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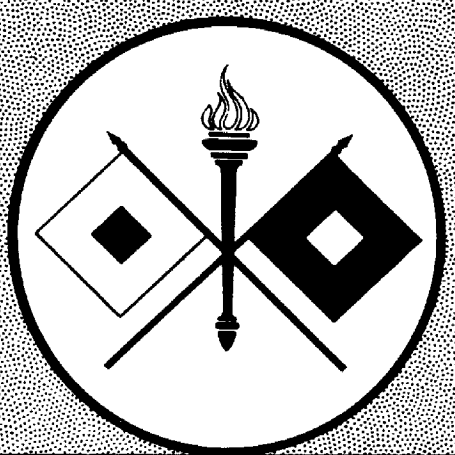
No. 19

RESTRICTED

SIGNAL CORPS TECHNICAL INFORMATION LETTER

JUNE · 1943

ARMY SERVICE FORCES · OFFICE OF THE CHIEF SIGNAL OFFICER



SIGNAL CORPS TECHNICAL

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WAR DEPARTMENT · ARMY SERVICE FORCES

OFFICE OF THE CHIEF SIGNAL OFFICER

EXECUTIVE OFFICE · SPECIAL ACTIVITIES BRANCH

24-32816

SIGNAL CORPS TECHNICAL INFORMATION LETTER

Signal Corps Technical Information Letter (SCTIL) is issued monthly for the purpose of keeping officers in charge of field activities informed on the newest training methods, operational procedures, equipment under development, standardization or procurement, and other pertinent information as coordinated in the Office of the Chief Signal Officer.

This Letter is compiled largely from information available in the divisions and branches of the Office of the Chief Signal Officer. All Signal Corps training centers and other agencies are invited to submit items of general interest. Such items should reach the Office of the Chief Signal Officer (SPSAY) not later than the 15th of each month for inclusion in the Letter of the following month.

Distribution of the Letter is made to army, corps and division signal officers; commanding officers of signal companies and battalions; service command and department signal officers; post, camp, and depot signal officers; the signal officers of bases and task forces; Signal Corps inspection zones, procurement districts, training centers and laboratories; directors of Signal Corps ROTC units; signal officers of Army Air Forces and Army Ground Forces headquarters and major commands; overseas headquarters; signal officers of bases and task forces; units of the Office of the Chief Signal Officer and of Headquarters, Army Service Forces.

If any such activity is now receiving a number of copies either insufficient or excessive for its present needs, a memorandum addressed to the Chief Signal Officer (SPSAY) will effect a correction of the mailing list.

This Letter is for information only. Requisitions for new types of equipment will not be submitted on the basis of data contained in this Letter.

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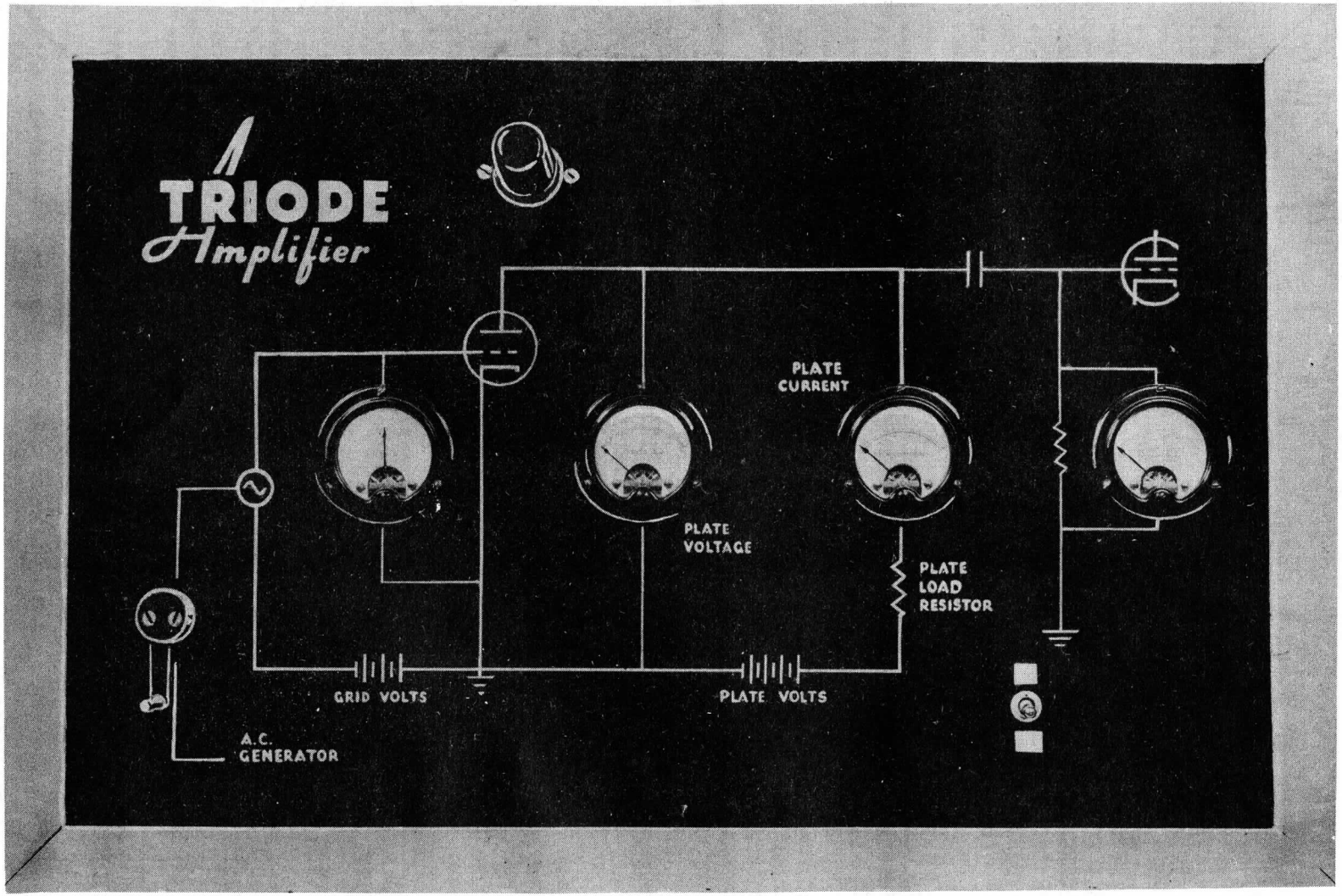

DEMONSTRATION BOARD EMPLOYED AT THE SOUTHERN SIGNAL CORPS SCHOOL TO ILLUSTRATE THE FUNCTIONING OF A TRIODE VOLTAGE AMPLIFIER

24-32816

VISUAL TRAINING AIDS

--- AT SOUTHERN SIGNAL CORPS SCHOOL

A good deal of attention has been given to the development and application of visual training aids at the Southern Signal Corps School, Camp Murphy, Florida. Many of these devices were developed for use in specialized training programs but others have sufficiently wide application to be of interest to other schools and it is the purpose to describe two of these here.

VOLTAGE AMPLIFIER DEMONSTRATOR

A front view of this training aid is shown opposite. It consists of a 1-stage voltage amplifier, a "slow-motion" a.c. signal source and meters which enable the student to see just what takes place in each portion of the circuit during the amplification of the simulated signal. To aid the student in visualizing the functioning of each portion of the circuit, its schematic diagram is etched on the panel with the meters themselves taking the place of corresponding schematic symbols.

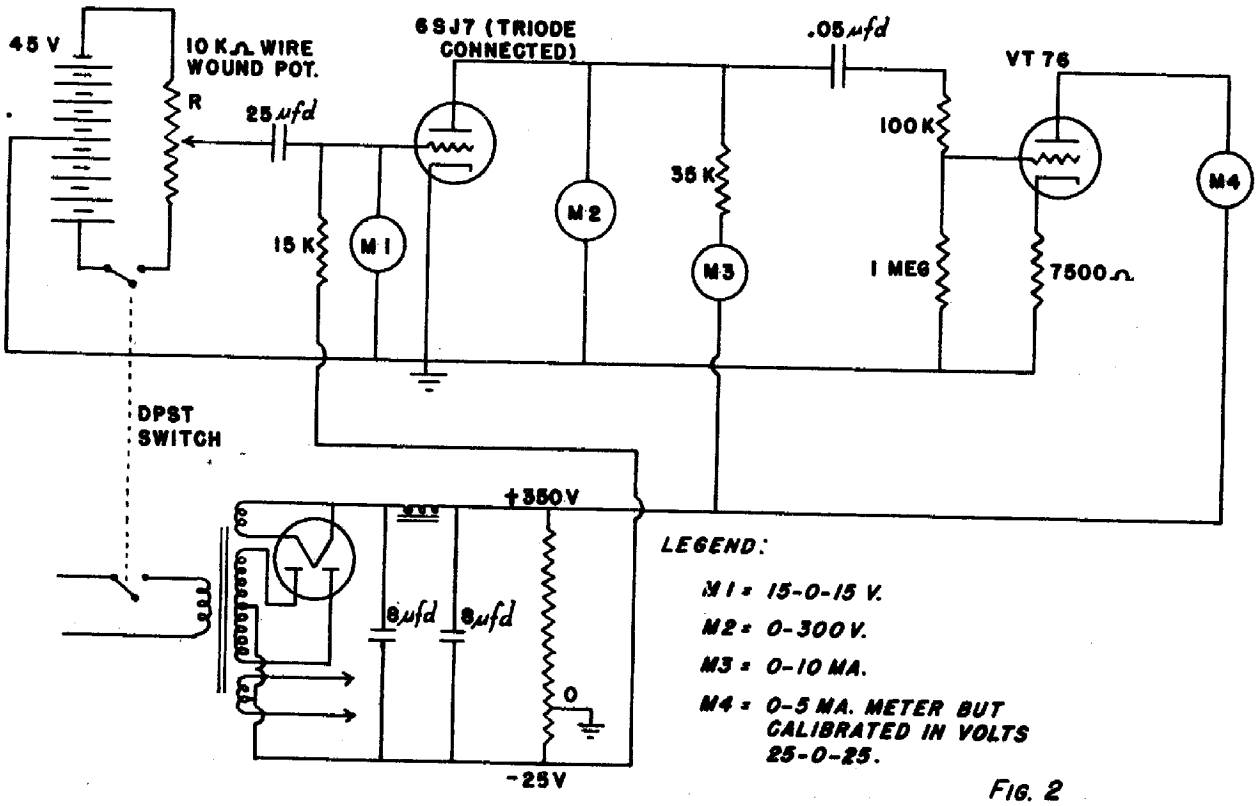

FIG. 2

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The actual circuit diagram is shown in Figure 2 and differs from the one shown on the panel in the substitution of a built-in power supply for the plate and bias batteries, and in the arrangement of the input and output circuits.

The signal is generated by the simple expedient of varying the voltage applied to the grid by a center-tapped, 45-volt battery. This is accomplished by means of the potentiometer, the shaft of which is so coupled mechanically to the hand crank that one revolution of this crank causes the potentiometer arm to move first in one direction, then in the other. Thus for each revolution of the hand crank at the lower left of the panel, one complete cycle of a.c. is developed. This varying voltage is applied to the grid of the tube

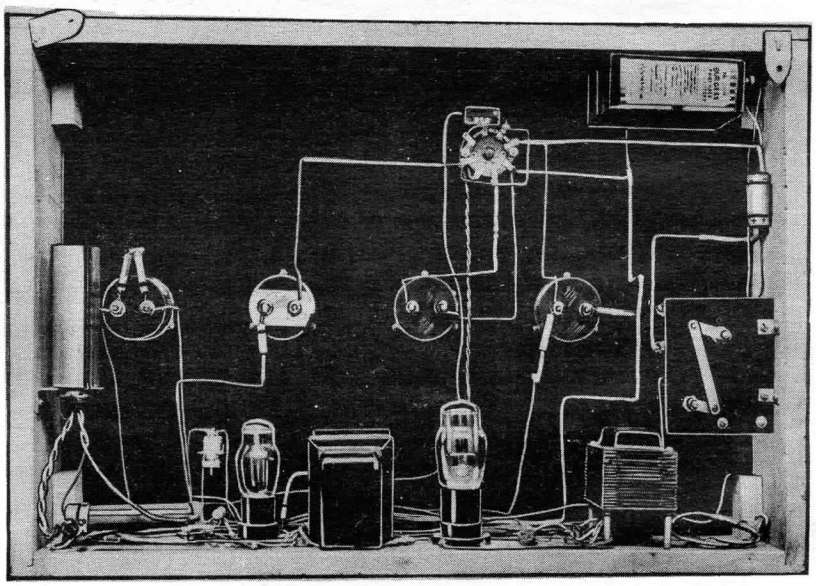

FIG. 3

through a 25 mfd. isolating capacitor, the primary function of which is to isolate the battery to avoid drain when the equipment is not in use.

The output circuit is effectively as shown in the circuit etched on the panel but actually is as shown in Figure 2. By placing a milliammeter in the plate circuit of the 76 tube instead of using a voltmeter in its grid circuit, the tube provides normal operating load for the 6SJ7 amplifier tube but at the same time the static plate current of the 76 maintains the meter at mid-scale when no signal is applied. Thus its zero position is at center scale and, when the signal is applied, the pointer moves back and forth, from this position, effectively conveying to the student the visual impression of alternating voltage.

The meters employed in these demonstrator boards are all of the same type, with 5-ma. movements. Multipliers and shunts were added externally, according to the function to be performed, then new dial plates of bristol board were made for each with the function and new calibration neatly lettered in. A mechanical adjustment of the input-grid meter brought the static position of

its pointer to midscale so that here again its forward and backward motions suggest a.c. action.

The rear view is shown in Figure 3. The "generator" mechanism which appears at the extreme right is shown in greater detail in the photo of Figure 4.

The entire unit is mounted on a sheet of Bakelite, set into a wood frame which has inside depth of about four inches and allows ample space for mounting the power supply, the 76 tube and other miscellaneous components along its base without defacing the panel with mounting screws, as would be the case if all components were mounted on the Bakelite.

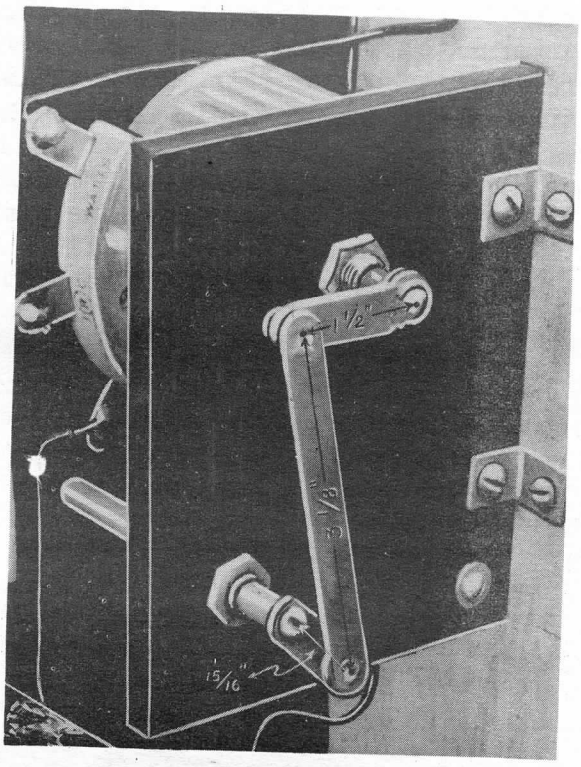

FIG. 4

Duplicates of this unit are prominently wall-mounted in each of the several SSCS laboratories where elementary vacuum-tube studies and preliminary radar training are carried on. Thus they are always accessible to students. Further, it is a requirement that the students take advantage of them. This is accomplished by making a special fill-in quiz, dealing with the principles demonstrated by the board, a part of the vacuum-tube training material. Mounted beside each unit is an explanation of the demonstrated principles. Important in electronic training is the phase reversal which takes place in a resistance-coupled amplifier stage. This is not always easy for students to comprehend, but with the aid of these demonstration boards becomes much more simple to many.

ACTION MODEL GASOLINE ENGINE

Another training aid which finds valuable application is a cutaway model of an internal combustion engine used in the Gasoline and Diesel Maintenance Sub-course, as given in the Southern Signal Corps School. Front and rear views of the model are shown herewith. When the hand crank on the rear of the panel is turned, it causes the various moving parts to operate, effectively illustrating the actual functioning of an engine.

This model is constructed for the most part of wood. Such parts as push rods, rocker arms, etc., are cut from scrap brass and brass welding rods. Gears are from worn out magnetos, and some of the parts are cut from scrap bakelite.

The construction is not entirely in correct proportion, but is sufficiently so to demonstrate all of the separate parts necessary to operate an internal combustion engine. All moving parts are correctly shown in their relation to one another, and are timed so as to give a true and correct picture of the operation of a four-cycle gasoline engine.

The cylinder walls were the first parts to be cut out, and were secured to the ply-wood background. The piston is cut from ply-wood also, and the cylinder walls are grooved to fit the piston. The connecting rod is made from a piece of bakelite and secured to the piston with a small bolt.

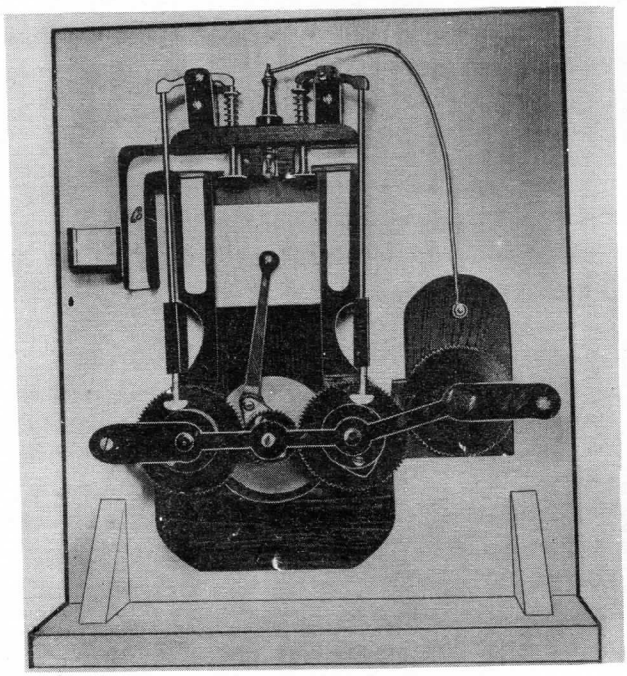

FIG. 5

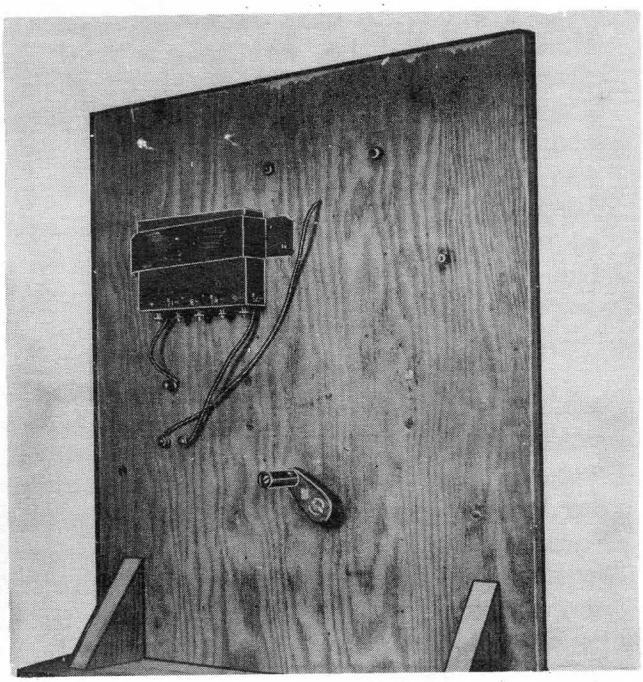

FIG. 6

The crank shaft is represented by a crank pin fastened between the brass fly wheel and the crank shaft gear. The cam shaft gears are fiber gears from old magnetos, and have cams mounted on them, which are cut from bakelite. The push rods are pieces of brass welding rod, and to secure smoother operation it was necessary to thread the lower ends of them and put shoes on them. These shoes are not a true profile of engine parts as actually used in modern construction, but it was found that the push rods would not function properly without a base to receive the thrust of the cams.

The spark plug and ignition system (magneto) are represented by a model of a spark plug cut from bakelite. In this plug a flashlight lamp replaces the normal gap. When the model operates, this lamp flashes at the proper time of ignition. The voltage source is a small radio battery. The timing is accomplished by two contacts mounted on the under side of the magneto timing gear. These contacts come into contact with two carbon brushes in the wood representation of the magneto at the proper time to cause the lamp to flash.

The wires from the battery (and also the battery) are mounted on the reverse side of the model so that the only visible wire is the one from the magneto to the spark plug, giving a true picture of actual wiring practice.

The carburetion system is represented by hollowed out wood profiles of the carburetor and manifold. The throttle butterfly is added to increase the likeness to an actual engine, and a small nail is turned up in the manifold to simulate the jet.

--- AT EASTERN SIGNAL CORPS SCHOOL

SIMULATED BOMBER INSTALLATION IN RADIO REPAIR COURSE

A novel, practical training aid has been introduced for the subcourse in Radio Repair — Aircraft Communications Equipment, at the Enlisted School, Eastern Signal Corps School, Fort Monmouth, N. J. To give the students a clearer and more vivid idea of the use of radio equipment in a modern bomber, the instructors of this subcourse have built a simulated bomber. This unique device is constructed of wood, and is approximately 10 feet high and 20 feet long. The various compartments for the gunner, navigator, pilot, etc., are arranged to correspond with those actually found in a B-17-E "Flying Fortress." The radio equipment is installed in exactly the same relative position as in the real bomber.

This mock bomber is complete in all respects including a coat of olive drab paint. An ingenious idea, which permits the operation of a trailing wire antenna, is also part of this installation. This antenna passes through the floor and, by a system of weights and pulleys outside the building, the antenna wire may be reeled in or out by simply turning a switch contained in the radio operator's compartment of the bomber.

The students, under the instructors' supervision, are permitted to operate and repair all the radio equipment installed in the bomber. The device is also used for the orientation lecture that is given to all new students entering the course. After the student has advanced in his work, he is given an opportunity to trouble shoot in this radio installation. Troubles are placed in the various radio sets by the instructors, who know just what troubles are likely to occur in actual operation.

Experience has shown that the use of this mock bomber stimulates interest in the course and helps give the student a better idea of the part that radio plays in the operation of a modern bomber.

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MECHANICAL AID EXPLAINS FREQUENCY MODULATION

All men sent to the Enlisted School of the Eastern Signal Corps School, Fort Monmouth, N. J., to study radio maintenance may be divided into three groups. The first and the smallest group is made up of men who have had previous experience or training in electrical work and are interested in radio. These men are usually easy to teach. The second group consists of men who at least believe themselves to be interested in radio, but have had no appreciable amount of previous electrical experience or training. The difficult job of giving adequate training to these men within the allotted time is accomplished by a lecture presentation of the material. The subject is developed in simple terms, in a manner designed to develop or maintain the students' interest. The third group consists of men who have neither an interest in radio nor a background in electrical work. The seemingly impossible job of teaching these men is accomplished, in a large proportion of the cases, by going to extremes in devising methods of holding their interest long enough to give them some knowledge of the subject.

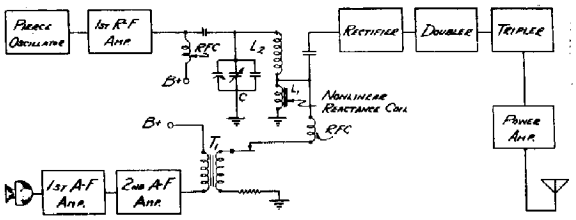

FIG. 1

In the course of their work with the second and third groups described above, the instructors have worked out many ingenious demonstrations, analogies, "gadget" teaching aids, etc., which are of great value in creating and maintaining the students' interest and in "putting over" the subject under discussion. An example of these "gadgets" is a cleverly designed arrangement of scrap materials mounted on a board, as shown in Figure 2. It is used to illustrate the effects of frequency modulation.

The mounting board has a groove, G, cut along its entire length, about one-third of the distance from the bottom. A narrow triangular strip, A, made of thin orange-crate wood is glued to a small block of wood, B, as shown to the left of the figure. The size of the block is such that, when set in the groove, it can slide freely toward either end. The sine wave form D is made from a piece of rigid wire, which up to the time of its re-employment, served the school as a coat hanger. This wave form is anchored to the board by means of a wood screw to which it is soldered at point P. The wave form is free to swing around point P within narrow limits, as determined by the bus wire guides H. Two brads are driven part way into the base of each triangular strip, as shown at C. The wire wave form is so placed that it runs in between the two brads at the base of each strip. As the wave form is made to see-saw on the point P, it causes the triangular strips to move back and forth along the groove, as shown in Figures 3 and 4. This device is used as a lecture aid in explaining phase modulation, as accomplished in the f-m transmitter of the SCR-508.

Before explaining the use of this teaching aid it will first be necessary to discuss the modulating circuit of the transmitter. Figure 1

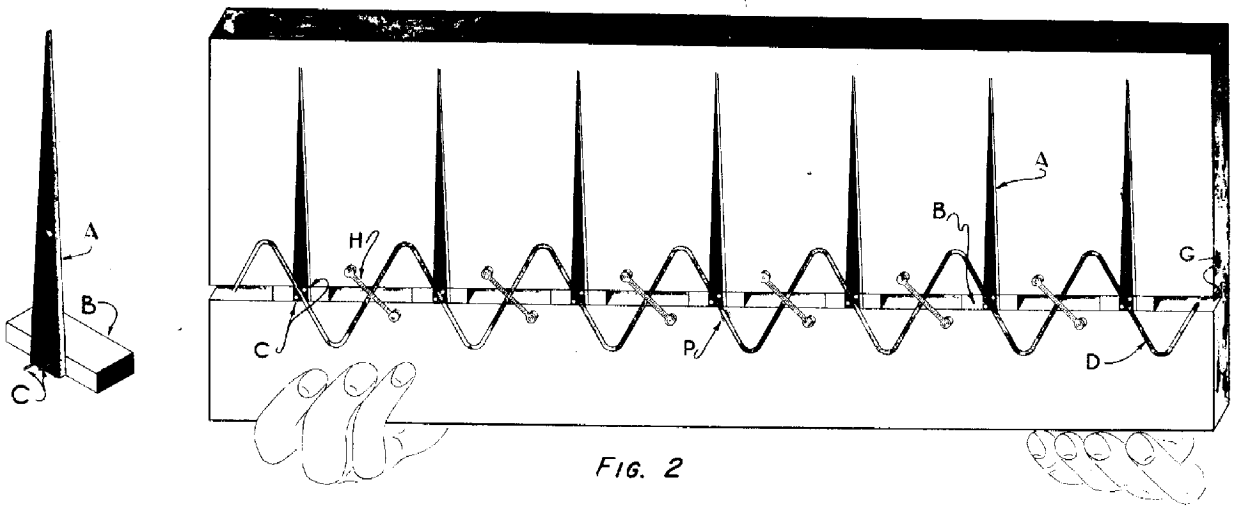

FIG. 2

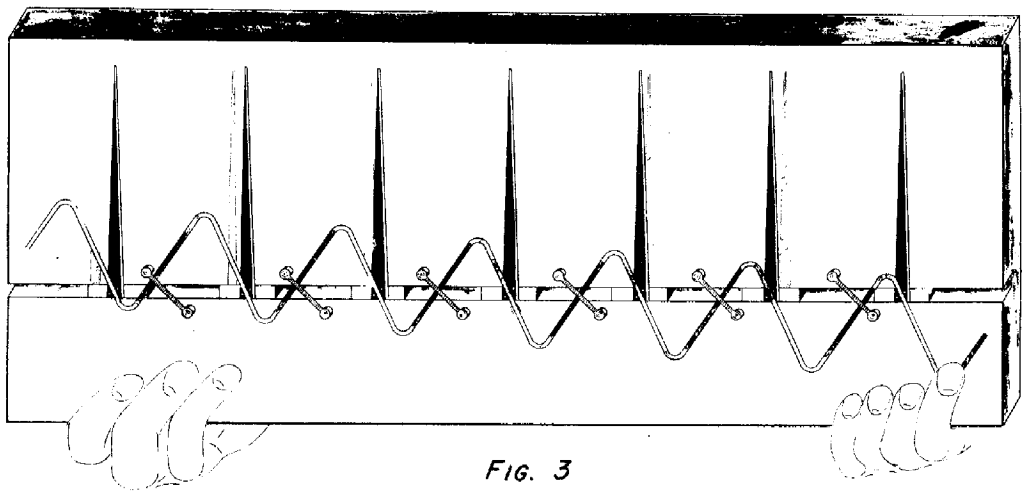

FIG. 3

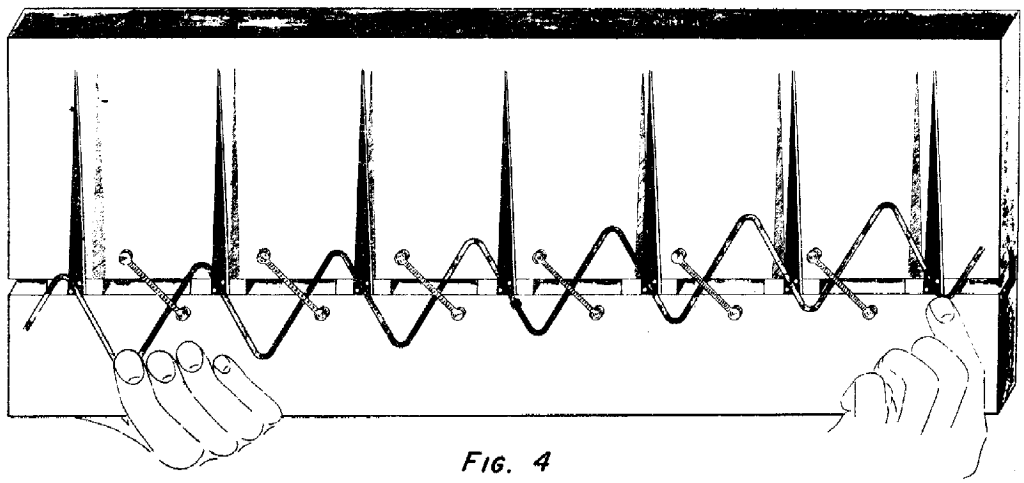

FIG. 4

shows a block-circuit diagram of the transmitter of the SCR-508 with the phase-modulating section represented in circuit form. The output of the Pierce Oscillator is fed to the r-f amplifier. The shunt-fed plate circuit of this amplifier is tuned to the oscillator frequency by the resonant circuit made up of L_2 in series with the non-linear reactance coil L_1, and the tuning, trimmer, and temperature compensating capacitors C. The audio signal from the first and second a-f amplifiers is also coupled, through transformer T_1, to the non-linear reactance coil. As a result, both the circulating r-f current of the resonant circuit as represented in Figure 5 (B) and the audio current of the transformer T_1 secondary as shown in Figure 5(A) combine to form the resultant current of Figure 5 (C), which flows through the non-linear reactance coil L_1.

The non-linear reactance coil is a permalloy core coil and is the device which produces phase modulation in this set. It is able to do the job because of its characteristic of becoming saturated when currents above certain small values flow through it. When no signal is being supplied by the audio section, and the sine wave output of Figure 5 (B) from the r-f amplifier is being applied to the coil, no counter-electromotive force will be developed across the coil during that portion of the cycle when the magnitude of the current has increased in either a positive or a negative direction beyond the

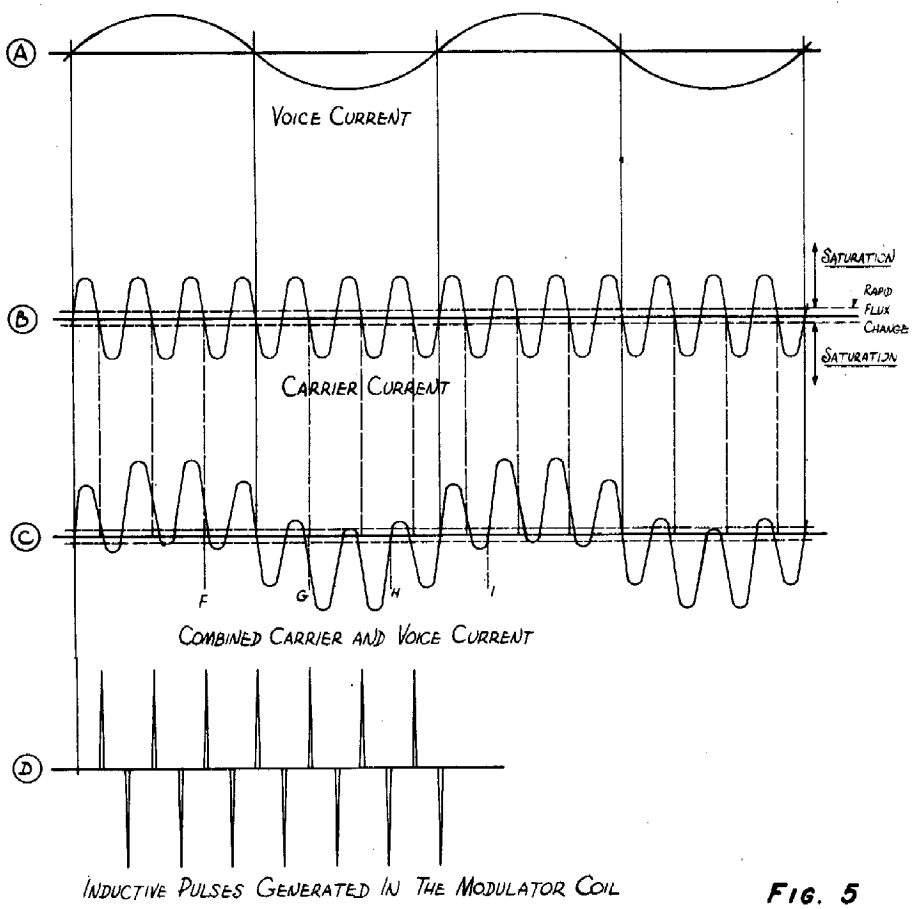

FIG. 5

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values indicated by the dotted lines. However, as the current goes through its values around zero, as indicated between the dotted lines, sharp voltage pulses are created as shown at (D). These pulses of counter-electromotive force are due to the rapidly changing flux set up about the coil by the current as it decreases below the saturating value in one direction and increases toward the saturating value in the opposite direction. During the discussion on this subject, the production of these sharp pulses of voltage is shown by a demonstration in which the output leads of an audio oscillator and the input leads of an oscilloscope are connected across a saturable coil designed to work on audio frequencies. As the output of the oscillator is increased from a very low to a high value, the image on the oscilloscope screen is seen to change from a sine wave of low amplitude to a very sharp, narrow, peaked wave form, as shown in Figure 5 (D).

With an audio signal being supplied to the saturable coil by the audio section, it combines with the r-f current to form the resultant current shown in Figure 5 (C). It can be seen from the figure that this resultant current goes through its zero values at constantly changing intervals. The pulses of voltage created as the current goes through its values around zero will also occur at constantly changing intervals. The time intervals will gradually change between maximum and minimum values, according to the modulating signal frequency. This sharp peaked signal is then passed on to the latter stages of the set through the class C amplifier or "rectifier."

The actual change in frequency accomplished by the coil is extremely difficult to show to a class of students during a lecture by means of an oscilloscope demonstration because of the small amount of change obtained. A much more successful and convincing demonstration is accomplished by means of the mechanical device illustrated here. This device shows the positive pulses of CEMF resulting from the application of only the r-f current to the non-linear reactance coil. The frequency of these pulses is the same as that of the applied r-f current, and is therefore at the resting frequency.

If the wire wave form is slowly turned on its pivot P so that the left end moves upward, the triangular strips A, representing pulses of CEMF, will slowly move toward the center, as indicated in Figure 3. The shaded peaks drawn on the board show the original position of the triangular strips. The wire wave form in this position indicates that portion of the wave between F and G of Figure 5 (C). The frequency of the voltage pulses indicated by the position of the triangular strips is higher than the resting frequency.

As the left end of the wire wave form is pulled downward, the "pulses" move past their original position and then away from the center of the board as indicated in Figure 4. This position of the wave form now corresponds to the HI section of Figure 5 (C). The frequency of the pulses produced under this condition is lower than the resting frequency.

As demonstrated by this device, the frequency increases above the resting frequency as the audio cycle is changing from its positive alternation

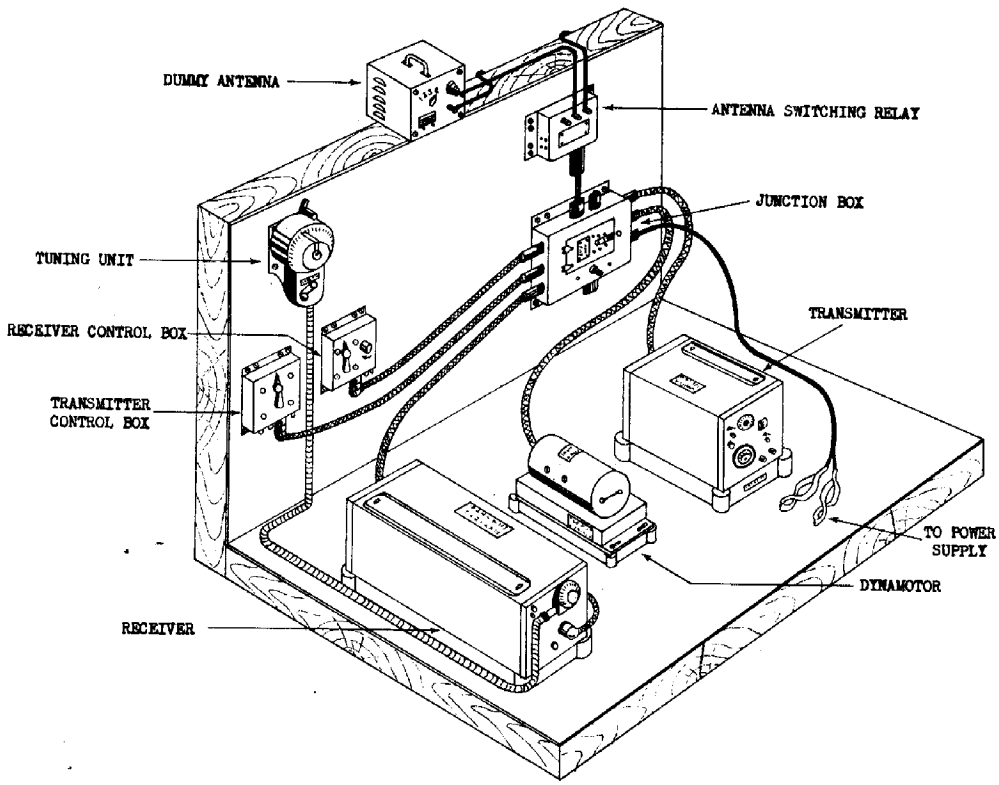
to its negative alternation and decreases below the resting frequency as the modulating signal is changing from its negative alternation to its positive alternation. The resting frequencies are then produced at each peak of the audio cycle.

The negative peaks of CEMF created by the saturable coil are eliminated by the rectifier and therefore are not included in the device.

ASSEMBLY OF RADIO SET SCR-183 ON DISPLAY BOARD

The Radio Division of the Air Corps Equipment Course at the Enlisted School, Eastern Signal Corps School, Fort Monmouth, N. J., is using an assembly of a complete SCR-183 to accompany lectures on the use, operation, and trouble shooting of this set. The assembly is made on a wooden display board, which has a base and a back, both 30 by 36 inches. The SCR-183 is a low-powered command set used in various types of airplanes. The set is remotely controlled, and can be operated from any position in the plane with the aid of the interphone equipment.

The diagram shows the location of the various parts as mounted on the display board.



SCR-183 ASSEMBLED COMPLETE FOR INSTRUCTION PURPOSES

HOW TO USE YOUR EYES AT NIGHT

(Extracts from Article of Same Title in
February 1943 issue of INTELLIGENCE BULLETIN, Number 6)

Modern war is often fought at night. This means that men must learn to see in the dark — or at least to use their eyes in new and unfamiliar ways.

This article is written to tell you how to make the best use of your eyes at night. It will help you, whether your job is in an airplane or a tank, on a ship, or driving a truck, or just getting about on your own feet. It will not give you the uncanny eyes of an owl or a cat, but it may give you just the edge on the enemy you need to get in the first shot — and to get home.

You already know that when you go into a dark room from a bright one it is hard to see until your eyes have become used to the gloom. At a movie it takes a minute or two to see the vacant seat. It may take another minute or two to be able to recognize a friend. During these minutes your eyes become more sensitive to the faint light.

Adjusting for Darkness

You actually have two kinds of sight. Your day eyes use one kind of vision cells known as "cones." They are principally located in the very center of the eye. Your night eyes use an entirely different kind of cells, the rod cells, which are mostly around the outside edge of the eye.

The rod cells used by your night eyes are color blind. If you see a colored light shining at night, and it looks red or green or blue, it is only because it is bright enough so that you can see it with your daylight eyes.

But your night vision is much more sensitive to light of some colors than to others. Red is seen equally well by night and day vision. Blue light, however, affects your night eyes 1,000 times as much as it does your day eyes. For this reason it is extremely dangerous to use blue lights in a blackout because it affects the enemy's eyes just as much as it does yours.

Night eyes lack the sharp vision for detail that your day eyes have. If you want to see to read, if you want to watch the dial of an instrument, if you must look at a map, a road sign, or your watch, then you must use your day vision. But night eyes are extraordinarily sensitive to faint light. Under ordinary night conditions, a match can be seen from a plane many miles away.

Night vision is not in use as soon as you step into the dark. It takes time — a half hour or more — before your eyes are completely adapted to the

dark. When you leave a sunny street to go into a darkened theater, or step from a brightly-lighted room into the dark outdoors, you are completely blind at first.

Then several things happen. First the pupil of your eye dilates, letting more light into your eyes. This is a mechanical action. Next the cones of your day vision adapt to the darkness. This takes about five minutes, and after that you feel more comfortable about moving around in the pitch dark.

After a much longer time, your rod vision adapts itself to the darkness and you can begin to see shapes and outlines in the gloom that were not even vague shadows when you first came in.

The soldier who, at a command or an alert signal, leaves a lighted room to run on duty without having prepared his eyes is completely at the mercy of the enemy insofar as his vision is concerned. By the time he gains the use of his night eyes, the emergency may be all over.

When your eyes are adapted to the dark, flashing on a light, even for a very short time, may ruin night vision for another half hour. You can lose in a few minutes all you gained by half an hour in the dark. The brighter the light and the longer you look at it, the more you lose.

Getting Your Eyes Ready

Complete darkness is the best preparation for night fighting. It pays to protect your eyes from light before you start and while you are out. If you can't stay in darkness, keep the lights around you as low as possible and don't look straight at them. If it is necessary to look at any lighted object, be as quick as you can about it. Experiments have shown that looking at an instrument dial lighted only by radium paint will cut down the distance at which you can see by fifty percent. Don't look at the dial any longer than you must or the loss will be greater. Experienced gun pointers and spotters know that they must not watch the flash of their guns as they fire. Looking away from the flash gives almost complete protection. Luckily the flash of rifles and small-caliber machine guns has much less effect on the eyes.

There are several ways by which one can become dark-adapted or maintain dark-adaptation, even though working in a fairly bright light. A patch worn over one eye, for instance, will keep this eye ready for night duty at any time, even though vision from one eye alone is not as accurate as binocular (two-eye) vision, especially in judging distances of nearby objects. Or an individual may work in red light, or wear close-fitting red goggles, either of which are effective since red light has little effect on the rod cells and leaves one ready for nearly instant action in the dark. It is wisest to consult a medical officer concerning the necessity for such preparation and the methods best suited for the task at hand.

Using Your Eyes Properly

Always remember that you must look a little to one side in order to see best on a very dark night. It takes practice to learn to do this, but it is worth the trouble to learn the trick. And don't keep looking steadily to the same side of an object. This will make it disappear too.

Try it out yourself and see how your eyes at night can play "parlor magic" tricks on you. When in your darkened room or outdoors, hold up your finger and look steadily at it. It will disappear. Look a little to one side and it will appear again. But if you keep staring at this side it will soon be gone again. Move your eyes to the other side and it will reappear.

This means that in searching the sea or the sky for a dark object, when you think you have spotted something, keep looking first on one side of the object and then at the other, or above and below it.

But don't try to sweep your eyes over the sky or the horizon. You can't see well while the eyes are moving. "Scan" the sky, don't sweep over it. Night eyes are slow in responding. At night a faint object may not be recognizable until you have looked near it a number of times. On the other hand, you won't see it at all if you stare. You have to look again and again at points near it.

Contrast Helps Night Vision

Another thing that affects our vision at night is the contrast between an object and its background. If the thing observed is very different from its background, it is much more easily seen. An airplane may be clear if you look up at it against the night sky, but invisible if you look down on it against the dark ground.

To notice small differences in contrast, it is essential to have clear vision. It is for this reason that windshields must be kept clean and free of scratches or fog. These tend to scatter light in all directions and reduce contrast. Careless night fighters have been known to tolerate enough dirt on their windshields to double the time it takes to see a plane moving along near-by. And sailors on ships sometimes let the salt from spray pile up in blotches on the glass. This is courting death. For the same reason it is important to keep down the lights on your side of a windshield. If it is necessary to have any light on your side, keep it as dim as you can and screen it. This also helps your adaptation to darkness.

Vitamins

There has been a good deal of talk about the effect of shortages of vitamins A and C on ability to see at night. These are the vitamins in fresh vegetables, cheese, and fruit. People who don't get enough of these vitamins do become poor in night vision, but regular Army and Navy rations supply

plenty of these vitamins. Extra vitamins don't improve night vision if your diet and your night vision are already normal.

Night vision is affected by fatigue. Anything that reduces your physical well-being has a greater effect on night vision than on day vision. Experiments have shown that hangovers, slight illnesses, or excessive fatigue may double or even triple the amount of light needed to see an object.

SUBSCRIBER SETS FOR MAKING PEG COUNTS

In attempting to limit telephone installations to the minimum essential for the efficient transaction of official business in compliance with AR 105-20, AR 105-30, AGO Memorandum No. W105-3-42 and WD letter file SDSLP 676.1 - Gen., it was found difficult at Fort Monmouth to determine which requests for new installations were justified.

Fort Mason telephone service is furnished through underground cable by means of dial locals from a remote dial central office located at the Presidio of San Francisco. It was impossible to justify by actual figures the need for requested additional installations since no message registers were available for determining the traffic on the locals already installed in the sections requesting such additional installations.

To fulfill this need the Telephone Officer in the Port Signal Office at Fort Mason devised a scheme whereby a peg count of traffic on locals could be taken by personnel in his office. This scheme involved the installation of three telephone subscriber sets connected to the main terminal box at Fort Mason through existing house cable. By the use of jumper wires at the terminal box these subscriber sets can be connected as extensions from any local lines on the post. Indication of outgoing calls on the locals under observation is given by bell tapping on the sub-sets, caused by the dial pulses. Indication of incoming calls is given by actual ringing on the sub-sets. By use of this scheme traffic counts can be taken and definite determinations made as to whether requests for additional telephone installations are warranted. This scheme is being refined by the addition of visual signals consisting of neon lamps bridged across the ringer terminals on the sub-sets.

Already by the use of this scheme to provide definite usage data, considerable saving in telephone equipment has been effected.

Since the following is a rather unusual as well as an easily installed method for taking peg counts on telephones operating as locals from machine switching equipment, it is thought that perhaps this description may be passed on for the information of other signal officers who have a similar problem.

"RADIO-FREQUENCY TRANSMISSION LINES"

A book of the above title, recently prepared by the Training Literature Department of the Southern Signal Corps School, should find wide interest among Signal Corps officers and their radio commands.

The subject of transmission lines is considered from an elementary standpoint, working right up through to presentation of practical graphs which aid in the design and efficient application of open and concentric lines and impedance-matching stubs.

The uses of lines for various functions including impedance matching, phase shifting, as metallic insulators for high radio frequencies, as filters, and for frequency measurement are discussed. Perhaps the best idea of the scope of coverage will be gained from the following Table of Contents:

Lumped and Distributed Constants
The Infinite Line
Reflection
Distribution of Energy
Open-end and Closed-end Lines
Non-Resonant Lines
Line Terminated in a Reactance
Resonant Lines
Transmission Lines and Resonant Circuits
Impedance Matching with Transmission Lines
Types of Transmission Lines
Construction of Parallel Two-wire Line
Construction of Concentric Line
Construction of Twisted Pair
Characteristic Impedance of Two-wire Line
Characteristic Impedance of Concentric Line
Measurement of Characteristic Impedance
Wavelength Determination
Lecher Lines
Applications of Resonant Lines
Quarter-wave Line as Metallic Insulator
Quarter-wave Line as Filter
Transmission Line as a Reactance
Transmission Line as an Impedance Matching Device
Stub Line
Transmission Line as Phase Shifting Device
Frequency Control of Oscillator

The book takes the form of an 8" x 10½" training pamphlet, mimeographed, with a total of 31 extensively illustrated pages. It was prepared only for use in the S.S.C. School, but the Commandant of that school has expressed willingness to send an individual copy to any organization down to battalions which has a real need for this book for reference purposes. Requests should be addressed, through channels, to: The Commandant, Southern Signal Corps School, Camp Murphy, Florida.

EQUIPMENT NOTES

SIGNAL CORPS BOARD

THE FOLLOWING DIRECTIVES WERE SENT TO THE SIGNAL CORPS BOARD:

Date	No.	Subject
1 May 1943	527	Test of Packboard, Plywood
12 May 1943	528	Service Test of Semi-Trailer, 6-Ton Gross, 2-wheel, Expansible Van.

THE FOLLOWING SIGNAL CORPS BOARD REPORTS HAVE BEEN APPROVED BY THE CHIEF SIGNAL OFFICER:

Signal Corps Board Case No. 503 - Development of Methods for Use of Cable Assembly CC-358.

Part B - Use of Plow (Plow, LC-61). Approved April 30, 1943.

Part C - Rapid Construction. Approved May 3, 1943.

Part D - Improved Construction. Approved May 11, 1943.

The Signal Corps Board was directed to supervise, coordinate and report on tests of techniques developed by the Bell Telephone Laboratories, Inc., for the efficient handling of Cable Assembly CC-358 (Spiral-Four Cable).

Part A of this report, dealing with the design and construction of the cable Plow LC-61, was approved by the Chief Signal Officer December 12, 1942, and was reported in the Technical Information Letter No. 15, February 1943.

The results of experience and research of the Bell Telephone Laboratories were embodied in a proposed technical manual which was checked against the construction by the 930th Signal Battalion of a 103-mile facility between Dunnellon and Keystone Army Air Fields in the vicinity of Gainesville, Florida.

The terrain was typical of the region, varying from flat to gently rolling, covered with scattered pine woods, interspersed with patches of pin oak and palmetto. The soil was fine limestone sand compacted in places to a soft stone.

Underground, surface and aerial types of installations were used in this line. Each was covered by a report of the Signal Corps Board.

Part B; Use of Plow: A section of the line, 30 miles in length, was buried by means of the Plow LC-61 and a 2½-ton, 6x6, O-Truck, Cargo, with winch. 10¼ miles of this section consisted of 2 cables laid simultaneously by the Plow 16" deep at an average rate of .54 miles per hour. The remainder of the section contained only 1 cable laid at the same depth at the average rate of 1.975 miles

per hour, with the expenditure of 39.54 man hours per mile. The recovery of the cable was accomplished by means of Plow LC-61 at the average rate of .89 miles per hour. This included the restoration of the ground surface after picking up the cable. 6 of the 152 one-fourth mile sections were injured in the process. Further development of the recovery device was considered necessary.

Part C; Rapid Construction, covers the check on the installation of approximately 73 miles of Cable Assembly CC-358 between Dunnellon Army Air Field and Grove Park, Florida. This line was laid on the ground with overhead or buried crossings where necessary. The line was installed and the route policed with a labor expenditure of approximately 14 man hours per mile. The final 25 percent of each portion assigned to a construction platoon was completed under blackout conditions. Observers estimated that a properly equipped and organized construction section should be able to install spiral-four cable at the rate of 3 miles per hour, using the methods employed in this test.

Part D; Improved Construction, relates to the aerial installation of 26.8 miles of Cable Assembly CC-358 on trees and poles fabricated of 2" x 4" lumber. Using inexperienced men, a construction platoon was able to advance the line at an average rate of 1½ miles per hour with a labor expenditure of 30 man hours per mile. As a result of the test, observers estimated that a fully trained and equipped construction platoon should be able to install the cable at the rate of 2½ miles per hour. Recovery of the cable was accomplished at the average rate of 1.08 miles per hour, with no evidence of damage to the cable.

The approved recommendations in this case are that:

1. The procurement of cable Plow LC-61 be continued to fill approved requirements;

2. Technical Manual 11-370, Cable Plow LC-61, be finally reviewed and edited with a view to publication and distribution at the earliest practicable date;

3. Signal Corps Ground Signal Service be directed to continue development of a recovery device for use with cable Plow LC-61;

4. Technical Manual 11-369, Spiral-Four Cable, be finally reviewed and edited with a view to publication and distribution;

5. Research and Development Division furnish Military Organization Branch, for inclusion in the Equipment Pool, a list of necessary hardware accessories and line materiel for the construction of spiral-four facilities, in order that the procurement, storage and issue of these items to appropriate Theaters of Operation may be initiated.

Signal Corps Board Case No. 507 (Final Report) - Investigation of Fault Location Equipment. Approved May 3, 1943.

The proper maintenance of line facilities used by the Signal Corps requires that faults be located and cleared promptly. The technique used for the location of distant line faults is highly developed in commercial telephone and telegraph practice. The application of the methods employed to Signal Corps field lines would, if practicable, result in fewer casualties and better service.

The Signal Corps Board was directed to study the available methods of fault location, to examine the available types of apparatus and to recommend the advisability of making changes in fault location equipment issued to Signal Troops.

The Board found that present standard fault location equipment in use on Signal Corps field lines is not abreast of the advancing art. A wire chief's set should provide for location of shorts, crosses and grounds. It should be capable of measuring low resistance and the direct measuring of insulation resistance. The instrument should be reasonably accurate in the location of opens. A lineman's test set should be capable of direct measurement of resistance and provide for the short range location of opens.

The Board examined and tested several types of equipment, including special development apparatus. It was found that no existent standard article was capable of the results obtained by the use of a modified Fault Location Test Set B-162599 manufactured by the Bell Telephone Laboratories, Inc. Minor external additions to Weston Voltohmmeter, Model 564, now provided for equipment tested, will adapt this instrument to line testing.

It is contemplated that a combination of these two instruments would replace Test Set EE-65, and that the modified voltohmmeter alone would be used by linemen in hunting down faults after the approximate location has been made by the use of the combination instrument in the hands of the wire chief. The approved recommendations in this case are as follows:

It is recommended that:

1. No further consideration be given at this time to the apparatus listed in the report for purposes of fault location in line facilities used by the Signal Corps;

2. Military Characteristics for Test Set I - (Combination Bridge for Line Testing) and Test Set I - (Voltohmmeter for Line Testing), substantially as set forth in the report, be adopted;

3. Action be initiated to:

a. Standardize Test Set I - (Combination Bridge for Line Testing) and Test Set I - (Voltohmmeter for Line Testing);

b. Submit production models of the equipments referred to in a. above for the approval of the Signal Corps Board before issue to troops;

c. Reclassify Test Set EE-65-( ) as: required type, adopted type, limited standard article;

4. The basis of issue for fault location equipment be reviewed, giving due consideration to the recommended new test equipment and the procurement problems involved;

5. Information on routine testing procedures, bridge methods of fault location, including opens, and the use of the voltohmmeter in line testing be included in the Wire Communication section of the current revision of Basic Field Manual 24-5, "Signal Communication";

6. Details of fault location, using such improved equipment as may be adopted, be included in appropriate technical manuals;

7. The action contemplated in subparagraphs 3., 4., 5., and 6. be given high priority in the Office of the Chief Signal Officer with the objective of procuring the improved equipment at the earliest practicable date;

8. Arrangements be made to assign to the Signal Corps Schools a high priority on the procurement of improved fault location equipment;

9. In the review of the basis of issue for fault location equipment by the Office of the Chief Signal Officer, consideration be given to:

a. The changes proposed in Parts List for Tool Set TE-56 (Cable Splicer), shown in the report;

b. The inclusion of the recommended fault location equipment in Parts Lists for Maintenance Equipments ME-11, ME-30, and other appropriate maintenance equipments, also Test Equipment IE-10.

Signal Corps Board Case No. 512 - Compass, Vehicular, Navigational. Approved April 30, 1943.

The Signal Corps Board was directed to make a study of the need for a vehicular, navigational compass in Signal Corps organizations and if a need for such equipment was found to exist, recommend a basis of issue.

The experience of troops on maneuvers and reports from active Theaters of Operation indicate that compasses are needed on trucks, tanks and other vehicles. The modern infiltration type of warfare places a great stress upon the ability of small units to operate in enemy territory. Night operations are frequent and every aid possible is required to enable the combat team to properly perform its mission.

The ordinary type of compass is unsatisfactory. It is not sufficiently

accurate. It is hard to read when carried in a moving vehicle and is affected too much by external influences such as the presence of metals in the vehicle. Special vehicular compasses, with provision for overcoming these faults, have been developed.

The Corps of Engineers has made a study of vehicular compasses and recommends two types for general military use:

1. A general purpose compass;
2. A navigational compass of greater accuracy for use on command cars or other vehicles where its greater accuracy is demanded and its greater cost justified.

The Pioneer Compass (navigational type) is much larger, harder to install and adjust, and difficult to keep in adjustment. It is also much more expensive than the Hull compass. This instrument is found to be accurate within 2° on cardinal and 5° on mid-cardinal points. It has internal illumination and by the use of luminous paint on the dial markings, has been made readable in the absence of any other source of light. It functions normally between 40° F. and 158° F.

It was recommended that:

1. The Ordnance Department be notified that the Signal Corps recommends installation of compasses, vehicular, general purpose, on all standard vehicles (1/4, 1/2, 3/4, 1 1/2, 2 1/2 tons, etc.) and on chassis supplied for special Signal Corps vehicles;

2. The Corps of Engineers be notified that the Signal Corps recommends that Military Characteristics for Compass, Vehicular, General Purpose, as proposed for adoption by the Corps of Engineers, be modified to require inter-cardinal compensation so as to obtain maximum practicable accuracy on both cardinal and inter-cardinal points.

Signal Corps Board Case No. 514 - Vehicles and Equipment for Cross Country Wire Laying. Approved May 11, 1943.

Various proposals have been received from Signal Corps units in the field relative to equipment and vehicles for cross-country wire laying. The Signal Corps Board was directed to study these proposals and the standard Signal Corps equipment used for a similar purpose. Recommendations or Military Characteristics for the most suitable types were requested.

The Board made a study of all available material on the subject, including reports from field units. Several types of proposed special equipment was inspected. Conferences were held with members of the Engineering Division, Holabird Motor Base, Holabird, Maryland.

As a result of this study, it was decided to eliminate all special vehicles due to difficulties in procurement, maintenance and replacement. The

following types of standard vehicles and Signal Corps wire-laying devices were tested:

Vehicles	Equipment
Cargo Truck, 2½ ton, 6x6	Reel Unit RL-26-A
Cargo Truck, 1½ ton, 4x4,& 6x6	Reel Unit Rl-26-B
Truck, ¼ ton, 4x4	Reel Unit RL-31
Weapon Carrier, 3/4 ton, 4x4	Reel Unit RL-37 (Wire Thrower)
Trailer Unit, ¾ ton, 2-wheel cargo	Axle RL-27-( )
Trailer Unit, ½ ton, 2-wheel cargo	

It was concluded that no military need exists for special types of vehicles for cross-country wire laying; that the standard Weapon Carrier, 3/4-ton, 4x4, with winch, is the most satisfactory vehicle when used over a wide variety of terrain; and that Reel Unit RL-26-B was the most satisfactory device for the laying of cross-country lines of field wire and cable. However, modification of Reel Unit RL-26-B is desirable in order to eliminate certain objectionable features.

The approved recommendations are that:

1. A copy of the report be forwarded to the Commanding Generals, Army Ground Forces and Army Air Forces, with the recommendation that consideration be given to revision of appropriate Tables of Organization and Tables of Equipment, using the report as a guide;

2. The Signal Corps Ground Signal Service be directed to improve Reel Unit RL-26-B in the following particulars and submit a development model for test to the Signal Corps Board:

a. A power plant capable of extended operation without the need for extensive maintenance.

b. Main and secondary clutches of longer life than those now used.

c. Reduction of vibration at reel spindle bearings.

3. An orderly procedure be established in the form of a training circular for routine mechanical inspection and periodic maintenance of wire laying equipment, in the manner now applicable to automotive equipment;

4. The text of Technical Manual 11-360, "Reel Units RL-26 and RL-26-A" (August 21, 1941) be revised to incorporate the RL-26-B, the inspection and maintenance procedure referred to in 3. above, a report form, and eventually, the proposed new power plant;

5. A field manual be prepared and published on the subject "Technique of Field Wire," having the purpose, scope and general contents outlined

in the report;

6. Instructions be prepared and disseminated to Signal Corps troops for improvising the proper wooden frame necessary for mounting the Reel Unit RL-26-B in the standard 3/4 ton, 4x4 with winch (Weapons Carrier).

Signal Corps Board Case No. 520 - Oil Burner Unit, Tent Stove, M-1941 (Experimental). Approved May 3, 1943.

The Signal Corps Board was directed to test Oil Burner Unit, Tent Stove, M-1941 (Experimental) to determine its suitability for heating tents and shelters in combat area where smoke is undesirable or in zones where gasoline or fuel oils are available.

The burner was installed in a Stove, Tent, M-1941 erected within a large wall tent (14'4" x 14'6" x 11'). Due to the lateness of the season, extreme winter tests could not be obtained but the results are considered representative of normal cold weather operation in the latitude of Fort Monmouth, New Jersey.

The oil burner unit was found to be well-designed and of good construction. Its operation is satisfactory and hazards from smoke, fumes and explosions are lacking when ordinary precautions are taken. The rate of fuel consumption is satisfactory.

The Signal Corps Board recommends that:

1. The Signal Corps representative on the Quartermaster Technical Committee be instructed to approve standardization of Oil Burner Unit, Tent Stove, M-1941 (Experimental) for use with Stove, Tent, M-1941;

2. Issue be made to Signal Corps organizations on basis of one each per Stove, Tent, Complete, M-1941 (when authorized by Commanding Officer);

3. Actual use of the burner be determined in the field as a command responsibility.

EQUIPMENT COORDINATION

MICROPHONE T-49

Military characteristics for Microphone T-49 were submitted to the Signal Corps Technical Committee, April 26, 1943. Microphone T-49 is a hand held microphone with a noise-cancelling unit, for use in high noise levels. It will be much lighter than other standard hand held microphones.

MESSAGE CENTER NUMBER SHEET

Concurrence has been obtained to adopt a new Message Center Number Sheet for use in place of War Department, Signal Corps, Form No. 159. The new sheet contains two columns of fifty numbers each in place of the four columns containing twenty-five numbers each on the old form. Additional headings have been provided and provision has been made for the date at the bottom as well as at the top of the form. It has been requested that necessary action be taken to obtain new number sheet on future procurement.

MASK, GAS, DIAPHRAGM

The Chief Signal Officer concurred in the recommendation of the Chief of Chemical Warfare Service pursuant to discontinuing the Mask, Gas, Diaphragm as an item of issue.

CIPHER DEVICE M-94

The Signal Corps Technical Committee on May 3, 1943, recommended that Cipher Device M-94 be reclassified from Standard to Limited Standard. This Cipher Device is being replaced by Converter M-209.

HYDROGEN GENERATOR ML-185

Hydrogen Generator ML-185 has been authorized for issue on the basis of one per Meteorological Observation Set SCM-12. Necessary action has been initiated to delete hydrogen cylinders and hydrogen now included in the parts list of this item.

RADIO SETS SCR-293-( ) and SCR-294-( )

Recommendations for the reclassification of Radio Sets SCR-293-( ) and SCR-294-( ) from Standard to Limited Standard were presented to the Signal Corps Technical Committee. These sets are commercial police frequency-modulated radio sets adapted to meet the need of the Armored Force, and were procured as stop-gap equipment. Radio Set SCR-293 includes a combination transmitter-receiver and a separate receiver. Radio Set SCR-294 has a receiver

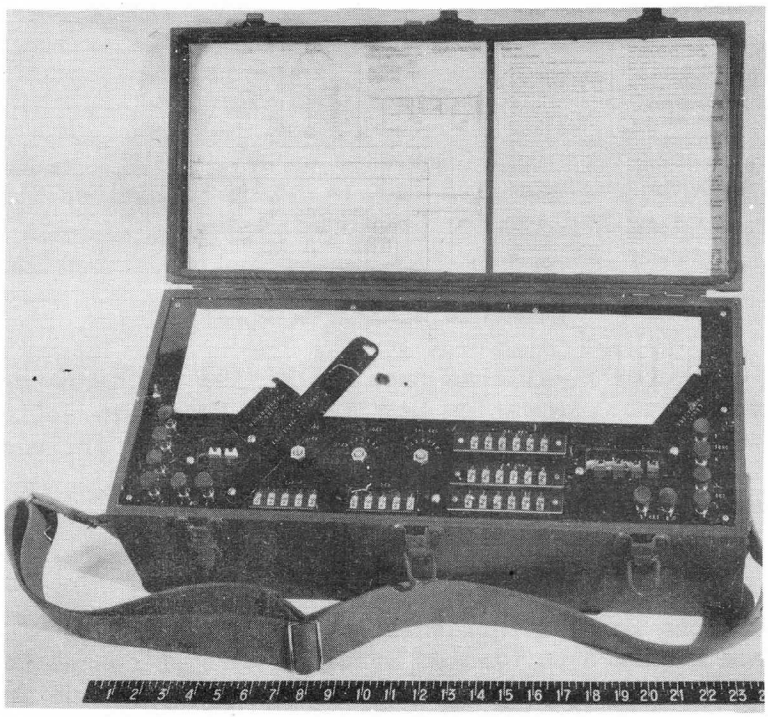
only. The military need for these sets is now fulfilled by Radio Sets SCR-508, SCR-528, and SCR-538.

RADIO SETS SCR-175 and SCR-176

Recommendations for the reclassification from Limited Standard to Obsolete of Radio Sets SCR-175 and SCR-176 were presented to the Signal Corps Technical Committee. Radio Set SCR-175 is a high speed recording equipment with a frequency range from 15 kc. to 25,000 kc. for operation from 110-Volts 25 Cycle power source. Radio Set SCR-176 is a similar set for operation from 110-Volts 60 Cycle power source. Replacement tubes are no longer available for these sets and the sets do not appear on Tables for issue at the present time. These sets were classified as Limited Standard by The Adjutant General on February 11, 1938.

TWO WIRE OPERATION OF FIELD CARRIER EQUIPMENT

Carrier Hybrid CF-7-( ) has been developed for providing operation of the field carrier equipment on a two wire basis. One Carrier Hybrid CF-7-( ) is needed with each Telephone Terminal Set TC-21-( ) (Carrier) and two with each Repeater Set TC-23-( ) (Carrier) which is to be operated on a two-wire basis. If a four wire spiral-four cable line is to be extended with a two-wire line, only one Carrier Hybrid CF-7-( ) is needed with the Carrier Repeater at the junction point.



CARRIER HYBRID CF-7-( )

The equipment uses the principle of hybrid balance for separating the two directions of transmission on the two-wire line. This balance is obtained by means of a universal network which can be adjusted by switches and strapping between screw terminals for any type of open wire line or one pair of a spiral four cable or field Wire W-143-T-5 or -6. Composite equipment is included to provide for d.c. operation on each conductor of an open wire pair. It is expected that all four voice channels or three voice and four telegraph channels of the field carrier equipment can readily be operated over a single pair of the rapid pole line construction for distances of sixty to seventy miles without intermediate repeaters. On larger wires or "all copper" wires, substantially greater distances are possible. The main use of this equipment is expected to be in making use of existing facilities or providing for rapid movement when it is necessary to use carrier systems operating over spiral four cable mixed with various types of open wire line construction. The equipment is relatively small in size and portable and requires no power supply. Its limitation depends upon the need for fairly uniform lines which can be balanced by the adjustable network. Also, it does not coordinate with other carrier systems on the same pole line. Procurement will be initiated in the near future but equipment is not expected to be available for several months.

WAVEMETER BC-150

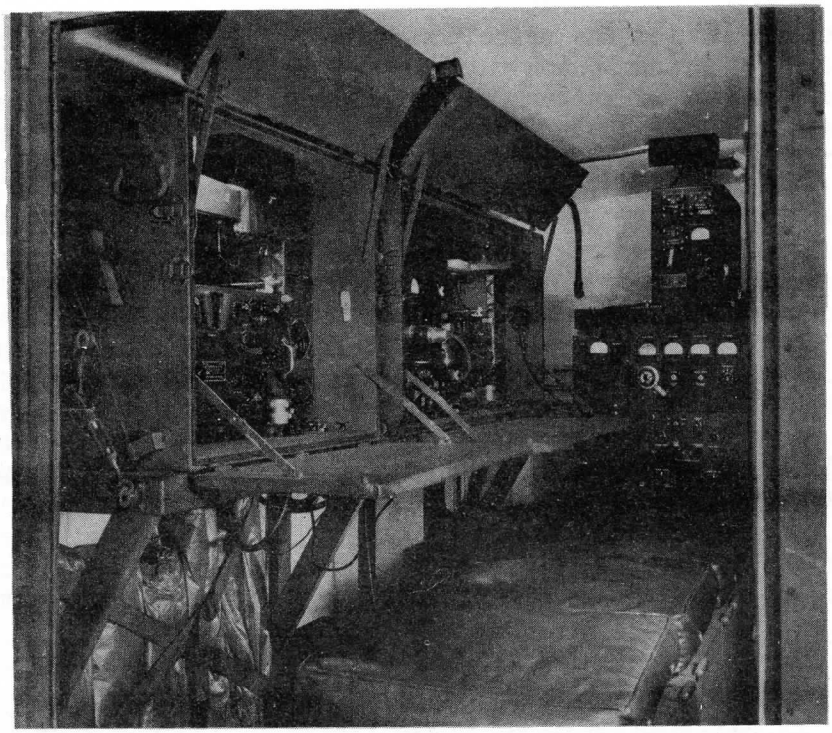
Recommendation for the reclassification from Limited Standard to Obsolete of Wavemeter BC-150 was presented to the Signal Corps Technical Committee. Wavemeter BC-150 is a commercial instrument procured for use with radio sets now classified as Limited Standard or Obsolete. The military requirement for the item is now fulfilled by Frequency Meter Set SCR-211. This item does not appear on Tables for Issue at the present time.

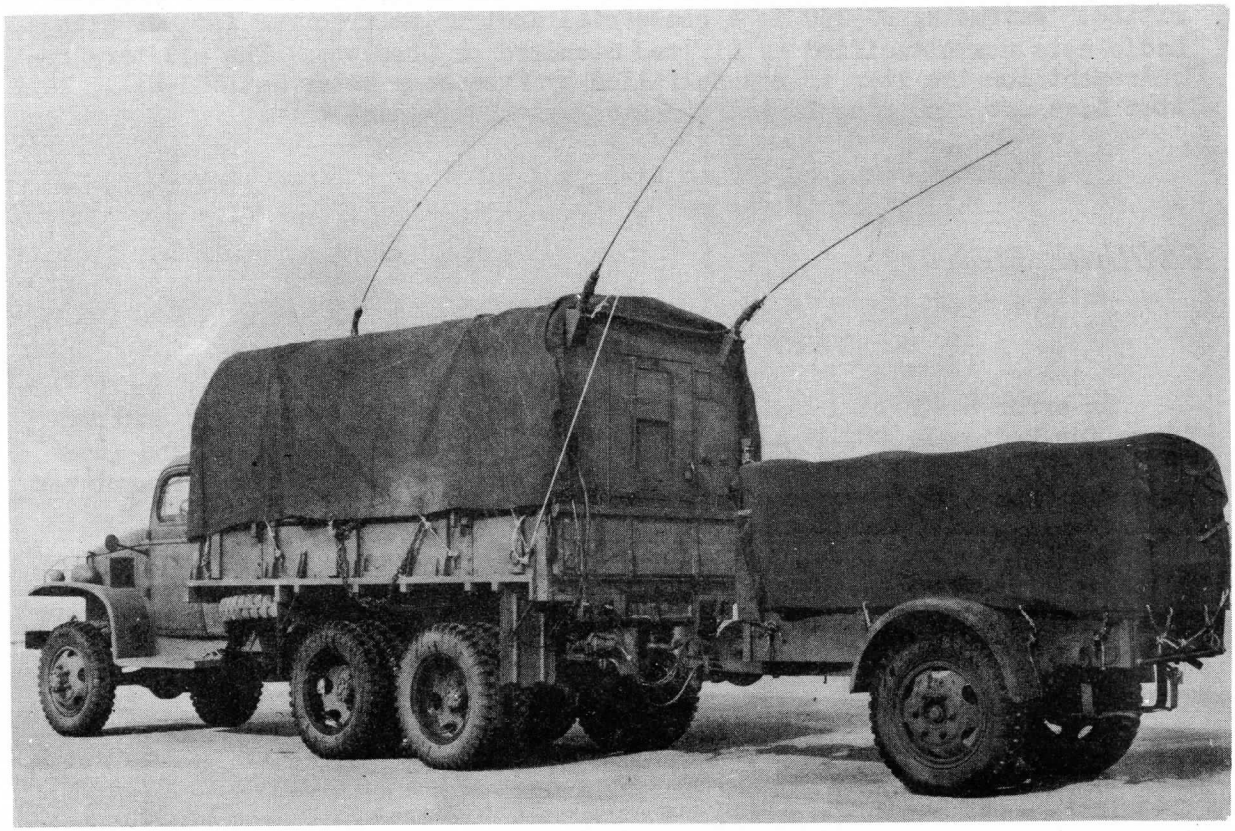
GROUND SIGNAL

CORRECTION NOTICE — SCR-299-C (BC-610-C)

An error has been found in Figure 21, Page 59, of Preliminary Instructions for Radio Set SCR-299-C on Orders 2659-CHI-42, 2660-CHI-42, and 4668-CHI-42. This figure is titled "Socket Voltage Diagram for Radio Transmitter BC-610-C, Front Edge of Modulator Chassis."

The lower left-hand corner of this illustration indicates incorrectly the voltages measured at the sockets for the two Tube VT-95 in the modulator unit. Pins #2 on both sockets should read <u>-7 volts d-c.</u> Pins #3 on both sockets should read <u>-380 volts d-c.</u>





RADIO SET SCR-399-A INSTALLED IN SHELTER HO-17-A

TYPE NUMBERS CHANGED TO SHOW INSTALLATION

To distinguish between various models of Radio Set SCR-299, additional nomenclatures have been set up. Their significance is:

Radio Set SCR-299. The components are mounted in a 1½-ton truck, which is part of the radio set;

Radio Set SCR-399. The components are mounted in Shelter HO-17 for transport in a 2½-ton truck. The truck will not be furnished as part of the radio set, but will be added to the T/BA of the using organization;

Radio Set SCR-499. The components are adapted for air transport by being mounted in specially designed chests.

MORE MATERIALS SAVED THROUGH SUBSTITUTIONS

The Materials and Pre-Service Tests Branch, Fort Monmouth Signal Laboratory, has announced further savings in critical materials through the substitution of other materials in certain equipments and components thereof. The results are presented in tabular form:

Material	Substituted for	Used in	Saving per 1000 units
Malleable iron	Brass	Spring retainers of Mast Base MP-14	7964 lb.
Malleable iron	Brass	Spring retainers of Mast Base MP-37	5929 lb.
Malleable iron	Brass	Bushing, extension, inner and outer spring retainers of Mast Base MP-47	8054 lb.
Malleable iron	Bronze	Socket retainer, insulator retainer and inner and outer spring retainers of Mast Base MP-48	8821 lb.
Steel	Brass	Washer, nut and screws of Mast Base MP-48	623 lb.
Malleable iron	Brass	Spring retainers of Mast Base MP-57	6029 lb.
Steel	Brass	Washers of Mast Base MP-75	86.4 lb.
Steel and Malleable iron	Brass & Bronze	Recommended in Microphone T-21-B	30800 lb.
Steel	Brass	Rods of Holder M-167	270 lb.
Steel	Brass	Binding Post TM-175	52.3 lb.
Masonite	Rolled steel	Plates of Holder M-167	2700 lb.
Ceramic	Mica	Capacitors of Radio Set SCR-506	216 lb.
Paper	Mica	Capacitors of Radio Set SCR-808	18 lb.
Malleable iron	Brass	Recommended in Telephone EE-8	31 lb.

BATTERY TESTING REQUIREMENTS

A table of testing requirements for all standard Signal Corps dry batteries was prepared by the Inspection Administration Branch, Fort Monmouth Signal Laboratory, for use in the depots. It is intended to facilitate the testing of batteries prior to issue in order to prevent the issue of deteriorated batteries.

WATERPROOFING RADIO SETS

Radio Set SCR-509-( ), SCR-510-( ), SCR-609-( ) and SCR-610-( ) are being made waterproof by the provision of additional sealing means for all openings therein. These improvements will be incorporated in all production models, the Inspection Administration Branch, Fort Monmouth Signal Laboratory, reports.

WIRE W-130-A GETS NEW INSULATION

Assault Wire W-130-A having vinylite insulation has been approved as a substitute for latex-insulated Wire W-130, and this substitution is planned for as large a part of future procurement orders as production facilities will permit, according to the Wire Branch, ESL. The reason for the change is not only that the use of vinylite makes possible a saving of rubber, but also because service tests have shown it to have greater resistance to abrasion, and to aging by sunlight.

NEW BULB PROVIDES BETTER PERFORMANCE

The Sound, Light and Heat Branch of Eatontown Signal Laboratory has made a comparison of the 0.06 ampere bulb recommended by the Signal Corps Board, and a 0.10 ampere bulb for use with Battery BA-30 in Flashlight TL-194. Indications are that useful light per battery, as measured in candlepower-hours, is approximately 50 percent greater for the 0.06 ampere bulb.

NEOPRENE FOR CABLE WC-548

Neoprene has been allocated in place of rubber in the jacket of Cable WC-548 in order to reduce rubber consumption. The new insulation is superior to rubber in its resistance to oil, abrasion, and aging by sunlight.

It is understood that enough neoprene will be available by August of this year to permit its substitution in the jackets of Cable WC-534 and WC-535 as well, the Wire Branch, Eatontown Signal Laboratory, reports.

NEW PLUGS RECEIVE NOMENCLATURE

Two new and more rugged plugs have received nomenclature. Plug PL-55-A is the more rugged version of Plug PL-55. Similarly, Plug PL-68-A is the same as Plug PL-68, except that it is more rugged.

MODIFICATIONS IN RADIO SETS

The following modification in Radio Set SCR-510 and SCR-610 is in progress: a mounting cable with a right-angle connector is being supplied with the power supply case.

The following accessories are being considered:

1. A protective shutter for the loudspeaker;
2. A carrier for field use.

These modifications and accessories are announced by the Inspection Administration Branch, Fort Monmouth Signal Laboratory.

NEW MOUNTING FOR SCR-511

Springs will replace the rubber cushions in Radio Set SCR-511-( ). Outside heat had been causing deterioration of the rubber, and the use of springs will obviate this trouble.

TUBE TESTING DATA

Information on testing Tube VT-182, VT-185, and VT-229 in Test Set I-56-A will soon be available to the field through customary channels.

Action is being taken to obtain and distribute adapters to make possible the testing of Tube VT-171, VT-172, VT-173 and VT-174 in Test Set I-56 and I-56-A.

EQUIPMENT BECOMES AVAILABLE

As production rolls faster more equipment is becoming available for immediate use. Some of the Items now coming through are:

Line Unit BE-77-A. Several hundred have been promised for May delivery and an even greater quantity for June, as a result of conferences between a Ground Signal Equipment Branch representative and prime and subcontractors. This unit is one of the controlling items on deliveries of Telegraph Printer Set EE-97.

Power Unit PE-77. Large quantities of newly designed gasoline engines with mechanical instead of air vane governors have been promised for May, with increasing shipments in June.

Telephone Central Office Set TC-1. A limited quantity of these equipments became available during April 1943.

Telephone Repeater EE-89-T3. A number of these items have been shipped to a port of embarkation. This equipment has now been standardized as Telephone Repeater EE-89-( ) (two-wire, voice frequency) and quantity procurement is being initiated.

CHANGES IN PARTS LISTS

The parts lists of the following apparatus have been revised to include all spare parts which are carried with the equipment:

Telephone Terminal Set TC-21-( ) (Carrier)
Telegraph Terminal Set TC-22-( ) (Carrier)
Repeater Set TC-23-( ) (Carrier)
Ringer Set TC-24-( ) (Double Circuit).

Also, Technical Manual TM-11-369 (Spiral Four Cable), Voltohmmeter I-166 and Junction Box JB-10 have been added to Telephone Terminal Set TC-21-( ) (Carrier) and Repeater Set TC-23-( ) (Carrier), the Wire Branch of ESL states.

FUNGUS GROWTHS

A critical problem affecting not only communications equipment but most army materiel used in hot, humid tropical climates is the rapid, mushrooming growth of fungus of which some 2,000 types attack and destroy equipments.

Fungus causes the rapid rotting of rubber, moleskin and felt covering; of leather and woven products. It decomposes jute, and is even responsible for the deterioration of iron and steel in tropical climates due to bacterial corrosion, an oxidation by the fungus micro-organism.

At the Fort Monmouth Signal Laboratory a spearhead of attack against this fungus growth is in progress in coordination with leading U. S. Mycologists. To study this problem, a wide number of fungus gardens are being used and cultures provided to grow many of the 2,000 existent fungi. Radio sets, telephone equipment, carrying bags, coils, cables and condensers are subjected to exposures in these gardens before and after treatment by a wide variety of fungicides and deterrants, while eliminating one or more species of fungus only cause others to thrive.

Due to close coordination with a number of leading U. S. Chemical Laboratories, development is progressing to a point where equipments, destined for service in a particular theater, will shortly be treated to resist micro-organism fungi in that theater.

PREFERRED CLASSIFIED VACUUM TUBES

MARCH 1, 1943

TO THOSE CONCERNED WITH THE DESIGN AND MANUFACTURE OF ARMY OR NAVY EQUIPMENT UTILIZING CLASSIFIED VACUUM TUBES:

1. The following Army-Navy Preferred List of Classified Vacuum Tubes sets up a group of classified tubes selected jointly by the Signal Corps and the Bureau of Ships. The purpose of this list is to effect an eventual reduction in the variety of tubes used in Service equipment.

2. IT IS MANDATORY THAT ALL CLASSIFIED TUBES TO BE USED IN ALL FUTURE DESIGNS OF NEW EQUIPMENTS UNDER THE JURISDICTION OF THE SIGNAL CORPS LABORATORIES OR THE RADIO AND SOUND BRANCH OF THE BUREAU OF SHIPS BE CHOSEN FROM THIS LIST. EXCEPTIONS TO THIS RULE ARE HEREINAFTER NOTED.

3. The term "new equipments", as mentioned in Paragraph 2 above, is taken to include:

   a. Equipments basically new in electrical design, with no similar prototypes.
   b. Equipments having a similar prototype but completely redesigned as to electrical characteristics.
   c. New test equipment for operational field use.

4. The term "new equipments", as mentioned in Paragraph 2 above, does not include:

   a. Equipments either basically new or redesigned, that are likely to be manufactured in very small quantity, such as laboratory measuring instruments.
   b. Equipments that are solely mechanical redesigns of existing prototypes.
   c. Equipments that are reorders without change of existing models.
   d. Equipments in the design stage before the effective date of adoption of this Preferred List.

   NOTE: The foregoing statements in Paragraphs 3 and 4 above are explanatory in nature and are not intended to be all-inclusive.

5. In the event that it is believed that a tube other than one of those included in this Preferred List should be used in the design of new equipments for either the Signal Corps or Navy, specific approval of the Service concerned must be obtained. Such approval, when Signal Corps equipment is concerned, is to be requested from the Signal Corps Laboratory concerned with such equipment; the said Laboratory will then make known its recommendations in the matter to the Office of the Chief Signal Officer where the final decision will be made and returned to the laboratory for transmittal to the party requesting the exception. When Navy equipment is concerned, the request for exception shall be addressed to the Bureau of Ships, Navy Department.

6. The publication of this list is in no way intended to hamper or restrict development work in the field of vacuum tubes or vacuum tube applications.

7. This list is to take effect immediately.

ARMY-NAVY PREFERRED LIST OF CLASSIFIED VACUUM TUBES

1N21	5R4GY*	371A*	708A
2AP1*	7BP7	434	714AY
2C26*	9EP1*	446A	715A
2J21 THRU 2J34	9EP7	447	718 AY, BY, CY, DY & EY
3BP1*	9GP7	471A	720 AY, BY, CY, DY & EY
3B24*	12DP7	530A (VT122)	721A
3DP1	15E	532	723A
3FP7	53A	532A	724A
4C27 (CV92)	73R*	700 A, B, C, & D	726A
5CP1*	VT127A	705A*	729A
5CP7	304TH*	706 AY, BY, CY, DY, EY, FY, & GY	8014A
5FP7	327A	707B	8020*

* Unclassified Tube; also listed on the unclassified Army-Navy Preferred List of Vacuum Tubes.

RESTRICTED

ARMY-NAVY VACUUM TUBE SECURITY CLASSIFICATION

APRIL 22, 1943

NOTE: This list supersedes the Signal Corps list of December 10, 1942, and the Radio and Sound Branch, Navy Department List of November 21, 1942, covering Security Classification of Vacuum Tubes.

To Those Concerned with the Use and Dissemination of Information Concerning Classified Vacuum Tubes:

1. The following list sets forth certain vacuum tubes used by the Radio Division, Bureau of Ships, Navy Department, and the Signal Corps, Army Service Forces, together with the security classification of same. The purpose of this list is to insure uniformity in the security classification of vacuum tubes and vacuum tube information used by the aforementioned Services.

2. THE OMISSION OF A TUBE FROM THIS LIST DOES NOT NECESSARILY INDICATE THAT THE TUBE IS UNCLASSIFIED.

3. Technical data and information concerning tubes under development, or already developed but not in production, which would be of great advantage to a foreign nation by virtue of:

a. Disclosure of wavelengths or operational frequency, or
b. Disclosure of novel design and constructional features, or
c. Disclosure as to application,

MUST BE CLASSIFIED AS SECRET.

4. a. All vacuum tube information which directly or indirectly reveals specific pulse modulation ratings must be classified as CONFIDENTIAL.

b. All vacuum tube information which directly or indirectly reveals specific operational frequencies in the ultra-high frequency spectrum must be classified as SECRET. Photographs or drawings of frequency-determining elements of tubes are included in this category.

5. Tubes for which technical data have been published and generally distributed prior to this date will not be classified in the future unless reasons of National Security necessitate such classification; in which event the recipients of this list will be notified.

6. The type number of a classified tube may be listed in an unclassified document when such listing does not disclose either wavelengths, basic principles, or technical details of the tube.

The following tubes are classified as "CONFIDENTIAL":

K-O Series	3CP1	REL-7	HY-145ZT	WL-442	WL-532,A	724A
J-1 Series	3CP1-S1	8B	VT-158	WL-443 Series	WL-538	725 Series
1B23(729A)	3DP1	9EP7	QF-196	446,A,B	GL-541(ZG-541)	726A,B,C
1N21	3DP1-S1	9FP1	QF-197	447	700 Series	728 Series
1N22	3FP7	9GP7	QF-200 Series	ZP-449	701A	729A
1P24(936,ZJ-516)	3HP7	9HP7	QF-202	GL-455	702A	730AY
D-2 Series	GA-4	9MP9	QF-206	464,A	706 Series	SA780
GY-2	4C27(CV92)	12DP7	QF-213	GL-471,A	707A,B	SA781 Series
2B24(QF-197)	GA-5	12HP7	QF-214	GL-484	708A	SA782 Series
2C27(QF-200C)	GA-5A	15E	QF-215	GL-485	709A	933
2C28(SA-780)	5CP7	REL-21	HK-227	GL-486	710A	936
2D29(SA-782B)	5D21	53A	227A	GL-488	714 Series	1636
2E27(QF-206)	5EP1	CU58	327A	ZG-489	715A,B	1860
2E28(HY-145ZT)	5EP7	VR78	417	ZJ-516	718 Series	1960
2E29(SA-781A)	5FP7	CV92	417A	WL-530	719A	WX-3074
2J21 Thru 2J34	5J21 Thru 5J25	100R	419,A	530A	720 Series	8011
2JB51	REL-5	100TS	421,AA	ZG-530	721A	8014A
2KB72	7BP7	VT-127,A	434,A	GL-531(ZG-531)	722A	8025
3BX	K-7 Series	HY-145YT	WL-441 Series	ZG-532	723A	8026

UNCLASSIFIED TUBES PREVIOUSLY CONSIDERED CLASSIFIED

C1B	5CP1	TS-70	304TH	451	717A	1630
2E22	5CP4	72R(RKR72)	313CC	HY615	727A	7193
C5B	5GP1	73R(RKR73)	316A	703A	732A	8012
3B24	6C21	100TH	326A	704A	829A	8013A
3FP1	9EP1	HY114B	371A	705A	832	8016
5BP1	15R	RX233	393A	713A	953B	8020
5BP4	EF50	274B	450TH	716A	1000UHF	8021

Chief of the Bureau of Ships,
Navy Department.

Office of the Chief Signal Officer,
Headquarters, Army Service Forces,
War Department.

AN EXAMPLE OF S.C. CONSERVATION EFFORTS

From a single day's production of any one factory, W-110-B Field Wire may be called upon to withstand the sub-zero temperatures of the arctic; it may be coated to the breaking point with ice or icicles in a more temperate climate; on the other hand, wax coatings and saturants if not properly selected and compounded may cook, boil, and ooze from the wire into the tepid mud and waters of a tropical jungle, or under a boiling sun, drip upon the hot sands of an equatorial desert.

Little wonder then that, faced with such drastic extremes of service, substandard wire production and rejections are as old as the industry itself.

Field Wire is a highly engineered and specialized product. The disposal of such which does not meet every last requirement of an exacting specification is a problem. You can't afford to feed critical copper, tin, and rubber to the scrap furnace. Reclamation is costly as well as totally destructive of all labor, facilities, and transportation wrought in its production. Its dollar value in the scrap market, even today, does not pay the costs of carting it away from the wire mill. The salvage of the rubber, the waxes, the separation of the fine strands of copper and steel wire fabricated into the product presents a difficult matter. The reclamations of the tin and the zinc coatings require many complicated and highly expensive processes.

What to do with substandard W-110-B Field Wire is a typical example of an ever recurring series of problems currently presented to the Conservation Section of the Resources Branch, OCSigO.

Report recently reached that Section that there were 6,135 miles of substandard wire on hand in various factories. A vast quantity of critical copper and steel wire stood on the brink of the melting pots for scrap metal. These were wrapped securely in a coating made with virgin crude rubber. What could the Conservation Section do -- and do with dispatch -- to avail the war effort of every useful efficiency of substandard W-110-B?

Studies were made to ascertain its every military as well as commercial use and value. These involved determinations with respect to each feature in which it failed to meet unlimited field requirements as well as possible use in its existent form.

As a result of these studies, 1,500 miles will now go into Signal Corps Training, some to replace specification wire now on hand in depots. As a further result and as this letter goes to press, information is at hand that the Army Ground Training Units will take 5,000 miles off the hands of Signal Corps Suppliers. 1187.5 miles went into commercial use as duct, drop and distributing wire, where the commercial telephone services are to be installed "for the duration." In this manner a total of 7,687.5 miles of substandard field wire will be put to work in performing its highest function in the war economy, the 6,135 miles now on hand in factories plus additional amounts gradually accumulating there.

CLOSER CONTROL OF RECURRING REPORTS

Unnecessary Recurring Reports

For some time, the Control Division, OCSigO, has been concerned over the increasing burden being placed upon the operating offices, installations, and agencies under the jurisdiction of the Chief Signal Officer, in preparing recurring reports. A year ago it started to eliminate reports which upon investigation were found to be unnecessary.

More than 100 Reports Eliminated

Investigation and studies of recurring reports revealed that many reports, some of them elaborate, were being prepared which were no longer required by the offices originating the requests and were no longer useful to those offices which had requested that their names be placed on the distribution list. It was also found that many similar or duplicating reports were being prepared which could be combined or eliminated. A substantial correction of this situation has been made by the Control Division through effecting a cancellation of many of the original directives and requests for recurring reports. To date, more than one hundred such reports have been eliminated.

Requests for Recurring Reports to be Supervised

In order to effectively control and coordinate the need for existing recurring reports, and the requests for new reports, there is being established a procedure whereby Control Approval Symbols will be placed on the upper right-hand corner of the front cover or first page of each recurring report to identify the office, agency or installation requesting the report. The departmental office or installation, under the control of the Chief Signal Officer, which prepares an existing recurring report will identify the originator of the report by placing the appropriate identification symbol on the report. Requests for recurring reports from agencies of the War Department other than departmental offices or installations under the control of the Chief Signal Officer will be forwarded through the Control Division, OCSigO, to the Control Division, Headquarters, Army Service Forces, for assignment of Control Approval Symbols. The only exceptions to the foregoing procedure will be with respect to those existing recurring reports which are required by Army Regulations or by directives from authority higher than the Commanding General, Army Service Forces, or agencies outside his jurisdiction; and for those reports which are initiated, prepared, and distributed only within a departmental office (branch) or within a field installation.

When the foregoing procedure has been placed into effect, it is believed that there will be disclosed additional unnecessary existing recurring reports which can be eliminated. The procedure will also enable Control Division to exercise a more effective supervision over the creation of additional recurring reports and to prevent or eliminate duplicating reports.

LITHIUM HYDRIDE AIDS SEA RESCUE

When the Signal Corps standardized Radio Set SCR-578-A as an emergency sea rescue radio equipment for use by the Air Forces, it was necessary to establish a source of supply for hydrogen generators. These generators are employed to inflate a balloon which raises the 300-foot antenna in those conditions where the wind is insufficient to give stable operation with the antenna lifting kite.

When this equipment was under development at the Aircraft Radio Laboratory, Wright Field, Dayton, Ohio, consideration was given to the utilization of compressed hydrogen in steel cylinders as well as the employment of ferro-silicon and caustic soda mixture, calcium hydride, or lithium hydride for the generation of hydrogen. The compressed gas in steel cylinders possibility was eliminated due to the hazard of explosion when the high pressure tank was hit by enemy fire. The ferro-silicon and caustic soda mixtures were eliminated due to the violent reactions involved with the danger of malfunctioning or explosion. As between the two remaining possibilities, the use of calcium hydride in a canister requires approximately three times the volume of lithium hydride, and although the generation of calcium hydride is more rapid, the more violent reaction and the nonavailability of processing capacity resulted in the standardization of a hydrogen generator employing lithium hydride.

Lithium hydride is capable of generating approximately 45 cubic feet of hydrogen per pound when reacting with water, and its yield of hydrogen is approximately twice the amount of hydrogen initially required for the formation of hydride. For equal volumes of hydrogen, the weight ratio of lithium hydride to compressed hydrogen in steel cylinders is approximately 40 to 1 in favor of lithium hydride. Similarly, the ferro-silicon caustic soda mixtures utilized in some hydrogen generators has a set ratio of at least 10 to 1 in favor of the lithium hydride.

At the time Radio Set SCR-578-A was standardized by the Signal Corps in the early part of 1942, there was only one source for the production of lithium metal in the United States and no existing facilities available for processing this metal into lithium hydride. This processing involves the production of spodumene concentrate from ore currently mined in the Dakotas, the conversion of this concentrate into lithium chloride, its transfer into lithium metal by electrolysis, and finally the change from lithium metal to lithium hydride under hydrogen pressure in an electric furnace.

Since the SCR-578-A facilitates the rescue of trained pilots in the case of emergency landing at sea, it was desirable that as many of these equipments as possible be produced and supplied to the Air Forces. In view of the critical nature of the equipment, and the hydrogen generators which are the restricting item, the Signal Corps sponsored a government-financed expansion of one firm for the manufacture of lithium metal, its conversion into lithium hydride, and the assembly of the complete generators, M-315-A. Subsequent to this initial expansion action, the Signal Corps has sponsored a self-financed expansion of the original lithium metal producer in order to provide a second

source having adequate capacity to meet the requirements. The establishment of this expanded capacity involving unique processing procedures has had effects on the chain of supply clear down to the mines supplying the basic ore.

Due to the increased procurement of hydrogen generators for Radio Set SCR-578-A, and the possible employment of this class of equipment for other uses, such as meteorological, cognizance is taken of the limited supply of lithium hydride. Consideration has been given the use of calcium hydride in lieu of the lithium products, even though its use adds approximately 3 lbs. to the weight of the generator. However, due to the advantages of lithium hydride, every effort is being made to increase the capacity of the current normal supply and the early obtainment of production from the second source, in order that production from these two sources may be increased to adequately meet the projected requirements.

RADIO SETS IN SOUTH PACIFIC AREA

The following are comments on equipment gleaned from the reports coming out of the South Pacific area:

RADIO SETS

Infantry Sergeant in Guadalcanal asks: "Are we getting more small hand radios? Man, they're sure needed for communication within the company and within the battalion..."

* * * * *

When one officer visited Guadalcanal, his impression and consensus of opinion by all concerned was that "for jungle warfare valuable radio sets are the two-man hand generator sets (SCR-284), the Cavalry Guidon Set (SCR-511), and the small 'walkie-talkie' (SCR-536). Some of the others are less useful in the jungle because of the heavy underbrush and foliage. The Infantry wanted to increase by 100 percent the number of hand generators, guidon and hand walkie-talkie sets."

The vehicular sets (SCR-245 and SCR-193) and the long-range headquarters set (SCR-299) are working out as expected. The headquarters set, of course, is too powerful for ground force use in island warfare -- the vehicular set (SCR-193) and ground set (SCR-177) meet all needs so far. But the headquarters sets have come in exceedingly handy in local administrative and airways circuits and as fighter-directors.

MILITARY TRAINING

ADVANCED TRAINING COURSE FOR OFFICERS

The many-sided program for instruction of Signal Corps officers now being conducted at Fort Monmouth includes an advanced training course for selected officers, which has as its objective the training of officers to qualify as commanders of tactical signal battalions, and as signal officers of tactical Ground Force and Air Force units.

Although much of the material studied in the earlier phases of this twelve-week course might be regarded as basic, the time devoted to these subjects is so limited that an officer without sufficient background would experience considerable difficulty in completing the required work. A few of the subjects covered in this preliminary training are military maps, including those of foreign countries, interpretation of aerial photographs, development of field signal orders, supply and repair of signal equipment, and capabilities and limitations of the means of signal communication. Considerable time is spent on the organization of the armed forces and on the tactical application of signal communication to the various organizations considered. Liaison officers from the Infantry, Field Artillery, Air Force, and Marine Corps present the particular problems that confront each of their various units under different operational conditions. After discussion of the principles of the tactical application of signal communication, the officer is required to demonstrate his ability to apply these principles by practical map exercises.

During the latter part of the course, the officer is confronted with the major problems of signal communication for Ground and Air Force units. These problems test the officer's knowledge of the correct tactical application of signal communication to various situations, and also his ability to coordinate the signal officer's functions with those of various members of the General Staff and the Special Staff. In addition, the officer must demonstrate that he is capable of issuing the proper orders to signal unit commanders serving the command. The Ground Force exercises require the officer to apply signal communication to an Infantry Division in all phases of its operations, an Armored Division in offensive and pursuit operations, a Motorized Infantry Division during a march and preparation for attack, a Corps concentrating, and a Corps in attack. Other problems include coordination of air-support signal communication with a Corps; signal communication for a reinforced Corps; signal communication for an Army concentrating, in advance, and in combat with air support; and signal communication for the communication zone.

Study of the communication requirements of the Air Force comprises a detailed consideration of communications in the various commands. The first phase of this work consists of a problem employing the Air Support Command. In this problem, student officers are required to make their recommendations, as signal officers of the Air Support Command, for the proper employment and coordination of communication during the movement of the Air Support Command,

during a period of concentration, and during actual combat when in support of a ground force. The next phase deals with the Air Service Command, the Signal Corps units serving with this command, and the communication and supply requirements for typical service command installations. The principal problem which confronts the officer is the establishment of signal communication for the air defense of an area. This involves the recommendations from the officer, acting in capacity of signal officer of a Fighter Command, for the location of radar installations and for the provision of wire and radio communication for the Fighter Command. As the class progresses through these various stages, discussions are held in which each officer is given ample opportunity to bring before the group any ideas he may have pertaining to the subject in question. At the completion of this phase, the officer is assumed to be the signal officer of the Air Force, and as such must recommend the establishment of a wire system to serve the Bomber Command, the Service Command, and the Fighter Command, and, in addition, prepare such traffic and circuit diagrams as would be necessary for a complete understanding of the proposed system. Once the wire phase is completed, the radio phase is considered, and the officer is required to recommend the establishment of nets for the Air Force and to prepare the radio frequency assignments for these nets.

In addition, a study of the capabilities and limitations of the various types of wire and radio equipment is carried on. Conferences and demonstrations are so interspersed with the other subjects that the officer receives instruction concerning equipment that he will be employing theoretically in the solution of his map exercises and problems.

Because of the advanced nature of this course, officers usually are not selected unless they have completed the General Subjects Course and at least one of the Officers' Specialist Courses of the Officers' School with a grade of at least "Very Satisfactory," and have demonstrated fitness for higher command responsibilities. An officer who lacks the aforementioned qualifications, but has sufficient technical background and ability, together with adequate field experience and readiness to assume the responsibilities of higher command, may also be considered eligible to attend this course. Quotas for the Army Ground Forces and the Army Air Forces are established by the Chief Signal Officer and published periodically.

COURSE IN REPEATER AND CARRIER EQUIPMENT

Prior to 1941, the Signal Corps used commercial communication schools, such as those provided by the American Telephone and Telegraph Company and by Associated Bell System Companies, to train repeatermen and personnel for carrier equipment maintenance. These Bell System Schools still furnish their assigned quotas of specialists.

As large-scale maneuvers were held throughout the Army, it became clear that wire communication facilities, within the fields of operation, would have to be improved, as regards range of transmission, message load capacity, and

quality of service rendered. Telephone repeater and carrier equipment essential to meet these expanded requirements was already on priority production schedules. There remained the problem of training enlisted personnel in sufficient numbers.

The problem was solved by the establishment of a subcourse on repeater and carrier equipment maintenance within the Wire Division, Enlisted School, Eastern Signal Corps School. The purpose of the subcourse is to train enlisted personnel for the job of lining-up, operating, and maintaining long telephone circuits. As a preliminary to carrying out this program, it was necessary to include basic related subjects, such as the fundamentals of telephone transmission lines, the use of telegraph composite sets and composite ringers, vacuum tube principles, filters and artificial lines. This was followed by specific application of principles to the repeater and carrier equipment, culminating in circuit line-up and maintenance procedures, and their application to the field carrier equipment.

During the interval required to obtain the equipment, the course was organized, and non-commissioned-officer instructors with some experience in long-lines equipment were sent to Bell System Schools to acquire the appropriate background. Lessons and sets of data were drawn up to cover the basic equipment to be utilized in the course (that is, the H-1 type carrier system, and the V-1 (2-wire) telephone repeater). Laboratory breadboards, mock-ups, and necessary visual and training aids were also developed. When the H-1 carrier terminal and intermediate equipment and the V-1 telephone repeater were received, students assisted in assembling and installing the units for use. Arrangements were made with the Officers' School to use the field carrier equipment (CF-1 and CF-3, carrier telephone and repeater equipment; CF-2, carrier telegraph equipment; and EE-100, voice frequency ringing equipment) which was being employed for the instruction of officer students.

The enlisted personnel for this subcourse is selected on the basis of previous civilian experience with communication equipment, or is chosen from other Enlisted School courses which involve basic understanding of telephone inside plant equipment and maintenance procedure.

The enormous growth in student load has necessitated an additional H-1 carrier system and additional V-1 repeater units. Also, the original subcourse has been augmented by maintenance instruction on facsimile equipment (FX-1A), on field type Telephone Repeater EE-99, used in 4-wire circuits composed of standard W-110-B field wire, and on Telephone Repeater EE-89-( ) (2-wire).

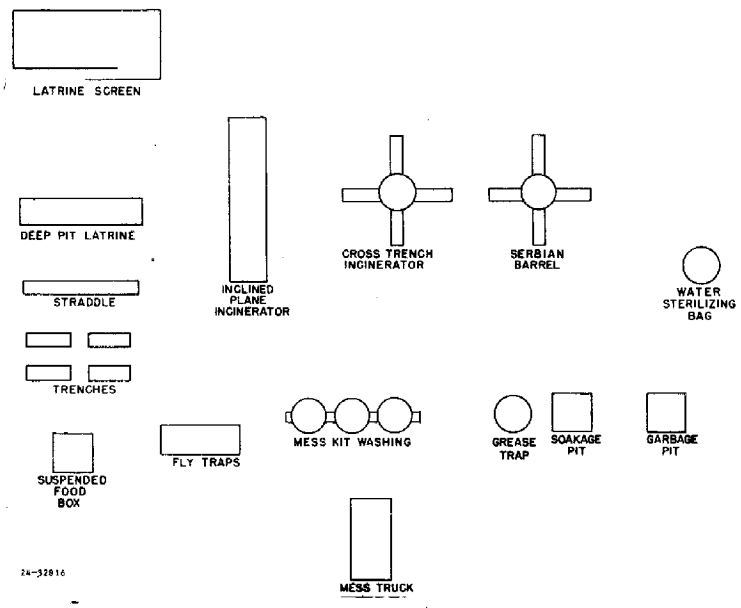
Throughout the subcourse, it has been found essential to teach correct use of the equipment in the field. In the future, therefore, instruction will include field trips, in which the field type carrier systems will be used with spiral-four cable, involving displacement of telephone centrals. Experience has shown, also, that it is advisable for the students to be grounded in certain fundamentals of teletypewriter maintenance, so that they will understand the principles involved in connecting teletypewriter circuits through the carrier telegraph terminal equipment (CF-2-A).

The course utilizes the standard Enlisted School methods of instruction, including lesson study, lecture, demonstration, laboratory exercises, critique, quiz, and when required, a review of an entire lesson. The student must be familiar with all of the information involved, up to a certain point, before he is permitted to progress further.

To increase further the number of trained repeatermen (SSN 187) available, the repeater and carrier equipment maintenance subcourse is also being taught at the Central Signal Corps School and Western Signal Corps School by instructor personnel who have had some training at the Enlisted School, Eastern Signal Corps School.

SANITATION AND MESS FIELD EQUIPMENT DEMONSTRATED AT OCS

In line with its policy of combining classroom instruction with practical field work, the Officer Candidate School, Fort Monmouth, has added a demonstration area on field sanitation and mess management. The layout is illustrated herewith.



FIELD SANITATION AND MESS MANAGEMENT DEMONSTRATION AREA AT FT. MONMOUTH OCS.

Small groups of candidates are conducted through the area by an instructor, who explains each display and answers questions presented by the candidates.

The items in the display include the following: straddle trench latrines; deep pit latrine with urinal; latrine screen; inclined plane incinerator; Serbian barrel; water sterilizing (Lister) bag; garbage pit (closed and marked); soakage pit; grease trap; mess kit washing; mess truck; gasoline field range M-1937; fly traps; and suspended food box.

AID FOR ALIGNMENT OF CRYSTAL FILTER

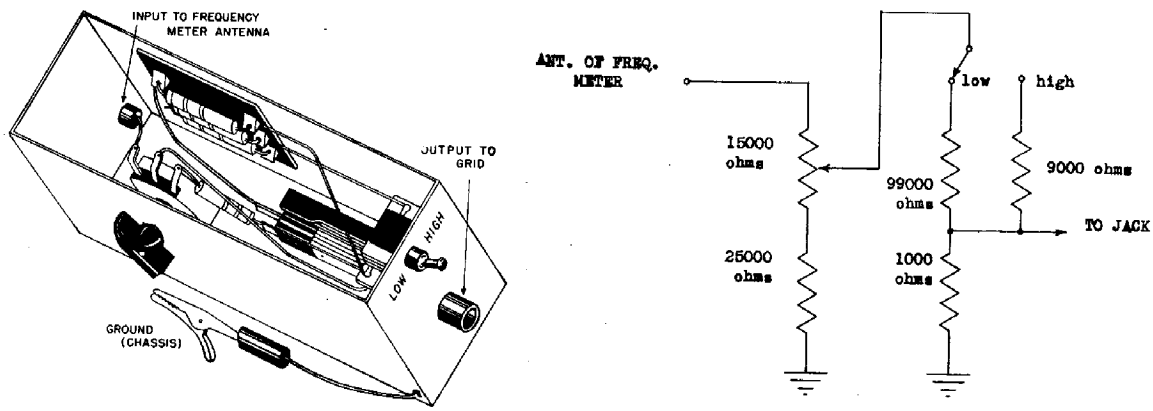
The Radio Division of the Air Corps Communication Course at the Enlisted School, Eastern Signal Corps School, Fort Monmouth, New Jersey, has adopted a new aid for the alignment of the crystal filter in Signal Corps Receivers, particularly Radio Receivers BC-224-( ) and BC-348-( ). The need for such a device arose from the fact that available signal generators do not have vernier scales calibrated with sufficient accuracy for this alignment.

Frequency Meter BC-221-( ), on the other hand, is calibrated with sufficient accuracy and is otherwise suitable for use as a signal source except for provision of attenuation of known ratios. It is this latter function that is supplied by the device described here.

The attenuator, as shown in the accompanying drawing, consists of four fixed resistors, one potentiometer, one output jack, and one single-pole double-throw switch, all mounted in a shielded case, which is designed to fit on top of the Frequency Meter BC-221-( ) and connect directly to its antenna terminal. The circuit and values are shown on the accompanying diagram.

When the crystal filter is checked, the receiver must be on A.V.C. with a 0-200 d-c microammeter in series with the second detector diode and the volume control. A 915-kc signal (I-F frequency) is fed through the attenuator and a .1-mfd capacitor to the first detector grid. A shielded lead must be used between the output of the attenuator and the grid. With the switch set to "low," the potentiometer is adjusted until the meter reads 100 microamperes. Then the switch is set for "high" and the frequency meter is tuned 900 cycles above resonance. The compensating capacitor in the crystal bridge circuit is adjusted until the meter again reads 100 microamperes. This corresponds to a sensitivity 20 decibels lower than that at the I-F frequency, since the output ratio of the attenuator is 10 to 1.

The crystal band width is then measured by recording the frequencies at which the meter reads 100 microamperes, the band-width being the difference between these two frequencies.



CRYSTAL FILTER ALIGNMENT ATTENUATOR

RESTRICTED

ADVANCES IN INSTRUCTIONAL LITERATURE

Possibly the most important key to the operation of Signal Corps equipments is the instructional literature which accompanies these equipments to guide troops in efficient operation of these sets. So important is this function that its best use has been the subject of intensive study and research which has resulted in interesting changes in instructional approaches.

The first point of analytical attack was a searching survey of a typical cross-section of ten thousand troops. Polled were ranks from colonel to private who were asked a number of questions: Exactly where could our Signal Corps instructional literature be improved? What was needed more, what less? What about language, illustrations, cartoons? In short, what was needed to streamline and tailor our literature to fit the needs of 1943.

Received and tabulated by the Instruction Book Section of the Fort Monmouth Signal Laboratory, which initiated the survey, returns from the poll show a striking trend: Our army is calling for different literature than was used in World War I. It wants, instead of the technically heavy and long-worded army literature of the last decade, simple, plain-talking language stated in typical every-day terms. It wants more illustration, visual aids, overwhelmingly cartoons to nail operational faults. If slang, sports parallels or catch-phrases put over a point, our troops ask by all means that these be used.

Because the usefulness of instructional literature is predicated upon having it read and remembered, our literature is now beginning to follow findings of this poll. The changes are carefully studied as to effect.

Major operating troubles, stemming from misuse of equipments, are being lampooned by a series of appropriate cartoons, strategically placed in books. Soldiers, who have been rendering portable radio sets inoperative by carrying them by their battery cable, for example, find themselves aptly cartooned; likewise those who sleep instead of listening for weaker and long distance signals, or spill gas on a hot, engine-powered generator.

A number of books containing these new techniques are now in the field and the results have been immediate.

The language is also far different. What in World War I onwards used to read "operating personnel should exercise caution lest the fault hereinafter described should occur ---," now reads: "Don't do it or there'll be hell to pay!"

FOREIGN LANGUAGE CLASSES AT KOHLER

Classes in Spanish, French, Russian, and German have been started on the post and are open to Camp Kohler men and their families. Two basic and one advanced class are being held in Spanish, while only basic studies will be taken up in the other classes. Besides textbooks, phonograph records have

been obtained from the Special Service Division of the Army Service Forces to aid in learning pronunciations.

BASIC EXAMS TEST COMBAT KNOWLEDGE

The Eastern Signal Corps Replacement Training Center is taking no chances on basic trainees forgetting the lessons they learn in the basic school at Camp Edison. Every week, during their four-week course, they must undergo an examination in the subjects taught. At the end of the third week, the test is a two-hour written examination designed to ascertain whether the basic has absorbed properly the teachings of his instructors. At the end of the 1st, 2d and 4th weeks, the basic must show by performance what he has learned.

The Plans and Training Section at Camp Wood supervises the tests. Considerable care has been taken in standardizing the tests in order that the results from each unit in basic training can be readily compared. This also provides a check on the relative efficiency of the instructors. It is a fertile source also of intra-company rivalry.

The tests are vital in the training program of basics, as the difference between life and death springs from knowledge gleaned in the short basic period of Camp Edison. Basic trainees at Edison are fresh from civilian life, and the transformation to a rigorous routine of military activity must be accomplished quickly if the new soldier is to become an asset to the Army and the Signal Corps rather than a liability.

The tests at the end of each week's schooling determine whether a soldier has absorbed this new knowledge which is to most of them entirely foreign to any training they have received in civilian life. This basic knowledge that every soldier must possess is no longer tossed at these embryo fighters and killers with the hope that they will catch it. The element of chance is eliminated by the periodic tests, and if these reveal that a soldier is missing the boat, he stays around until his feet are firmly planted on the deck.

The results of the test are computed automatically upon an electric scorer far more accurately and consuming far less time than if scored by hand. The signalman of today is not the result of a hit-or-miss program of training. He is sent into the field as a technician to "Get the Message Through" with the dispatch of a fighter trained in the hard school of the Infantry soldier and prepared for all the sly tricks of wily veteran enemies. He gets his lessons fast, but he gets them complete, and the tests make sure that he gets them!

PUBLICATIONS

The following new manuals of interest to the Signal Corps have been published and may be obtained through regular Adjutant General Channels:

TM 11-307, Signal Generator I-72-G and I-72-H, March 16, 1943;
TM 11-859, Radio Set SCR-593-A, March 2, 1943;
TM 11-313, Allen Model E-2 Unitron Rectifier, March 8, 1943;
C1, TM 11-333, Telephone EE-8-A and EE-8, April 2, 1943;
FM 24-10, Combined Radiotelegraph (W/T) Procedure, January 20, 1943;
FM 24-6, Radio Operator's Manual, Army Ground Forces, April 12, 1943;
FM 24-12, Extract of Combined Operating Signals, April 5, 1943.

TRAINING FILMS

The latest unrestricted Signal Corps training films to be approved for release include:

TF 11-1069 Pole Line Construction, Part IV - Fundamentals of Guying;
TF 11-1070 Pole Line Construction, Part V - Installation of Anchors;
TF 11-1071 Pole Line Construction, Part VI - Installation of Guys.

The above films complete the Pole Line Construction series of seven training films. Part IV, Fundamentals of Guying, gives the principles and considerations involved in guying poles. Part V, Installation of Anchors, illustrates anchoring, showing the installation of log type and expanding plate anchors. Part VI, Installation of Guys, gives specific examples of using guys and of meeting and solving particular cases where poles must be guyed in the field.

The photography and the narration in this series convey the information in a clear, forceful manner. These training films will be very useful in the second week of the specialist phase of training of Mobilization Training Programs MTP 11-1, MTP 11-2 and MTP 11-3.

The newest series of unrestricted film strips to be released are those dealing with Radio Sets SCR-608 and SCR-628. The titles of these films are as follows:

FS 11-9 Radio Sets SCR-608 and SCR 628, Part I - Introduction;
FS 11-10 Radio Sets SCR-608 and SCR-628, Part II - Installation;
FS 11-11 Radio Sets SCR-608 and SCR-628, Part III - Operation;
FS 11-12 Radio Sets SCR-608 and SCR-628, Part IV - Presetting Radio Transmitter BC-684;
FS 11-13 Radio Sets SCR-608 and SCR-628, Part V - Presetting Radio Receiver BC-683.

These film strips are to be used in the third week of the specialist phase of training in Mobilization Training Programs MTP 11-1 and MTP 11-2. Parts I, IV and V in the above list have supplementary notes, which will be distributed as Illustrated Instructors' References, with the film strip number in the upper right-hand corner.

FROM THE COMBAT ZONE

Lessons learned by troops in action should be utilized to the fullest degree in training programs. The following extracts from reports received from combat zone in the North African Theater are published for the information and guidance of all concerned:

1. "Discipline of radio nets has not reached sufficiently high standards."

2. "Operators insist upon too high a signal strength, causing unnecessary interference."

3. "Operators are not able to work constantly through moderate interference."

4. "The standard operating procedures do not sufficiently place the responsibility for rescuing telephones and small communications during retrograde movement during combat."

5. "Signal Corps units must be prepared to operate on radio exclusively during combat as wire installations may fail due to intensive aerial or artillery bombardment by the enemy."

6. "The test point-test station doctrine of maintenance of field wire systems under combat conditions has proved to be the only feasible doctrine.

7. "Divisions and corps (except armored) must not have telephone switchboard installations permanently mounted in trucks."

This information should be so used in the training stage that the deficiencies reported from the combat zones may be corrected.

SUBSCRIPTIONS TO MAGAZINES

To alleviate the burden placed on the overseas mail service resulting from forwarding publications, the practice of furnishing subscriptions to technical publications and periodicals such as Electronics, Radio, Telephony, and Telephone Engineer, to tactical organizations has been discontinued by the Chief Signal Officer.

CORRECTION

In an article entitled "Aerial Tram Constructed as Field Problem" in Signal Corps Technical Information Letter No. 18 (May 1943), the last sentence on page 16 should read: "A minimum of three 15,000-pound cables must be used in such a case; it is advisable, however, to use four 15,000-pound cables."

CSCS OFFICERS TO GO THROUGH STUDY PROGRAM

Officers of the Central Signal Corps School now have a school of their own. Started in May, they go through a 26-week training period, with instruction from 6:30 to 8:30 p.m. each Tuesday and Thursday, in officer schools already set up in Building 3772 in the 800th Signal Training Regt. and Building 3556 in the 804th Signal Training Regt.

Brig. Gen. Henry L. P. King, school commandant, ordered attendance of staff and faculty officers at the classes in accordance with a directive from the Office of the Chief Signal Officer pertaining to specialized officer training at Signal Corps training establishments.

Subjects are supervision of military and civilian personnel, Signal Corps units, instructional methods, map reading, combat orders, agencies of signal communication, technical equipment and camouflage. Instructors are from the two regiments. Field manuals, training manuals and Army regulations serve as texts. Training films are used from time to time.

NEWS BROADCASTS

As a current phase of the Army Orientation Course, the Central Signal Corps Replacement Training Center has put its public address system to work in bringing news of the day to the Replacement Center personnel.

Every Monday, Tuesday, Wednesday, and Friday evening, from 6:05 to 6:15, world-wide news of the day is broadcast to all company mess halls while the men are eating. On Thursday evening, from 6:30 to 6:45, war news of the week is reviewed in March of Time narration style. Near the program's close, answers to questions submitted during the week by soldiers are given.

Following the broadcast, discussions of war news and local problems are conducted in the various companies by commanding officers. These sessions sometimes last as long as 90 minutes.

Programs are produced and presented by the CSCRTC Special Service Section, under the supervision of the CSCRTC Training Division.

O.C. SIG. O. LIBRARY

Following are a few of the books added to the collection in the Signal Corps Reference Library, 4C340, Pentagon Building, during the last month:

Advanced Electrical Measurements by W. C. Michels. 2d ed. New York, Van Nostrand, 1941. 347p. QC535.M5.

A Textbook of Sound by A. B. Wood. New York, Macmillan, 1941. 578p. QC225.W6.

Company Administration by C. M. Virtue. 12th ed. Harrisburg, Military Service Pub. Co., 1943. 403p. UB153.V5.

Dynamic Meteorology by Bernhard Haurwitz. New York, McGraw, 1941. 365p. QC861.H2.

Elements of Electrical Engineering by A. L. Cook. 4th ed. New York, Wiley, 1941. 622p. TK146.C62.

Elementary Cryptanalysis; A Study of Ciphers and Their Solution by H. F. Gaines. Boston, Am. Photographic Pub., 1943. 230p. Z104. G15.

Higher Mathematics, with Applications to Science and Engineering by R. S. Burington and C. C. Torrance. New York, McGraw, 1939. 844p. QA300.B85.

High-frequency Alternating Currents by Knox McIlwain and J. G. Brainerd. 2d ed. New York, Wiley, 1939. 530p. TK1141.M17.

Introduction to Electricity and Optics by N. H. Frank. New York, McGraw, 1940. 398p. QC521.F78.

Map and Aerial Photo Reading Simplified by W. F. Heavey. Harrisburg, Military Service Pub. Co., 1942. 104p. UG470.H4.

Maps and Survey by A.R. Hinks. 4th ed. Cambridge, Eng., University Press, 1942. 301p. GA51.H5.

Photography, Its Principles and Practice by C. B. Neblette. 4th ed. New York. Van Nostrand, 1942. 865p. TR145.N4.

Radio Operators' License Manual by Wayne Miller. Chicago, W. Miller, 1942. 211p. TK6554.M5.

Radio-frequency Electrical Measurements by H. A. Brown. 2d ed. New York, McGraw, 1938. 384p. TK6553.B7.

Technical Report Writing by F. H. Rhodes, New York, McGraw, 1941. 125p. PE1475.R5.

Tensor Analysis of Networks by Gabriel Kron. New York, Wiley, 1939. 635p. TK3226.K8.

The Scientific Photographer by A.S.C. Lawrence. Cambridge, Eng., University Press, 1941. 180p. TR145.L38.

Transients in Electric Circuits Using the Heaviside Operational Calculus, by W. B. Coulthard. London, Pitman, 1941. 203p. TK3226.C64.

Transients in Linear Systems Studied by the Laplace Transformation by M. F. Gardner and J. L. Barnes. New York, Wiley, 1942. 389p. TK3226.G3 v.1.

Weather Analysis and Forecasting by Sverre Petterssen. New York, McGraw, 1940. 505p. QC995.P5.

Writing the Technical Report by J. R. Nelson. New York, McGraw, 1940. 373p. T11.N4.

Sound; A Physical Textbook by E. G. Richardson. London, E. Arnold, 1940. 339p. QC225.R5.

Kodachrome and Kodacolor From All Angles by Fred Bond. San Francisco, Camera Craft Pub. Co., 1942. 232p. TR520.B6.

Plastics by D. E. Mansperger and C. W. Pepper. 2d ed. Scranton, International Textbook Co., 1942. 350p. TP986.A2M35.

MILITARY INTELLIGENCE

GERMAN MINE-LOCATING INSTRUMENTS

According to information made available by Military Intelligence Service, War Department, the "Frankfort" mine-detector in use by the German Army is an electrical device for locating metallic land mines. It consists essentially of three parts: the batteries and electric oscillator circuit which are mounted in a pack on the back of the user, the searching stick with antennae which is carried in the hand, and a pair of headphones connected to the oscillator circuit in the pack.

The user first assembles the apparatus and then, while holding the antennae away from the vicinity of any metallic object, adjusts the tuning dial of the instrument until a uniform low-pitched buzz is heard over the headphones. The operator then moves forward slowly, swinging the searching stick in a half-circle in front of him with the antennae held about 1 or 2 inches above the ground. The electrical balance of the antennae and oscillator circuits will be upset when the antennae are brought into the proximity of any metallic object. This unbalance results in changing the tone of the note heard in the headphones from the original low-pitched tone to a high, shrill sound. The closer the antennae are moved to the metal object, the higher the note becomes; this enables the user to locate the exact spot at which the mine or other metallic object is buried.

One weakness of this device is that it is impossible to distinguish between metallic mines and odd bits of metal, such as tin cans, shell splinters, and the like. Another weakness is that it can be defeated by using wooden cases for mines instead of metal cases, in which event the detector fails to give any warning of the proximity of the mine. The device is sensitive to the average metallic land mine up to a distance of about 3 feet.

In order to overcome the last objection given above, the Germans still use a bayonet or a form of metallic probe to locate the mines by probing in the area under search.

From another source than that responsible for the above information, it is reported that in recent experiments with mine detectors, and improvised mines under about 4 inches in depth, the older model Aachen gave consistently better results than the new Frankfort detector.

CAMOUFLAGING WIRE LINES

Russian signalmen use telegraph poles, with the bark still on, and set them up at irregular distances. The line of poles is laid to conform with the country. Earth at the foot of the poles is carefully camouflaged, and trampling of the earth along the line of the poles is strictly avoided. Wire is also laid to conform with the general contouring.

GERMAN VISUAL COMMUNICATION BETWEEN AIRCRAFT AND GROUND TROOPS

Modern warfare puts a heavy premium on successful coordination of all of the various arms. For that reason, comprehensive and flexible methods of communication must be devised. Liaison between air and ground forces presents special problems, and a German document gives the following outline of methods used to meet some of the difficulties.

Cooperation

Cooperation between army and air force is to be arranged through the respective headquarters, prior to each action. The appropriate headquarters of both branches of the service are also responsible for keeping themselves mutually and speedily informed of all movements in their battle area, both on the ground and in the air.

Method of Recognition

Detailed knowledge of friendly aircraft types, pre-arranged signals, and the air situation, distributed down to companies, will facilitate early recognition by the troops.

When the air crews possess knowledge of the situation on the ground, of the general conduct of ground troops in battle, and of the signals arranged for, this will enable the pilot to distinguish quickly between friendly ground troops and those of the enemy.

Recognition signals can only be seen if they are given at the right moment and in the correct position.

Ground troops must give their signals early and in a position easily observed from the air. Aircraft must be able to observe the signals well before arriving over the position.

Aircraft must NOT give their signals too soon, as ground troops are often hindered in their observation by cover. Only when the ground is flat and when aircraft are flying low should early signals be given. Flying unnecessarily low over friendly troops is to be avoided, as recognition by the troops is made difficult through the sudden appearance of planes.

Signals

1. Recognition of Friendly Ground Forces

Means which are employed during daytime to indicate friendly troops are as follows:

a. Orange-colored smoke signal — most easily recognized from the air. It means "friendly troops; we are here." It is the chief recogni-

tion signal for all ground troops.

b. Yellow panels (only for the front line) - in general recognizable from medium heights if they are laid out in an advantageous position. Numerous yellow panels side by side facilitate recognition. Yellow panels mean "here is our own front line." They are only to be used for this signal and NOT in any other situation, in order to ensure that the front line is clearly indicated. The aircraft can draw its own conclusions as to the battle situation. When friendly troops advance, the yellow panels must NOT be left behind. In addition, the orange smoke signal is to be used as extensively as possible.

c. Swastika flags - can hardly be seen from great heights, and only with difficulty from medium heights. They mean "friendly troops; we are here." They are generally used in rear positions, particularly by columns, etc., but can be used in the front line if yellow panels are NOT available or if NO particular value is attached to the distinct recognition of the front line. As swastika flags alone are NOT generally sufficient, the additional use of the orange smoke signal is advisable.

d. Any other signals which assist recognition - if the usual recognition signals are NOT available. Improvised signals can include: laying out of swastika flags on snow or light background, and waving of steel helmets and handkerchiefs, etc. These signals are, however, only an improvisation. They do not afford any guarantee that the ground troops will be recognized.

2. Recognition of Friendly Aircraft

Means by which aircraft can be recognized are:

a. Type of aircraft and national marking.

b. Special painting (or camouflage) - usually ordered to be uniform throughout the entire air force for a fairly long period; for instance, yellow wing tips and a ring round the fuselage.

c. Recognition light signals - changed continually and must be made known to the commands, etc.

d. Any other improvised signals - can include: dipping the nose and tail of plane up and down, and repeated deceleration and acceleration, etc. These signals are only improvised if others are NOT available and they afford NO guarantee that the aircraft will be recognized.

Means for Night Indication of Friendly Troops or Friendly Aircraft

1. For Ground Troops:

a. Flashes and light signals of all descriptions.
b. Special light signals ordered from time to time (for short-

distance, night reconnaissance aircraft).

2. For Aircraft:

a. Recognition signals and lights.
b. Fixed lights.
c. Flashes with searchlight on aircraft.

The above signals are continually changed and must be made known to companies, etc.

Use of Recognition Signals

1. Recognition Signals by Day Must be Given by Ground Troops:

a. When called for by signal from air units.
b. If an attack is threatened by friendly aircraft.

The order to signal is given by the company commander; by aircraft, when fired on by friendly troops.

2. Recognition Signals by Day Can Further be Given:

a. By ground troops, if they consider it necessary to identify themselves to the aircraft, without being called upon to do so - particularly if the position justifies the assumption that the aircraft has omitted to call for signals.

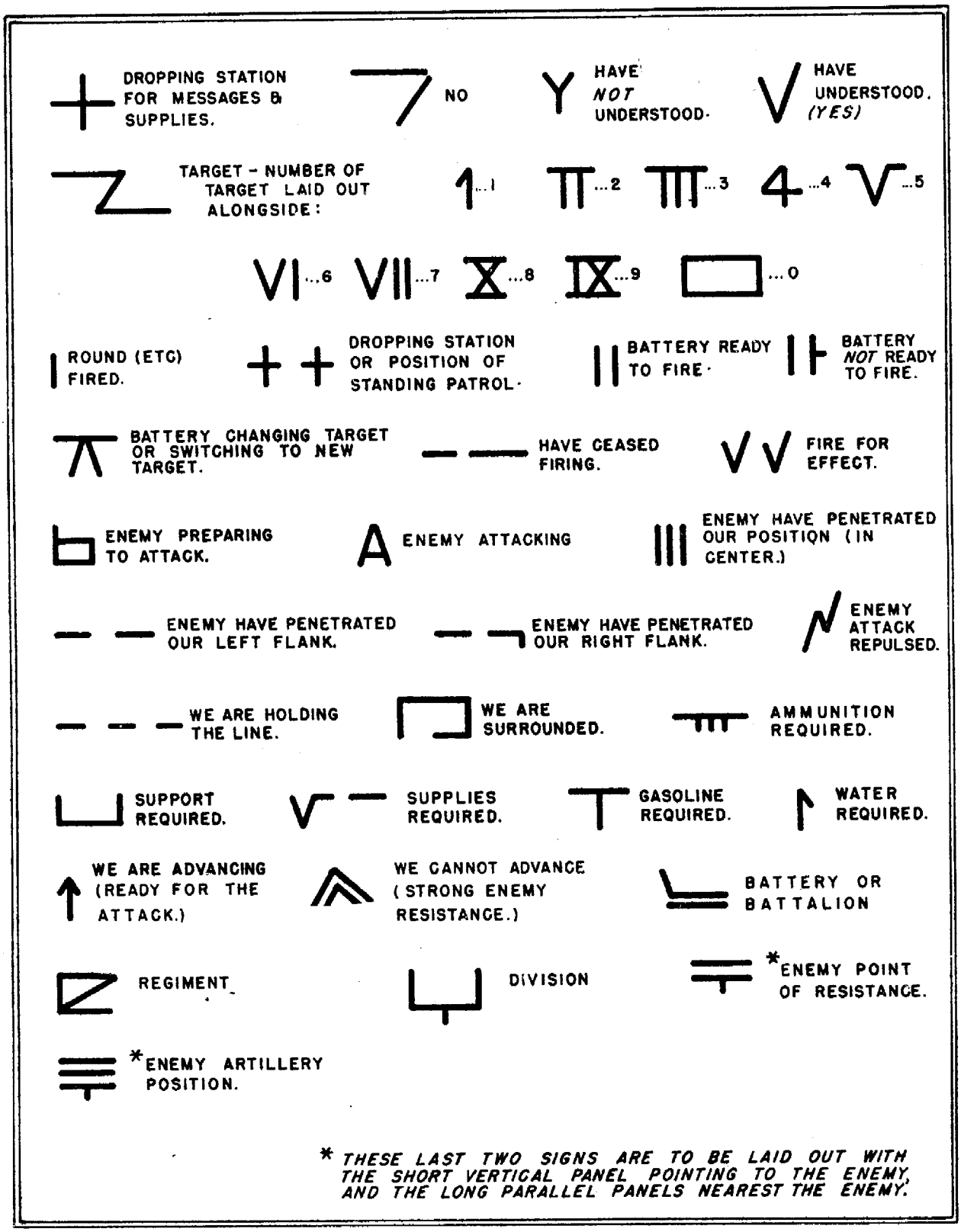
b. By aircraft, when suddenly emerging from clouds over own territory, or as a request to ground troops to give their signals.

3. Recognition Signals by Night must be given by ground troops, when called for by friendly aircraft; also, when the position justifies the anticipation of a bombing attack by friendly aircraft. The order to signal is given by the company commander; by aircraft, if in danger of attack from friendly troops.

4. Night Signals Can Further be Given by Aircraft:

a. To ascertain own territory, if bearings are lost.
b. If it is known or believed that the aircraft are crossing the front (generally this is usual only on the return flight).
c. As a request to own troops to give their signals.
d. In the area of an airfield, shortly before landing.

5. Special Signals: In addition to these general instructions, special signals and their use in certain cases can be arranged by cooperation between flying units and ground troops.



* *THESE LAST TWO SIGNS ARE TO BE LAID OUT WITH THE SHORT VERTICAL PANEL POINTING TO THE ENEMY, AND THE LONG PARALLEL PANELS NEAREST THE ENEMY.*

GERMAN GROUND PANEL CODE

RESTRICTED

6. Safety Line:

a. Arrangements can be made between the respective air and army headquarters for a safety line for a fixed period. Operations in rear of this safety line can only take place if recognition of the front line is perfectly clear (with good visibility, at about 6,500 to 10,000 feet), or if the target ascertained through tactical reconnaissance immediately before the attack is free of our own troops. Night attacks on the near side of this safety line must NOT be undertaken.

b. The safety line should give a safety zone of at least 1,000 feet.

Secrecy of Recognition Signals

The enemy may be expected to copy German signals and every soldier must NOT ONLY realise the necessity of secrecy but must also report immediately any cases where the enemy are using our recognition signals.

Ground Panels

A time may be laid down in orders for making signals. The aircraft may call for signals by flare. The troops may put out signals on their own accord. The order for making these signals will NOT be given by officers below the status of company commanders, etc.

These panels will be laid out so that they are always read when looking towards the front. They must be laid out in good time so that the aircraft does NOT have to circle over the battle area. They may only be lifted when the aircraft is out of sight.

The signs must be laid out on a background against which they can be clearly picked out from the air. Where possible they must be laid out in open ground, as aircraft usually observe while approaching and NOT when directly over the position. Thus, bushes, trees, etc., may prevent the signs being seen obliquely.

Messages by Use of Very Lights, etc.

1. By Aircraft:

a. White* Very Lights - a demand to the troops to make recognition signals.

b. Green* Very Lights - the observer is going to drop a message; "Lay out message-dropping cross or make some other indication of dropping place."

c. Red smoke signals** or red Very light; "Beware enemy antitank weapons, antitank gun, artillery, obstacles."

d. Blue or Violet smoke signal**; "Beware enemy tanks."

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* White and green Very lights will be fired obliquely downwards over the battle area, or approaching it.

** Smoke signals will be thrown by hand from the aircraft in the direction of the enemy target which has been spotted. Their direction of flight and position will indicate the approximate target.

Improvised methods can be used, such as: the aircraft circles over the battle area several times, or flies low over the troops several times, in order to attract their attention (this is a demand for the troops to display recognition signals); diving on the enemy area in a certain direction, firing in bursts to indicate the observed target to the troops; dropping of short written messages to supplement the information (messages will be dropped in message boxes which emit a yellow smoke while dropping, and on the ground). If this is NOT possible, they will be dropped in message bags with a red and white streamer.

2. By Troops:

When the normal system of ground panels is NOT used, short messages can be transmitted by the use of Very lights. These signals and any other improvised methods MUST be prearranged.

The 1st "A" Type Platoon of the Signal Photomail Company, with an authorized strength of one officer and twelve enlisted men, was activated at Fort Myer, Virginia, on April 30, 1943. The following elements of the Signal Photomail Company will be activated at Fort Myer, Virginia, on May 15, 1943, each with an authorized strength of two officers and twenty-one enlisted men:

8th "B" Type Platoon
9th "B" Type Platoon
10th "B" Type Platoon
11th "B" Type Platoon) Amendment to basic letter deferred date of
12th "B" Type Platoon) activation to July 20, 1943.

Upon activation, the units are assigned to the Military District of Washington and placed under the control of the Chief Signal Officer for training only. The units will be prepared for extended field service.

On April 16, 1943, the Commanding General, Third Army, was requested to issue instructions to transfer one combat section of the 280th Signal Pigeon Company from Camp Claiborne, Louisiana, to Camp Hood, Texas, on temporary change of station. This unit will be returned to Camp Claiborne, Louisiana, upon completion of this temporary duty.

The 1st Mobile Radio Broadcasting Company was constituted on April 17, 1943, and was activated at Camp Ritchie, Maryland, on April 19, 1943, by the Commanding General, Third Service Command, with an authorized strength of sixteen officers and one hundred twelve enlisted men. The personnel and equipment of the 1st and 2d Signal Radio Service Sections (Psychological Warfare Unit) were transferred to the 1st Mobile Radio Broadcasting Company, and concurrently the 1st and 2d Signal Radio Service Sections (Psychological Warfare Unit) were disbanded. This unit is assigned to the Third Service Command and placed under the control of the Chief, Military Intelligence Service, Assistant Chief of Staff, G-2, War Department General Staff, for training only.

The 292d and 293d Signal Companies (Special) were constituted on April 20, 1943, assigned to the Second Army, and will be activated by the Commanding General of the Second Army at Camp Butner, North Carolina, at the earliest practicable dates in May and July 1943, respectively, each with an authorized strength of eleven officers and two hundred fourteen enlisted men. On call of the Commander, Amphibious Force, Atlantic Fleet, the Commanding General, Second Army, will make the 292d Signal Company (Special) available to the Commander, Amphibious Force, Atlantic Fleet, for amphibious training by August 15, 1943, and the 293d Signal Company (Special) by October 1, 1943.

Under date of April 20, 1943, the Commanding General, Desert Training Center, was requested to issue instructions to transfer the 1st General Assignment Unit, 196th Signal Photographic Company from Desert Training Center, Camp Young, California, to Camp Pickett, Virginia, for temporary change of station. This unit will not return to the Desert Training Center but will be ordered to a new permanent station. Upon arrival at Camp Pickett, Virginia, this unit is

relieved from assignment to the Desert Training Center and is reassigned to the Second Army.

To coordinate and supervise the supply and maintenance of the Army Airways Communication System, the installations indicated below were established on April 21, 1943, and were organized by the Chief Signal Officer at the places indicated on April 30, 1943:

Southeast Sector, Army Communication Service, Miami, Florida;
Northeast Sector, Army Communication Service, Presque Isle, Maine;
Northwest Sector, Army Communication Service, Seattle, Washington;
Southwest Sector, Army Communication Service, San Francisco, Cal.

The units listed below are redesignated as indicated;

Present Designation	New Designation
1st Signal Service Company	971st Signal Service Company
2d Armored Signal Company	149th Signal Armored Company
9th Signal Service Company	972d Signal Service Company
12th Signal Service Company	973d Signal Service Company
101st Signal Radio Intelligence Company	130th Signal Radio Intelligence Company
102d Signal Radio Intelligence Company	131st Signal Radio Intelligence Company

The inactive units listed below are disbanded:

903d Signal Depot Company
904th Signal Depot Company
905th Signal Depot Company
906th Signal Depot Company
907th Signal Depot Company
908th Signal Depot Company

The Commanding General, IV Corps, was requested by letter dated April 24, 1943, to issue instructions to transfer the 96th Infantry Division, the signal element of which is the 96th Signal Company, from Camp Adair, Oregon, to Fort Lewis, Washington, for permanent change of station.

On April 25, 1943, the Commanding General, Second Army, was requested to issue instructions to transfer the following listed Signal Radio Intelligence Companies from stations shown to new stations as indicated:

Unit	To be moved from	New Station
111th Signal Radio Intelligence Company	Camp Crowder, Mo.	Fort Lewis, Washington
116th Signal Radio Intelligence Company	Camp Crowder, Mo.	Fort Dupont, Delaware
119th Signal Radio Intelligence Company	Camp McCain, Miss.	Fort Ord, Calif.

These are permanent changes of station. Upon arrival at destination, each of the above signal companies is relieved from assignment to the Second Army and assigned as indicated below:

Unit	Assigned to
111th Signal Radio Intelligence Company	IV Corps
116th Signal Radio Intelligence Company	XIII Corps
119th Signal Radio Intelligence Company	II Armored Corps

The following units will be activated at Fort Myer, Virginia, by the Commanding General, Military District of Washington, on July 20, 1943, each with an authorized strength of two officers and twenty-one enlisted men:

13th "B" Type Platoon, Signal Photomail Company;
14th "B" Type Platoon, Signal Photomail Company.

Upon activation, the units are assigned to the Military District of Washington, and placed under the control of the Chief Signal Officer for training only. The units will be prepared for extended field service.

As of May 7, 1943, the 3d General Assignment Unit, 196th Signal Photographic Company, was assigned to the Western Defense Command and will be activated by the Commanding General of the Western Defense Command, at a station to be selected by him, with an authorized strength of one officer and six enlisted men. The personnel and equipment of the 8th General Assignment Unit, 165th Signal Photographic Company, will be transferred to the newly activated unit and concurrently the 8th General Assignment Unit, 165th Signal Photographic Company, will be transferred to Fort Sam Houston, Texas, reassigned to the Third Army, and refilled immediately.

The 13th Airborne Division, the signal element of which is the 513th Airborne Signal Company, will be activated by the Commanding General, Second Army, at Fort Bragg, North Carolina, on August 13, 1943.

The 4th Official Mail Section, Signal Photomail Company, will be reorganized on May 15, 1943, without change of station or assignment, by the Commanding General, Military District of Washington, with an authorized strength of one officer and eight enlisted men.

On May 9, 1943, the Commanding General, Second Army, was requested to issue instructions to transfer the 257th and 261st Signal Construction Companies (Negro enlisted personnel) from Camp Forrest, Tennessee, and Camp Butner, North Carolina, respectively, to the Desert Training Center, Camp Young, California. Movement will be made on or about May 20, 1943. These are permanent changes of station. Upon arrival at the Desert Training Center, these units are relieved from assignment to the Second Army and are assigned to the Desert Training Center.

The units listed below are redesignated as follows:

Present Designation	New Designation
1st Engineer Amphibian Brigade 286th Signal Company, Amphibian	1st Engineer Special Brigade 286th Signal Company
2d Engineer Amphibian Brigade 287th Signal Company, Amphibian	2d Engineer Special Brigade 287th Signal Company
3d Engineer Amphibian Brigade	3d Engineer Special Brigade
4th Engineer Amphibian Brigade	4th Engineer Special Brigade

A directive was issued, dated April 13, 1943, giving the information that the 528th Base Headquarters and Air Base Squadron (Special) was constituted, assigned to the Air Service Command, and would be activated at Merced, California, on April 20, 1943, by the Commanding General, Air Service Command, with a strength of thirty officers, one warrant officer, and one hundred twenty-five enlisted men.

The Signal Headquarters and Headquarters Company, Aircraft Warning Service, III Fighter Command, is redesignated as the Signal Headquarters Company, Aircraft Warning Service, III Fighter Command, by directive dated April 16, 1943, and will be reorganized, without change of station or assignment, by the Commanding General, Third Air Force, with an authorized strength of nine officers, two warrant officers and one hundred fifty-six enlisted men.

The 136th Signal Radio Intelligence Company, with station at Bolling Field, D. C., will be reorganized on May 15, 1943, on the basis of one Headquarters platoon and six operating platoons. This reorganization will effect no change in present stations or assignment of existing detachments of this company.

The Headquarters and Headquarters Squadron, 40th Bombardment Wing, is redesignated as the Headquarters and Headquarters Squadron, 40th Bombardment Wing (Hv), without change of station, strength or assignment.

By directive dated April 22, 1943, the 430th Sub Depot (Signal) was constituted, assigned to the Air Service Command, and would be activated on April 25, 1943, at Allenhurst, New Jersey, by the Commanding General, Air Service Command.

Under date of April 21, 1943, a directive was issued for the Commanding General, Third Air Force, to inactivate the Headquarters and Headquarters Squadrons, 10th and 11th Fighter Wings, on May 1, 1943. Upon inactivation, personnel of the Headquarters and Headquarters Squadron, 10th Fighter Wing, will be transferred to the control of the Commanding General, First Air Force, for reassignment to Air Defense Wings in that Air Force; and personnel of the Headquarters and Headquarters Squadron, 11th Fighter Wing, will be transferred to the control of the Commanding General, Fourth Air Force, for reassignment to the Air Defense Wings in that Air Force.

In accordance with a recent directive from Army Service Forces to eliminate by July 1, 1943, all items not considered expendable from OCSigO Circular 10-1, certain deletions have been indicated on Change No. 1 to Circular 10-1 which upon publication will be dated May 1, 1943. Microphone T-30 with a basis of issue of 1 Per Radio Set was deleted on Change No. 1 since it has been included on the parts lists of all radio sets with which it can be used. All new sets will be issued with appropriate microphones. Requisitions should be submitted for appropriate microphones when not issued as part of the set on the basis that they are required for use with the set. Cord CD-318, which is used to connect Microphone T-30 to a radio set, was deleted on Change No. 1 for the same reason in that it is now included on the parts lists of appropriate radio sets.

Upon the request of the Commanding General, Army Ground Forces, the Chief of Ordnance has been directed by the Commanding General, Army Service Forces, to include the Signal Corps item Flashlight TL-122 in standard nomenclature lists and tool sets for motor vehicles. Due to this change each arm and service has been requested to revise published tables by deleting where necessary any basis of issue of Flashlight TL-122 which is listed as "1 per fuel consuming motor vehicle." Until tables are changed, a duplicate issue will not be made, but all organizations are now authorized Flashlight TL-122 on the basis of 1 per motor vehicle in addition to any other basis published.

T/A 20, dated March 10, 1943, authorizes certain signal equipment for post communication schools, division communication schools and corps communication schools. Equipment for the post communication school is authorized any post, camp or station when required for signal instruction of personnel not authorized either a division communication school or a corps communication school. Equipment for a division communication school is authorized any post, camp or station at which a division is in training. Equipment for a corps communication school is authorized any post, camp or station at which corps or army troops requiring signal instruction are stationed. Each post, camp or station requiring the equipment listed for any of the schools should requisition the necessary equipment through service command channels, stating the troops for which it is required. Issue will be made by the Chief Signal Officer upon receipt of the requisition stating sufficient basis for issue.

MILITARY PERSONNEL

DECENTRALIZATION OF PERSONNEL AUTHORITY TO SERVICE COMMANDS

Fort Monmouth and Camp Murphy Class IV Installations. On May 12, 1943, The Adjutant General published War Department Circular No. 28, subject: "Designation of Training Activities and Installations under the provisions of AR 170-10," which provides that certain Army Service Forces' replacement training centers, unit training centers and schools, are placed under the command of the Chief of administrative or supply service indicated, rather than the Commanding General, of the Service Command. This directive includes Fort Monmouth, New Jersey, and Camp Murphy, Florida, as such Class IV installations, to be under the jurisdiction of the Chief Signal Officer. This means that activities at Monmouth and Murphy will be strictly under the Chief Signal Officer, who will have control over the organization, assignment, reassignment, transfer, discharge and promotion of all military personnel. The allotment for military personnel will be transferred back from the Service Commands to the Chief Signal Officer in the very near future.

Change of AR 170-10. As of April 14, 1943, AR 170-10 was changed and revised so that the selection, assignment, promotion and relief of the training staff and faculty personnel assigned to schools or training centers was no longer in the hands of the Chief Signal Officer, but had been delegated to the Service Commander. This meant that full control of the officer and enlisted allotments of all schools and training centers under the Chief Signal Officer was exercised by the Service Commander, to administer as he saw fit. Previously, allotments had been granted with strings tied to them, which meant that the Service Commander had to sub-allot exactly as directed by Army Service Forces. Under the new change, he has full control. This revision means that the responsibility of the Chief Signal Officer (with the exceptions noted above) is limited to the promulgation of training doctrine, the scheduling of programs and the conduct and supervision of training.

Sixth Service Command. Allotments of military personnel in the Sixth Service Command were radically changed during the week of April 12. All enlisted allotments were made Branch Immaterial (men assigned regardless of arm of service with which formerly affiliated) so that hereafter the Service Command can requisition sufficient personnel required to perform Signal Corps duties without regard to allotments authorized by the Chief Signal Officer. The officer allotments are limited to a total number of officer positions, without breakdown as to grade. This means that the officer positions will be filled as requisitioned by the Service Command and that the Service Command will have complete responsibility regarding the grades of the officers, attempting to control them on an over-all basis.

WOMEN'S ARMY AUXILIARY CORPS PERSONNEL WITH THE SIGNAL CORPS

Policy. Policies governing the utilization of WAAC personnel were established on March 31, 1943. Summarized briefly, they provide for the replacement of a man by a woman in an allotted position of noncombat character.

This means that any allotment of enlisted personnel may be filled by furnishing WAAC personnel in lieu thereof. Existing companies of WAAC's already furnished to replace enlisted men on Signal Corps duties, are to be reorganized and the personnel allotment made available to the Service Command. However, it is not believed that this will affect in any way the actual assignments of WAAC's already on duty. Quotas of WAAC's are established by Army Service Forces for the Arms and Services, dependent upon needs. The Chief Signal Officer was originally granted a quota of three hundred WAAC's for installations under the Chief and subsequent authorizations are being secured to take care of additional requirements.

WAAC Companies on duty at Signal Corps installations. WAAC companies have been supplied to Camp Crowder and are in process of arriving at Fort Monmouth. A total of four hundred and eighty-nine WAAC auxiliaries and ten WAAC officers are on duty at Camp Crowder, Missouri. The following breakdown represents their assignments:

Camp Crowder Installation	Under Command Of	WAAC Designation	Number Officers	Number Auxiliaries
Replacement Training Center	Brig. General Milliken	154th WAAC Post Headquarters Company	4	200 (approx.)
Signal Corps School	Brig. General King	155th WAAC Post Headquarters Company, School Platoon	-	100
Unit Training Center	Colonel Willard	155th WAAC Post Headquarters Company, UTC Platoon	-	18
Unit Training Center	Colonel Willard	155th WAAC Post Headquarters Company, Administrative Overhead	3	18*
7th Service Command Station Complement		53d WAAC Post Headquarters Company	3	153*

* Takes care of Unit Training Center and School Platoons.
** Stationed at Crowder, takes care of Administration of WAAC's on whole Post.

Fort Monmouth, New Jersey, is to have four officers and three hundred and forty-four auxiliaries, comprising the 167th and 168th WAAC Post Headquarters Companies, although the designation may be changed to "Fort Monmouth WAAC Detachment."

OVERSTRENGTH OF OFFICER PERSONNEL

Approval has been received on requests submitted to Army Service Forces, requesting that the Air Forces and Ground Forces direct field Signal Units to submit requisitions for officer personnel up to 25 percent overstrength. This request was made in order to furnish field training for junior officers and, in addition, to free experienced officers from field units to fill high priority requisitions from overseas theaters. The Army Air Forces stated that they had contacted commands for an indication of station assignments to attain the designated overstrength. Upon receipt of replies from the field, a requisition will be submitted for immediate requirements toward the attainment of the indicated overstrength.

WIRES PROGRAM (WAAC SIGNAL TROOPS TRAINING PROGRAM)

Name of Program. In the absence of any legal decision on the use of the name of WIRES (Women In Radio and Electrical Service), WAAC Headquarters and Military Training Branch have temporarily adopted the name "WAAC Signal Corps Training Program" for this project.

Approval of Program. Civil Service approved the program for training women in Signal Corps specialties on April 6, 1943, the Fiscal Director allotted funds to be available upon request to the Service Commands on April 13, 1943, WAAC Headquarters approved the letter to The Adjutant General, and a directive was sent on April 27, authorizing the recruitment of ten hundred and eighty women under the WIRES program. The recruiting program was to get under way by May 1, 1943, and as of May 4, 1943, the Fourth Service Command has already registered its first enrollees. Actual training of this personnel will begin on or about May 15, 1943.

Training Program. As a result of studying Signal Corps overhead enlisted positions, the following percentages and categories have been set up for the above-mentioned training:

Radio Operator (766).....	56%
Radio Operator, Fixed Station (777)...	6%
Radio Repairman (174).....	13%
Radio Repairman, Fixed Station (649)..	6%
Teletypewriter Operator (237).....	19%

These percentages are set up as a guide and may be varied slightly to have the number trained in each specification serial number conform to normal class sizes. All radio operators will be trained as high speed operators (SSN 766). Those not attaining the necessary speed of 25 words per minute will be used as low speed operators.

Schools are now being set up in the Service Commands and reports indicate that WAAC recruiting officers and auxiliaries are working with Service Command personnel to push the program through. At least one Service Command has already provided facilities for board and room at approximately forty

dollars per month for trainees.

CONFERENCE ON PROCUREMENT OF OFFICERS OFFICER PROCUREMENT SERVICE

Representatives from Military Personnel Branch, Major Horney and Major Millican, are accompanying representatives of Officer Procurement Service who are to attend meetings of the OPS Field Officers in Washington, New York, Dallas and Chicago. At these meetings, representatives of the Field Offices of OPS will appear at OPS Headquarters in order to hear discussions by Signal Corps, Engineer Corps, and Surgeon General personnel on the types of officer personnel needed from civilian life. These conferences will last at least a day and a half at each OPS Headquarters, and will give each of these above-mentioned representatives from ASF an opportunity to explain their personnel requirements, so far as procurement from civilian life is concerned. These meetings are planned so that they will also afford a means of establishing methods of expediting the processing of civilians, in such matters as speeding up applications, supporting documents, reports of physical examinations and so forth.

OFFICER PROMOTIONS

The following promotions have occurred among Signal Corps personnel during the period from April 23, 1943, to May 13, 1943, inclusive:

Lieutenant Colonel to Colonel (Temporary)

Bibb, Joseph Robbins
Forsythe, Robert Graham
Hatch, Carl Hendon
Magee, Francis Joseph (2-25-43)
Morrell, Samuel Charles
Philbrook, James Roy
Sherry, Bertram John
Stafford, Rolland Edward

Major to Lieutenant Colonel (Temporary)

Burke, Alvin Lee
Frost, Robert Frederick
Fry, Richard Ellis
Gaither, Loren Elmer
Hale, Nathaniel Claiborne
Harris, Robert Lee
Hatfield, Benjamin Frank
Lotz, Walter Edward, Jr.
Lyons, Lawrence Ellsworth. Jr.
Moore, Lucius Lisk
Nee, Patrick Joseph
Pikus, Harry
Ramsey, Jack Wilmer
Riordan, Forrest Heth, Jr.
Scherner, Hermann
Simmons, George Millard
Snyder, Burr M.

Captain to Major (Temporary)

Anderson, Leif
Backer, Labon
Backus, William Alden
Baldassari, Carlo
Bowden, Clifton Morris
Boykin, Edward McCallum
Bullock, John Forrest
Carlisle, Gerald
Carlton, Miles Nelson
Caskey, Edward Adolph
Crook, Evan J.
Davies, Homer Gwynn
Day, William Edward
Dees, Allen DeWitt
DiPietro, Joseph Anthony
Evans, Kenneth Keith
Farnsworth, Louis D., Jr.
Ferree, Robert Weston
Fineran, Edward Vincent
Floyd, William Ralph, Jr.
Ford, Albert
Freedman, Harry Leo
Green, Stafford Freemont
Hachet, Harry Arlin
Hahn, Thomas Marshall
Hanley, Arthur Francis
Harper, William Edgar
Harthrong, Louis Keith
Heck, Donald
Heinz, James Isadore
Helmrath, Norman Kenneth
Hubbard, Douglas Gerald
Hummel, Lynn Franklin
Jager, Charles Rattray
Kaufmann, George Warren, Jr.
Koehl, Joseph Leonard
Lemley, Clarence Edward
Lewis, Gomer
Little, Littleton Ludlow
Lord, Reginald Beach
McLean, Arthur
Miller, Merle Wayne
Mollella, Isaac
Moore, Howard Nelson
Meyer, Otto
Newell, Frank Wathen
Nichols, Doyle Chester
Nixon, Russell Laurence
Norton, John Ernest
Pelton, Charles David
Pride, Edward Walter
Pritchard, Thomas Edwin
Raleigh, John Michael
Raushenberger, Everett Joseph
Robinson, Wilfred Francis
Rose, Philip
Ross, Adrian Elois
Sass, Isidore
Shehane, Barney Arthur
Silverstein, David Fredric
Smith, Charles Estelle
Steele, William Ernest, Jr.
Strother, James French, Jr.
Svendsen, James
Tucker, William Freeman
Vansant, Franklin Taylor
Weldon, Samuel Vance
Whipple, Robert Scott
Whitcomb, James Lee
Williams, Alfred Augustus
Williams, William Llewelyn Charles
Williamson, Rufus Alexander
Wood, Ernest Charles