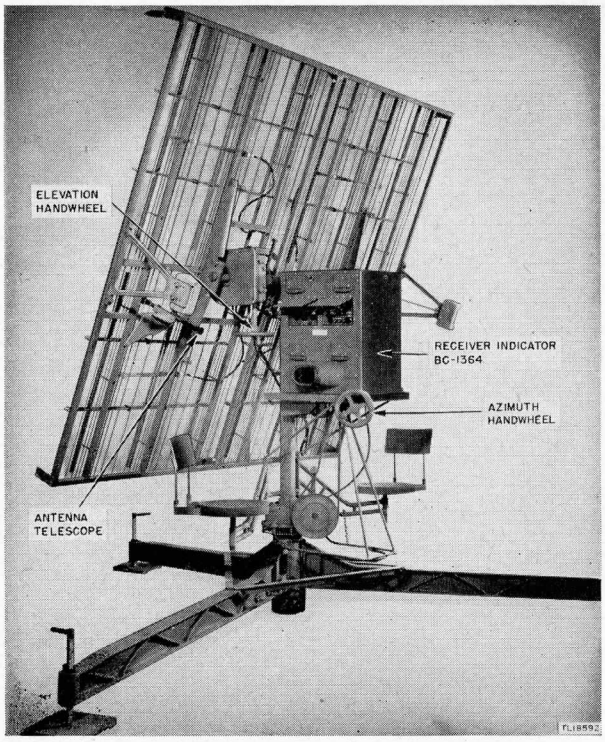


RADIOSONDE AN/AMT–2 ASSEMBLED FOR FLIGHT FOR USE WITH RADIO SET SCR–658.

Radio Set SCR–658 is a light weight transportable meteorological radio direction finding equipment designed for operation on a frequency of 397 mc. The antenna array, consisting of 4 bays of 8 dipoles each, is approximately 8 feet square, and is supported on a tripod base, with provisions for continuous rotation in azimuth and rotation through 90° in elevation. Each of the antenna bays are fed through a concentric transmission line to a mechanically rotated switch which successively connects the 4 bays to a specially designed radio receiver. Direction finding on an airborne transmitter is accomplished by rotating the antenna array in both azimuth and elevation and comparing the height of 2 pairs of vertical traces on a 5-inch cathode ray tube. One pair of traces is matched to obtain the elevation of the transmitter and the other pair is used for determining azimuth. A special channel in the receiver is used to transfer signals to Radiosonde Receptor AN/FMQ–1( ).

SCR–658 is used to track Radiosonde AN/AMT–2 which is carried aloft by a sounding balloon. When released from the ground, this balloon is approximately 5 feet in diameter. It ascends at a rate of approximately 12 feet per minute to a height of 50,000 to 60,000 feet where it usually bursts due to increase in diameter and to the low temperature (approximately 70° F.) encountered.

The radiosonde transmitter is frequency modulated. The frequency and the rate of change of audio modulation is determined by the meteorological elements which are incorporated in Radiosonde Modulator ML–310/AMT–2. This modulator consists essentially of a barometric switch, a number of meteorologically sensitive elements, and associated parts. The barometric switch moves an arm which slides across a strip commutator as the barometric pressure decreases, due to the ascent of the balloon. This arm successively connects the different circuits containing varying resistances into the circuits of the transmitter. These resistances consist of a temperature sensitive unit, a humidity sensitive unit, and two references resistors. The first two elements constitute the means for measuring atmospheric conditions. The reference resistors



RADIO SET SCR–658 SETUP FOR FIELD OPERATION.

are used as a means of checking the operating characteristics of the transmitter. Power for the airborne unit is provided by miniature storage batteries precharged at the time of manufacture.

In operation, Radio Set SCR–658 is located in a fairly level and clear location. Balloons with attached radiosondes are released in free flight from two to four times per day. During the observation Radio Set SCR–658 is operated by one man who keeps the set continuously on target. At each minute during the flight the operator of the radio set reads the angles of azimuth and elevation on dials located in the base of the equipment and telephones this information to the plotting desk. Simultaneously, radiosonde data is transmitted through a cable from Radio Set SCR–658 to Radiosonde Receptor AN/FMQ–1 and is recorded. The recorder plots the temperature, pressure, and humidity data during the course of the balloon ascension. The temperature and humidity data are used directly for analyzing atmospheric conditions. The pressure is used as a means of determining the altitude of the balloons at each reading throughout the flight. Radiosonde Receptor AN/FMQ–1 may be located in the plotting room where an operator can keep the equipment adjusted and evaluate the data.

As the flight progresses, another operator plots the position of the balloon and computes the upper wind velocity. The balloon position is determined from the altitude and the readings of elevation and azimuth obtained on the SCR–658. Wind speed and direction may then be determined by computing the movement of the balloon between successive positions. In general, wind velocity is calculated by measuring the distance over which the balloon travels in a 2-minute interval.

SYSTEMS ENGINEERING MANUAL

Publication of Technical Manual TM 11–486, *Electrical Communication Systems Engineering, General Information,* has been announced. Distribution is taking place through AG channels, down to and including divisions. This manual, in preparation since late 1943, supersedes a preliminary edition which received limited distribution early in 1944.

TM 11–486, and its companion volume TM 11–487, *Electrical Communication Systems Equipment,* is for the use of staff officers for planning communication systems. TM 11–486 contains information on all aspects of wire and radio systems, including facsimile, multichannel radio relay, carrier telephony, etc. It is the first complete systems engineering manual published by the Signal Corps for the Army.

TM 11–487, distributed during the fall of 1944, is an expanded version of Chapter XII of the preliminary draft of TM 11–486.

TM 11–486 was produced by the Signal Corps Publication Agency at Fort Monmouth from information supplied by the Bell Telephone Laboratories and the Systems Engineering Section, Coles Signal Laboratory, Signal Corps Ground Signal Agency, Bradley Beach, N. J.

30TH SIGNAL COMPANY

Signal Activities in November During Ninth Army's Drive on the Siegfried Line

UNTIL THE jump-off 16 November 1944, the 30th Signal Company, part of the 30th Infantry Division, United States Ninth Army, was in rear area undergoing rest and recreation and training for the coming operation. Equipment was reconditioned, and replacements indoctrinated. The Division was spread out over three towns in Germany and one in Holland.

Early in the month, an infantry regiment and a field artillery battalion were attached to the division. The regimental communications officer was given a copy of the SOI and conferences were held in detail. One battalion of this new regiment had lost its signal equipment and had to be resupplied from division dump.

Before the attack, VII Corps ran a lateral spiral-four cable between 104th Infantry Division on the right and 30th Division CP. One circuit terminated in division artillery and a second in division switchboard. The division had laterals to the 29th Infantry Division and the 2d Armored Division on the left. Lines were advanced as the units moved forward. For the initial objectives, reached on 19 November, no changes in division or regimental CPs took place.

Strong resistance was encountered by the 29th and 2d Armored Divisions on the left. Accordingly, a portion of the 29th's sector was turned over to the 30th, and on 21 November the 30th's 120th Infantry Regiment launched an attack east toward the Roer River, against heavy resistance. In contemplation of the forward movement of the 120th's CP, a spiral-four cable was laid to Hariadorf.

On 23 November Altdorf, on the Inde River south of Julich, was captured. The next day, 24 November, a switching central was installed at Hongen in order to provide flexibility, conserve wire, facilitate trouble clearing, and insure continuity of service. Two circuits to Altdorf, through Ninth Army cable, were utilized, as was a German commercial cable between Altdorf and Hongen. The spiral-four cable to the 120th Infantry was cut into the switchboard thus giving division four circuits. This move saved many miles of wire inasmuch as several other units moved to Hongen and vicinity. Division artillery also established a forward switch in close proximity to Hongen.

In order to improve transmission to the 120th Infantry's advance CP at Pattern, and later to the 17th Cavalry Squadron which replaced the 120th there, a spiral-four cable was placed between the Hongen switch and the 120th's CP at Langenweiler and two Repeater EE–89–A were installed at midpoint of the two trunks running to the 120th's advance CP at Pattern.

As division units moved forward, laterals were laid through to the switching central established at Hongen.

(The use of spiral-four below division headquarters is exceptional and is not considered normal practice. In some situations, spiral-four has been used to fulfill requirements for circuits longer than is possible with Wire W–110 or along the proposed axis of advance of the division CP. Either of these may have been the case in the report above.—Ed.)

Excellent cooperation from higher headquarters contributed materially to successful communication in the division. Army placed a 20-pair cable between Kerkrad, Holland (rear area headquarters before the attack) and Altdorf. Later a 38-

NINTH ARMY ADVANCE

ON 16 November 1944, SHAEF announced the the United States Ninth Army had joined with the United States First, Third, and Seventh in an all-out offensive against the Siegfried Line. It was reported in the line north of Aachen.

Geilenkirchen, northern bastion of the Siegfried Line, was captured by the Ninth on 18 November. By 22 November, the Ninth was west of the Roer River and involved in one of the largest tank battles on the western front at that time. On 23 November, the Ninth was across the Roer below Julich and had cleared Altdorf across the Inde River. On 30 November, the Ninth was attacking Dusseldorf, in the Ruhr.

BATTALION COMMUNICATIONS

A 30th Division battalion communications officer, now returned for hospitalization in the States, reports on some of the details of his work.

EVERY CHANCE I got, during lulls or static periods in France and Germany, I'd pick out three or four men from the companies in the battalion and teach them all I could about Radio Set SCR–300, emphasizing operations and first echelon maintenance * * *.

We did little leap-frogging when we moved forward. Instead, we set up a regimental-battalion communications system. And, if we were attacked and the opposition was heavy, we'd lay wire right behind us. If the regiment moved forward, instead of extending the division line, they'd move forward on a battalion line and then division wire crews attached to the regiment would lay new lines back to the division CP. It was the quickest and most convenient way to do it, and it worked * * *.

In our battalion, we had attached to the forward CP, two runners from each company as members of the battalion command group. They could be used for a thousand and one jobs—from delivering radio call signs (which changed daily) to supplying radio batteries and rations. It was SOP for our runners to pick up the morning and unit reports from the companies * * *.

Our division used the following setup: Each battalion had a Radio Set SCR–610, as did regiment. They all used the same frequency. This gave us a double regiment-to-command net. The SCR–610, being a short-range set, we also used a Radio Set SCR–284 which is a long-range set that can be picked up from quite a distance. We kept the SCR–284 at the rear, almost out of range of enemy mortar fire * * *.

In regard to wire crews, battalion commanders should appreciate the fact that there are times when wire communications simply cannot be kept in. At Ubach, on a corner of the Siegfried Line, my men laid 5 lines between battalion forward and battalion rear, and 3 lines between battalion forward and battalion OP. It took my entire crew—14 men—working 24-hours-a-day even to maintain sketchy communication, and then we couldn't depend on it. So much of our line was over open terrain—there was no cover for the wire for more than a quarter of a mile. The wire crew had no cover at all. Jerry had a lot of snipers on the job. One of my men had his test clips shot right off a line by a sniper * * *.

The T/O of a battalion communications platoon is 21 men. I had 42 and could have used 50. This need for more men is especially acute in the wire section, which provides for only 8 men—just half what the number should be. My battalion commander gave me carte blanche in requisitioning personnel; we were 100 percent overstrength and damn glad of it. Even so, there were times when I myself had to lay wire * * *.

pair cable was added. XIX Corps' signal officer kept division informed of all Army, Corps, and commercial circuits available. Whenever circuits were required along any route, Corps signal officer arranged for their use.

Between Kerkrad and Altdorf, division used four Army circuits; from Altdorf to Hongen, two commercial circuits; to the Hongen switch, two Corps spiral-four circuits, and from Hongen switch to Aldenhoven, two Corps spiral-four circuits. These circuits released many miles of field lines and contributed to the ability of the Signal Company to recover much of this wire.

During this time, there were 143 failures on wire circuits. Of these, 47 were caused by enemy shelling and bombing. All troubles averaged 140 minutes out of service; during the night this averaged 182 minutes and during daylight, 61 minutes. Of 52 failures occurring after dark, 8 were not cleared until the following morning, as

duplicate circuits were available.

A 24-hour count of originating calls was made on all lines terminating in rear echelon. As a result of this analysis, an additional extension was placed in the Adjutant General section. The Inspector General and Judge Advocate were given separate extensions and party line bridging was installed on low call rate lines.

A 2-hour *holding time* study was made on trunks from CP to rear echelon. One call of 10 minutes duration was made, but all other calls were terminated within three minutes.

RADIO COMMUNICATIONS

Radio traffic was light due to the relatively static position of the units and the availability of wire communication. Five cases of enemy jamming on channels in the 30.6 to 35.8 megacycle range occurred. A sixth attempt which occurred when an enemy station attempted to enter the net was only moderately effective. In the other five cases, the jamming was very effective. In three of these cases the enemy simulated commands. In two cases, a 60-cycle modulated tone was used and in one case the channel was not blocked.

In most cases, it was possible to use alternate channels. In the case of infantry regimental command, no alternate was assigned, so spare sets were aligned on division artillery alternate channel and furnished regiment for substitution in order to conserve time and avoid interruption.

Jamming was encountered as units approached the Roer River. It would appear from this that the enemy made maximum use of terrain to locate their jamming sets close to the front where their effectiveness was greatest. It was assumed that the enemy used captured Radio Set SCR-610 and jammed only on channels already aligned on the set. This assumption was based on the fact that there was no widespread jamming over the 600 series band, but only on specific channels.

Some interference from adjacent units was experienced due to the relatively narrow fronts. The most acute condition resulted when a liaison artillery plane from the First Army sector operated over 30th Division regiment CP.

Two German-speaking operators monitored German radio nets and picked up worthwhile information. On 29 November, Ninth Army instituted a new tactical reconnaissance broadcast which was used successfully.

An M–8 vehicle was provided for the commanding general of the division and an SCR–506 mounted. Infantry units found the M–29 vehicle effective in traveling over muddy and water soaked terrain.

A repair team visited regiments, battalions, division artillery, field artillery battalions, and attached units to inspect equipment in place and in use. In addition to accomplishing many minor repairs, instruction was given in first echelon maintenance and much was accomplished in scheduling the rotation of major units for shop overhauling. As a result of this instruction, a special class was continued on first echelon maintenance of power units. A byproduct of the instruction was the universal requests made for two more Telephone EE–8–A per battalion. This additional equipment was issued after approval by Ninth Army.

This operation was preceded by a close-in bombing preparation. In view of the haze and variable weather which prevailed in this season of the year, it was vital that that Division's front lines be marked plainly, first to avoid hitting friendly troops and second to permit infantry to be well forward so as to move rapidly on the enemy immediately following the bombing. Corps prescribed nine cerise panels be laid out 3 by 3—1 yard separation with axis parallel to front lines and groups spaced three or four to the front line. Seven hundred eighty-six fluorescent panels were obtained from the Army signal depot, and distributed to division units. Marking was very successful.

With concentration of our war effort on Japan, a good many seasoned soldiers will face new problems incident to operation in the tropics. One of the most important of these is the problem of excessive moisture and fungus growths on equipment. Every officer who may find himself in the Pacific should begin now to learn all he can about tropicalization and the preventive maintenance services that go with it. Get a copy of TB SIG 13 and look in the index to FM 21–6, under Moistureproofing for other publications on the subject.

FREQUENCY CHANGES ON RADIO TELETYPE CIRCUITS

The information printed below, extracted from the Standing Operating Procedure currently used in an overseas theater of operation, is furnished as a matter of general information. Throughout this article where a single asterisk (*) appears it indicates that a local prearranged code has been deleted and the appropriate operating signal substituted therefor.

1. *General.*—This standing operating procedure sets forth the detailed steps necessary to accomplish a frequency change on any radioteletype circuit. Due to variations in the amount of equipment available at different installations two methods are given:

a. The c-w method.

b. The teletype transmitter and printer method.

2. *Preliminary conditions.*—a. It will be assumed that the center of activity and all controlling functions are at the remote receiver site of both terminals of the circuit under consideration.

b. The necessity for frequency changes is determined by adverse or failing receiving conditions at either end of the teletype circuit. It will be assumed that receiving conditions at the "near" end of the circuit make it necessary to change frequency on one-half of the circuit, that is, the receivers at the "near" end only, and the transmitter at the "far" end only. This is often actually the case even when both ends use similar frequency. The "near" end of a radioteletype circuit may be forced to change frequency due to poor receiving conditions while the "far" end of the circuit may enjoy good receiving conditions for a considerable time afterwards on the receiving frequency being used at that time. In case both the "far" and "near" ends of the circuit find it necessary to change frequency at the same time, it will be necessary to change frequency on one end at a time to avoid losing contact between terminals.

c. For clarity the procedure of changing frequency will be described from the point of view of the personnel at the "near" end of the radioteletype circuit.

d. The "far" transmitter attendants should have either a receiver, tuned to the "far" end of their particular circuit, a signal line from their receivers enabling them to listen to the "far" end of their circuit, or a direct "order" line from the receivers for receiving instantaneous instructions regarding adjustments on their transmitters.

3. *The c-w method.*—a. The c-w method for changing frequency is used on radio-teletype circuits where the receivers at one or both ends of the circuit are not equipped with teletype keyboard transmitters and printers.

b. To facilitate adjustments between the two ends of a radio-teletype circuit requiring the use of c-w for frequency adjustment the following *operating signals have been arranged:

*QIP6—Run spacing signals.	*QIP2—Run test tape.
*QIP5—Run marking signals.	*QIP4—Run traffic tape.
*QJU2—Your frequency shift is too narrow.	*QGZ2—Your frequency is too low.
*QJU1—Your frequency shift is too wide.	*QGZ1—Your frequency is too high.

c. (1) "Radio control" will be requested to send a note to the "far" end of the circuit asking for a frequency change on their transmitter only when receiving conditions at the "near" end of the circuit become unsuitable for reliable traffic handling. This will be determined by the receiver attendants. The receiver attendants also specify the new transmitting frequency for the "far" end.

(2) The "far" end of the circuit will acknowledge the request and proceed to turn off their transmitter in preparation for changing to the frequency designated by the "near" end of the circuit.

(3) The receivers will then request control of the transmitting circuit from "radio control" and ask them to disconnect the teletype transmitting equipment from the keying line to the transmitter so that the transmitter may be keyed from the receivers over a special keying line. This permits the receiver attendants to direct transmitter adjustments at the "far" end of the circuit using c-w telegraphy with the "near" transmitter which is

set on the "mark" frequency.

(4) The teletype line relay will be plugged out of its normal circuit and a blank plug inserted into the teletype line jack. This prevents damage to the relay from abnormal arcing at the contacting points. (This abnormal arcing occurs when the "far" transmitter leaves the air for adjustments.) The receiver attendants at the "near" end of the circuit will notice abnormal chattering of this relay and also erratic movements of the frequency indicator meter. These indications are useful not only when frequencies are being changed but also when the "far" transmitter leaves the air without warning.

(5) The receivers at the "near" end of the circuit will now be switched to the new frequency, and with the teletype line relay plugged out, the signal from the "far" end of the circuit will be monitored by listening and watching the frequency indicator meter. The meter will stop moving erratically when the transmitter at the "far" end comes on with a steady "mark" signal.

(6) The "far" end now starts calling the "near" end using c-w telegraphy, and the "near" end will answer in the same manner using a hand key on the control line to the "near" transmitter.

(7) When contact has been established the "near" end requests the "far" end to send first a steady "mark" signal and then a steady "space" signal so that the degree of "spread" on the signal shifter at the "far" end may be determined from reading on the frequency indicator meter at the "near" end of the circuit. This is the case when the shifter aligns on "space." The reverse is true if the shifter aligns on "mark," i. e., ask for "space" first, then "mark." Both types of shifter, those that adjust on "space" and those that adjust on "mark," are to be found in operation. The operators on both ends of the circuit should know which type is being used at the other station.

(8) If the "spread" is too great at the "far" end of the circuit, the "near" end will send *"QJU1" and the "far" end will acknowledge with "R" for ROGER. Thereupon, the transmitter attendant at the "far" end of the circuit, either by a directly relayed phone order or by having listened to the instructions over a receiver or a monitoring line, will begin to *very slowly* decrease the "spread" by means of the shifter tuning control. When the correct adjustment has been reached, the receiver attendant at the "near" end of the circuit will send a *long dash* indicating a correct setting of the "spread" control, and the transmitter attendant at the "far" end will stop at the point of adjustment thus indicated.

(9) Recheck the "spread" adjustment. The "near" end will again request a steady "mark" signal and then a steady "space" signal. If satisfactory, a request for a *"test tape" transmission will be made and the results checked at the "near" end on a printer in the "radio control" room.

(10) When operation of the circuit is considered satisfactory, the "near" end will break the "far" end using c-w, and direct that the circuit be turned over to traffic by sending the *operating signal "QIP4." The plug in the teletype line jack will be removed and "radio control" will be notified over direct phone that the circuit is ready for traffic.

4. *The teletype transmitter and printer method.*—a. The following procedure for changing frequency is used on radioteletype circuits where the receivers at both ends of the circuit are equipped with teletype keyboard transmitters and printers.

(1) "Radio control" will be requested to send a note to the "far" end of the circuit asking for a frequency change on their transmitter only when receiving conditions at the "near" end of the circuit become unsuitable for reliable traffic handling, as determined by the receiver attendants. Receiver attendants requesting the change in frequency will specify the new frequency for the transmitter at the "far" end.

(2) The "far" end will acknowledge the request and will proceed to turn their transmitter off in preparation for the change in frequency.

(3) The receivers will then request control of the transmitting circuit from "radio control" and ask them to disconnect teletype transmitting equipment from the keying line to the transmitter so that the transmitter in turn can be keyed from the receivers over a special key line. This is to permit the receiver attendants to direct transmitter adjustments at the "far" end of the circuit using a teletype keyboard transmitter and printer located in the receiver room.

(4) The receivers at the "near" end of the circuit will be switched to the new frequency as soon as the "far" transmitter leaves the air. The teletype line relay will be plugged out, and the signal from the "far" end will be monitored by listening, and by watching the frequency indicator meter which will stop moving erratically when the transmitter at the "far" end comes on with a

steady "mark" signal.

(5) The "far" end will start calling the "near" end, using their teletype keyboard, and the "near" end will answer in the same manner.

(6) When contact has been established, the "near" end, using the appropriate operating signal will request the "far" end to send first a steady "mark" signal, and then a steady "space" signal so that the degree of "spread" on the signal shifter at the "far" end may be determined from the readings on the frequency indicator meter at the "near" end of the circuit.

(7) If the "spread" is too great at the "far" end of the circuit, the "near" end will request a decrease in spread and the "far" end will acknowledge with "ROGER." Thereupon, the transmitter attendant at the "far" end will be ordered by direct phone line from the receivers to *very slowly* decrease the "spread" by means of the shifter tuning control. When the correct adjustment has been reached, the receiver attendant at the "near" end will send a series of "bell" signals over his teletype transmitter keybroad and the receiver attendant at the "far" end will instantly order his transmitter attendant to stop turning the "spread" control at the point of adjustment thus indicated.

(8) Recheck the "spread" adjustment. The "near" end will again request a steady "mark" signal and then a steady "space" signal in order to recheck the "spread" adjustment. If satisfactory, a request for a *"test tape" transmission will be made and the results checked on the printer at the "near" receivers.

(9) When the operation of the circuit is considered satisfactory, the "near" end will direct the "far" end to turn the circuit over to traffic. The plug in the teletype line jack will be removed and "radio control" at the "near" end of the circuit will be notified over direct phone that the circuit is ready for traffic.

5. *Miscellaneous considerations.*—a. Although not often necessary, if a frequency adjustment is called for during a change in frequency, the procedure will be the same as for "spread" adjustments. The "near" end of the circuit will state the amount and direction of the required frequency shift. The transmitter attendant at the "far" end will slowly make the change. He will be stopped at the correct adjustment by either a c-w or "bell" signal from the "near" end.

b. In the event that the receivers are notified by "radio control" that trouble is appearing on the circuit, receiver attendants will cut in a monitor printer and watch the operation to analyze trouble. If and when the cause of trouble is determined, a note is sent to the "far" end of the circuit regarding the same.

c. If the cause of trouble on a radioteletype circuit is not easily ascertained, the receivers at both ends of the circuit will take over the control and communicate by means of c-w, if necessary, and jointly work out the causes for the delay in traffic.

6. In conjunction with the Standing Operating Procedure outlined above, consideration should be given to the fact that because of the frequency deviation possible in the PWFS12A frequency shifter, occasions might arise when a receiving station will be tempted to request a transmitting station to shift off an assigned frequency in order to avoid interference with reception. Such shifts conceivably could result in a general frequency movement and widespread interference, therefore, all frequency shift radio teletype stations should adhere to assigned frequencies within the closest limits possible with available frequency measuring equipment.

MERITORIOUS SERVICE UNIT PLAQUE AWARDS

EUROPEAN THEATRE OF OPERATIONS

121st Signal Radio Intelligence Company.
124th Signal Radio Intelligence Company.
810th Signal Service Battalion.
3110th Signal Service Battalion.
72nd Signal Company, Special.
74th Signal Company, Special.
163d Signal Photographic Company.
207th Signal Depot Company.
226th Signal Operation Company

ZONE OF THE INTERIOR

389th Army Service Forces Band, Fort Monmouth, N. J.
9423d Technical Service Unit, WD Signal Center, Washington, D. C.
17th Signal Service Company, Military District of Washington.
9400th Technical Service Unit, Signal Corps Publications Agency, Fort Monmouth, N. J.
9420th Technical Service Unit, Second Signal Service Battalion Headquarters and Detachments, Army Communications Service.

CHEMICAL MORTAR SIGNALS

Wire Lines Based on Specific Utilization of This Intermediate Artillery

COMMUNICATIONS IN chemical mortar battalions are of interest to Signal Corps and communication personnel due to the wide use now being made of these units. Chemical mortar battalions use 4.2 mortars and fire HE and smoke shells. Fire is by battery and for mass effect. The usual procedure is to attach a chemical mortar battalion to a division, with a company of mortars assigned to each infantry regiment, and a platoon of mortars to each infantry battalion. However, variations of this organization are practiced when the tactical situation so demands.

The first chemical mortar battalion went into action during the Sicilian Campaign. Various changes have been made in doctrine and organization since then. Figures 1 and 2 show, as of this writing, accepted procedure, and indicate in some respect the communication set-up.

The communication section of a chemical mortar battalion is headed by a communication sergeant and consists of seven linemen and telephone operators, four radio operators, one switchboard operator, and one radio repairman. Each company of such a battalion includes eight linemen, two radio operators, two switchboard operators, and three telephone operators.

A selected list of equipment for a mortar battalion and one of its companies follows:

Battalion	Equipment	Company
3	Telephone EE-8	10.
	Switchboard BD-72	1.
1	Switchboard BD-71	
4 miles	Wire W-110	10 miles.
4 miles	Wire W-130	10 miles.
	Radio Set SCR-300	8.
1	Radio Set SCR-193	
1	Radio Set SCR-619 (or 609)	1.
2	Radio Set SCR-694 (or 284)	1.

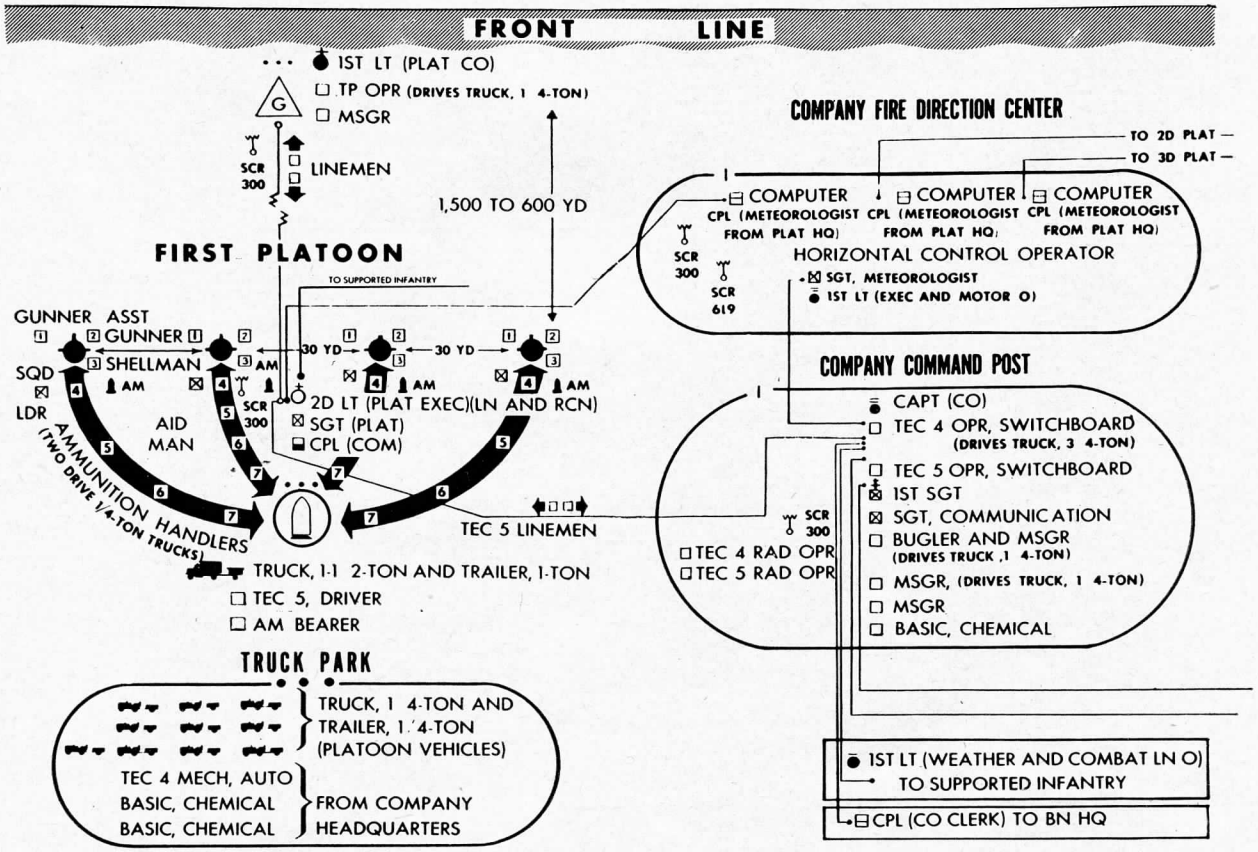


FIG. 1—CHEMICAL MORTAR PLATOON DEPLOYED FOR ACTION IN FIRING POSITION.

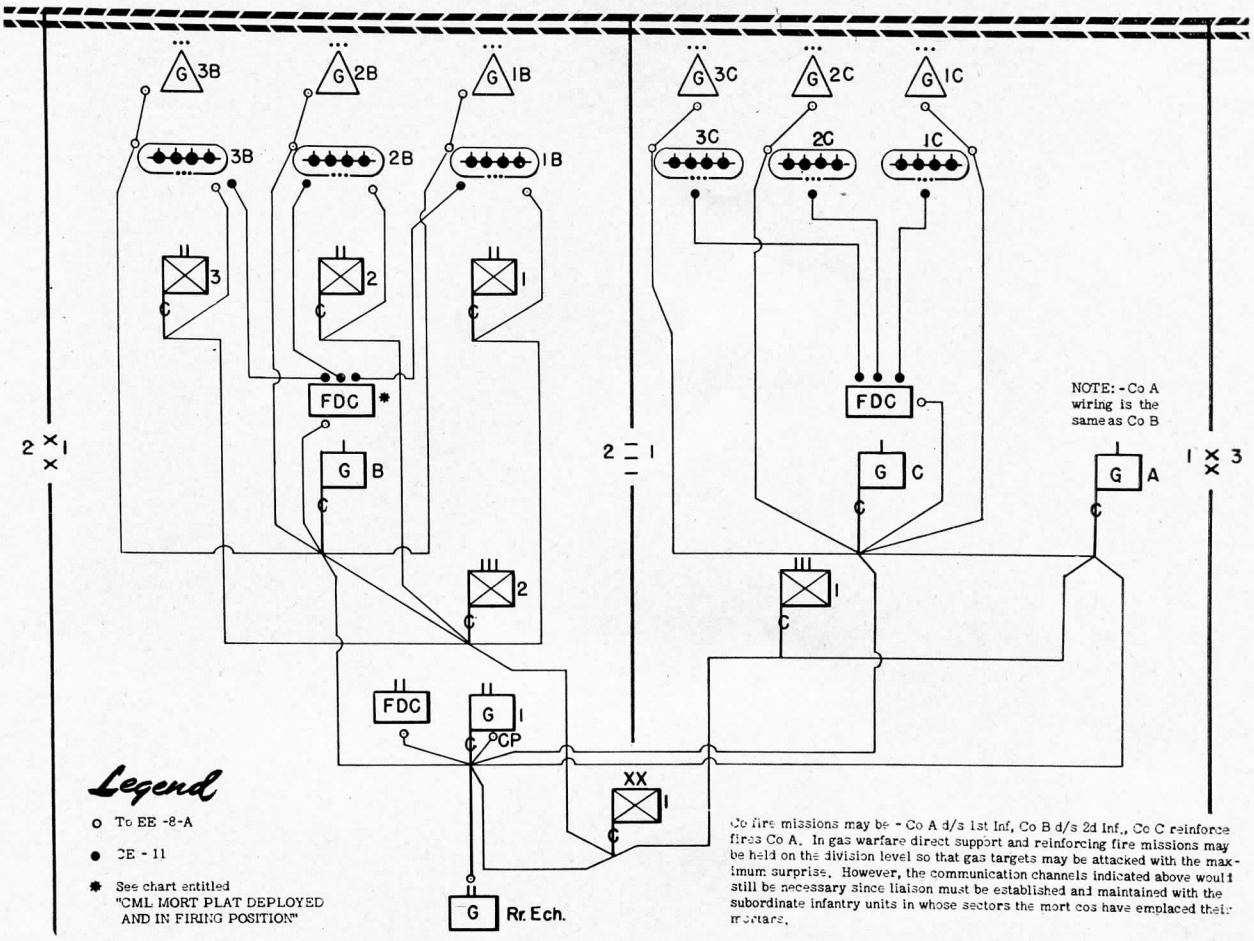


FIG. 2—WIRE DIAGRAM OF A CHEMICAL MORTAR BATTALION ATTACHED TO AN INFANTRY DIVISION WITH CENTRALIZED CONTROL.

In the normal communication setup (a company attached to a regiment), the following wire lines are needed:

1. One circuit Wire W–110–( ) from the infantry regimental CP to the chemical company CP.

2. Three circuits Wire W–130–( ) from the chemical company CP to each of its platoons.

3. Three circuits Wire W–130–( ) from each of the chemical platoons to each of the forward infantry battalion OPs.

The following radio nets are required:

1. One Radio Set SCR–284–( ) tied into the chemical battalion net.

2. One Radio Set SCR–300–( ) at the chemical company CP, each platoon gun position, and each of the forward infantry battalion OP's.

Another system, practiced in some situations, is to attach a chemical mortar company to regimental artillery and to tie it in with the FA FDC. The company offers close-in supporting fire to both battalions of the regiment making the main effort.

In this plan, the following wire lines are needed:

1. One line of heavy wire from infantry regiment to the chemical company CP (laid and maintained by regiment).

2. One line from the chemical company CP to the FA FDC.

3. One line from the chemical company to each of its weapons platoons.

4. One line from the chemical company to one of the infantry battalion OP's where the company maintains a combination liaison and observer officer.

These radio communications are essential:

1. One set at the chemical company CP tied in with the chemical battalion net.

2. Sets at the chemical company CP operating

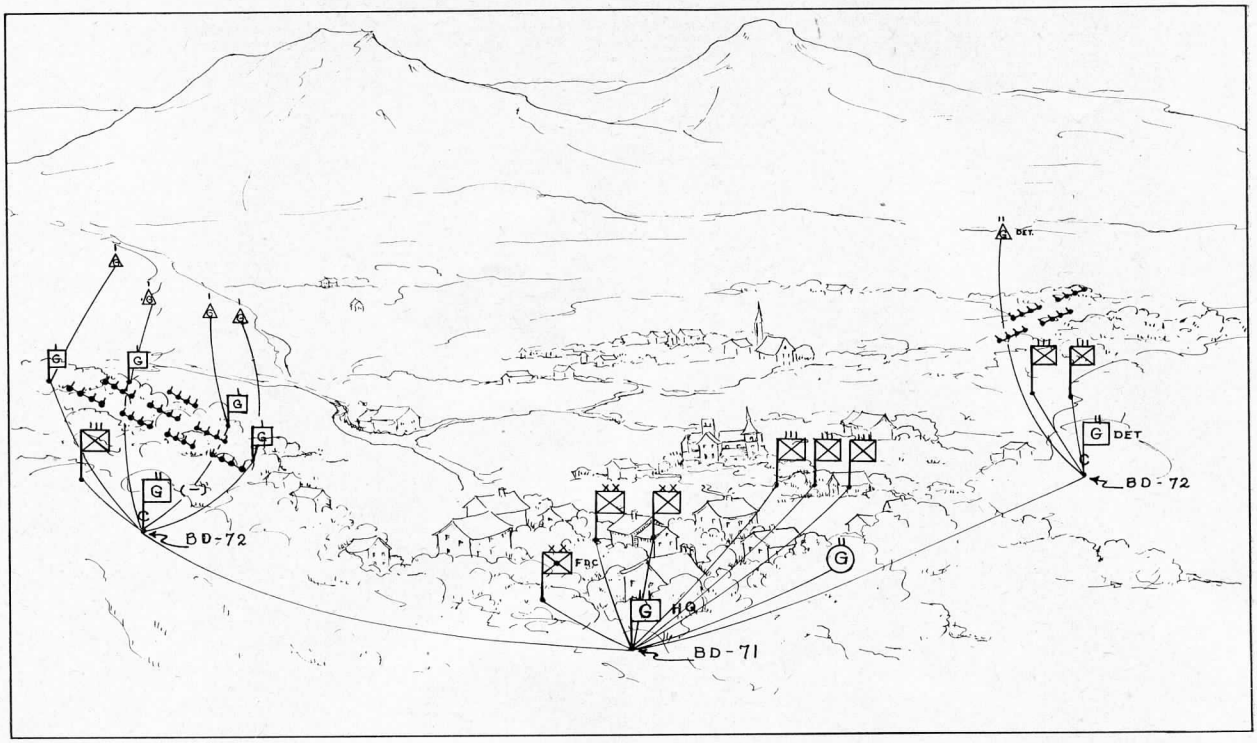


FIG. 3—CHEMICAL MORTAR BATTALION SET-UP FOR ACTION AT MINTURNO, ITALY, 11 MAY 1944.

with the company R and L officer at the infantry battalion OP.

An illustration of the wide deviation from established communication plans was the situation of a chemical mortar battalion which took part in the Garigliano River crossing in Italy, 11 May 1944. Its mission was to support two divisions, one of which was to take a hill at the southern end of the sector and the other a hill at the northern end of the sector. The division at the southern sector was to *jump off* first; the second division to follow shortly thereafter.

In order to accomplish its mission, the battalion split into 2 sections; 1, of 4 companies (32 guns), to support the southern sector division, and the second, a detachment of 16 guns, to support the northern sector division.

The mortar battalion's CP was set up in the town of Minturno. A Switchboard BD–71, borrowed from Army (at that time mortar battalions were not authorized this six-drop exchange) was used at the CP and lines were laid to the two division CP's and to the FA FDC of one division. Lines were also put into three regiments of one division, in reserve, and to the mortar battalion's ammunition dump.

Each of the companies at the southern sector was connected to the section head through a switchboard BD–72, which in turn was tied into the battalion line. One line was also laid to a divisional regiment in this sector. Each company also had a line forward to its OP. In the northern sector, a switchboard BD–72 served as the terminal for a line from battalion CP and also for two lines to two divisional regiments. In addition it linked each gun section to this section head and also a forward OP. (See fig. 3.)

For 3 days, this was the communication link that enabled the mortar battalion to operate. Several times during the 3-day battle it was the only circuit for both divisions to its regiments. This was due to the heavy shelling that tore up divisional lines and *outs* that occured due to friendly tanks and vehicular traffic.

The mortar battalion's lines were all overheaded, having been installed in 4 days by its own communication men. More than 50 miles of wire was used during this one operation by the battalion alone, considered by many CWS officers an outstanding example of the special situations with which mortar battalion are confronted.

Equipment Notes

ARMY PICTORIAL

CARE OF MOTION PICTURE EQUIPMENT

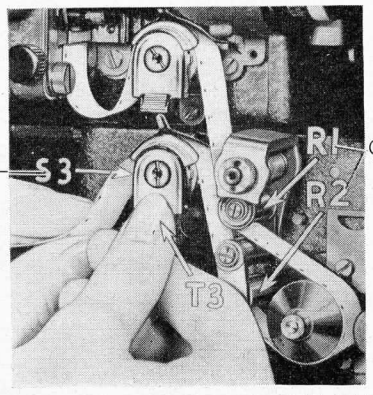
ONE OF the major functions of the Army Pictorial Service is the distribution of motion picture projection equipment and processed motion picture films. At the beginning of the war, the majority of these films distributed throughout the Army were training films. With the movement of troops to overseas theaters of operations, a necessity arose for additional types of film, i. e., entertainment, orientation, and morale. To obtain maximum benefits from these films, facilities had to be established for obtaining good screen showings and projection equipment had to be kept in good operating conditions at all times. Capable projectionists were needed to insure proper maintenance and operation of the projectors. The following suggestions have proven helpful and have added greatly to the success of many a film showing.

Motion Picture Projection Equipment.—Projectors are precision machines consisting of two major components: projector and sound system. If improperly maintained and improperly operated, they may ruin a film on its first showing, and a ruined film can never be shown again. To prevent this, every projectionist should be thoroughly trained in cleaning and threading the projector, oiling it at proper intervals, replacing lamps, fuses, and belts. Regular reference to a record of lamp replacement will help to eliminate delays in projection service. Each projection lamp is rated at 25 hours effective life. To prevent burn-outs, the lamp should be replaced after being used 25 hours. A record should likewise be kept of cleaning, oiling, and repairing so that the projector will be ready for use at all times. Any malfunction of the equipment should be reported at once.

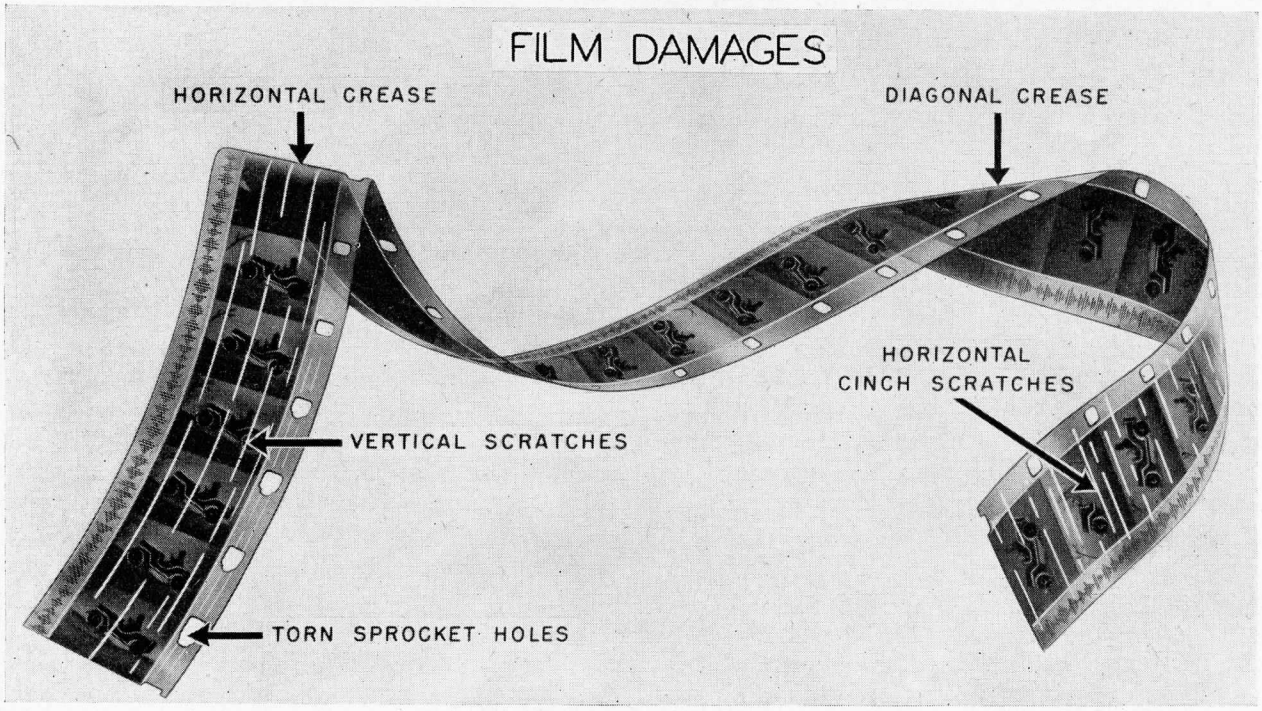
Maintenance of Motion Picture Film.—Equal in importance to the maintaining of projector equipment is the inspection of the reels of film as each is returned to the film exchange. This involves careful examination, both visually and by touch, of the entire length of each print. The film is inspected for breaks, edge tears, torn or raised perforations, pimples, heat blisters, defective or weakened splices, and any other damage that may have developed. The thumb and second finger will feel any edge damage as the film passes between them. At no time should the finger move over the flat surface of the film as the dirt from the hands acts as an abrasive on the film surface.

Buckled Film.—Care should be taken to see that film is not overheated while running, and that it is rewound slowly to dissipate the heat evenly. If not, the film will cool along the edges but retain so much heat in the center that the celluloid base will no longer lie flat against the aperture. When projected on the screen, the edges will appear in sharp focus and the center will be distorted. Care must likewise be taken to insure that rewinds are properly aligned; if not, the film will pull or ride against the flanges of the reels causing scratches, edge-breakdown, and uneven or out-of-parallel winding.

Green Film.—Special caution should be taken to safeguard against the use of the green film. Green film is film which contains some residual moisture from laboratory processing, causing the



POINTS AT WHICH EXTREME CARE SHOULD BE TAKEN WHEN THREADING PROJECTOR PH-131.



emulsion to be soft and susceptible to scratches and abrasion. Green film may first be detected by chatter in the projector. Such an occurrence indicates that emulsion is accumulating in the gate and rubbing against the film with increasing pressure until the film binds against the deposit and dislodges it. When this occurs, the film should be removed and allowed to dry. If not removed, excessive tension from friction or abrasion of the film passing through the gate will result in subsequent scratches and torn perforations.

Green film may likewise be detected by *breathing.* This consists of a contracting and expanding of the film as it is seen on the screen, causing the picture to be in and out of focus. This is brought about by the accumulation of residue on the shoe or aperture plate.

CONTROL OF FOG IN OUTDATED EMULSIONS

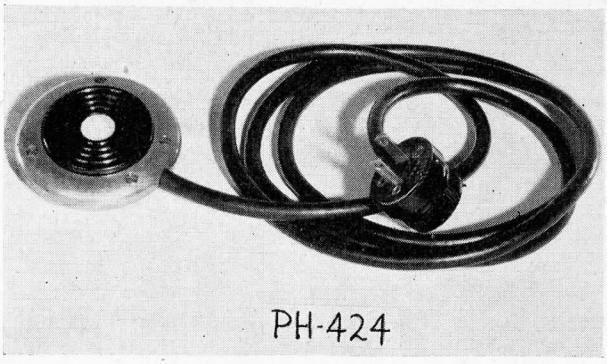
The problem of fogging in photographic emulsions caused by prolonged storage can be effectively dealt with if a small amount of benzotriazole in a stock solution is added to the developer before processing. Benzotriazole is a light tan crystalline chemical with which a stock solution is prepared by dissolving 30 grains (approximately 2 grams) of benzotriazole in 1 quart of water heated to at least 125° F. It is recommended that the mixing vessel be thoroughly heated with hot water prior to preparing the measured quantity of benzotriazole solution, as cooling below 125° F. will materially lengthen the time for complete solution.

The stock solution is added to the typical developers in the quantities shown. No deviation from regular processing procedures is necessary for either film or paper.

Type	Developer	Stock solution
Low Energy Developers	D 76	½ ounce to 1 quart developer.
Medium Energy Developers	DK 50, DK 60A	1 ounce to 1 quart developer.
High Energy Developers	D 19, D 72	2 ounces to 1 quart developer.

If it is found that the quantities of stock solutions given above do not materially lessen the age fog, additional amounts, not exceeding the amount originally specified, may be added.

When benzotriazole is consumed in the quantities stated in the foregoing table, 1 ounce of chemical used in a 0.2-percent solution will treat 233 gallons of low energy developer. From this figure it may be deduced that 1 ounce will likewise treat 117 gallons of a medium energy developer or 58 gallons of high energy developer.



Benzotriazole, identified by Signal Corps Stock No. 6G129, may be requisitioned from the depot in 1-ounce quantities from which stock solution may be prepared as needed. The stock solution is quite stable and may be stored for extended periods of time under the customary conditions for storage of liquid photographic chemicals.

The use of benzotriazole is recommended only for restraining age fog in photographic emulsions and not for the elimination of damage caused by damp storage conditions.

FOOT SWITCH PH–424

Foot Switch PH–424, Stock No. 8A1108–424, recently adopted as standard by the Signal Corps Technical Committee, provides an efficient and compact switch for use with Processing Equipments PH–395 and PH–406. The Foot Switch, as illustrated, consists of a circular, treadle-type switch with grooved bakelite footplates in a metal case and includes 6 feet of rubber covered cord with a molded combination plug and receptacle. It has a rating of 10 amperes at 110 volts a-c.

COMMUNICATION EQUIPMENT

MODIFICATION OF T–14/TRC–1

MODIFICATION WORK Order Sig 11–2601–3, February 1945, *Modification of Radio Sets AN/TRC–1, AN/TRC–1A, AN/TRC–1B, AN/TRC–1C* authorizes modifications to the microphone circuit of Transmitter T–14/TRC–1, T–14A/TRC–1, T–14B/TRC–1, and T–14C/TRC–1 to prevent generation of undesired impulses in the transmitted carrier when the microphone push-to-talk switch is pressed. Since the effect of this impulse is to cause errors in transmission of teletype signals over a multichannel radio relay system comprising Radio Terminal Set AN/TRC–3( ) and Radio Relay Set AN/TRC–4( ), MWO Sig 11–2601–3 is properly applicable also to the various models of Transmitter T–14( )/TRC–1, also a component of Radio Terminal Set AN/TRC–3( ) and Radio Relay Set AN/TRC–4( ). Change 1 to MWO Sig 11–2601–3, issued 7 April 1945, makes this change.

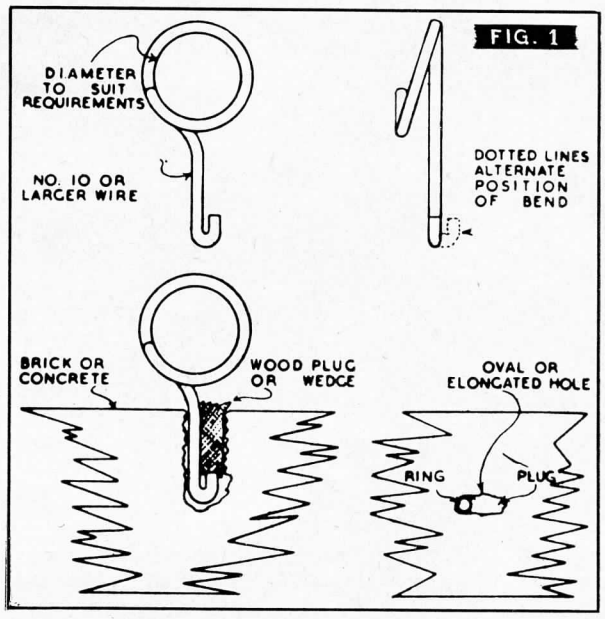
IMPROVISED BRIDLE RING

An installation recently was made by the 904th Signal Depot Company (Avn) in the European Theater of Operations, which required that wires be placed along a brick wall of a new building. Since difficulty was encountered in using standard bridle rings, a ring of somewhat different design was improvised which proved simple to make and to install. The ring is illustrated in figure 1.

The improvised ring offers an advantage over standard type Ring PF–73, PF–74, PF–75, and PF–76 with anchors under conditions where soft masonry is encountered.

CLEANOUT SPOON FOR GASOLINE HAMMERS

Barco and Syntron Gasoline Hammers formerly issued under Signal Corps nomenclature *Tool*



Equipment TE–59–( ) are presently issued under Corps of Engineers designation *Paving Breaker Equipment, Tool Set No. 1, Portable, Gasoline.*

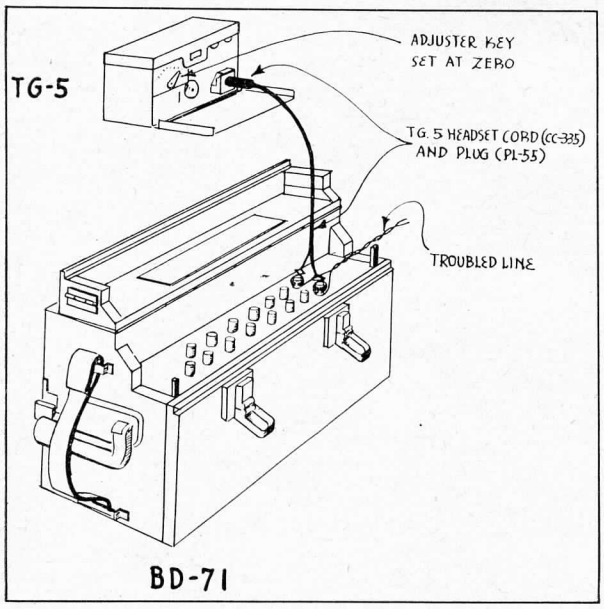
Reports from the field and tests conducted by the Signal Corps Board and the Corps of Engineers have indicated that Barco Gasoline Hammers, formerly designated Tool Equipment TE–59 and TE–59–A, are unsatisfactory for digging holes unless a means for cleaning out the hole is provided. Tests have shown that the use of a cleanout spoon for this purpose is preferable to commercially available blower attachments which cause the eqyipment to overheat.

The Corps of Engineers has therefore taken action to include *Spoon, Cleanout, Drill Hole, 30 inches long, ¾-inch bowl, Stock No. 41–7807.030–070,* in all future procurements of *Paving Breaker Equipment, Tool Set No. 1* and also to stock this spoon for issue upon requisition. The cleanout spoon is being stocked primarily for use with the Barco Hammer but may also be used with the Syntron Hammer.

USING THE TG-5 IN TROUBLE SHOOTING

TWO TECHNICAL sergeants of the—Signal Radio Intelligence Company operating in European Theater of Operations recently completed an experiment involving the use of Telegraph Set TG–5 in trouble shooting. A description of this successful experiment as submitted by their organization follows:

As every lineman and switchboard operator knows, trouble shooting in a mass of tangled lines is very difficult. It frequently has been necessary to search for an open, ground or short on just 1 line that is mixed up with 20 or 30 others all hanging from the same pole or tied to the same building. At night, especially, it is impossible to trace this line by sight, so the trouble shooter must test each line individually, each time calling back to the switchboard operator to see if he is testing the line that is out. To eliminate this practice of disturbing a busy operator, it was decided to put a signal on the faulty line. In this way, the lineman can tap all his lines until he hears a tone, which identifies the faulty line.



A SLIGHT MODIFICATION IS NECESSARY WHEN USING THE TG–5 WITH A BD–71. THIS IS SHOWN ABOVE.

To obtain the tone desired, Telegraph Set TG–5 was used and found workable. The only batteries required are 2 BA–30's which furnish current for interruptor (BZ–7). Place one plug of a pair of cords into earphone jack (JK–35) of TG–5, and the other plug of the pair into the switchboard jack in which the troubled line is terminated. Turn adjust key on relay (BK–7) to zero. The trouble shooter merely searches for the line carrying a tone, which eliminates the necessity of calling the switchboard operator to identify the faulty line. After repairing the circuit he may then call the switchboard, whereupon the supervisory drop on the pair of cords being used automatically falls.

The procedure described above may be employed with Switchboard BD–91, BD–96, BD–71, and BD–72, with the exception that in the BD–71 and BD–72, plug PL–11 will not fit jack of TG–5. To overcome this obstacle, place test clips on end of TG–5 headset cord (CC–335) and connect these clips to terminals L1 and L2 of faulty lines, or place TG–5 plug (Pl–55) and one end of test clips. Either method will work.

The device as described above is now in use by the wire section of the—Signal Radio Intelligence Company and has proved to be of great practical value. It greatly facilitates the location and repair of troubled lines by the lineman and reduces unnecessary expenditure.

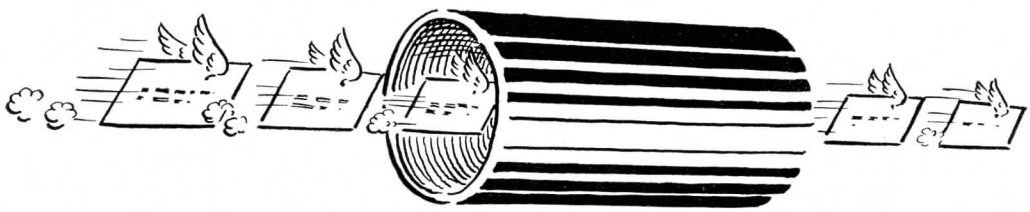
Having Trouble, Soldier?

THE CHIEF SIGNAL OFFICER CAN HELP YOU.

See Technical Bulletin TB Sig 118, "Digest of Field Reports for Ground Signal Equipment"; TB Sig 132, "Digest of Field Reports of Ground Radar Equipment" and changes thereto for information on corrective action you can take.

Send your Unsatisfactory Equipment Report (WD AGO Form 468) to the Chief Signal Officer, Washington 25, D. C., or write a letter through channels.

LONG messages *clog* war wires



SHORT msgs get through **FASTER**

Be Brief!

ARMY COMMUNICATIONS SERVICE