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SIGNAL CORPS
Technical Information Letter

APRIL · 1945

ARMY SERVICE FORCES · OFFICE OF THE CHIEF SIGNAL OFFICER

SIGNAL CORPS

TECHNICAL INFORMATION LETTER

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

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

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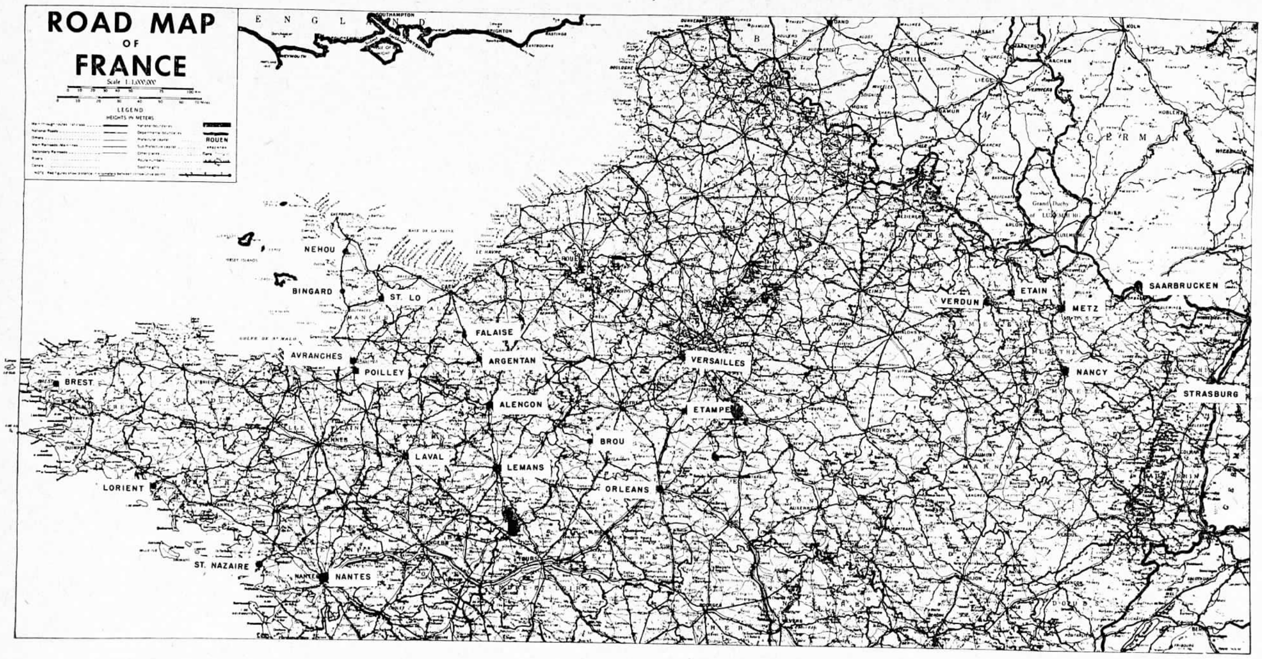
WARNING THIS publication is issued solely to give proper and speedy dissemination to timely, useful information concerning pertinent trends and developments. Nothing herein is to be construed as necessarily coinciding with United States Army doctrine. Changes in official doctrine, as they become necessary,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

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

CONTENTS



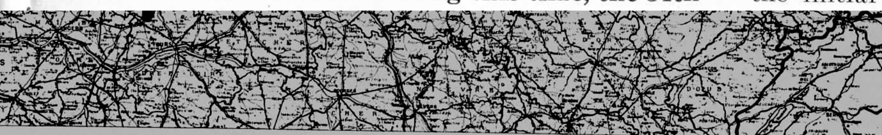
WIREHEADS IN FRANCE

Test Installations for Third Army Trunk and Long Local Circuits Were Essential

The following history of wirehead equipment and personnel was reported by the 34th Signal Construction Battalion and is based on the experiences of the battalion during the dash of the Third Army through France to the German border. During this time, the 34th

trouble crews. The installation and operation of these wireheads as they were called, was given to the construction battalions of the Army.

The wirehead handled not only the testing and clearing of trouble on installed circuits; but also the initial tests on circuits being put in. New

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lines were started at the wirehead and were not turned over to the wire chief at the switchboard until they were completed and tested clear.

This battalion, prior to its entry into France, had no experience in the operation of wireheads; consequently the development of these installations is based on operational experience only. The equipment which was added from time to time was included to meet actual field needs as dictated by the operation. The following summary of events provides a history of the bat-

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fore any training could be given. The men had to learn the procedure and the system of records while actually in operation.

The installation was made in a dugout 8′x8′x6′ which was roofed over and camouflaged. A frame was constructed and terminal strips were mounted at one end of the dugout. Lines were brought in and through the terminal strips which provided an easy way for opening the circuits for testing. Inasmuch as the command post was in operation before the wirehead was started, it was necessary to cut all existing circuits which ran from the switchboard into the wirehead. This was done by **T** splicing the line into the terminal strips before opening the circuit.

To provide for additional circuits, 10-pair rubber-covered cables were installed from the switchboard to the wirehead. One pair was connected directly between the operations wire chief and the wirehead for use as an engineering circuit.

No provision was made for the termination of spiral-four circuits at the wirehead. These were run directly from the carrier van to the units. When new circuits were installed, they were started at the wirehead which did the testing for crews during installation. Upon completion, they were connected through the 10-pair cable to the switchboard.

Trouble clearing was done by opening the circuit in trouble at the wirehead terminal strip and connecting a test set to the line. If more than one circuit was in trouble, several Telephone EE–8 were connected to keep contact with the clearing crews. As this method was too slow, a Switchboard BD–72 was soon added. This made it possible to connect the circuits in trouble to a drop on the board, and by equipping the Test Set EE–65 with a plug, the change from line to line could be made much faster.

Three trouble crews consisting of three men and a driver with a weapons carrier did the trouble clearing. These crews bivouacked near the wirehead and were on call at all times. At the time the wirehead closed it was handling 46 circuits.

Bingard—
Opened 29 July 1944;
Closed 2 August 1944.

Orders for the installation of this wirehead were received while the Nehou set-up was still in operation. In order to start this installation it was necessary to take part of the personnel and equipment from Nehou.

The wirehead was begun by placing terminal strips on posts set in the ground in the open. This was necessary in order to provide a starting point for circuits being installed. As soon as time permitted, the installation was moved into a small shed on a farm.

The operations switchboard did not arrive until the day following the start of this wirehead. When it did get there, 10-pair cables were run to

THIRD ARMY IN FRANCE

A BRIEF

CONSOLIDATION OF the Normandy coast was accomplished by mid-July 1944 and Allied forces gathered for the second phase of the invasion of Europe. On 27 July, the First Army exploded through St. Lo. While it held a hole open, the Third Army smashed through and rammed straight for Avranches.

On 2 August, the Third Army swung one column into Brittany for the strategic ports of St. Nazaire, Lorient, Brest, and Nantes, and a second column eastward. This second column headed for Laval and then Le Mans. At Le Mans, one section pushed northward toward Argentan (and the Argentan-Falaise pocket) while the second section roared onward to Versailles, Etamps, and Orleans.

By early September, the Third Army was over the Marne, through Verdun and within 48 hours into Metz. Fighting at Metz (and its stubborn Fort Driant) and at Nancy occupied the Third Army until mid-December at which time the Saar River was crossed and the first belt of Siegfried Line fortifications was breached. Saarlauten and Habkirchen were taken and Saarbrucken was hemmed in.

The pace of the Third Army from Avranches to the German border has been considered amazing. It is 400 miles from Avranches to the Metz-Nancy region, and the Third Army averaged from 30 to 40 miles per day. In one case, elements of the Third Army traveled 300 miles in 12 days. In another case a flying column traveled 65 miles in one day to take over the Verdun hills.

the wirehead and circuits that were completed were cut through for operation.

Due to the fast moving tactical situation, this installation operated for only 4 days and fewer circuits were installed.

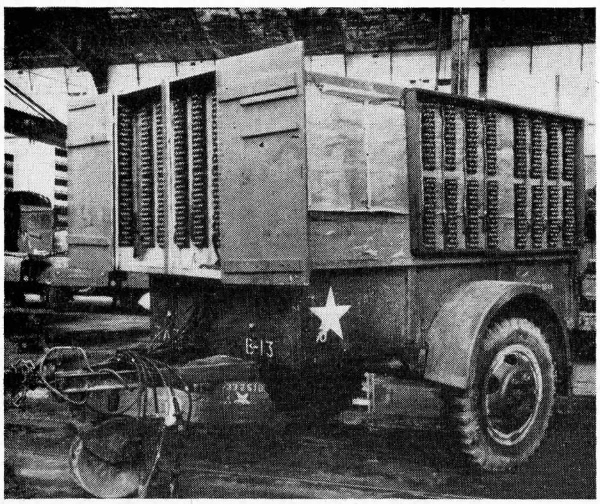
Poilley—
Opened 3 August 1944;
Closed 13 August 1944.

Prior to the opening of this wirehead, it was realized that the installation should be made portable so that it could be moved from place to place without complete disassembly. A 1-ton trailer was selected for the set-up. A test desk was built inside and terminal-strips mounted so circuits could be terminated easily. The frame was built in 2 sections, one side going to the switchboard and the other to the line. A capacity of 60 circuits was provided for. The Switchboard BD–72 was modified by cutting the repeating coils out, thus permitting the use of 4 more drops for testing. Circuits were run to the switchboard with 10-pair cable.

At this installation, as in all later ones, provision was made for spiral-four testing by locating a coupling at the wirehead. When the wire chief reported a cable in trouble, it was necessary only to disconnect it at the wirehead and bring it to the test board.

This trailer was found to be very satisfactory in operation. However, the 60-circuit capacity was found to be insufficient and provision had to be made for 10 extra circuits.

At this installation, trouble calls were very frequent and a greater number of circuits were cut at the same time. Enemy bombing in the vicinity of St. James tore out many circuits and saboteurs were cutting spiral-four cable with axes. It was necessary to supplement the wirehead crews with teams from the battalion in order to keep up with the work.



THIS IS AN EXTERIOR VIEW OF ONE OF THE TRAILERS AT THE POILLEY WIREHEAD SHOWING MOUNTING OF THE TERMINAL STRIPS.

INTERIOR VIEW OF TRAILER AT LAVAL SHOWING TERMINAL STRIPS FOR CROSS-CONNECTING CIRCUITS AND DESK ARRANGEMENT.

Laval—
Opened 13 August 1944;
Closed 5 September 1944.

The wirehead at Poilley was closed prior to the start of this one, so it was possible to move the trailer and set-up intact to this location.

This installation was similar to the previous one and operated normally. However, longer spiral-four stubs were provided so that reels could be located further from the trailer. This permitted more space to work and avoided the confusion caused by congestion.

It was realized that more than one wirehead trailer was necessary in order to make moves. The personnel of this group were split and other men added to each of the groups formed. An additional trailer and equipment were obtained. Each company now had a wirehead.

Brou—
Opened 19 August 1944;
Closed 5 September 1944.

This wirehead was the first that operated after the division of the original set-up into 2 wireheads. This was also built into a 1-ton trailer with an installation similar to the previous one. A Cabinet BE–70 test set was used instead of the Test Set EE–65.

This trailer was similar to the original one in construction. The test desk was placed inside. Terminal strips were placed on the outside for the termination of circuits both from the switchboard and field. These strips were connected to a duplicate set inside; thus the actual circuit cross connections were made inside and could be opened there for testing. Provision was made for 80 circuits.

Operation was similar to previous set ups. It was found that the 12 drops of the Switchboard BD–72 could not handle all the simultaneous cases of trouble. As an emergency expedient, several Telephone EE–8 were hooked to additional circuits. This was the first indication since the advent of the wirehead trailers that testing facilities were not adequate. At this time no additional equipment was available to expand the test desk so operation had to continue as originally planned.

It was further observed that the number of circuits installed was increasing with each installation.

Sens—
Opened 6 September 1944;
Closed 26 September 1944.

This wirehead was installed by a different crew than the previous one at Brou, and was the first one operated by this portion of the original force. Thus, this marked the beginning of the rotation system of responsibility for installation of wireheads.

Profiting by past experience, the crews increased the capacity of the wirehead while it was in operation. The test desk was enlarged and an additional Switchboard BD–72 and Test Set EE–65 installed to permit 2 test men to work at the same time. The terminal strip arrangement was similar to that in the other wirehead and provided for 90 circuits.

At about this time, through the cooperation of all signal units, the wireheads were provided with a copy of the line route map of each circuit installed from their trailer. This supplemented the information kept on the line record card and aided trouble shooters in finding the route of the line.

Verdun—
Opened 7 September 1944;
Closed 28 September 1944.

The wirehead which functioned at Brou moved to provide this installation, which was located in a room at the PTT repeater station in Verdun. The trailer was moved into the building as it could operate as a unit. This was more efficient than removing the equipment and remounting it in a room. Everything was as in the previous set-up except that black-out of the trailer was not necessary because the room was blacked out.

Inasmuch as this trailer still provided for only one test man, it had to be enlarged while in operation. Instead of rebuilding the test desk, an additional table was placed outside the trailer and a German switchboard and Test Set EE–65 installed. These were used to test circuits during installation. Thus the regular test desk was left free to concentrate on trouble clearing on operating circuits. Later the additional board was used for trouble shooting also.

By now it was definitely established by actual operation of two wire-heads that two test men were necessary to maintain good operation.

Etain (Forward)—
Opened 20 September 1944;
Closed 26 September 1944.

The order for establishing this wirehead was received while the installations at Sens and Verdun were still operating. There was no organization within the battalion available with equipment to start this set-up.

In order to provide a temporary place for termination of circuits, terminal strips were placed on a frame in a tent and lines were brought in there. The work was done by personnel of construction crews. The Command Post had not opened at this time so the work consisted chiefly of listing and cutting through new circuits.

The wirehead at Sens was released just before the Command Post opened and they arrived to take over the installation. The existing circuits were cut into the trailer and from then on the installation and operation proceeded in the routine manner.

It was now evident that two wireheads were not sufficient. The two Army construction battalions had six wireheads operating or being installed simultaneously. Plans were begun for providing an additional wirehead in each company, making a total of four for the battalion.

This wirehead operated very well but inasmuch as the Command Post remained open longer than usual, the number of circuits exceeded the capacity. At the peak of operation, 100 circuits were being handled.

TYPICAL TEST DESK DIAGRAM

The test jack board at left to have a capacity of 75 switchboard and 75 line jacks. In diagram they are designated as *S* and *F*, *switchboard* and *field*. The drop well at bottom to have as many drops as there are jacks on the test board at the right. These drops to be connected direct to the jacks of the BD–72 or its equivalent.

The 2 BD–72's or an equivalent board to have a capacity of 24 lines. These are the actual test boards.

A ring key is shown in the test table. If a new board is designed it should be made for both generator and automatic ringing.

Cabinet BE–70 or Test Set EE–65 to be mounted horizontally in the table with the test cord and plug mounted directly in front for testing.

The test cord and plug to be mounted in test table in front of test set.

A hand set to be mounted on right side of table for use with test board.

Operation

A line is reported in trouble.

Test man checks his record for army line number and gets his jack number.

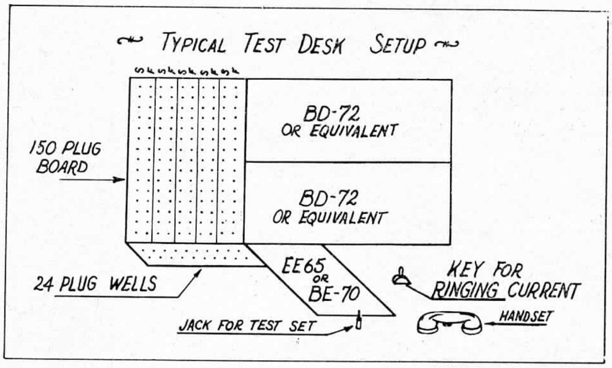
Test man inserts plug in switchboard side of proper jack. The switchboard side of line is now up on test on a jack on the test board.

Test man picks up hand set which will be mounted on right side of test table or hung on test board and talks to wire chief at main army switchboard by throwing key on test board to talk position. He can test for ringing by throwing ring key, and throw key on test board to ring position.

By inserting test plug of EE–65 or BE–70 in proper jacks he then makes electrical test.

Test man follows same procedure for line side of circuit in question.

(Testboard BD–101, newly developed and under procurement, will satisfactorily handle the functions of the test equipment described above. Details of the BD–101 will be published in a future issue of SCTIL shortly before delivery date.—Ed.)



Due to a relocation of the Command Post this wirehead was cut out and trunk and long local circuits were rerouted to another wirehead.

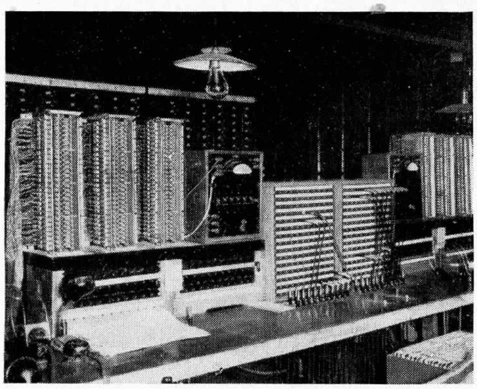
Etain (Rear)—
Opened 24 September 1944;
Closed 29 September 1944.

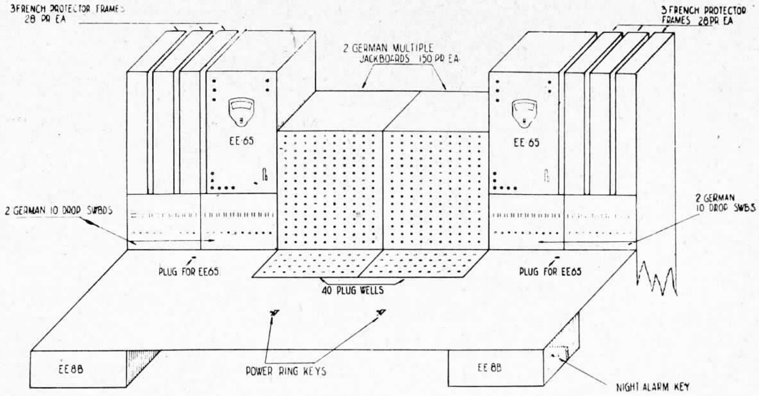
This wirehead was begun while those at Verdun and Etain (Forward) were still operating. Fortunately, a start had been made at equipping more wireheads. As a trailer could not be spared to build this set-up, the frame with the terminal strips and the test desk were placed in a tent. The battalion had obtained additional test sets and more captured German equipment so the problem of equipping this wirehead was easily solved.

This installation was not very large as most of the phones were locals within the area and did not go through the wirehead.

Nancy (West)—
Opened 2 October 1944;
Closed————

This wirehead was located at the west edge of the city of Nancy in a blockhouse which was an underground cable termination. The set-up was built completely indoors and the necessary equipment was removed from the trailer. Circuits to the Command Post area which was about 5 miles away, were routed through the PTT underground as well as through spiral-four cables and field wire installed by Army units.





NANCY (WEST) WIREHEAD LAYOUT SHOWING TEST DESK WITH FRENCH PROTECTOR FRAMES. GERMAN SWITCHBOARDS AND CIRCUIT PATCH BOARDS AND TEST SET EE–65. THE DIAGRAM IDENTIFIES THE EQUIPMENT IN THE PHOTOGRAPH.

Provision was made for handling 150 circuits. As plenty of space was available, additional modifications of the wirehead set-up were made. All circuits were brought through French protector frames to multiple patch boards at the test desk.

Thus it was only necessary to remove the fuses in order to open a circuit for testing. Each test man had 2 German 10-drop switchboards and a Test Set EE–65. A cord and plug from each drop of the switchboard was mounted in the desk.

When notification was received that a circuit was in trouble, the test man removed fuses, plugged one of the cords of the switchboard into the circuit jack of the patch board and picked it up for testing. This saved much time as it was no longer necessary to remove jumpers at the terminal strips.

Spiral-four cables all had a coupling within the room. To take one over for testing it was only necessary to open the coupling and connect to a stub which was tied through to the patch board. Underground circuits were connected to the patch board also.

The operating personnel, in addition to doing the testing normally associated with wireheads, made cross connections to establish underground circuits.

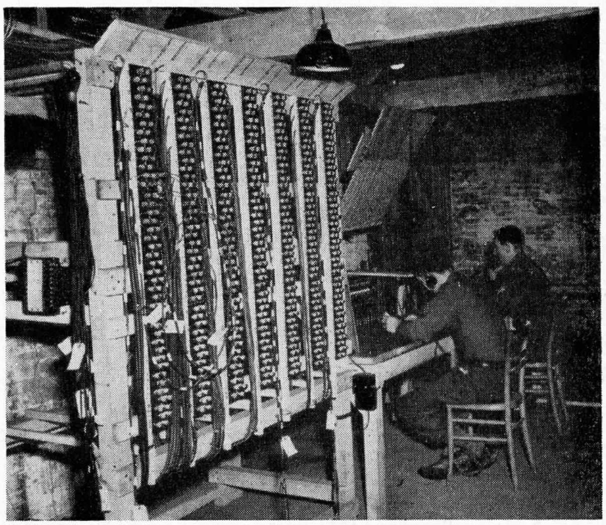
Nancy (East)—
Opened 3 November 1944;
Closed————.

This wirehead was located near the southeast edge of the city of Nancy, about 2 miles from the Command Post area. Unlike the West wirehead, this installation had no connection with permanent PTT facilities and consequently was more on the order of a field set-up.

As there was plenty of space in the building selected for this wirehead, the equipment could be spread out to avoid confusion. A rack was built to carry the incoming lines and a main frame constructed for mounting the terminal strips. A large table was converted to a test desk and provisions were made for two test men.

The operating procedure was similar to the field set-up. A circuit in trouble was opened at the terminal strips, connected to one of the test switchboards by means of test clips and leads, and tested from there with a Test Set EE–65.

Connections from the wirehead to the Command Post switchboard were made through spiral-four and field wire circuits installed by the battalion. To reduce the possibility of trouble developing in this section, the cables were suspended in a semi-permanent manner on messenger attached to poles.



THE NANCY (EAST) WIREHEAD IN OPERATION. SHOWN ARE TWO MEN AT THE TEST DESK AND THE TERMINAL STRIPS MOUNTED ON THE IMPROVISED MAIN FRAME. SPIRAL-FOUR CABLE AND FIELD WIRE CONNECTED THE WIREHEAD TO THE CP.

RECOMMENDATIONS FOR STANDARD WIREHEAD

EXPERIENCES IN the present operation have proven that there should be a ratio of one test jack on the test board to about three termination points on the test frame. Operations and needs at different installations have varied but with the wirehead built in standard sections and the above ratio maintained it is felt that any situation can be met even though it may mean the use of two standard sections.

Test Table

Each test table should be assembled as one complete section. Each section should obtain the following items:

1. One Cabinet BE–70 or Test Set EE–65 in lieu thereof.
2. Two Switchboard BD–72.
3. Five- and ten-pair cables or jumper wires to be placed between test desk and test frame as test pairs.
4. If second method of test circuit termination is used it will require a bank of test jacks with enough capacity to handle all line circuits.
5. There should be an engineering circuit between the main army switchboard and the test desk and one between the carrier van and test desk.
6. One 107A amplifier and 76A test set can also be used very handily for identifying circuits.

Wirehead Main Frame or Test Frame

The test frame should be made of Terminal Strip TM–184 or an equivalent method of termination. The frame should be built in sections with each section having a capacity of at least 75 in and 75 out terminations. The frame should be a portable type so that it can be set up in a van or placed in a building.

Methods of Test Circuit Termination

All test circuits from the test desk which appear on the main test frame should have long leads with test clips attached, so that any termination on that section of frame can be reached. There should be a small section of the test frame used for handling six spiral-four test stubs which could be plugged into any spiral-four in trouble.

Another method of setting up test circuits would be to have a bank of test jacks so arranged that they would have the same capacity as the main frame. This would mean that each circuit coming into the wirehead main frame would be terminated on the test board. When the plug on the test jack board is inserted it will automatically connect the circuit on test to the test board proper which is the Switchboard BD–72 or its equivalent. The circuit is then connected for talking and testing. The carbon block protector bank is not considered necessary if the test jack board is built to automatically throw the circuit on test.

Suggested Methods of Circuit Terminations for Van Installations

A series of terminal strips can be mounted on the outside of the van as a secondary frame. Circuits coming to the wirehead van from the switchboard and field or line side can be terminated here. One section of strips marked *switchboard* the other *line*. Tie circuits can be run from the terminal strips to the inside of the van. These circuits to terminate on the sides of main test frame designated as *switchboard* and *line*. In the case of spiral-four carrier circuits a rack can be built on the outside of the van, so that the coupling joint can be broken at this point for testing. These circuits would not enter van except when opened for testing and plugged into one of the test cables as outlined in paragraph below.

Spiral-four stubs can be run from outside the van to the main frame inside of the van. When trouble develops on a spiral-four circuit the coupling can be broken outside the van and plugged into the test cable.

Another method would be to have all circuits come inside the van without any outside terminations. In this case it would be necessary to build a rack to handle the spiral-four coupling joints which would not terminate but merely go through the van so that they can be broken for testing.

Another method would be to have a portable secondary frame built and hung on the outside of the van. The frame to have a capacity of 75 lines to line side and 75 lines to switchboard side. Each side should have protector arrangements. There should also be a quick method of cross-connecting between line and switchboard side so that van, main frame, and test desk inside van can be quickly isolated from trunk circuits.

Any or all of the ideas suggested under *Van Installations* can be incorporated in building installation. With a standard test desk and frame it would be very easy to adapt it to any building.

Additional Features

Ringing current can also be employed to good advantage if test boards are built to handle ringing current. The ringer at the wirehead is not absolutely necessary but would save the time of piping ringing current from the switchboard van.

Conclusions

A method of circuit termination, and test desk design is given below. Experience has shown that a design of this type is necessary for most efficient operation.

For efficient operation it is felt that all circuits should appear on the main frame.

Test cases have proven that carrier circuits working over spiral-four can appear on the wirehead test frame, and need not be looped straight through the wirehead. Carrier circuits have worked with as much as three miles of field wire between the wirehead frame and carrier van. The best method would be to have the spiral-four (line side) come into the wirehead secondary frame and then out on another spiral-four to the carrier van. This short distance does not effect the operation of carrier even though the carrier circuits do appear on the main frame. This method has the advantage of having circuits on the frame and ready for test at any time, it also eliminates the need of a spiral-four coupling joint rack either inside or outside the van.

Recommended Arrangement for the Wirehead

The following arrangement for the secondary frame, main frame, and test table is recommended:

1. The secondary frame should have a capacity of 75 lines. Seventy-five lines to line side and 75 to the switchboard side. Each side should have protector arrangements. There should also be a method for quick cross-connecting of circuits, in other words a method of quickly isolating the van and main frame from the trunk lines. The present operation has proven that it is necessary to move wireheads quickly. In some instances the secondary frame would become a test point, in other instances new units move in and take over the circuits. This could be done quickly if a standard secondary frame were designed.

The frame should be in cabinet form to make it waterproof, dustproof, and also large enough to make it easily accessible for connection of circuits.

The frame should be equipped with hangers to make it easy to remove from van.

The line and switchboard cables coming from the inside of the van should be fanned out on a strip with shoe type lugs which can be slipped under screws inside the secondary frame cabinet and quickly tightened down. This would make the circuits always appear in a uniform manner at the main frame inside the van.

Each van should be equipped initially with four secondary frames. Two for installation as situation warrants and two for installation at new location if a quick move is necessary.

2. The main frame inside the van should have the same capacity as the secondary frame outside. A fanning strip could be employed but it is not absolutely necessary. The tie cable could be permanently connected to the frame. No protector arrangement is necessary here.

The frame should be designed so that it will set as near the wall of van as possible to conserve space.

One side of the frame to be employed as the line side and the other as the switchboard side.

Rings should be placed vertically and horizontally throughout the frame to carry jumper wire or cable cross-connecting between test jack board and main frame.

A small rack or ring arrangement should be designed to carry the jumper wires or cable over head to the test jack board which would be located on the opposite side of the van.

3. The test desk could, of course, be of several designs, but the most efficient design for operations, it is thought should be the following:

A test jack board of same capacity as the frame with double jack arrangement. One jack to open line toward the switchboard side and the other to open the circuit toward the line or field side.

Each pair of jacks on the test board must contain a numerical designation, so that the test man can keep an accurate set of records showing cross reference to army circuit number.

A small card holder could also be attached to the main frame for circuit cross reference.

4. Remarks.

Ringing current could be employed here but is not absolutely necessary. The generator on the switchboard can be employed.

Space should be left available in each van for installation of second test desk and main frame.

Sufficient quantities of test desks, main frames and secondary frames should be made available at depots for quick delivery.

IT HAS been extremely useful to lay combat Wire W–130 or telephone Wire W–110 to platoon CP's and even combat wire to individual gun positions and observation posts. There is a great saving of BA 40 Radio Batteries for SCR–709's and aside from being able to give and receive more and clearer information there is a large security factor gained. (——— Tank Destroyer Battalion.)

From AGF Board Report

USE OF

STEREOGRAPHIC PROJECTION

FOR

MAP POSITION PLOTTING

AN INDIRECT method has been devised in Engineering and Technical Service, Office of the Chief Signal Officer, in cooperation with Division 13 (Electrical Communications), National Defense Research Council, by which the (1) determination of great circle bearing between two positions, (2) determination of great circle distance between two positions, and (3) solution of triangulation of bearing problems from two or more positions may be transformed to a normal stereographic projection and solved as quickly or quicker than by the use of trigonometric functions or special projections.

The advantage of this method over the use of a gnomonic projection is that distances and bearings may be read off without corrections. The disadvantage of this method is that its accuracy does not approach that of the gnomonic projection until distances of the order of 300 to 500 miles are involved.

Some suggested uses for this method are:

1. Orientation of directional antennas.
2. Finding great circle bearing between two positions for use in checking radio direction finder performance.
3. Finding great circle bearing between two positions for navigation or other purposes.
4. Finding great circle distance between two positions for navigation or other purposes.
5. Triangulation of bearings obtained from two or more radio direction finders in a net.

The method to be described requires (1) a normal stereographic projection of the earth's latitude and longitude lines. This serves as a grid. (2) A transparent overlay (tissue paper or plastic) free to rotate about the center point of the stereographic projection and capable of taking pencil marks. This serves as a map of the northern hemisphere of the earth, although in general this map will remain blank except for positions of interest in any particular application. A thumbtack through the center can serve as a pivot.

The grid is composed of lines which are projections of meridians and parallels, and for want of better names they will be called such. Similarly, the equator, north pole, and south pole will be terms applied to the lines and points which resemble the equator and poles of the normal stereographic projection as it is customarily used. IN THIS CASE such parts of the grid do NOT REPRESENT meridians, parallels, equator, and poles of the earth's surface. To avoid confusion, when such terms are used, hereafter, to refer to the underlying grid, they will be underlined, and when such words refer to the actual meridians, parallels, or any other parts of the overlay, they will be overlined. Underlining will NOT be used for emphasis.

Marking of the Normal Stereographic Projection To Be Used in This Method of Map Position Plotting

Referring to the projection inserted in this issue, it will be seen that the meridians are numbered every 10° starting with 0° of the left boundary of the equator and finishing with 90° at center of the grid. There is an "N" after each number denoting North Latitude. Starting at the center of the grid and continuing to the right are the same numbers (in slanting instead of block print), with 0° at the center (the numeral corresponding to 0° is omitted for clarity) and 90° at the right boundary again with "N" after each number. Starting at the right boundary and continuing to the left it will be seen that the meridians are marked in the same manner as above but with an "S" after each number to denote South Latitude.

Starting at the left end of the equator with 0° and progressing clockwise for 180° to the right end of the equator, every tenth parallel is numbered. There is an "E" after each number denoting East Longitude. Similarly, starting at the left end of the equator with 0° and progressing counter-clockwise for 180° to the right end of the

USE THE INSERT

In order to get the most from this article, the examples cited herein should be worked out with the projection inserted in this issue and an overlay.

APPENDIX

The stereographic projection method makes use of the following axioms which apply to a sphere:

1. Any great circle on a sphere can be identified by either of its two poles. (The poles of a great circle being a point 90° away from every point on the great circle.).
2. The poles which identify all possible great circles through a given point lie on a great circle (called the polar circle of the given point), and the given point is the pole of this polar circle.
3. Through any two given points it is possible to draw one great circle. The pole of this great circle is 90° from both of the two given points, and thus is on the intersection of the polar circles of the two given points.
4. The polar circle of any point is the same as the polar circle of the antipodes of that point.
5. Since either pole identifies a great circle, all great circles can be identified on one hemisphere.
6. The polar circle for any point on the equator is a meridian, and the polar point of every meridian lies on the equator.
7. Any position in the Southern Hemisphere can be uniquely represented by its antipodal point in the Northern Hemisphere.

equator, every tenth parallel is numbered, with a "W" after each number to denote West Longitude.

Along the central meridian (the straight vertical line which crosses the equator at the center of the grid) numbers representing bearings appear at each tenth parallel, starting with 0° and 180° at the north pole and continuing to 180° and 360° at the south pole (the numerals corresponding to 90° and 270° are omitted for clarity).

In this method only the Northern Hemisphere appears on the map (overlay), and the center of the map represents the north pole. However, any point in the Southern Hemisphere may be represented by its antipodal point in the Northern Hemisphere and, thus, this method can be used for operations involving either the Northern or Southern Hemispheres, or both. (See Appendix, Axiom No. 7.) The equator of the grid represents a meridian of the map. The equator of the map is the full circle which bounds the entire map. Since there is only one equator on the grid, only one meridian on the map can be graphically depicted at one time. When desiring to operate upon a particular meridian, the overlay is rotated so that the desired meridian coincides with the equator of the grid, whereupon the latitudes on that meridian are given by the numbers on the meridians of the grid.

For positions of Northern Latitude, the numbers on the left half of the equator represent the parallels between the equator and the north pole. For positions of Southern Latitude (in which case the antipodal points are actually mapped), the numbers on the right half of the equator represent the parallels between the equator and the south pole.

For each point on the equator, the polar circle appears as the meridian having the same number (in slanting instead of block print) on the other half of the equator. For instance, the POINT on the equator numbered 35 N on the left half of the equator has for its polar circle the meridian numbered 35 N (in slanting print) on the right half of the grid. (See Appendix, Axiom No. 6.) Therefore, the polar circle for any point on the overlay can be obtained by rotating the overlay until the point in question lies on the equator. Then, with pencil the meridian having the same number and latitude letter (in slanting print) on the other half of the grid can be traced onto the map, forming the polar circle of the point.

OPERATION

An example of the use of this method will be given in which two positions will be plotted on the map, then the bearing of each position from the other will be determined, and finally the distance between them will be measured. Also a position fix will be made using bearings supplied by these positions, and one other.

Let the two of these positions be New York and Paris. For simplicity the fractional parts of degrees will be disregarded in this example, so for New York consider the Longitude 74 W, and the Latitude 41 N, for Paris, 2 E, 49 N.

First, place a longitude index mark for Greenwich Meridian (0 Longitude) at the edge of the overlay. As this need never be removed, it can be in ink.

To Plot Geographical Positions

Now, to plot the position of New York, rotate the overlay until the longitude index mark is at 74 W on the boundary of the grid. In such orientation, the meridian coinciding with the left half of the grid's equator is the 74 W meridian, on which New York is located. The Latitude of New York, 41 N, is given by the numbers appearing along the equator, so at 41 N put a pencil mark. This is the position of New York.

For Paris, rotate the overlay until the longitude index mark is at 2 E, for which orientation the meridian coinciding with the left half of the equator is the 2 E meridian. Now put a pencil mark on this meridian at 49 N. This is the position of Paris.

To Determine Polar Circles

To find the polar circle from New York, return the overlay to the orientation which puts New York on the equator of the grid. Since New York's position is at 41 N on the left half of the equator, the meridian having the same number (in slanting print) on the right half of the grid is the polar circle of New York and with a pencil it may be traced onto the overlay. (See Appendix, Axiom No. 6.)

The polar circle for Paris is found the same way. After rotating the overlay again so that the position of Paris falls along the left half of the equator, then the meridian with the number 49 N (in slanting print) on the right side of the grid can be traced in pencil onto the overlay.

The intersection of these two penciled polar circles is the pole of the great circle between New York and Paris. (See Appendix, Axiom No. 3.)

Suggestions as to other uses and comments concerning the need for and usefulness of this method of plotting in the field are solicited. Interested organizations desiring further information should write to the Chief Signal Officer (SPSRL-2L), Washington 25, D. C.

To Determine Great Circle Bearing of One Position From Another

To find the bearing of Paris from NEW YORK, rotate the overlay until NEW YORK is on the equator as when originally plotted. Then observe the parallel on which the pole of the great circle between New York and Paris lies (determined as described above). Reading the bearing from the numbers along the central meridian it is seen that the bearing of Paris from NEW YORK is 54 or 234 (one being the reciprocal of the other). By considering the direction of Paris from NEW YORK, it is apparent that 54° is the direct bearing, 234° the reciprocal.

Next, to find the bearing of New York from PARIS, rotate the overlay until PARIS is on the equator as when originally plotted. The pole of the great circle between Paris and New York lies on the parallel which is numbered 112 or 292 at the central meridian. Obviously 292° is the direct bearing and 112° the reciprocal.

To Avoid Tracing Great Circles on Overlay

Slightly less accurate, but much quicker than tracing the polar circles of the two positions is the following procedure for obtaining the bearing of one position from the other: Rotate the overlay until the positions of New York and Paris lie along the same meridian on the left half of the grid. Observe the number of this meridian (in this case 53 N). With a pencil mark a point at 53 N (in slanting print) on the right side of the equator. This point will be the same as the intersection of the two polar circles as traced in the procedure described previously and thus is the pole of the great circle between New York and Paris. The bearing of one position from the other is then determined exactly as described above.

If a position is in the Southern Hemisphere, the procedure is exactly the same as for the Northern

Hemisphere except that the position is plotted on the right half of the equator using the numbers with "S" instead of with "N." Southern Latitude points may be plotted in red pencil to show they are the antipodes of the actual positions. (See Appendix, Axiom No. 7.)

With one position in the Northern Hemisphere and one in the Southern Hemisphere, the pole of the great circle between them is determined as above. The bearing between the position in the Northern Hemisphere and the one in the Southern Hemisphere is determined as described above for two stations in the Northern Hemisphere. The bearing between the position in the Southern Hemisphere and the one in the Northern Hemisphere is determined by rotating the overlay until the position in the Southern Hemisphere is on the right side of the equator. The pole of the great circle between the two positions now lies on the parallel corresponding to the bearing between the two positions.

To Measure Great Circle Distance Between Two Points

Using the same example (New York and Paris) rotate the overlay so that the two positions fall on the same meridian of the grid and so that the pole of the great circle between them lies on the equator. (See Appendix, Axiom No. 6.)

The distance in DEGREES between the points can be read along the central meridian between the parallels crossing this meridian at the two positions. For more accuracy and convenience, a straight edge and pencil can be used. Draw two straight lines from the pole of the great circle (NOT from the center of the map) through the two positions and continuing to the outer boundary of the map. The numbers around the boundary of the grid can now be used as a protractor, and by rotating the overlay so that one of these penciled straight lines crosses the boundary of the map at 0, the other pencil line where it crosses the boundary gives the distance between the two geographical positions in DEGREES. Multiplying by 60 gives the distance in nautical miles, or multiplying by 69.096 gives distance in statute miles.

To Solve Problems in Triangulation

Let New York, 74 W, 41 N; Paris, 2 E, 49 N, and a location in Canada, 90 W, 70 N, be the positions of three radio direction finder stations.

Assume the reported bearings are as follows:

New York, 100°.
Paris, 260°.
Canada, 120°.

Plot the position of each station as described above. Now rotate the overlay so each position, one after the other, falls on the equator. On the polar circle on the right side of the grid corresponding to that position (see Appendix, Axiom No. 6), place a pencil mark at the point where the parallel corresponding to the bearing at that station crosses the polar circle. Now rotate the overlay, with the three polar points just plotted, until they fall along one of the meridians on the right side of the grid. It will be found that it is the meridian marked 32 N (in slanting print). This is the latitude of the fix. The index mark is over the longitude of the fix, which is 43 W.

On the equator on the left-hand side of the grid make a mark at the meridian marked 32 N (in block print) and label "fix." This is the position of the fix, which in this case is somewhere in the Atlantic Ocean.

TO AFFORD the utmost in protection for both the SCR–193 radios and the operators during winter months, plywood shacks were built over all radio jeeps. This shack provides a warm, dry, easily blacked-out position for the operator in the coldest and wettest weather. (——— Division.)

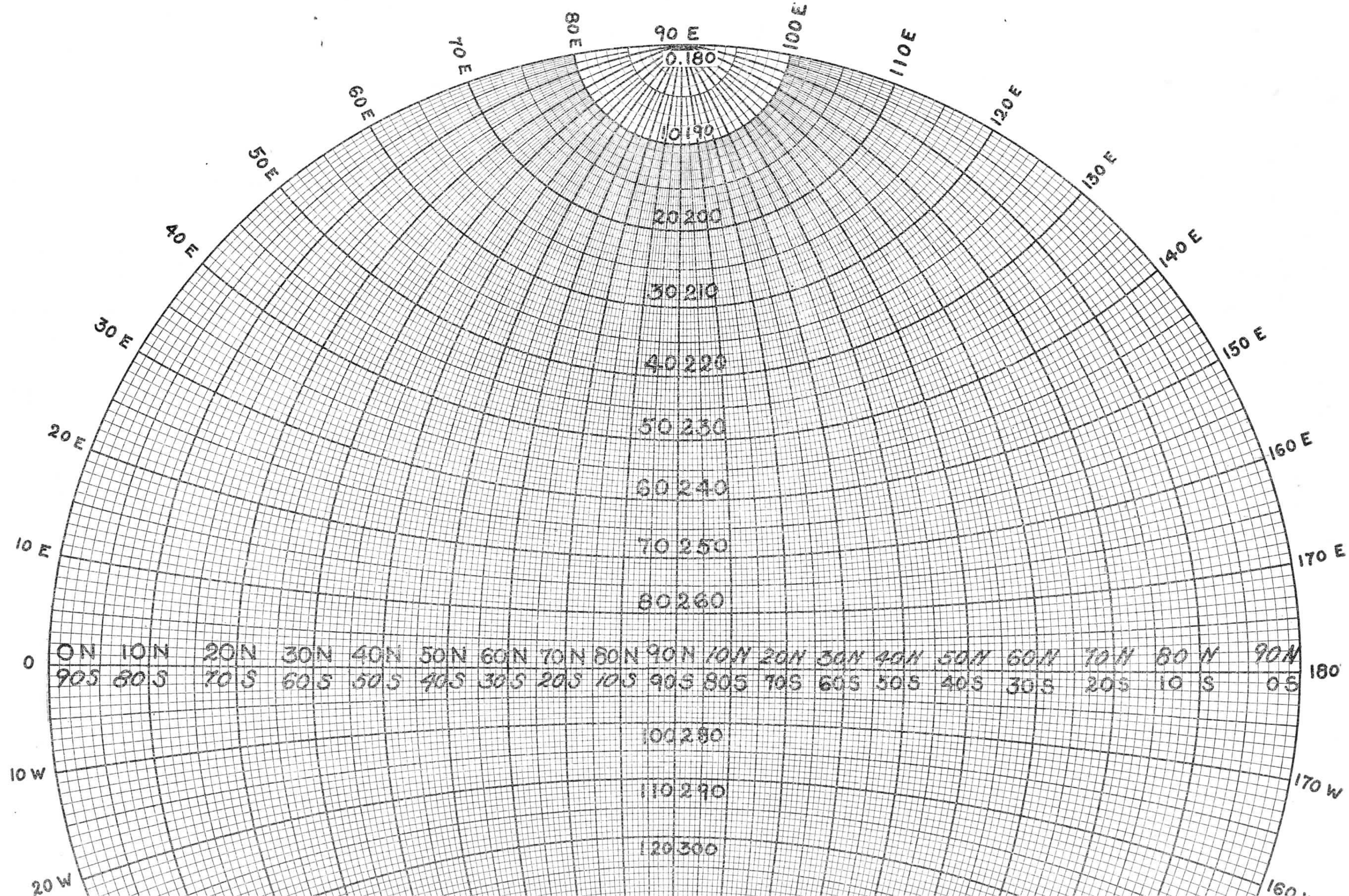
From AGF Board Report

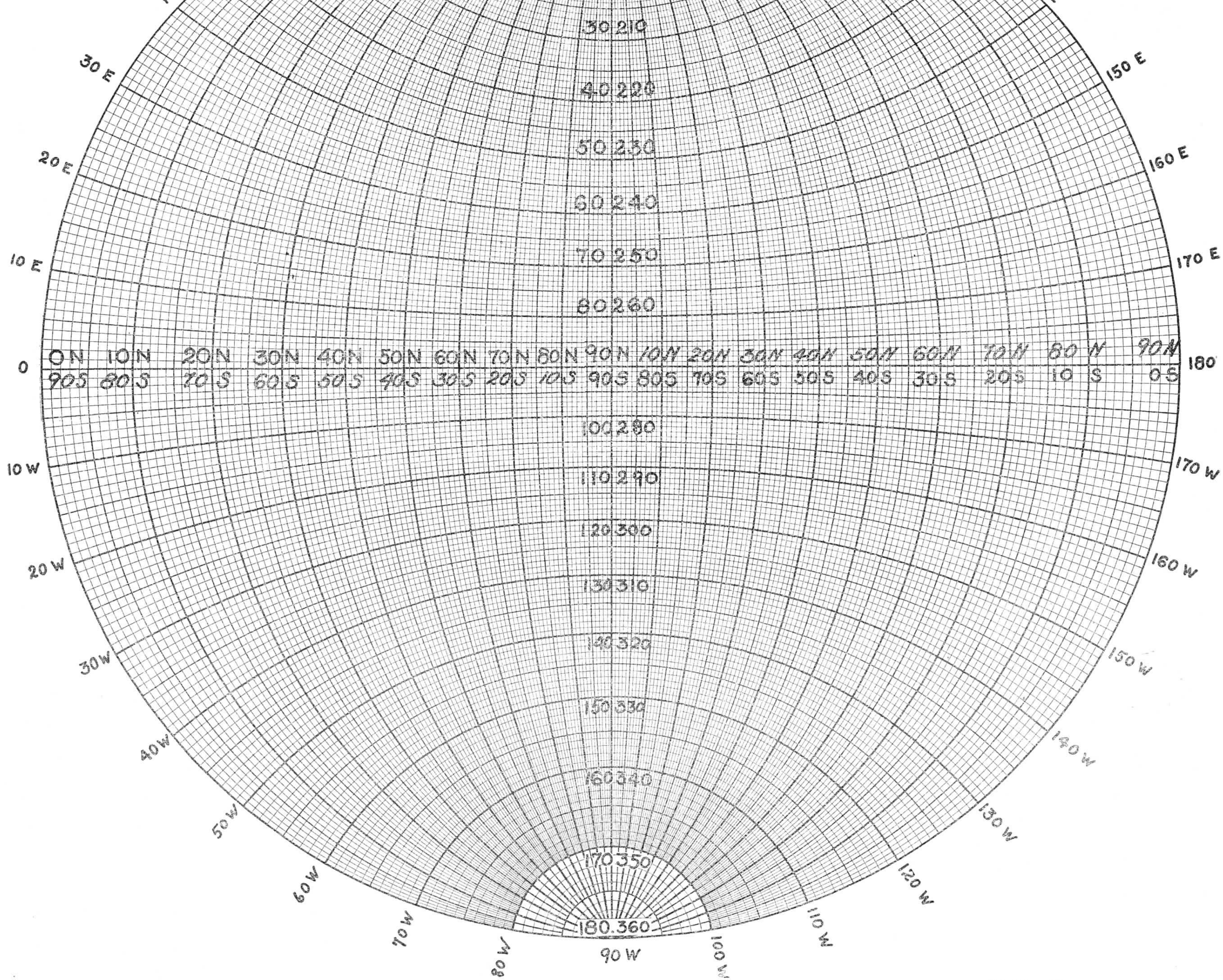
Steoreographic Projection

for

Map Position Plotting

Special Insert SCTIL No. 41

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638883—45

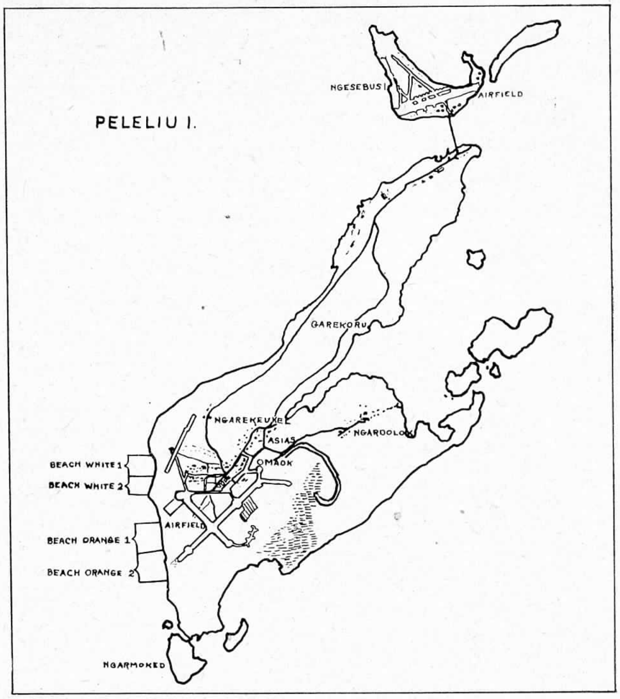
PALAU—COMMUNICATIONS

Signal Corps Radio Sets Primary Means for Marine Corps Messages

THE PALAU group forms the western rim of the Carolines, and extends nearly 100 miles in a northeast-southwest direction. There are eight principal islands, Peleliu and Angaur being the most important.

In the assault on Peleliu, the 1st Marine Division made landings following a preliminary naval bombardment and air strikes, on White and Orange Beaches. (See map.) Little opposition was encountered on the landing beaches and although extensive mine fields had been laid, United States troops advanced inland for a considerable distance before the enemy began to assert himself. Heavy fighting continued all during D-Day (15 September 1944) with the enemy launching three counterattacks, all of which were repulsed. By 1800 of D-Day, Marines had gained a beachhead 3,000 yards in length and averaging 500 yards in depth. During the night of 15–16 September, enemy attacks were repeated but all failed.

On D-plus-1, United States troops, under heavy machine-gun and mortar fire, overcame pillbox and tank obstacles and captured the airfield. By nightfall, Marines had reached the eastern shore of the island and had isolated enemy forces on the southern tip of the island. Two days later, American ground forces, following close behind a supporting air and naval gunfire preparation, wiped out all enemy opposition in that area. The attack was making steady progress east and north, and by nightfall of D-plus-5, against stubbornly resisting enemy, the eastern coast except the isolated finger of land to the northeast had been secured. Throughout the remainder of September, the 1st Marine Division, reinforced by a regimental combat team of the 81st Infantry Division (United States Army), pushed northward. The 81st Infantry Division had overrun the neighboring island of Anguar in a 4-day combat which ended 20 September. On the 25th, Japanese resistance began to crack, and on the night of the 28th, the enemy began *banzai* attacks. By the end of September, the entire island except for a



pocket of high ground to the north of the airfield was in United States hands. A battle of attrition continued in October until the cliffs and caves of this high ground had been cleaned up.

COMMUNICATIONS

According to a 1st Marine Division action report, communications in the Palau Islands operation were adequate and very satisfactory. The frequency plan for the division was exceptionally good; mutual interference being essentially nonexistent. Interference that was noted was due in most part to harmonic and spurious frequency output.

Prior to the operation, the 1st Marine Division was reinforced by a joint assault signal company, a radio intelligence platoon, two separate wire platoons, a Navy mobile communication unit and a Navy radar unit. These organizations and their equipment were all assault-loaded with the Division and increased the over-all efficiency of the Division to a marked degree.

Wire communications to the regiments were installed by H-plus-6. Tracked vehicles rendered wire laid on the ground on or near the beaches useless. In certain instances, some commanding officers went without wire communication for short periods of time in order to enable the wire personnel to overhead the field wire.

The primary means of communication based on actual traffic handled the first 2 days was radio. Radio Set SCR–300 and SCR–610 performed excellently. The SCR–300 was used in the Division command net from H-minus-3 on D-Day until the departure of the Division from the Island. It proved to be the outstanding piece of signal equipment during the operation. The SCR–610 operated entirely satisfactorily in the Corps net and in an intelligence net between Division and regiments. Radio Set SCR–536 sets proved valuable in company and battalion nets. Radio equipped jeeps were landed too soon and casualties to equipment were heavy. Little use was made of them in the Division in view of the ease and reliability of maintaining SCR–300 and SCR–610 nets. Tank communications utilizing Radio Set SCR–508 and SCR–528 sets were satisfactory.

Two radio equipped DUKWs were landed and operated moderately well, failure mostly being due to moisture. These installations were used by Commander Support Air (Ashore) and the Division Air Liaison Officer. One jeep-mounted Radio Set SCR–608 and one Radio Set SCR–694 completed the equipment provided for communication in connection with close air support. The SCR–694 operated excellently and was unanimously praised by each unit using this set.

Message Center operation at the Division was normal. Message Centers in regiment and battalion were little used as the tendency was for officers to talk directly over voice radio circuits. (This was encouraged.) This speeded communications and relieved crowded telephone circuits. Unloading difficulties prevented the establishment of Joint Communications Center and an Air Defence Communications Center before D-plus-15.

JASCO

Upon arriving at the staging area, the 10 communications teams, 9 shore fire-control parties and 13 air liaison parties were at once attached to the battalions and regiments with which they were to operate. Great difficulty was experienced in the control of the shore party communications teams attached to each battalion. On the whole, these teams worked well although in some cases some difficulty was experienced in coordinating the teams because they were not landed as a tactical unit. In one case, one team was embarked on 3 different transports.

Air liaison parties and shore fire-control parties worked very well. In many cases, air liaison parties and shore fire-control parties landed too soon. In one instance a party was landed at H-plus-6 minutes and in several other instances parties were landed on beaches where assault troops were pinned down by fire. Radio-equipped ¼-ton trucks were landed generally in the fifth or sixth waves, but in many cases were a complete loss since no personnel were available to perform salvage operations. Loss in equipment numbered more than 50 portable radio sets. These sets were replaced by 36 Radio Set SCR–694s, received shortly before JASCO sailed for the assault, and proved invaluable.

BATTLE PARTICIPATION AWARDS

NORMANDY

32d Signal Construction Battalion.
35th Signal Construction Battalion.
40th Signal Construction Battalion.
113th Signal Radio Intelligence Company.
165th Signal Photo Company.
175th Signal Repair Company.
6th Platoon, 187th Signal Repair Company.
215th Signal Depot Company.
246th Signal Operations Company.
255th Signal Construction Company.
257th Signal Construction Company.
282d Signal Pigeon Company.
286th Joint Assault Signal Company.
293d Joint Assault Signal Company.
294th Joint Assault Signal Company.
6th Signal Center Liaison Team.
3132d Signal Service Company.
3250th Signal Service Company.
3251st Signal Service Company.
3252d Signal Service Company.
Signal Company, Special, 23d Headquarters, Special Troops.
2d Mobile Radio Broadcasting Company.
92d Signal Battalion.
101st Airborne Signal Company.
82d Airborne Signal Company.
3253d Signal Service Company.

SPIRAL-FOUR CONSTRUCTION

Plan Followed by Seventh Army Signalmen Speeds Up Successful Cable Installations

THROUGHOUT THE campaigns of Southern France and Germany, 1st Signal Bn, Seventh Army, installed spiral-four cable trunk communications between army and corps, army and flank army, and from army command post to army rear echelon. Telephone and telegraph terminal carrier and intermediate repeaters were used to provide three voice and four teletype channels over distances up to 400 miles. The high operational quality of these circuits allowed 90 percent of all electrical traffic to be cleared by teletype. Voice transmission on these circuits was equally successful and telephone communication was available to all army tactical installations at all times even when the tactical advance was covering distances of from 50 to 60 miles per day. During the 90-day period, including September, October, and November, this unit installed 729 miles of aerial spiral-four cable on No. 9 GI wire messenger.

When existing lines permitted, four copper circuits were rehabilitated on existing French pole lines to supplement the spiral-four and to provide communication for maintenance control points and administrative switches along the communication axis. When spiral-four circuits were disbanded, they were either turned over to army group or the base section for further use, or the cable and messenger were recovered and returned to the signal depot for testing and further issue.

It is felt that the highly successful service obtained from this cable is the result of a detailed *installation ritual* outlined and followed by construction personnel of this unit in its installation and maintenance. Further, the great speed with which these troops are able to install spiral-four cable can be attributed to careful planning and supervision on the part of the officers and noncommissioned officers of the construction companies. As a result of their past successes, they have complete confidence in the cable itself and take great pride in its proper installation.

The following detailed installation plan used by this unit, with attached diagrams, shows how the various steps are accomplished.

CONSTRUCTION PLAN

When the immediate axis has been determined by army or corps headquarters and the *go-ahead* has been given to construct communications to a given point, the construction company commander briefs the platoon officers and noncommissioned officers as a group and outlines the communication requirement to them. From the map he selects a route and assigns sections to be constructed by each platoon leader.

Teams Are Spaced Along Right-of-Way

The platoon officers and platoon sergeants depart immediately to their section of responsibility to make an *on the spot* reconnaissance of the right-of-way. When this is completed they are able to space the teams along the full length of the section and properly distribute the amount of work to be accomplished. The team leaders load the necessary equipment, brief their teams, and move out to the job as soon as they are ready. The platoon officer and sergeant meet them at the starting point and space the teams along the section of platoon responsibility.

The construction companies of this unit are broken into three *four-team* platoons instead of 2 *six-team* platoons as outlined on the T/O. This organization provides the ideal size unit for construction of tactical communications since it reduces the number of personnel and equipment that one officer is responsible for and allows closer supervision on the part of the platoon officer and sergeants, and provides greater flexibility in meeting construction requirements.

Each team, which normally consists of 12 men and 3 vehicles, follows the same installation procedure as described below.

A ¾-ton weapons carrier with Reel Unit RL–17, mounted in the rear is used to pay out the messenger. This truck with a driver and a reel attendant moves out first along the right-of-way. The messenger is dead-ended to a pole or tree at a point about 4 feet above the ground line and the tension is maintained along the line by the use of Grips LC–11 every eighth or tenth pole and one at the far end of the messenger at the same distance above the ground level. This allows the men tying the cable to the messenger to lift the cable from the ground and keep the slack pulled up.

A 2½-ton, 6 by 6, cargo truck with a Reel Unit

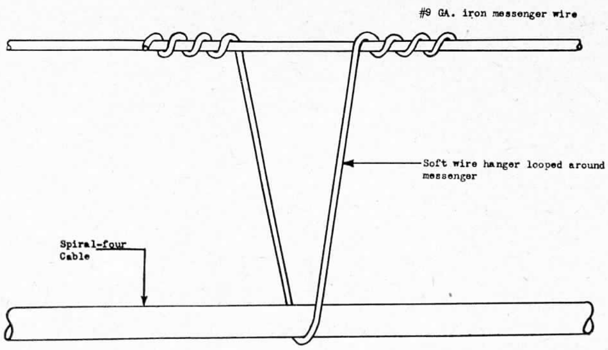


Figure 1.

RL–26A, mounted, follows the ¾-ton and pays out the cable. If three cables are to be installed an RL–31 may be used to pay out the third cable simultaneously. The driver, team loader, and one man to operate the reel are the only personnel necessary to perform this function. The team leader tests each drum of cable with a Test Set EE–65, before it is paid out; he tests for crosses, opens, shorts, and insulation resistance. These tests must be performed with a EE–65 or similar test set; testing by ringing through with a local battery phone is not sufficient. After a drum has been paid out he again tests the section and after it has been plugged into the original section the entire section is again tested.

Each ¼-mile section of cable is tagged with a soft aluminum disk which is tied to the cable near the plug with No. 20-gage soft copper wire. The tag is stamped with a metal stamp, showing the cable number and a letter representing the code name of the unit to which the cable is in operation. Thus A–60 would represent cable number 60 working to *Armor* switchboard.

This identification is very necessary for trouble-shooting teams to be able to find the correct cable and avoid opening working carrier circuits. These bright metal disks are easy to see at night and the weather will not damage them. These tags can be recovered with the cable and messenger.

Three men follow behind the two trucks and attach the cable to the messenger at 6-foot intervals with hangers, which are strips of soft wire, either copper or aluminum, about 14 to 16 inches long. This operation is outlined in figure 1. The cable is suspended from 2 to 3 inches below the messenger.

Three men and a truck driver follow next placing the cable in the air by tying it to either poles or trees, or when neither are available improvised lance poles are placed in the same manner as lance poles for field wire.

This crew is equipped with a line construction Truck K–43, which has a platform built over the front section of the sliding top for men to stand and work from. When the poles or trees are accessible along the road, the truck is driven beside the pole and the lineman is able to place the cable from this platform.

A twelve-penny nail is driven into the pole or tree on an angle at the height desired and the messenger is placed on this nail. Two men then pull the messenger and cable up to the desired sag and the messenger is secured to the pole with a modified horse-shoe tie. This tie is illustrated in figure 2. This tie is necessary to prevent the messenger from oscillating in the wind and wearing the nail in two.

The loose loop of cable that hangs below the tie on the pole is secured to the pole with a piece of marlin. The wind will blow this loop against the pole and break the insulation of the cable if it is not secured in this manner.

As each team completes its assigned section, the line is tested and plugged into the next adjoining section. A loop is formed with about 18″ of the end of each cable section and the loop is taped to the messenger to form a hanging loop with the two plugs. The plugs are supported to the messenger with a piece of marlin which is tied to the center of the two plugs and to the messenger directly above it.

The platoon sergeant tests the entire section constructed by his platoon after all teams have tied their sections together. After it has been determined clear it is attached to the next adjoining section.

An over-all test is made of the entire length of

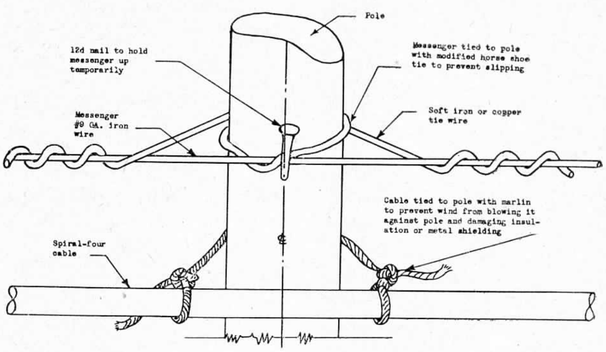


Figure 2.

the cable with the senior wire chief at the switchboard from which the cable has been constructed.

All empty cable drums and metal connectors are returned to the signal depot to be drawn when the cable is to be recovered.

A construction team can install from 2½ to 4 miles of cable on messenger in a normal working day when no more than 20 percent must be placed on lance poles. One construction company of this unit installed between 50 and 60 miles of spiral-four a day for 2 successive days from Pont d'Ain, France to Besancon, France. Cable is constructed along highways which makes it readily accessible to maintenance crews. Less interference is experienced from other signal units when the cable is tagged. At least 95 percent of the maintenance troubles experienced with spiral-four were man-made and not the result of faulty cable.

NEW WDLO DISTRIBUTION

IN LINE with the Army's policy of improving the efficiency of operations wherever possible, a new system of distributing War Department Lubrication Orders (WDLO's) is being put into effect. The system is intended to make distribution of these important maintenance instructions automatic, to insure that no piece of equipment is operated without them.

However, since no distribution system on such a large scale as that of the Army can be expected to be 100 percent effective, and since the distribution within individual units must of necessity be left up to officers of the unit, it is important that officers know at all times which WDLO's are available and how to obtain any copies they may need.

It often happens that in the distribution of WDLO's by The Adjutant General, because of frequent organizational changes, the unit commander will find that the number of copies allotted to his unit does not fill the requirements of the unit, so he will have to requisition copies in addition to those originally received. Then, too, copies will be lost or destroyed or worn out.

Under the new system, the WDLO for a piece of equipment is placed in the same classification as the equipment's technical manual. It is given the same distribution as the manual, and, to make identification simpler, it carries the same number, except that the letters *LO* replace the letters *TM*. For example, the technical manual TM 9–772 and the lubrication order LO 9–772 pertain to the same piece of equipment.

Although old-style lubrication orders will be superseded as rapidly as possible by the new-style ones (metal bound cards are out and only the decalcomanias and ordinary cards will be issued from now on), the former should continue to be used and requested until the new-style replacements are received or are listed in FM 21–6, *List of Publications for Training*.

This publication makes it easy to keep posted on the new WDLO's, for it comes out once a month, lists all WDLO's available, and marks those issued during the past month with an asterisk for quick identification. In addition to listing the WDLO's, FM 21–6 describes them, specifies how they are to be used and tells how the necessary extra copies may be obtained.

It is mandatory that each piece of equipment be accompanied by its WDLO at all times (see Cir. No. 114, W. D., 1944) and it is the officer's responsibility to see that this be carried out. Here, there are two important points that should be strongly emphasized. All too frequently, it will be found that a complete file of WDLO's is kept by the sergeant major of a unit when the equipment maintenance men do not have copies to work with. Inasmuch as WDLO's are *work* sheets, placing them in a file serves no useful purpose, and this practice must be stopped. It is the sergeant major's responsibility to see that WDLO's he receives are *distributed* to the men who need them. The other point that should be kept in mind is the fact that WDLO's must be constantly checked to make sure that the current one for every piece of equipment is being used. Here again, reference to FM 21–6 is important in checking WDLO's available for issue so that obsolete copies may be destroyed and replaced. In this regard, the enlisted man should feel no hesitancy in reminding the responsible officer of his requirements if WDLO's are not forthcoming when they are due. The unit commander is responsible for seeing that the prescribed lubrication is performed in accordance with the WDLO at all times.

Now is a good time to check up on WDLO's. Their use insures the correct lubrication of equipment that is necessary for most efficient operation and longest possible equipment life.

638883—45——3

PHOTOGRAPHIC LABORATORY

Improvisations Were the Rule in India, But the Processing of Film Never Lagged

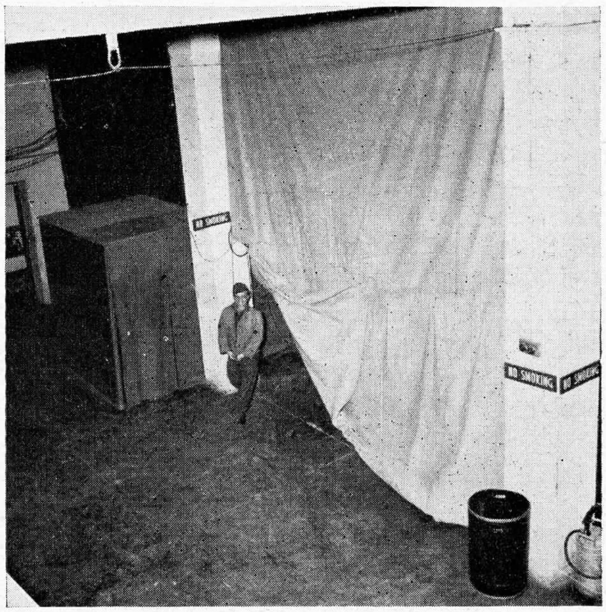
THE ——— Signal Mobile Photographic Laboratory, with a strength of 45 enlisted men and 3 officers, has now been in operation in India for more than a year. It is felt that the problems this unit encountered, and the expedients used to overcome these obstacles would be of interest and use to other units of similar character.

The primary mission of a mobile photographic laboratory is to service a theater of war in the field of photography, and its functions are to develop, print, edit or rough cut, and ship 35-mm motion-picture film. The word *mobile* when used in reference to this type of organization is not to be confused with the portable trailer-type laboratory used by the AAF with forward echelon units but rather to be construed as meaning *semipermanent, but capable of being moved if the need becomes urgent.* The nature of the organization is such that it is usually attached to, or a part of, staff headquarters or rear echelon headquarters, where light, power, water, and building facilities usually are readily available.

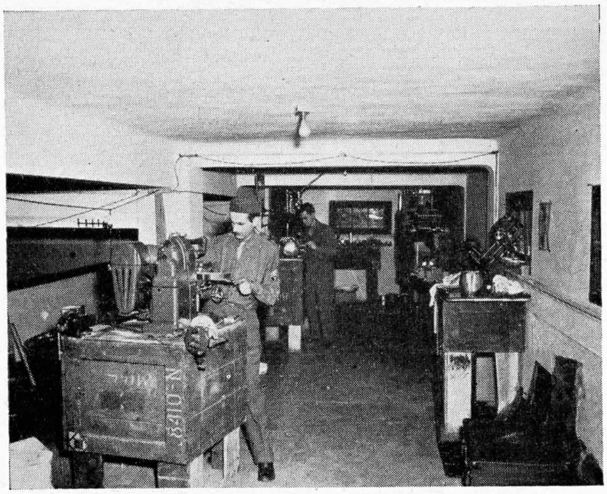
The unit is usually composed of three sections: laboratory, which includes equipment maintenance and still photographic and developing facilities; administration and supply; and an integral special assignment unit for motion-picture coverage.

Upon arrival, this unit found itself the only photographic organization in the theater, except for three enlisted men composing a small photo detachment of the signal service battalion. Thus the main function of the unit as a base organization in collaboration with a photographic company could not be realized immediately, and the unit began limited operations within a month, acting as the main theater still laboratory and the parent organization and principal source of supplies for three combat photographic teams. The photographic company assigned to the theater arrived 3 months after the advance units and upon its arrival a more normal distribution of operations was immediately set up.

The motion-picture section was provided with space which had originally been an automobile show room and was being used as a subsistence warehouse. This space was 50′x40′x17′. There was a 10′ wide balcony along the width of the room. Plans were immediately drawn for the necessary construction of partitions, plumbing, air conditioning, and electrical installation. However, since past theater experiences proved that it would take at least 6 months to secure administrative approval and construction, it was decided to attempt temporary operations with improvised darkrooms, temporary plumbing, and using a portable generator for power source. Existing facilities were utilized to the utmost. An L-shaped corner of the room became the main darkroom after heavy canvas curtains were hung from ceiling to floor. This room was used as a developing room, projection room, and cutting room. A small washroom was converted into a chemical mixing room, and rubber garden hose, connecting the washroom and developing machine, supplied the water and drain necessary for developing operations. The maintenance section was set up on the balcony, and directly below the balcony, a section was wired off and made into the supply room. Alongside of the supply room under the balcony another section was closed in with celotex wallboard and made into the power supply room. The 20–kw. generator, which is T/E equipment, was not sufficient to take care of all of the power needs,



"AN L-SHAPED CORNER . . . BECAME THE MAIN DARKROOM AFTER HEAVY CANVAS CURTAINS WERE HUNG . . ."



"THE MAINTENANCE SECTION WAS SET UP ON A BALCONY."

so two other generators, one 10–kw. and one 5–kw., were borrowed from other local signal units. These generators were intended to be used as emergency power, but became the main power source for operations for the next 7 months.

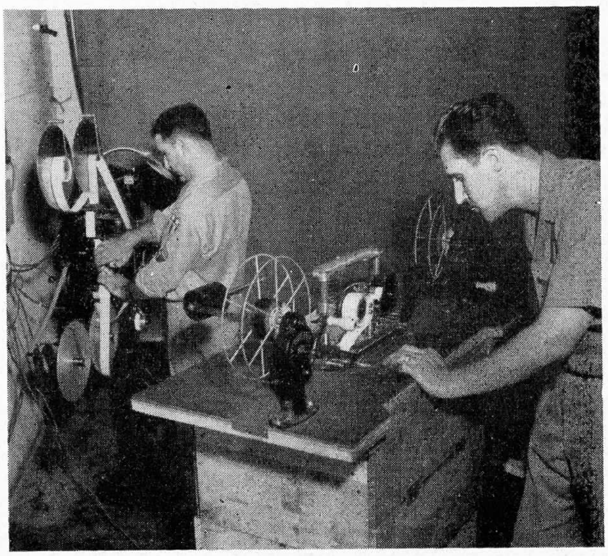
The still laboratory had few problems, being fortunate enough to find existing facilities adequate.

Motion-picture film was developed at night, due to the high temperature conditions, and the inability to make the canvas darkroom completely lightproof. Under this set-up it was impracticable to process and print more than 5,000 feet of negative nightly.

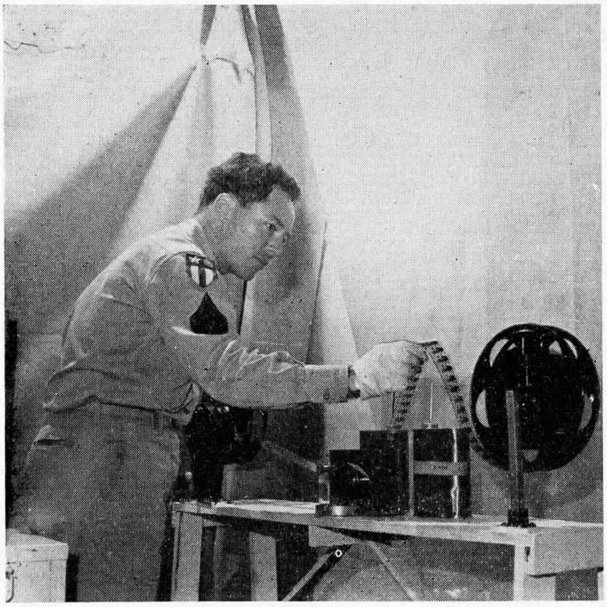
Because of the varied exposure and lighting of exterior subjects, and despite the skilled judgment used in timing, it was extremely difficult to turn out an evenly balanced print. The T/E had not authorized a Cinex light-test printing machine and its lack necessitated the handling of all negative for timing and constituted a distinct handicap to operations by slowing down the work. A light-testing machine Safelight PH 388 was requested from the States. Meanwhile pending its authorization and arrival, the maintenance department designed a strip-printing machine and built it out of scrap metals. This machine is functioning satisfactorily in the absence of the requested machine. The light strips have considerable value in that they can be forwarded after the negative is timed and printed to the cameraman with a critique of his work, so that he can see a sample of his work, and correct any defects which might be due to his operations.

The Developing Machine PH 298, which is the mechanical backbone of the unit, has been found to function satisfactorily with the following exceptions:

The refrigeration unit is inadequate to maintain proper solution temperature due to frequent room temperatures of 115° to 120° F. and water temperature of about 90° F. Wash water temperature was lowered to 75° F. by circulating it through an improvised coil installed in a beer cooler filled with ice. The polishing drum in the first compartment of the dry box was mounted close to the bottom rollers, forcing the film beyond the edge of the roller flange which caused the film to pile up and consequently break. This was remedied by installing the drum in a new mount halfway between the upper and lower rollers. It was found that the moving film was not carrying over sufficient replenisher to the developing solutions, so a siphon device, consisting of a rubber tube running from a graduated bottle to the developing solution tank, was installed. This enabled the operator to replenish the solution by releasing the clothespin valve on the rubber tubing, allowing the replenisher to flow automatically until the proper liquid level was reached in the solution tank. The metal staples, which are used to fasten the pieces of film together, were unsatisfactory and were replaced daily due to their tendency to corrode after immersion in the hypo. Adhesive tape is available in the theater and a tape splicer is now in the process of being designed and built in order to eliminate the metal staples. An edge waxing machine



". . . MAINTENANCE . . . DESIGNED A STRIP PRINTING MACHINE AND BUILT IT OUT OF SCRAP METALS."



"AN EDGING WAXING MACHINE WAS IMPROVISED . . . THE SOLUTION IS FED TO THE FILM FROM THE CONTAINER BY MEANS OF A SMALL COTTON WICK . . ."

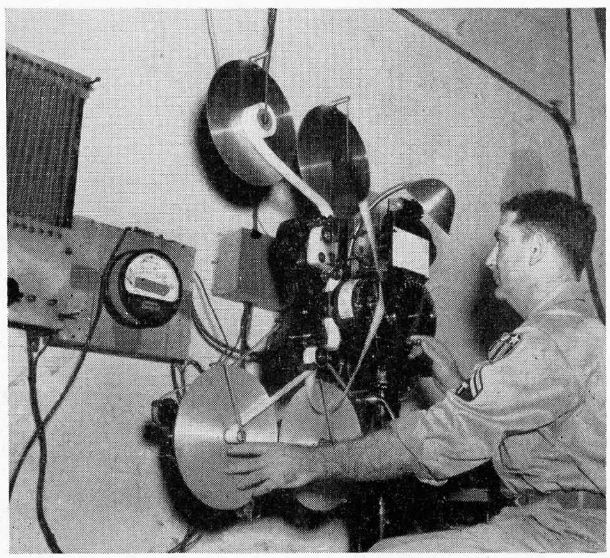
was improvised which consists of a brass wheel, rewind, carbon tetrachloride and wax solution in a small container. The solution is fed to the film from the container by means of a small cotton wick, which sucks up the wax and distributes it quite evenly on the edges of the brass roller where it is picked up by the film touching only the edges of the roller.

The inadequacy of constant power supply to maintain all operations at one time arose soon after operations began. The unit had one 20-kw. generator with a tungar rectified. All other work had to cease, when printing was being done, due to the necessity of maintaining a constant light and elimination of the voltage variation which was evident when the other machines were in operation. In order to eliminate this, a 5-kw., 110-volt generator was borrowed and was used solely for printing machine power source. T20, 500-watt prefocus projection lamps were used in the printing machine and in order to make the lamps, which were a critical item in the theater, last longer, the printer lamp voltage was reduced to 85 volts. Whenever it was necessary to print master positives, the printer lamp voltage was increased approximately 20 volts, the variation being dependent upon the density of the negative being printed.

In order to eliminate the need for maintaining more than one printing film stock level, No. 1302 positive, which is a fine grain release positive film, was used for making both regular daily prints and master positives. The 1302 film was used in preference to the regular 1365 printing positive, because it has a faster speed. The over-all results which have been achieved from the use of one stock as an all-purpose film have been gratifying.

Cutting room equipment was made by altering equipment furnished by the quartermaster. Moviola tables were made by cutting out the necessary holes in flat top desks, mounting lights underneath, installing frosted glass for diffusion, and attaching film bags made from sheets.

The maintenance section has had to make replacements parts for both the movie and still cameras because of the absence of any spare camera parts in this theater. The 6″ Atlas lathe, provided by the T/E, was found to be unsatisfactory to perform the highly accurate machine work needed for the construction of camera parts. The unit was fortunate in being able to obtain a 10″ Regal precision lathe which has proved invaluable in maintenance operations. The humidity of the jungle areas, where the majority of the photography was being done, caused excess emulsion pickup in the Eyemo cameras (Camera PH–330), which in turn, caused bad scratches on the film. The front pressure plates of every Eyemo that came to the unit were undercut to eliminate this type of scratch at its source. The humidity also caused the mirrors



"MAINTENANCE SECTION HAS PROVEN ADEPT IN THE IMPROVISATION OF SPARE PARTS . . . SUCH AS . . . VOLTAGE CONTROL FOR THE PRINTER."

on the Rolleiflex cameras to deteriorate rapidly, so the necessary chemicals were obtained from medical supply and, after experimenting for a short time, mirrors were front-silvered. The maintenance section has proven adept in the improvisation and manufacture of other types of spare parts and equipment, such as silvered reflectors, high-hats for the Mitchell camera, and voltage control for the printer.

About 7 months after arrival in the theater, the unit was notified to move into headquarters building. Various rooms in the new location were altered and walls constructed to allow for separate film vault, cutting, supply, developing, printing, negative assembly, chemical, and camera rooms. The unit was able to obtain a pair of the newest Cyclex arc projectors from Special Service, and they were installed in a specially constructed booth. They have proved much superior to the T/E-furnished DeVry incandescent projector. The DeVry machine was subsequently sent to a forward area headquarters, where there was a great need for a portable machine. Air conditioning has been installed in the developing, chemical, negative assembly, and cutting rooms, in the film vault and in the projection room.

Despite the lack of various articles of equipment and the condensed condition of facilities, operations compare favorably with small commercial motion-picture laboratories in the United States.

SIGNAL INSTRUCTIONS—SHAEF

The following instructions from SHAEF are republished herewith as a matter of information for signal officers.

SUPREME HEADQUARTERS

ALLIED EXPEDITIONARY FORCE

Signal Division

SHAEF/5276/3/Sig
TECHNICAL AND TRAINING
INSTRUCTION, Section II/6/2

FREQUENCY CHANGING PROCEDURE

Information

1. Frequency changing on fully remote controlled radio transmitters at times involves considerable delay or complete loss of contact in communication between radio stations.

Intention

2. To prescribe a simple procedure, the use of which will prevent delays and loss of contact between radio stations when changing frequency.

Method

3. Frequencies for all Supreme HQ, AEF, radio circuits are given distinguishing letters as follows:

A for NIGHT frequency
B for ALTERNATIVE frequency
C for DAY frequency

4. Arrangements will be made by all concerned:

a. To ensure that the transmitting site be constantly manned.

b. To provide telephonic communication betwen the receiving and transmitting sites.

5. The following frequency changing procedure will be used:

a. When the necessity arises to change frequency and both stations are working on *A* frequency the CONTROL station operator at the receiving site warns by telephone the attendant at the transmitter site.

b. CONTROL station operator sends QSW–B.

c. OUT station operator replies QYF–B.

d. CONTROL station operator orders, by telephone, the attendant at his transmitter site to change frequency.

e. OUT station operator retunes receiver to *B* frequency.

f. CONTROL station operator sends, on *B* frequency, tuning call and request for signal strength as follows:

QWF (followed by a series of Vs) INT QSA

g. OUT station operator replies on *A* frequency, giving signal strengths.

NB: If OUT station gives QXC and communication has not been established on *B* frequency after fifteen minutes, both stations will revert to transmission on *A* frequency and, having reestablished communication, will repeat above procedure.

h. Duplex working can then continue until the OUT station is ready to change frequency.

i. OUT station sends QSW–B.

j. CONTROL station replies QYF–B.

k. OUT station operator orders, by telephone, change of frequency at his transmitter.

l. CONTROL station operator retunes his receiver to *B* frequency.

m. OUT station operator sends on *B* frequency tuning call followed by INT QSA.

n. CONTROL station replies, giving signal strength.

NB: If CONTROL gives QXC and communication has not been established on *B* frequency after 15 minutes, the OUT station will revert to transmission on *A* frequency and communication having been reestablished with duplex working the above procedure will be repeated.

o. If contact is lost about frequency change time both stations will automatically come up on the new frequency within a period of twenty minutes.

6. Standard logging of frequency change times will be adopted by the Supreme Headquarters stations as shown in the following example where asterisks are used in the *IN* and *OUT* columns to indicate calling station:

EXAMPLE

Evening change from *B* to *A* frequency

OPERATOR'S LOG

Time	In	Out	Signals
1830		*	QSW–B (operation 5b)
1831	*		QYF–B (operation 5c)
1835		*	Tuning Call on B. (operation 5f)
1837	*		QSA–5 (operation 5g)

DUPLEX WORKING

Time	In	Out	Signals
1849	*		QSW–B (operation 5i)
1850		*	QYF–B (operation 5j)
1900	*		Tuning Call on B. (operation 5m)
1901		*	QSA–5 (operation 5n)

7. It is necessary to emphasize that the frequency change MUST be undertaken when signals begin to fade, at which time there normally will be sufficient time to permit an efficient frequency change. Delay will result in loss of communication. No alarm should be felt if initial communication on the new frequency is not as good as on the old frequency, since signals on the latter would deteriorate while those on the former will grow stronger.

8. It is also emphasized that, should circumstances arise to delay frequency changing and cause final loss of communication, all stations will call and listen on the new frequency, since signals on the old frequency will eventually disappear completely.

Distribution

9. No restrictions.

WIRE PLANTER

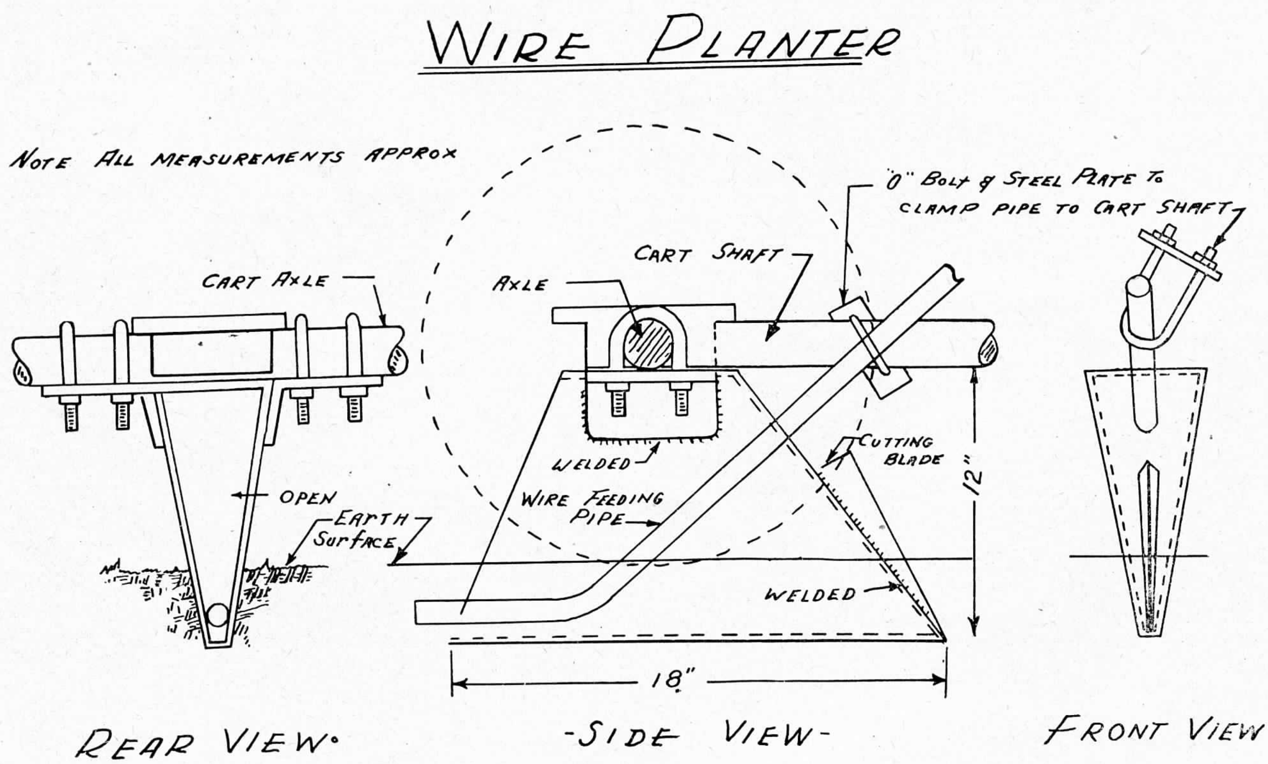
Improvised Plow Helps Infantry Outfit Bury Wire During Battle for Aachen

DURING THE operations of the ——— Infantry in the Aachen battle, it became apparent that an instrument or device of some sort to quickly install wire below ground level was needed. Under consideration was the fact that most strong points were in towns and the open terrain between towns while not necessarily under observation of the enemy was subject to constant blind shelling by the enemy in attempts to disrupt traffic and communications. Wire on the ground and above ground was almost equally subject to damage. Some means had to be devised to place wire, in some protective trough where shell fragments (*grass-cutters*) could not reach it. Since fragments of even the largest shells would not furrow any deeper than 3 or 4 inches it was decided that any means of placing wire rapidly approximately 6 or 8 inches below ground would provide the solution.

Working on an idea using the ordinary field plow or corn planter as the foundation, the communication officer of the ——— Infantry developed what he called a *Wire Planter*. The device was constructed in a hurry of salvage materials available and the item was tested and found to work quite efficiently. It has been used by the wire section of the regiment ever since with marked success.

Since then a few minor improvements have been considered, but the device basically is as follows (see sketch):

Over a length of bent 1-inch pipe, two steel plates were welded together in the shape of a **V** to form a plow. A cutting edge was then provided by welding another shaped steel plate directly in front of the **V** as shown in the diagram. The entire unit was then assembled and fastened to a Reel Cart RL–35, by means of steel plates and through **U** bolts fastened about the axle of the reel cart. The entire unit was then hooked to a ¼-ton, 4 x 4 truck or Carrier, Cargo, M–29 as the motive power and used about in the same manner as any corn cultivator. (In some types of earth it was found necessary to load the cart with ballast usually, the man supervising the laying. to keep the device biting into the earth.



Personnel who have used this equipment were enthusiastic about it and the following additional comments were offered on its operation: It placed practically any type of wire used within a division, including cable up to ⅜-inch, although added labor was involved in removing and replacing cable connectors. The wire was placed between 6 and 8 inches below ground and required practically a direct hit to damage it. While a ¼-ton, 4 x 4 truck pulled the *Planter* through most of the terrain encountered, it was recommended that a Carrier, Cargo, M–29 be employed as the truck very often bogged down in muddy fields. It was also necessary to operate the ¼-ton, 4 x 4 truck in four-wheel drive and at its slowest speed, which tended to overheat the vehicle. The trough or trench provided was approximately 1½ to 2 inches wide, with no covering as the earth was merely pressed aside instead of being overturned as by a plow. This permitted ready access to wire for trouble shooting when necessary and was almost completely invisible especially when grass started growing or the earth receded to its original position. It was primarily used on a route of the shortest distance, across fields and gardens, hard roads being cut by hand when necessary or when overheads were unsuitable. Other wire which it crossed at right angles was lifted by hand to permit the passage of the *Wire Planter*.

The device was very simply constructed and can be built by any unit in the field from scrap material. It was suggested that where an RL–35 was available as in this case, the wire reels be left on the Reel Cart, and fed directly to the pipe instead of from the Reel Unit RL–31 on the ¼-ton, 4 x 4 truck. This would then provide the necessary added weight to keep the cutter biting into the earth, and also permit personnel supervising the installation to more easily control the braking of the wire drum.

(Plow LC–61 is provided for burying field wire and cable and should be used whenever available. However, the *Wire Planter* described above does have possibilities for units needing a plow only occasionally or for emergencies—Ed.)

FIRST ARMY DIRECTIVE ON SALVAGING WIRE

THE SHORTAGE of field wire (W–110) must again be emphasized to all units. The recovery of all wire installed and subsequently serviced for reuse is of the utmost importance. When wire has been reused so often it becomes unserviceable, it still has salvage value and will be returned for salvage and replacement wire requisitioned.

Many units are unable to recover wire at times for various reasons, such as rapid movement forward or displacement to new areas. When practicable, units will return to these locations and recover all wire possible. If that is not practical it will be the responsibility of the next higher headquarters to take the necessary steps to insure its recovery.

A tendency is arising to cable field wires together to present a better appearance. Neat installations are to be desired and encouraged, but cabling, which prevents units from recovering their field wire, will be avoided where possible, e. g., cabling at crossroads, etc., is necessary and desired, but cabling along open roadways is not necessary or desirable as it increases the possibility of damage to facilities in case of bombing or shellfire.

By Command of Lieutenant General HODGES:

/s/t/ R. S. Nourse,
Colonel, AGD, Adjutant General.

FIRST ARMY SIGNAL SERVICE

Signal Unit Accomplishments on the Continent of Europe Are Considered Outstanding

Some of the achievements of First Army Signal Corps organizations are recounted below as published in the ETO Current Information Letter, February 1945.

IT HAS been found extremely difficult to single out exceptional performances. With the task that lay ahead of the Signal Corps in getting ready for the invasion of the Continent, an exceptionally high standard of performance was required, trained for, expected and, in the opinion of the First Army, was attained. The pressure has varied from time to time according to the tactical situation with emphasis shifting from one means to another, but all personnel have done a first-class job.

The following paragraphs cover some of the most exceptional and outstanding activities of the Signal Corps personnel under First Army:

One of the most difficult services performed by tactical signal troops involved the provision of communications for units up to the last minute prior to embarkation for the invasion of Europe. The unusual dispersion of troops required by processing and landing made the distribution of final urgent instructions between tactical headquarters, at the lower levels in particular, hard to accomplish. At the same time, the signal troops providing this service had to be processed and loaded. Great credit is due the individual messengers and other personnel of the 17th Signal Operation Battalion and the 246th Signal Operation Company who accomplished assigned missions in the face of these abnormal conditions which existed during the transit period, from home station in England to the near-shore beaches.

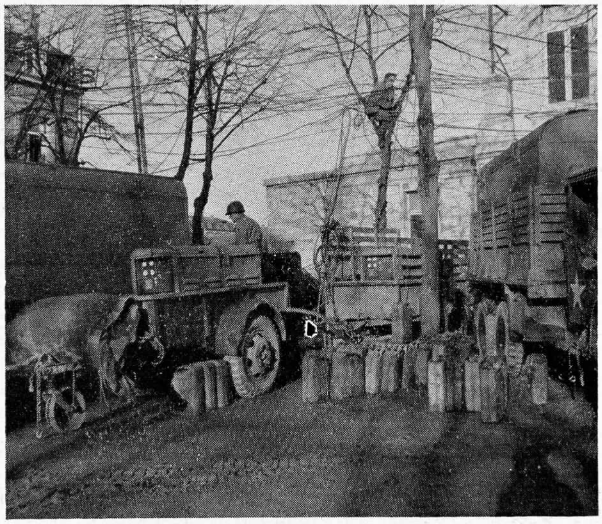
Signal troops that served aboard the headquarters ships deserve particular mention. The operating conditions afloat involved many unusual and unfamiliar problems which were met and solved in a manner worthy of the highest praise. The lack of messenger service afloat, on which so much dependence is placed ashore, forced the use of

A WIRE TEAM OF THE 56TH SIGNAL BATTALION USING A "WEASEL" TO LAY WIRE ON A MUDDY ROAD IN GERMANY (THIS PICTURE WAS TAKEN IN MID-FEBRUARY).

visual means and produced a volume of radio and cryptographic traffic out of all proportions to normal conditions for signal troops ashore. The new conditions were accepted and met admirably by the men concerned.

The D-Day through D-plus-1 work done by one wire team of the 56th Signal Battalion, V Corps, attached to the 1st Infantry Division was definitely of a notable nature. The plan called for an advance detachment of the Signal Battalion to install and operate V Corps Headquarters communications from about 1200 hours on D-Day. Due to unavoidable contingencies, this detachment failed to get ashore, as also did the wire team with the 29th Infantry Division. Thus the entire burden of installing and maintaining communications to two divisions and the beach fell upon this one team of the 56th Signal Battalion which did get ashore. The resources were limited and the few personnel were constantly under enemy fire. Despite these obstacles the team laid and kept in fairly successful operation three point-to-point circuits; no switchboard was available until the balance of the advance detachment belatedly came ashore on the afternoon of D-plus-1.

During the campaign on the Cotentin Peninsula the 50th Signal Battalion provided continuous communications for the VII Corps task force operating in that area. Wire was maintained to 6 divisions, Corps troops and many other units not normally served by a corps. In one instance a Battalion wire team not only maintained the 82d Airborne Division line but also installed and maintained the Division's regimental lines when the Division Signal Company suffered heavy casualties. From 1 August 1944 to 15 September 1944 this Signal Battalion maintained communications for the VII Corps during 11 moves, totalling 600 miles. An axis of spiral-four cable with carrier and laterals to divisions along the cable route from advanced switches was used. Signalmen on the Corps wire axis did not meet without enemy opposition. At times men on the wire axis bypassed enemy pockets of resistance. During one period this cable reached 110 miles from VII Corps Rear Echelon to the Advanced Corps Switch. The 50th Signal Battalion has the enviable record of having laid an axis across France, Belgium, and into Germany in 45 days. Radio relay equipment supplemented wire during these rapid moves and was used as an invaluable voice channel when wire was interrupted. It was a primary means of communications to the 3d Armored Division in many instances.



MEN OF THE 59TH SIGNAL BATTALION SET UP COMMUNICATIONS FOR VIII CORPS IN NEUFCHATEAU, BELGIUM, 20 MILES FROM BASTOGNE, TARGET OF THE GERMAN OFFENSIVE LATE IN DECEMBER.

The 59th Signal Battalion with VIII Corps operated in the Brittany Peninsula between 7 August 1944 and 26 September 1944. Throughout the 6 weeks of this campaign, this Signal Battalion was responsible for the establishment, maintenance, and operation of all communications on the peninsula. To accomplish this 7,250 circuit miles of existing open wire and underground cable were rehabilitated and placed in service, augmented by additional spiral-four cable installations over breaks and to various units. This extensive program, accomplished in approximately 4 weeks' time, resulted in excellent communications and restored practically all of the facilities on the peninsula for eventual use by the French.

It is of interest to note that the 1st Infantry Division Signal Company has laid approximately 2,200 miles of wire since the landing D-Day on the Continent of Europe. This company has laid over 8,000 miles of wire since it was committed to action in Africa on 8 November 1942.

In the race across France and Belgium with the exception of local installations, no attempt was made by the 143d Armored Signal Company, with the 3d Armored Division, to maintain wire communication and the burden fell on radio operators. The radio section of this company took over the communications load in an excellent manner when under very trying and difficult conditions.

SIGNALMEN OF THE 1ST SIGNAL COMPANY REPAIRING A LINE IN GERMANY LATE IN FEBRUARY

During this time the 3d Armored Division CP was cut off from its forward and rear echelons a majority of the time when it was operating well ahead of friendly infantry but behind its own combat units. Radio was frequently the only contact with higher and lower headquarters, and at one time a complete field order changing the plan of attack for the next day's operation was issued in the dead of night by radio. The command post was frequently in contact with the enemy, and anyone leaving the command post to go either forward or to the rear was expected to encounter the enemy somewhere on the journey. Messengers lived a rather perilous life and were frequently away for 2 or 3 days at a time, working back through the enemy that had filtered across the routes. Not a messenger was lost and no information handled by these men fell into enemy hands, although at one time it was necessary to use a light tank to deliver field orders to the combat commands. During this time the traffic load on radio was approximately 400 messages per day.

Probably one of the most outstanding undertakings by Signal Corps personnel was the construction and maintenance of the vast wire network required by this Army for operations. Both the 32d and 35th Signal Construction Battalions accomplished this mission in a praiseworthy manner.

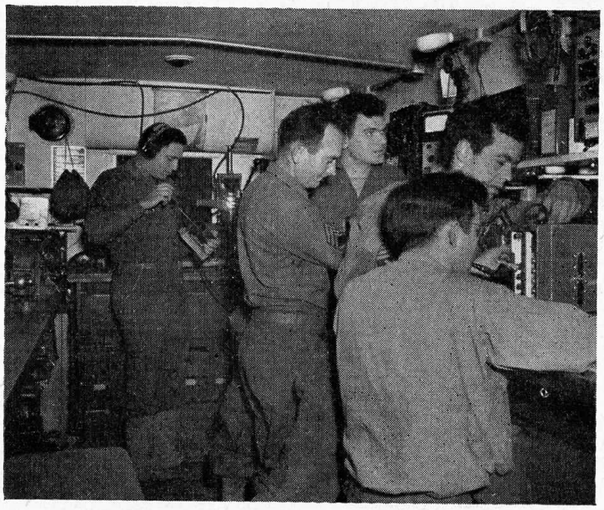
For a period from 25 June 1944 to 30 November 1944 the 32d Signal Construction Battalion maintained a daily average of 3,327 circuit miles of wire communication. This was composed of spiral-four cable, field wire, open wire, and lead cable. During this period, an average of 100 men were dispersed in small independently operating detachments throughout numerous test stations. These men in the initial phase of operations were inexperienced in maintaining such a tremendous network of wire under battle conditions and were dependent upon individual resourcefulness and initiative to keep these circuits working under a great variety of circumstances, including troubles caused by both enemy and friendly troops. One of the biggest problems was the maintenance of foreign construction which had never been seen before by these men. On occasions it was necessary to work in places exposed to enemy artillery and small arms fire. However, in spite of these difficulties and many others incident to wide dispersion over distances as great as 150 miles, these small detachments of men successfully completed the mission assigned to this unit.

AN SCR–206 IS SET UP IN A GERMAN FIELD BY A MEMBER OF THE 143D ARMORED SIGNAL COMPANY EARLY IN OCTOBER.

THESE MEN OF THE 35TH SIGNAL CONSTRUCTION BATTALION ARE SALVAGING WIRE IN BELGIUM (THIS PICTURE WAS TAKEN EARLY IN JANUARY).

From D-plus-5, when the first communication line was installed on the Continent by the 35th Signal Construction Battalion, the problem of maintenance began. The congested area of the Normandy Beachhead presented problems in wire maintenance that would have dismayed the most experienced of trouble shooters. It was almost impossible to place a trouble-free line due to the narrow roads, heavy vehicular traffic, and enemy action. It soon became apparent that centralized testing at the First Army wirehead was inadequate to handle the heavy burden of traffic which appeared almost immediately. The unreliability of carrier equipment to operate through the slightest trouble was also detected at this time. The first step to surmount these obstacles was to establish frequent test points on important wire routes. In many instances the trouble experienced required that test points be only 6 miles or less apart. To man such points effectively it was necessary to produce equipment and adequate operating personnel almost overnight. The equipment problem was solved by obtaining a number of Test Sets EE–65. Test groups were set up around single men who had displayed ability to use the Test Set EE–65 or who, upon intensive but brief instruction, showed an aptitude for such work. The lessons learned on the Normandy Beachhead, supplemented by frequent improvements and further experience, has produced trouble teams capable of coping with practically any situation pertaining to the reduction of wire trouble.

The photographic coverage of the Continental campaigns by the 165th Signal Photographic Company has been highly commendable. This company furnished personnel to photograph every type of activity within the Army. The coverage in the initial assault of amphibious and airborne landings was exceptionally well done. The cameramen displayed great courage and devotion to duty with complete disregard for their personal safety so as to obtain the high caliber of pictures of the ensuing campaigns. As evidence of this outstanding work to furnish a comprehensive pictorial and historical record of the war on the European Continent, the 165th Signal Photographic Company has been presented the Meritorious Service Unit Plaque and personnel of the company were decorated with 1 Legion of Merit, 3 Silver Star awards and 14 Bronze Star medals.



FIRST ARMY SIGNAL REPAIR MEN MAINTAIN RADIO EQUIPMENT IN THIS MOBILE RADIO REPAIR TRUCK IN BELGIUM EARLY IN SEPTEMBER.

THIS CAMERAMAN OF THE 165TH SIGNAL PHOTOGRAPHIC COMPANY FILMS THE BURNING VILLAGE OF SINDORF, GERMANY. EARLY IN MARCH OF THIS YEAR.

The tremendous task of the supply and maintenance of signal equipment was very ably handled by the 175th Signal Repair Company and the 215th Signal Depot Company. A remarkable feat was accomplished by the 215th Signal Depot in the establishment of three storage and issue sections on D–Day, D-plus-1 and D-plus-2 for use by the assault divisions. These units were of great help in consolidating equipment as it came ashore and in replacing vitally needed battle losses during a period when time was a critical factor. This was the first instance of such an undertaking being attempted in this theater of operations. The successful results achieved illustrate the practicability of utilizing this system in future amphibious operations. Approximately 10,000 tons of signal equipment were moved six times by the 215th Signal Depot Company as the depot locations advanced along First Army supply routes. The 175th Signal Repair Company completed a total of 17,276 work orders during the first 6 months of operations on the Continent. These jobs varied from minor radio repairs to the construction of radio link trailers and bus-body offices. The speed and efficiency in handling the repair and maintenance of signal equipment by the personnel of the 175th Signal Repair Company has helped immeasurably to keep desperately needed equipment in operation. These men operated 24 hours a day, when necessary, to expedite the return of equipment to an operational status.

In general, it can be stated that the mission assigned to Signal Corps units has taxed to the extreme the strength, courage, initiative, and ingenuity of all personnel participating in this operation. In such a situation outstanding performance of duty became the rule rather than the exception and unusual situations, because of their continued presence, became routine.

ANTIJAMMING NOTES

See *10 Points on Antijamming*, SCTIL, No. 37, December 1944

1. CLEAR TRAFFIC.
2. TEST FOR JAMMING:
   a. Frequency spread?
   b. Receiver trouble?
3. IDENTIFY.
4. REPORT.
5. CHANGE FREQUENCY *AND CALL SIGN.*
6. OPERATE CW.
7. SET FREQUENCY AND CRYSTAL FILTER.
8. SET BFO.
9. SET VOLUME.
10. KEEP TRYING! TRY MOVING.

DIVISION MESSAGE CENTER

Men of the 91st Division Operate More Efficiently in Combat Than When on Maneuvers

ONE OF the striking differences between the operation of the message center of the 91st Infantry Division on maneuvers and in combat was the ease with which its members were able to function in combat. This was probably due in part to the rigorous training back in the States. Also, on maneuvers, the situation was usually fast moving, and even the breaks between problems were hardly a rest for communications personnel. Wire had its difficulties in the fast-changing situations, and everyone seemed to want to write tactical messages which flooded the code clerks. On the other hand in combat, wire has been a most reliable means of communication, and with few exceptions wire has been maintained almost without interruption. Staff officers came to rely on the telephone for their communications. Consequently, the burden placed upon message center was considerably lightened, and to a large extent purely administrative traffic was handled rather than tactical traffic.

The means of communication most frequently selected for administrative traffic was, naturally, messenger. Radio traffic was used much less than anticipated, due to the lack of security in this type of communication and at the same time the convenience of wire. Teletype to higher headquarters was a reliable means of communication, but it was neglected since most staff officers failed to appreciate its value. There was no occasion to use air-ground communication or pigeons.

The physical set-up at the command post was usually in the issued CP tents, though as cold weather approached buildings were used. Many units preferred a built-up message center truck, but it was felt that a CP tent made a neater installation. It was less cramped for space than a truck, and the time to erect or dismantle the installation never interfered with operations. For the advance message center, two jeeps were sent forward with about six men, who operated out of a home-made kit containing the SOI, the Converter M–209, and the necessary forms. Normally, traffic did not warrant having an advance message center for more than an hour or two before the new CP opened.

The primary purpose of the message center was the receipt, routing, and delivery of messages. A record of both incoming and outgoing traffic was maintained since a sealed envelope gave no hint as to the importance of the contents. The presence and accuracy of such records, saved for at least a month, well rewarded message-center personnel for the effort when it came to prove that they received, routed, and delivered the message.

However, faith was lost in the number sheet for outgoing messages. This sheet provided too little space for the information about each item handled, and necessitated looking over confusing files in the event of a check at a later date. FM 24–5 states that a message center may be provided with a skeleton copy of each message. Rarely did sections furnish the Division with a copy, and never in the case of sealed correspondence. Thus, for more than a year message center personnel have used their own mimeographed sheet which provides numbers and a space in which to describe in several words each item handled. Columns for other essential information to give an adequate picture of the item included its precedence, number, time received, to whom it is addressed, from whom it came, how it was sent, and the time cleared.

Incoming messages were journalized on a separate incoming journal sheet. A separate sheet was kept for each staff section for a day, and additional items added on the same sheet and delivered as they came in. Thus, in effect, message-center personnel had a delivery sheet, which in addition to the signature and time of receipt, showed the time the item came to the message center, from whom it came, and a short description of the item.

MESSENGERS SPOT UNITS

An accurate map showing the latest unit locations and a general picture of the tactical situation would seem to be almost a necessity as an aid for motor messengers in a division message center. Yet it was surprising how few message centers maintain such a map. It was found that information from the G–3 Section and the War Room was not always reliable, and frequently the messengers aided in more exactly spotting units on the map.

The necessity for motor vehicle maintenance is a well-worn subject in the Army. But it was found by the Division that constant check of vehicles was essential to their very operation. Muddy roads and deep ruts were responsible for terrific wear and tear in the continuous operation of their vehicles. Flat tires, broken springs, and shock absorbers proved to be the biggest difficulty. The skill of the drivers kept accidents to a surprisingly small number considering the many miles they have covered.

In operating 2 message centers, one at both forward and rear CP's, personnel were assigned as follows: First lieutenant, 1 warrant officer, and 27 enlisted men at the forward, and 1 warrant officer and 13 enlisted men at the rear. The second lieutenant was used elsewhere in the company. The forward message center was divided into 2 well-balanced teams which alternated on duty every 24 hours. Thus the team on duty had an ample supply of personnel to operate, and the off-duty team had a whole day to read, rest, and care for personal belongings and equipment. The message center chief, as section leader, remained at the message center and coordinated the work of both teams and supervised section supplies, details, routine reports, etc.

On the whole the equipment in the message center proved adequate. The four power units were burdensome to carry and trailers were the only practical way to carry them. The quantity of forms and small items of stationery carried almost necessitated more than one Chest BC–5. The issued mail bags were too deep, and as a substitute several field bags were used, which had the advantage of being divided into compartments. Several items of equipment were not used, namely the .50 Cal. Machine Gun, the Rocket Launcher, map templates, and compasses. In training much emphasis was placed on the compass, but in combat existence of the compass was almost forgotten. The issued gasoline lanterns proved useless since red gasoline clogged the generator and the mantles themselves could not withstand the rough treatment of field conditions. Generators and various pieces of electrical apparatus picked up in various places were more satisfactory both in convenience and safety than gasoline or kerosene.

THEY DID GET THROUGH

IN AN article on *The Campaign In Italy*, SCTIL No. 35, October 1944, it was stated (on p. 6) that all but one of the high-powered radio sets worked well. The set that did not operate, it was said, was the one assigned to the press. The article also read: *The DUKW carrying the press set went ashore and came face to face with a German tank, which fired a cannon shell that passed through the radio set without exploding. The driver of the DUKW then turned the vehicle around and drove off to a Signal Corps repair shop.*

This statement was an error. A recent communication to the Chief Signal Officer points out that the press set not only went into operation on D-Day at Salerno in spite of meeting enemy tanks but served initially as the only means of communication between a division and corps headquarters until the division's own radio set arrived at the CP. Operation for press traffic continued on a 24-hour-a-day basis until the end of February 1944. Three of the 5-man crew received Silver Stars for their exploits in this operation.

The statement made in the original article was based on information then available in the War Department. The Signal Corps Technical Information Letter is glad to correct the error and to give credit to the Signal Corps crew of this radio installation.

REDUCTION OF ITEMS PROGRAM

Classification of Stock Numbered Items According to Supply Status is Underway

THE MAJORITY of Signal Corps equipments in use today are radically different from those in use at the time of Pearl Harbor. Many of the equipments in use at that time have been redesigned, others have been declared obsolete, and many new ones have been developed and adopted by the Signal Corps. Standardizing new equipments and declaring as obsolete equipments no longer required is a continuing process necessary to keep abreast of new military requirements and technological advances. This ever-changing picture has developed a somewhat complex stock numbering situation.

At the start of the war, there were approximately 30,000 stock numbers in existence; today there are approximately 220,000. As equipments have changed, stock numbers for the equipments, for repair parts, and for other related supplies, have not always been identified as to supply status. Because there were no established standards for writing descriptions, more than one stock number has been assigned to a single item, due to variations in descriptions furnished for assignment of stock numbers. Although some items have been known to be substitutes for others, and could have replaced them for all purposes, such information has not generally been used to reduce the number of items to be procured, stored, and issued by the Signal Corps.

In order to bring the stock numbering system up to date, the Engineering and Technical Service, Army Communications Service, Army Pictorial Service, Procurement and Distribution Service, and the Army Air Forces cooperated in the Reduction of Items Program (RIP), under the administration of the Signal Corps Stock Numbering Agency. The mission of RIP was to analyze all stock numbered items, eliminate unnecessary ones, and determine substitutes in order to provide a more accurate and accelerated supply of Signal Corps parts and equipments. Stock numbered items were analyzed as to technical and physical characteristics, ability to serve their intended purpose, to replace other items or to be replaced, the likelihood of production in sufficient quantity to meet requirements, conformance with Joint Army-Navy Specifications, stock activity, etc. After analysis, each stock numbered item was classified into one of the following categories:

SELECTED.—Selected items are required items that will continue to be procured for depot stock. Items are selected because they can satisfactorily replace other items, or because they cannot be satisfactorily replaced by other items. Normally, only one item of an interchangeable group is a selected item. Interchangeable items are not always electrically or mechanically equal. Items are considered interchangeable if, for all practical purposes, it is believed that one item could be substituted for the other with, at most, only minor improvisations. Wherever possible, *Standard* items, in accordance with Joint Army-Navy Specifications, have been chosen as the selected items, even though these standard items may not have been previously used.

SUPERSEDED.—Superseded items are items which are identical to, or mutually interchanegable with, another item. The existing stock of a superseded item may be combined with the stock of the item which supersedes it.

LIMITED.—Limited items are those which will no longer be procured because more satisfactory stock numbered replacements are now available, or because no regular or authorized requirement exists. Existing stocks of limited items are satisfactory for issue, and will be issued from depots until existing stock is exhausted, at which time the selected item will be substituted. Limited items, which are replaced by selected items, are cross-referenced to the stock numbers of the selected items. Existing stock of limited items will *not* be combined with those of selected items to which they have been cross-referenced.

VOIDED.—Voided items are those which will no longer be procured or issued, and if in stock, will be disposed of. Items may be declared void because they are obsolete, because they are undesirable for use as Signal Corps equipment, or because they have never been procured, due to development having been abandoned. Voided items, which are replaced by selected items, are cross-referenced to the stock number of the selected item.

DEFERRED.—Deferred items are items which could not be classified into one of the foregoing categories because sufficient information was not available. Deferred items will continue to be procured, stored, and issued until such time as they may be classified into one of the foregoing categories.

In addition to classifying stock numbers into one of the foregoing categories, and indicating the selected stock numbers that replace limited and voided items, and cross-referencing superseded stock numbers to the stock numbers that supersede them, substitutes are indicated among selected and limited stock numbers when the following are applicable:

DIRECT SUBSTITUTE.—Is a substitute for an item which is completely interchangeable with that item, and which may replace that item in any application. A selected item is a direct substitute for an item that is limited by the selected item.

CONDITIONAL SUBSTITUTE.—Is a substitute for an item in some, but not in all applications. A technician, with a knowledge of Signal Corps equipment, should determine whether or not a conditional substitute can be used in place of the original item for a particular application. A limited item is a conditional substitute for its selected item.

The designation of items as either *direct* or *conditional* substitutes does not mean that the stock of these items may be physically combined with the stock of items for which they are substitutes. The stock of items for which they are substitutes. The only time that stocks may be physically combined identical or mutually interchangeable items, in which case one stock number is classified *Stk. No. Superseded, same as* ———, and a note is added to the other stock number stating that it is *same as* ———, the superseded item.

Information concerning the classification of stock numbered items will be published in ASF Signal Supply Catalog Sig 5–3, e. g., *selected*, *limited*, and *deferred*. Information concerning substitutions as determined by RIP will be published in ASF Signal Supply Catalog Sig 5–4, e. g., *Stk. No. 3DA250–88 is a direct substitute (D) for Stk. No. 3DA250–134*, or *Stk. No. 3DA6–77 is a conditional substitute (C) for Stk. No. 3DA6–46.* Information concerning voided items and cross-references between superseded items and the items that supersede them will be published in ASF Signal Supply Catalog Sig 5, e. g., *Stk. No. 3DB6–18.1 Void; obsolete*, or *Stk. No. 3DA30–3 Superseded, same as 3K5027311.* As a temporary measure, RIP information has been published in pamphlet form, by classes of items, pending the completion of the project and the revisions of Sig 5 mentioned above.

In order to implement the Reduction of Items Program, the activities listed below have established the following as objectives:

Procurement initiating agencies will only initiate procurement for selected and deferred items for depot stock. Procurement of items, for which stock numbers are not required, is not affected by RIP.

Depots will combine superseded items where practicable; will dispose of voided items; and will issue a direct substitute (preferably) or when the item on requisition is not available, a conditional substitute (after decision by a technician).

Stock Numbering Agency will complete the description of all selected items that are not now complete. A complete description of a selected item will include description of the items that are superseded by the selected item. Stock numbering procedures will be revised to conform with RIP recommendations.

Procurement districts will procure only selected and deferred items for depot stock.

Equipment development activities will use, wherever possible, selected components in the design of all future equipments.

Maintenance planning activities will indicate, wherever possible, the use of selected components for maintenance of all future equipments.

It is intended that *deferred* stock numbers be classified into another category, that all future stock numbers be classified upon assignment, and that classified stock numbers be reclassified into one of the previously mentioned categories as their status change, under the administration and coordination of the Stock Numbering Agency in order that the Reduction of Items Program may be kept up-to-date as a continuing Signal Corps policy.

Personnel responsible for maintenance of Signal Corps equipment should always keep in mind that moving parts usually require more attention than stationary parts. Items like generators and dynamotors should be checked regularly, and frequently.

Equipment Notes

ARMY PICTORIAL

EFFECT OF CHEMICAL AGENTS

Until recently, very little work had been done to determine the effects of chemical warfare agents on photographic film and sensitized paper and the probable serviciability of photographic supplies and equipment after exposure to various chemical warfare agents. A project was set up by the Chemical Warfare Service to determine (1) the effect of various chemical warfare gases and smokes on photographic film, sensitized paper, and photographic processing solutions, and (2) decontaminating procedures suitable for use on photographic supplies and equipment.

Packages.—Representative packages of sheet film, roll film for aerial cameras, printing paper, and photographic processing chemicals were examined to determine the protection afforded the contents against liquid vesicants and the probable ease of decontamination. These observations are shown in table I.

Films and Paper.—Pieces of processed negatives and glossy prints were treated with Plant-run Mustard (H), Lewisite (L), Decontaminating Agent Non Corrosive (DANC), dry bleaching powder, and 40:60 bleaching powder-water slurry. The samples were examined for wrinkling, discoloration, softening, or other damage. The results of these tests are contained in table II.

TABLE I.—*Indicated vesicant resistance and method of decontamination of packages for photographic supplies*

Description of package	Type of contents	Protection against liquid vesicants	Decontamination of package
Light cardboard box, waxed-paper inner wrapping.	Sheet film; printing paper.	Poor	Difficult; burn package.
Painted metal can, slip-on cover, taped seal.	Roll film for aerial cameras.	Excellent	Wash with soap and water; aerate; replace tape if necessary.
Metal can, friction-fit cover.	Photographic chemicals.	do	Remove labels, wash clean; aerate.
Glass bottle, cork or screw-cap closure.	Photographic solutions.	do	Wash clean with soap and water; replace cork if necessary.

TABLE II.—*Results of preliminary tests on photographic negatives and prints*

Material used	Effect of material on—	
	Processed negative	Glossy print
H, droplets	No effect	No effect.
L, droplets	Damages emulsion, 1 hour.	Damages emulsion, 1 hour.
DANC, M4 [1]	No damage, crystalline deposit easily removable.[2]	No damage, crystalline deposit easily removable.[2]
DANC+H	Same as DANC	Same as DANC.
Bleach, dry	No effect	No effect.
Bleach slurry 40:60 by weight.	Bleaches and removes emulsion, 1 hour.	Bleaches and removes emulsion, 1 hour.

[1] DANC, M4 is a clear solution consisting of 1 part of an active chlorine-containing compound, RH-195, dissolved in 15 parts of acetylene tetrachloride, all parts by weight.

[2] Crystalline deposit removed by soaking the item in clear carbon tetrachloride or in clean acetylene tetrachloride.

NOTE.—Small quantities of the various materials were placed on the emulsion side of the negatives and prints. Data indicates results after 24 hours except where noted.

Individual sheets of exposed, unexposed, and processed film and printing paper were subjected to high vapor concentrations of several well-known chemical warfare gases and smokes in small, lightproof test chambers. Results are shown in table III.

Tap water.—Samples of laboratory tap water were contaminated by the addition of as much as 0.5 percent by weight of liquid lewisite and plant-run mustard. After 15 minutes stirring, the clear water was decanted from the liquid vesicant settled in the bottom of the container and poured through a paper filter to remove sediment and tiny suspended droplets of vesicant. The filtered water was decontaminated by four different methods. Samples of water from each decontamination treatment were tested for their effect in presoaking and final washing baths by processing normal contrast printing papers. Table IV contains results of these tests.

Conclusions

Photographic film and sensitized printing paper are not affected by direct exposure to high vapor concentrations of well-known chemical warfare gases and smokes at ordinary temperatures.

TABLE III.—*Effect of chemical warfare gases, smokes, and fumes on photographic film, printing paper, and photographic solutions*

Description of agent		Results of tests on gassed film and paper [1]				Results of tests of gassed photographic solutions [2]			
								Water	
Type	Name	Exposure to agent (min.)	Super-XX film	Infrared film	F-2 paper	D-72 developer	Fixing bath	As presoak	As final wash
Nonpersistent	Phosgene	10	No effect		No effect	No effect	No effect		No effect.
	Cyanogen chloride	10	do		do	do	do		do.
	Hydrocyanic acid gas	10	do		do	Fogging	do		do.
	Chlorine	10	do		do	No effect	do	No effect	do.
Persistent	Mustard	60	do	No effect	do	do	do	Retarding	do.
	Lewisite	60	do	do	do	do	do	No effect	do.
	Nitrogen mustard	60	do	do	do	do	do	do	do.
Smoke	Titainium tetrachloride	60	do	do	do	do	do	Retarding	do.
	Chlor sulfuric acid $+SO_3$	60	do	do	do	do	do	No effect	do.
Fumes [3]	Decontaminated mustard DANC+H-.	12	do		do				

[1] Films and papers were gassed in the following stages of develpoment: (*a*) Unexposed, (*b*) unexposed, but exposed to light after gassing, (*c*) exposed, but not processed (latent image), (*d*) exposed and processed.
[2] Gases bubbled through the solutions at 3–5 1./min. until the total gas passing reached about 20 1./100 cc. solution.
[3] Prepared by bubbling air through a mixture of 294 g. DANC, M4 and 15 g. H at rate of 2 1/min. Temperature of mixture was 45° C.

NOTE.—All gas exposures conducted at 85° to 90° F. and 40 to 60 percent relative humidity.

Liquid lewisite and bleaching powder-water slurry both cause permanent damage to the emulsion on processed negatives and glossy prints within 1 hour, although liquid mustard, DANC solution, or the combination of DANC with mustard, have no damaging effect after 24 hours contact.

High vapor concentrations of well-known chemical warfare gases with the exception of hydrocyanic acid gas in developing solutions have little or no effect on photographic developing, fixing, or washing solutions although vapor-contaminated water may retard development and cause fogging if used for a presoaking treatment.

Water contaminated with Mustard or Lewisite may be made suitable for photographic purposes by treatment with activated carbon, or by distillation in a commercial water still; boiling or treatment with bleaching powder are unsatisfactory for this purpose.

DANC, M4, is suitable for decontaminating photographic equipment, but the decontamination of photographic supplies should be governed by the type of packages containing the supplies.

TABLE IV.—*Results of tests of methods for decontaminating water for photovraphic purposes*

Description of water		Effect on exposed printing paper of—		
			Final wash treatment	
Decontamination treatment	Contaminant	1 minute presoak treatment	After 1 hour	After 16 hours
None (filtered only).	H	Fogging and retarded development.	Brown tone	Sepia.
Boiling for 1 hour	H	do	do	do.
	L	do	No effect	No effect.
Hypochlorite[1]	H	Slower rate of development.	do	Slight brown tone.
	L	Retarded development.	do	Bleached spots.
Activated carbon treatment.[2]	H	No effect	do	No effect.
Distillation	H and L	do	do	do.

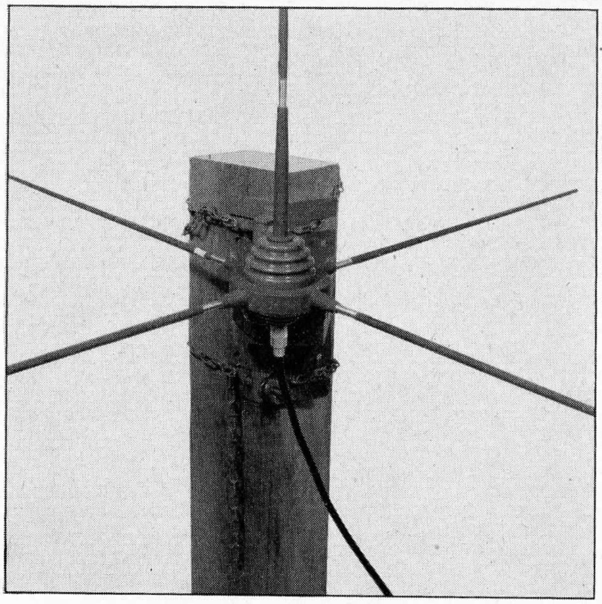
[1] Water was treated with the clear filtrate from a 10-percent slurry of ordinary bleaching powder until a strong starch-iodide test was obtained.
[2] Water was treated with 0.5 percent by weight of activated carbon, stirred for 30 minutes, and filtered.

COMMUNICATION EQUIPMENT

ANTENNA EQUIPMENT RC–291

Antenna Equipment RC–291 provides a means of increasing the range of Radio Set SCR–300–( ) when the set is used in dense jungle vegetation. Radio Set SCR–300 is normally equipped only with a vertical whip antenna directly attached to the set, and is particularly susceptible to range curtailment when operated in the jungle, since communication at such frequencies is materially better over transmission paths which are substantially line-of-sight.

Antenna Equipment RC–291 is an elevatable, ground-plane antenna, capable of being fastened to the tops of trees, poles, or other elevated structures up to heights of about 50 feet. This height will usually permit a line-of-sight path over the top of the intervening vegetation. The antenna is connected to the radio set, which is located on the



METHOD OF FASTENING MAST BASE MP–73 OF THE RC–291 TO POST FOR OPERATION.

ground, by means of a 60-foot length of Cord CG–102/TRC–7 (high frequency flexible coaxial cable). Additional lengths of the cord may be used if greater height is found necessary. No supporting structure is included with Antenna Equipment RC–291.

The following tabulation lists the major components of this equipment:

- One Mast Base MP–73.
- Ten Mast Section AB–22/GR (includes five spares).
- Ten Mast Section AB–23/GR (includes five spares).
- Ten Mast Section AB–24/GR (includes five spares).
- One Cord CG–102/TRC–7 (60 feet).
- One Packboard, plywood (QMC).
- Two Terminal Boxes TM–217 (includes one spare).
- One Bag BG–187, for carrying all of the above components.

Utilization of the components is as follows: The Mast Base MP–73 is so constructed that it can be chained to poles or tree trunks of random diameters, and includes an insulator suitable for connection of a ¼-wave-length vertical antenna and

COMPONENTS OF ANTENNA EQUIPMENT RC–291 USED TO RAISE THE ANTENNA OF THE SCR–300 ABOVE SURROUNDING FOLIAGE.

four ¼-wave-length horizontal radials. The radials are electrically equivalent to the lower half of a vertical dipole antenna. The mast base also includes a Socket SO–239 for connection to Cord CG–102/TRC–7. The center conductor of the cord connects to the vertical portion of the antenna, and the outer shield is connected to all four horizontal radials. The other end of the cord connects to a Socket SO–239 on Terminal Box TM–217, which contains a suitable network for matching the output of Radio Set SCR–300 to the input impedance of the elevatable antenna.

Antenna Equipment RC–291 is designated as being *for use with, but not part of, Radio Set SCR–300*, and the separate basis of issue therefor is as shown on T/O & E's.

BATTERY CHARGER PE–163

Battery Charger PE–163–( ) has been developed and standardized to provide a charger to give certain radiosonde batteries a quick charge a short time before they are used.

The charger operates from 115-volt, 60-cycle power supply. It is capable of charging simultaneously 1, 2, or 3 sets of batteries, each set consisting of one *A* Battery BB–51 and three *B* Battery BB–52. These later batteries are furnished in the form of Battery Pack BB–208/AMT. High voltage output is 180 volts at 70 milliamps, d.-c. Low voltage output is 7 volts at 1.5 amps, d.-c.

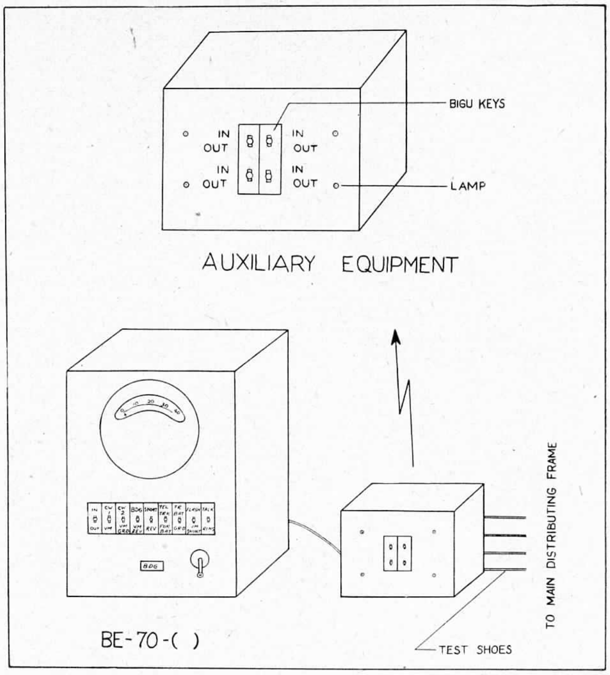
The charger consists of a transformer, a vacuum tube rectifier for *B* battery charging and copper-magnesium sulphide rectifier for *A* battery charging, a rheostat for controlling current in each circuit and a shunted milliammeter which may be selectively connected to each charging circuit to determine whether proper charging current is being supplied to these circuits.

All the components are mounted on a steel chassis having a bakelite panel which in turn is transported in a wooden carrying case. Over-all dimensions of case: 12″ x 5½″ x 10¾″; weight: 16¼ pounds.

This item is in production and deliveries have begun. TM 11–2549, *Battery Charger PE–163*, has been published.

MANUAL TELEPHONE FAULT TESTING

The equipment described below represents one of several methods used by the 975th Signal Service Company to facilitate the testing of faults in manual telephone offices equipped with Cabinet BE–70–( ). Experiments with this equipment



EXTERNAL VIEW OF AUXILIARY EQUIPMENT FOR MANUAL TELEPHONE FAULT TESTING (TOP) AND POSITION OF EQUIPMENT IN RELATION TO BE–70 (BOTTOM).

have proven it to be satisfactory in operation. The equipment was designed and constructed by the wire chief of this company.

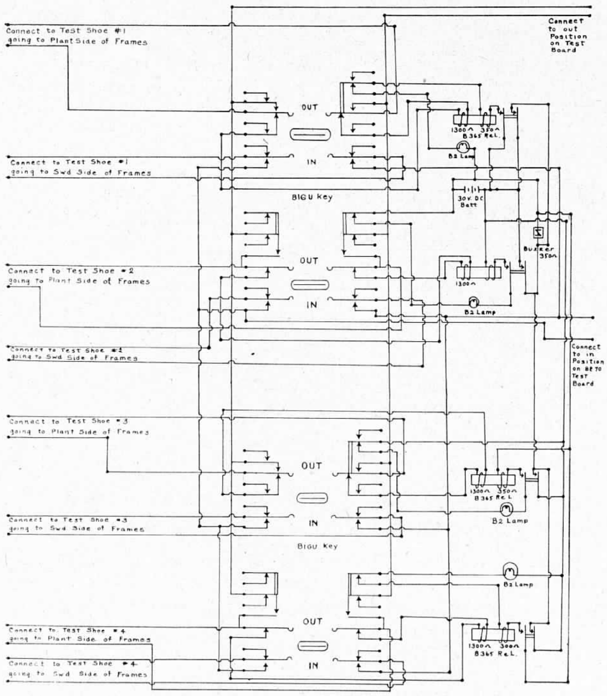
The auxiliary equipment in no way alters the operating procedure followed by the wire chief when using Cabinet BE–70–( ). Tests will be made strictly in accordance with instructions to be found in TM 11–345 *Cabinet BE–70–( ) Wire Chief's Testing*.

The auxiliary equipment is mounted in a plywood box or cabinet large enough to contain all parts (relays, buzzer, wiring, etc.). If equipment is to be installed permanently the cabinet may be mounted alongside of, on top of, or beneath Cabinet BE–70–( ), or at any other location where the auxiliary equipment is conveniently accessible to both the main distributing frame and Cabinet BE–70–( ). On the face of the cabinet are two

List of parts

Name	Quantity	Sig. C Stock No.	Manufacturer's Symbol
Key (unit of 2 lever type keys)	2	4C5042A	BIGU.
Relay	4	4C8719.365	B-365.
Buzzer	1	4Z3118.2	7A.
Lamp	4	4C5491-B2	B-2.
Power supply	(1)		

[1] Any source of 30 volts D. C.



CIRCUIT DIAGRAM OF AUXILIARY EQUIPMENT TO BE USED WITH BE–70 FOR MANUAL TELEPHONE FAULT TESTING.

rows of two keys each and the signal lamps associated with each key. Any one of the keys may be connected to any one of the lines at the main distributing frame by means of test cords and shoes. Since in this particular cabinet there are four keys, the testing and clearing of four cases of line trouble may be supervised by the wire chief at one time (not simultaneously). By proper manipulation of the keys associated with the auxiliary equipment and those associated with Cabinet BE–70–( ), the wire chief is able to conduct any test as set forth in TM 11–345 on any one case of line trouble.

Operation

Key at normal.—Line relay in auxiliary equipment is connected via test shoe to line under test at main distributing frame. Signaling current placed on the line under test by the lineman or operator at the distant end of the line energizes the line relay which closes lamp circuit establishing visual supervision. Line relay also closes buzzer circuit providing an audible signal.

Key at OUT position.—Removes line relay, lamp, and buzzer from circuit and connects line under test to Cabinet BE–70–( ). Key at OUT position allows tests to be made from main distributing frame out over line under test.

Key at IN position.—In this position Cabinet BE–70–( ) is connected to the switchboard side of the line under test, allowing tests to be made of the line's equipment at the switchboard. Line relay remains in the circuit connected to the outgoing line, and will operate lamp and buzzer if an incoming ringing signal is received.

Keys should be returned to normal position when tests have been completed.

ELECTRONIC EQUIPMENT

TUBE FLUORESCENCE

The man who uses tubes always looks suspiciously at any tube which shows a blue or other colored glow around or upon its inner parts during operation, because the presence of gas is often indicated by a glow. However, some of the solid inside parts of the tube may glow if the tube design is such that electrons can strike them; and this glowing of solid parts can continue for a thousand hours or more of use without harming the tube, impairing its functioning, or making it noisy.

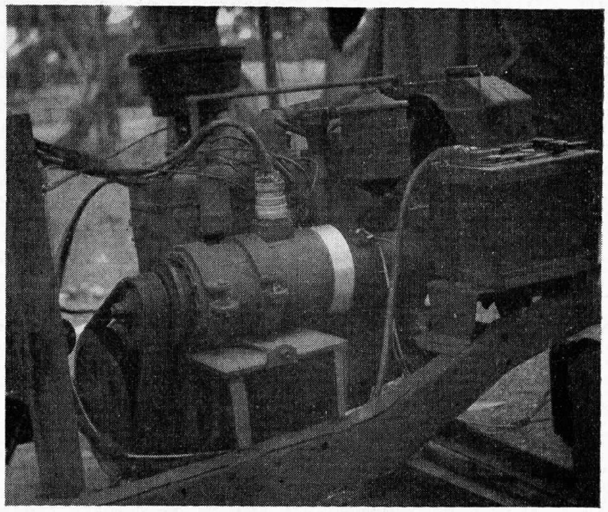
A recent laboratory test of 36 Type 715B tubes which had been rejected for miscellaneous reasons including so-called *gas glow* showed that about half were still usable but apparently had been discarded because fluorescence of solid parts had been mistaken for gas fluorescence or so-called *gas glow.* The basic distinction between the two effects is that gas glow always appears as a volume phenomenon in the space inside the tube—not necessarily the whole space—and solid fluorescence is a glowing of the solid surface, usually of the glass envelop or the ceramic insulators or the micas. The difference is not always easy to tell, since sometimes the gas in a tube will glow only in a thin layer around one of the electrodes; but careful inspection of such a glow will show a glowing layer outside the surface; this glow may flicker. The glow in a neon lamp, voltage regulator tube, or gas rectifier like the 866–A and 872–A is a gas glow. The glow on a cathode ray tube screen or a tuning indicator target is a solid fluorescence, with the light coming from the solid screen particles, and remaining just as steady as the current to the screen. Receiving tubes like the 45 often show a blue glow on the glass near the top of the plate where electrons miss the end of the plate and hit the bulb. This is typical solid fluorescence; it stays put, shows the shadow of the electrodes, gets brighter or dimmer to some extent as the current goes up or down and is all in the solid glass—not out in space; and it doesn't *clean up* except perhaps after hundreds of hours.

In summary: If the glow is all on the solid glass, ceramic, or mica and does not extend out into space and if the tube tests and performs properly—do not discard it. Of course, if you have a gas-filled tube like those listed above, the gas glow is always present when the tube is passing current in normal operation and so is no cause for alarm.

24-VOLT GENERATOR

In need of a generator with a 24-volt output to drive its radio testing equipment, a signal company of the 13th AAF Service Command in the Southwest Pacific constructed an efficient, smooth-running unit from salvaged parts of a B–25 Mitchell bomber, a Ford jeep, and an amphibious *Alligator*.

The welded frame was constructed with a 2-inch angle iron taken from mobile aircraft detector Radio Set SCR–268. A jeep 4-cylinder engine was completely overhauled and installed in the frame to serve as the power supply for the generator, a standard P–1 model taken from a wrecked B–25. The engine feeds from a jeep gas tank, and uses all jeep standard accessories, such as battery, starter, ignition, and radiator, in addition to the 6-volt electrical system. An improvised fan has



IMPROVISED 24-VOLT GENERATOR CONSTRUCTED IN SWPA BY SIGNAL CORPS MEN OF AN AIR SERVICE COMMAND.

been installed in the generator to serve as a cooling unit. Drive pulleys and fan belts are standard size, and were taken from the *Alligator*. The instrument panel has all standard instruments from the jeep and B–25; it is mounted above the gas tank and in front of the engine and generator. The unit is compact and facilitates easy packing for shipment. Completed, the power unit is 30 volts, 4,500 watts, and 150 amperes.

In operation, the unit is furnishing a steady 28 volts to the radio shop bench and is a substitute for the electrical plant installed in commercial and military aircraft. It is being used to test and repair airborne radio equipment in lieu of a Power Unit PE–143.

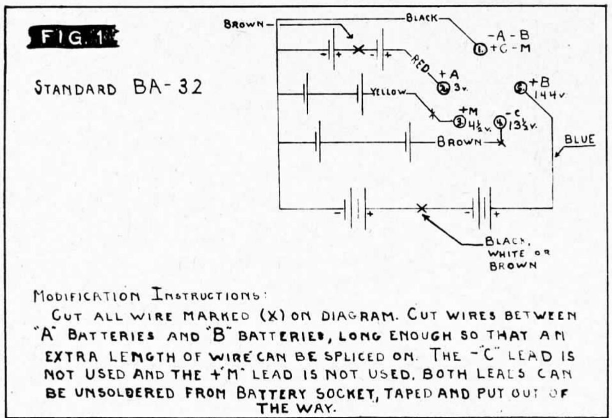
MAINTENANCE

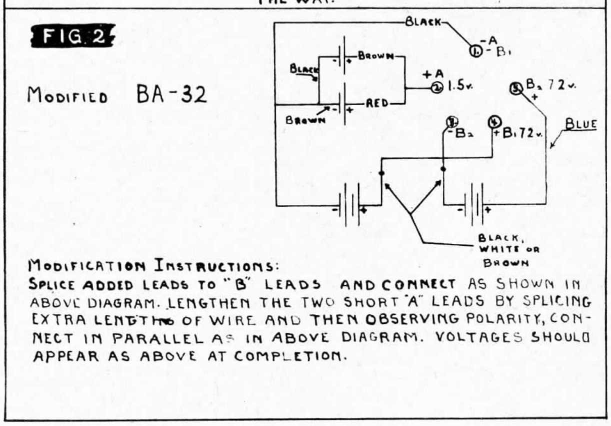
POWER SUPPLY FOR TESTING 511's AND 536's

Signal Corps depots charged with the maintenance and repair of Radio Set SCR–511–( ) and SCR–536–( ) can effect a large battery salvage and at the same time speed repairs and isolate troubles encountered in the above-mentioned radio sets more simply by the employment of an improvised power supply.

The power supply is composed of batteries that are of no value due to their age. These batteries are usually available in depot stocks and can be modified to provide voltages to operate Radio Set SCR–511–( ) and SCR–536–( ) for long periods of time without the necessity of being replaced. The power supply further makes use of otherwise worthless batteries and eliminates the necessity of using up new BA–49 or BA–37 and BA–38 batteries which might be needed by field organizations. It may be used as a substitute for Chest Unit T–39, part of Radio Set SCR–511–( ), thereby eliminating one definite source of trouble, Cord CD–571–A connected to Chest Unit T–39. Repair and maintenance personnel are enabled to make faster repairs since they have less equipment to handle.

Radio Set SCR–536–( ) can be handled in much the same manner through the use of a spare microphone and earphone mounted in the power





supply along with meters which indicate current requirements of the radio set. This provides a power source for the radio set and at the same time the set is outside of its case and facilitates the isolation of troubles in the components.

It should be understood that this power supply is primarily used for one purpose, the maintenance and repair of these radio sets. It is not for alignment purposes. Further, the building of such a power supply should be considered only if considerable numbers of Radio Set SCR-511-( ) and SCR-536-( ) require maintenance and repair.

All component parts such as batteries, earphone jacks, speakers, sockets and microphones can be obtained from salvage stock and represent no use of new parts. The batteries which are to be torn up and modified are BA-32 batteries.

Battery BA–32

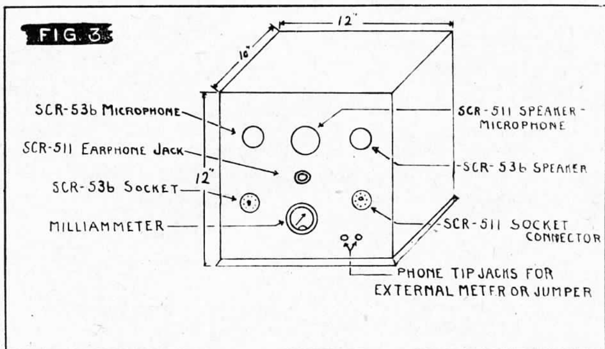
Obtain two Batteries BA–32 and tear them open, being careful not to injure the wires secured to the socket located at the top of the battery. Refer to figures 1 and 2. Observe the method of wiring the battery since the color coding used by some manufacturers may be different than that shown on the diagram. However, by substituting the change in color code for that used in figure 1 the modification may be easily followed. When wiring change is completed, the voltages obtained should conform to those shown in figure 2. Mark the battery socket with the proper voltages and the battery modification is complete.

Power Supply

Figure 3 shows a suggested method of making a test box; this need not be followed in detail though it is similar to one employed by some repair depots where the power supply is now in use. Meters may be mounted on the test panel at the discretion of the personnel. Figure 3 shows one of the two required meters mounted, and one used as an external meter. Through the use of phone tip jacks and jumpers, both meters may be kept as external meters by merely bringing all meter leads out to the phone tip jacks, and properly marking each jack.

Figure 4 shows the complete wiring diagram of the power supply. The list of parts required, less the batteries, are as follows:

1 ea____ Microphone and Speaker from Chest Unit T–39–( ), part of Radio Set SCR–511–( ).



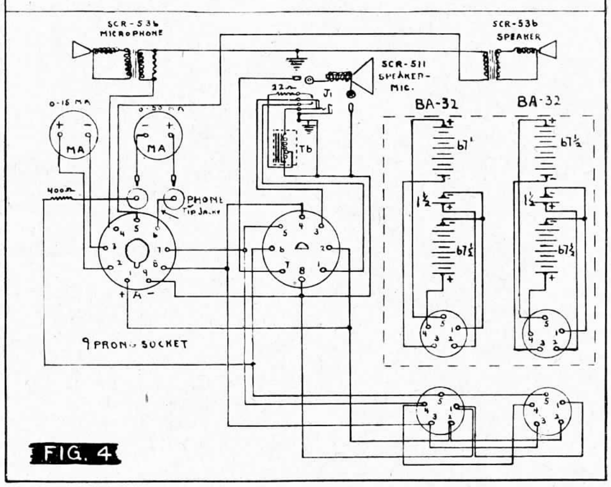
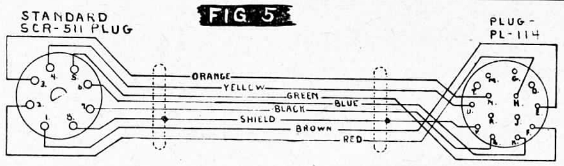
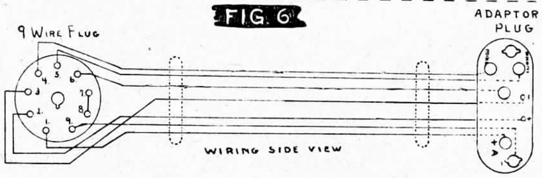


FIG. 5



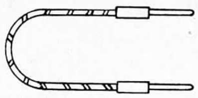
ADAPTOR CORD
For RADIO SET SCR-511-( ) with Modified Connector Ring Assembly

FIG. 6



ADAPTOR CORD
For RADIO SET SCR-536-(A to F)

FIG. 7



JUMPER
For use instead of External Meter, when not available or needed Will give circuit continuity while testing Radio Set SCR-536-(A to F) with Battery Power Supply

- 1 ea.... Earphone Jack from Chest Unit T-39-( ), part of Radio Set SCR-511-( ).
- 1 ea.... 22 ohm 1/3 watt resistor from Chest Unit T-39-( ), part of Radio Set SCR-511-( ).
- 1 ea.... Earphone Transformer T-6 from Chest Unit T-39-( ), part of Radio Set SCR-511-( ).
- 1 ea.... Socket Connector Assembly from Chest Unit T-39-( ), part of Radio Set SCR-511-( ).
- 2 ea.... 5 prong plugs, to plug into Batteries BA-32 to be connected in parallel as per figure 4.
- 1 ea.... 9 prong socket connector, preferably Amphenol. Any available will be usable.
- 1 ea.... Microphone Assembly including resistor, part of Radio Set SCR-536-( ).
- 1 ea.... Earphone Assembly part of Radio Set SCR-536-( ).
- 1 ea.... 400 ohm 5-10 watt dropping resistor.
- 1 ea.... 0-15 milliammeter.
- 1 ea.... 0.50 milliammeter.
- 4 ea.... Phone Tip jacks dependent on whether personnel desire to use meters externally.
- 8 ea.... Phone tips, 4 ea. for 2 jumpers and 2 ea. for each meter used externally.

Close adherence to the wiring diagram will provide a satisfactory power source for testing these radio sets. When completed, it is advisable to check the voltages appearing at the Radio Set SCR-511-( ) connector and the socket connector used for Radio Set SCR-536-( ). The correct voltages for Radio Set SCR-536-( ) can be measured only if the adaptor cord is plugged in since it connects the batteries up, to provide proper voltages through the use of a connector link in the adaptor cord plug.

Adaptor Cords

Figure 5 shows an adaptor cord to be made up for use with the new models of Radio Set SCR-511-( ). Lacking a Plug PL-114 the radio set can be quickly converted to Radio Set SCR-511-A or B by removing the connector ring assembly at the top of the Radio Receiver and Transmitter BC-745-( ) and substituting Cord CD-571-A in place of it. Figure 5 shows a Cord CD-571-A with a Plug PL-114 secured at the other end. Little trouble should be experienced in making up such a cord.

Figure 6 shows the adaptor cord to be made up for use with Radio Set SCR-536 A to F. The nine-prong plug at the end of the cable must match the socket connector on the test box panel. A connector plug for the base of the Radio and Transmitter BC-611-( ) can be obtained from a discarded Test Equipment IE-15-A. In the event that such a plug is not available, the base of the BC-611-( ) may be modified. This will require considerable ingenuity on the part of the servicing personnel, and if connections are placed so that each contact makes connection with those contacts at the base of the radio set in the correct order, little trouble should be experienced in devising locks to hold the plug securely to the base.

Figure 7 shows the jumper to be used in the event that meters are not available. They must be plugged in, in order to complete the circuits necessary to operate the Radio Set SCR-536.

Operation Notes

It is advisable to use two batteries in parallel in order that the total battery life may be extended so that replacements will not have to be made at too frequent intervals.

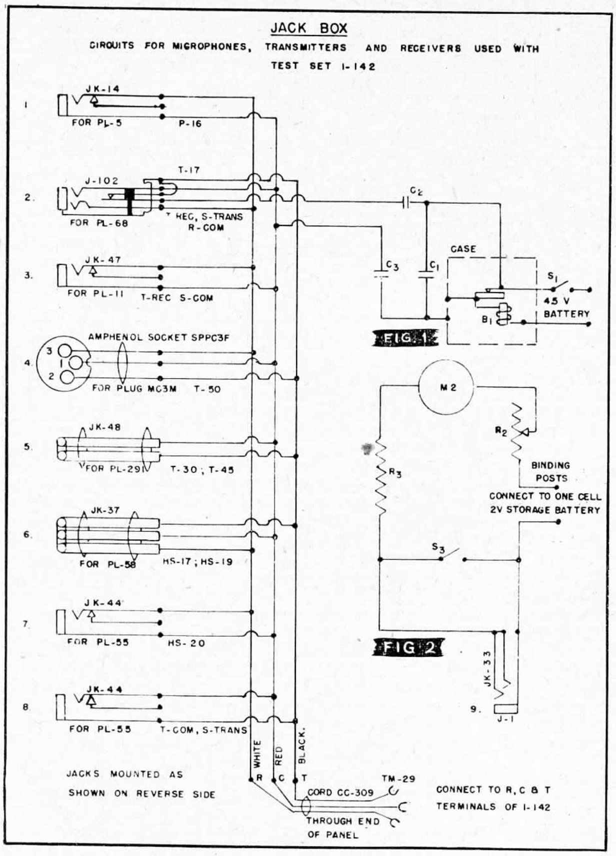
The adaptor cord for Radio Set SCR-536-( ) must be removed when Radio Set SCR-511-( ) is tested.

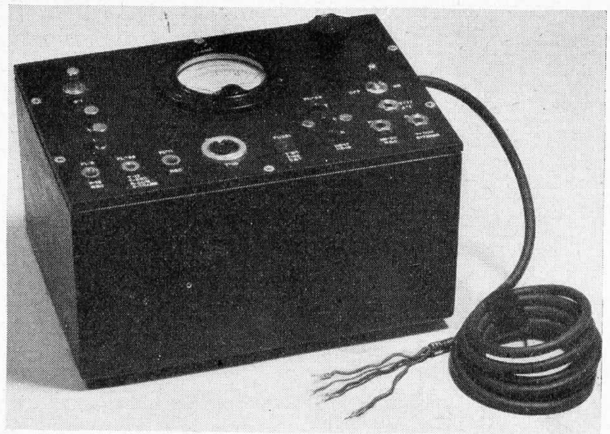
The adaptor cord for Radio Set SCR-511-( ) must be removed when Radio Set SCR-536-( ) is being tested.

The 2 radio sets cannot be tested at the same time with this power supply.

AUXILIARY EQUIPMENT JACK BOX

Numerous reports from repair shops have indicated the need for a suitable means of connecting telephone and radio receivers and microphones to





JACK BOX FOR CONNECTING TELEPHONE AND RADIO RECEIVERS AND MICROPHONES TO TEST SET I–142.

Test Set I–142. Several reports have included information on improvised methods for meeting this need.

As a solution to the problem, an experimental model of such a device was constructed. Standardization of this model is not contemplated but the several ideas proposed in reports received were combined and two additional circuits included to make a jack box which will materially assist telephone repairmen and inspectors in the performance of their work.

Circuit diagram of the jack strip is self explanatory as it makes it possible to connect various pieces of equipment to the I–142 without removing the plugs, so that individual wire can be connected to the R, C, & T terminals of the I–142.

Figure 1 of the circuit diagram gives a ready means of testing the capacitor in the Microphone T–17 without removing it. An abrupt decrease of more than five scale divisions in reading on the meter of the I–142, when buzzer voltage is applied, indicates that the capacitor is effectively open and should be replaced.

Figure 2 of the circuit diagram will immediately be recognized as a low resistance ohmmeter. This may be used to check the resistance of the control circuit of the Microphone T–17 which sometimes becomes too high to operate the relay and turn on the transmitter. It consists of a battery, resistance meter and adjustable resistance. Owing to battery and meter, used current will be of a convenient value so that Ohms law can be applied to change the difference between meter readings, with or without the external or unknown resistance, directly into ohms or tenths of an ohm.

CONVERSION OF SCR–211

The staff of the Radio Maintenance Section of the Signal School Detachment of the Replacement Command, MTOUSA, has devised a means for converting various models of the Frequency Meter Set SCR–211 (AA, B, N, etc.) for operation with 12- or 24-volt battery supplies by the use of a dynamotor power supply.

Due to the shortage of Battery BA–2 and BA–23, and the extensive use of the frequency meter, and the comparatively short life of the batteries, it is felt that such a system is especially important at this time. The matter should be also of particular interest to aircraft radio operators, since *24-volt* battery supply is standard on many planes, and the frequency meter is essential to proper operation.

A description of the circuit and the changes necessary for *24-volt* operation is as follows:

Filament Circuit.—The filament circuit as originally designed is arranged so that the three tubes, 2 VT–116 and 1 VT–167, are connected in parallel across a 6-volt source. The tubes used are so wired that pin No. 2 is grounded and pin No. 7 is

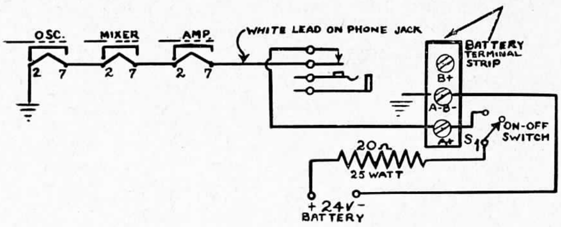


Figure 1.

connected to the positive (plus) terminal of the filament battery.

For operation with a dynamotor and a 24-volt supply, the following changes have been made in the filament circuit. The tubes are connected in series as shown in figure 1. Connection on No. 2 pin of the oscillator tube socket VT–167 remains unchanged. Then the No. 7 pin of the oscillator tube is connected to No. 2 pin of the mixer tube VT–116. No. 7 pin of the mixer is in turn connected to No. 2 pin of the amplifier tube VT–116. The No. 7 pin of this tube is connected to the *white lead* on the phone jacks 31–1 and 31–2. This completes the necessary changes in the frequency meter filament circuit design.

In order to apply only 18 volts to the heaters of the tubes, when connected to a 24-volt source, a suitable voltage dropping resistor is needed. A simplified diagram of the circuit and parts involved is shown in figure 1.

A 20-ohm, 25-watt resistor has been used since it was the only one available in this case. The power dissipated in the resistor is approximately 2 watts and one having a rating of not less than 5 watts will work very well.

Plate Supply Circuit.—In order to obtain high voltage for the plates and screens of the tubes, Dynamotor DM–36, designed for 24-volt operation is used. To drop the voltage to the normal operating range of 125 volts to 135 volts, a suitable dropping resistor is required. Figure 2 shows the connection of this resistor. It is a 7,000-ohm, 10-watt resistor and is placed in series with the high voltage lead.

A single pole—single throw *ON-OFF* switch is placed in the positive (plus) 24-volt lead from the

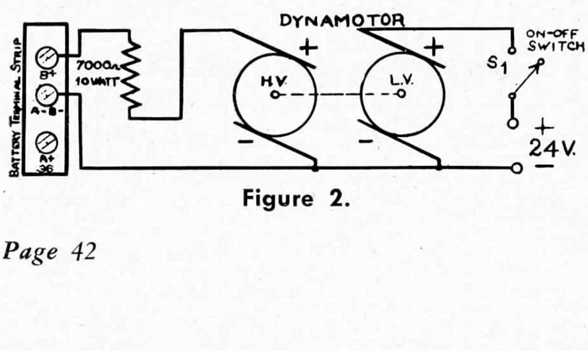


Figure 2.

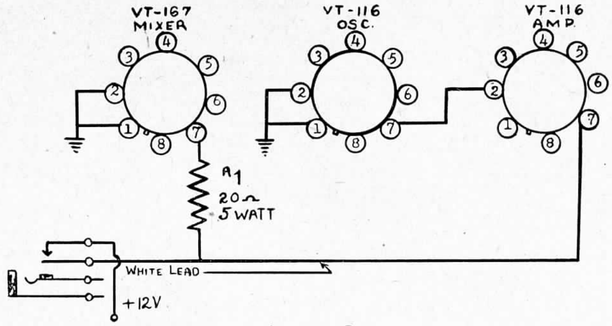


Figure 3.

battery, this switch controls the filament circuit and the dynamotor, power being supplied to both circuits when the switch (S–1) is placed in the *ON* position. This switch is selected in preference to the four-position switch (part No. 28) which is used in the frequency meter because the current carrying capacity of (part No. 28) switch for both filaments and dynamotor was not large enough.

The plate voltages obtained from the dynamotor match with those obtained from batteries in normal use. With the *OFF-CRYSTAL-OPERATE-CHECK* switch in the *CHECK* position the output voltage from the dynamotor measured at the battery terminal strip is approximately 135 volts. In the *OPERATE* position the voltage drops to 125 volts but this 10-volt drop in no way affects the operating frequency or characteristics of the frequency meter. No frequency drift was encountered during the extensive tests which were made.

A description of the circuit and the changes

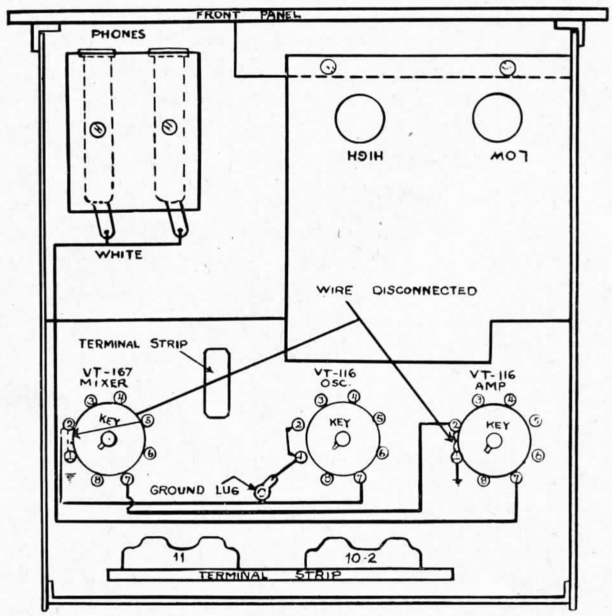


Figure 4.

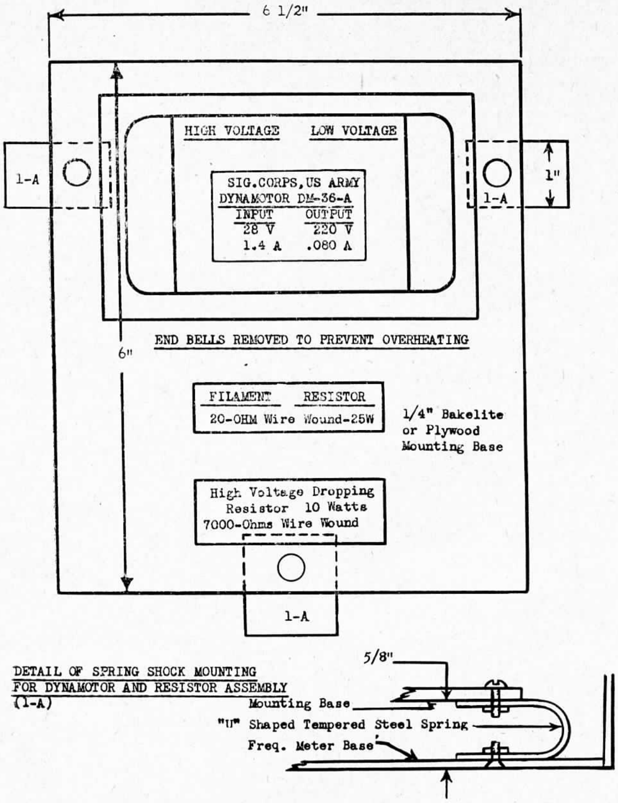


Figure 5.

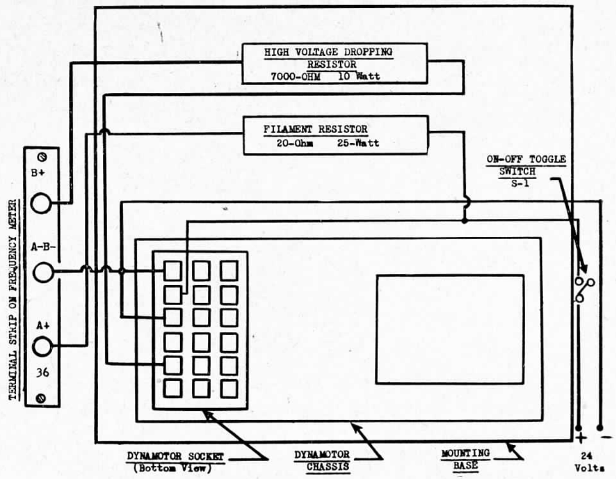


Figure 6.

necessary for operation from a *12-volt* power source are as follows:

Filament Circuit.—In order to operate the frequency meter from a 12-volt power source, the following changes have been made in the filament circuit. The connection on No. 2 pin of the oscillator tube VT–116 is left unchanged. The No. 7 pin of the oscillator tube socket is connected to pin No. 2 of the amplifier tube socket. Pin No. 7 of the amplifier tube socket is connected to the *white lead* of the phone jacks 31–1 and 31–2. The pin No. 2 of mixer tube VT–167 has no change in its connection. The No. 7 pin is connected to one end of resistor R–1. This resistor has a value of 20 ohms and a wattage rating of 5 watts. The other end of this resistor is fastened to the *white lead* of the phone jacks 31–1 and 31–2. A simplified schematic diagram of the component parts which are affected is shown in figure 3.

Plate Supply Circuit.—In order to obtain high voltage for the plates and screens of the tubes, Dynamotor DM–34, designed for 12-volt operation is used. Since the output voltage of this dynamotor is the same as that of Dynamotor DM–36, connections to the dynamotor plug remain the same as those shown in figure 2. The 20-ohm, 5-watt resistor shown in figure 3 has been removed and wired directly to the tube socket of VT–167.

Figure 4 is a lay-out diagram of the equipment, while figures 5 and 6 show the means of mounting and connecting the dynamotor and resistors.

It is believed that this development will be of some value as an expedient in view of the shortage of batteries.

TEST CLIPS

Several reports have been received from the field indicating that insulation-piercing test clips do not penetrate the insulation on wire because of dullness of the piercing point. For a short time, inferior test clips were produced due to the unavailability of desired materials. However, this was remedied and production of test clips was resumed using hardened steel with an electro-galvanized finish.

Although hardened steel is now used for the piercing point, it is assumed that in the field there is some misuse of the test clip for connection to ground rods or equipment chassis which will dull the piercing point. This misuse of the clips should be avoided by using the forward part of the clip for connection to solid materials.

It is also to be noted that synthetic insulation now being used in place of rubber will not allow the hole made by the piercing point to *close up* resulting in the entrance of moisture. This condition may be aggravated when plastic insulation is used in future production of wire. A wrapping of any available waterproof tape over the hole in the insulation that was made by the test clip will prevent the entrance of moisture.

Replacement of dull or defective test clips with new test clips is the only possible corrective action recommended for the field. Under no circumstances should the piercing point be filed, since the protective finish will be broken and corrosion will result.

MOISTURE AND FUNGI TREATMENT FOR LEATHER

Reports from units using Signal Corps equipment in the Tropics have long indicated that moisture and fungi were taking a high toll of leather items such as Telephone EE–8 cases, lineman's pouches, straps, etc. It has been found that moisture and fungi in leather cases also corrodes metal equipment housed in the cases.

Temporary methods used on Telephone EE–8 cases such as spraying the cases with moisture and fungi-proofing lacquer or use of *dubbing* materials have proved to be inadequate and unsatisfactory.

In order to provide adequate protection, leather must be treated with a material that will (1) provide a barrier so that moisture will not enter the leather (2) prevent the growth of fungi (3) retain the strength and flexibility of the leather. As a result of an intensive laboratory research, the Signal Corps has discovered a suitable material for treating leather known as *Compound, Moisture and Fungi Resistant, Leather Treating.* Signal Corps Stock No. 6G246 has recently been assigned for 5-gallon cans. The formula for the compound consists of the following and the mixing is accomplished as follows:

	Percent
Shirlan Extra (Salicylanilide)	2
Hexalin (Cyclohexanol)	25
Paraffin Wax	10
Stoddard Solvent	63

Dissolve the Shirlan Extra in the Hexalin, add the paraffin wax and stir until dissolved (solution may be expedited by heating at 110° F.). Add Stoddard Solvent to this mixture slowly, with constant stirring. Keep in airtight sealed containers to avoid evaporation. *Processing should not be done near open flame. This solution is inflammable.*

Method of Treating

The leather should be thoroughly cleaned and dried before applying the treatment. The solution should then be applied by brushing or dipping. Treatment by spraying will not give the proper penetration and is not recommended. In brushing, apply the solution liberally to all surfaces of the leather and then hang up to dry for 24 hours at room temperature (70° F.). If hot rooms or ovens are available, the leather may be dried at 120° F. for 8 hours. In dipping, immerse the leather in the solution for 5 minutes. Remove and drain for 30 minutes, changing the position of the article frequently to get a uniform coating. A recommended method is to change the position every 2 minutes for the first 10 minutes and then every 5 minutes for the next 20 minutes. Dry at room temperature of 70° F. for 24 hours or 120° F. for 8 hours.

Operating Temperatures

Best results are obtained by keeping the solution between 75° F. and 85° F. when dipping or brushing. Below 70° F. the paraffin wax will begin to separate and become lumpy. Therefore, treating should not be done at temperatures below 70° F.

If heating is necessary, open flame must not be used, as the solution is inflammable. Extreme caution should be exercised so as not to create *hot spots* in the solution or under the container during heating.

Several recommended heating methods are:

1. Electric heater of *hot-plate* type. Do not use in direct contact with solution container. Stir constantly until desired temperature is reached.

2. Place solution container in second container of hot water. Stir until desired temperature is reached.

Action has been taken to provide sufficient quantities of the compound with Moisture and Fungi Proofing Equipment MK–2/GSM as well as for domestic installations such as departmental, depot and service command shops and for general base depot signal organizations functioning for a theater. Official technical literature is in process of preparation as well as a supply bulletin with appropriate requirements, information and authority. Tentative general instructions and instructions for treating specific items are now available through Signal Corps Ground Signal Agency Maintenance Division, Architect Building, Seventeenth and Sansom Streets, Philadelphia 3, Pennsylvania.

REPLACEMENT OF SWITCH SW–118

Field reports indicate trouble with Switch SW–118 used on Head and Chest Set ES–3552 made by Kellogg Switchboard & Supply Co.

Possible failure of this switch can be prevented by replacing Switch SW–118 with SW–229. Use instructions contained in MWO SIG 20, issued

Receiver BC–683 in Radio Set SCR–608–( ).
Change orders for Radio Set SCR–508–( ) (15 February 1944), and SCR–608–( ) (20 March

s disclose that an inconsistency
cal Manual TM 11–600 and 11–620
grounding of the coaxial antenna
g PL–1 in use with Radio Receiver
io Set SCR–508–( ) and Radio

the subject radio receivers, any BC–603 or BC–683 being serviced should be examined to determine whether the shell is grounded at plug PG–1. If the change has not been made, it can be done at that time.

Investigation
exists in Techni
relative to the
lead shell at Plu
BC–603 in Rad

MILITARY TRAINING

LING DEMONSTRATOR

demonstrator illustrated in figure
he Enlisted Men's School, Eastern
chools, Fort Monmouth, to teach
ween the degree of coupling and
nd selectivity of a coupled circuit.
ised method of teaching this rela-
bersome and time consuming, and
lly of the following steps:
upled circuit is set up in such a
e relative angular placement and
the two coils of the circuit can be
vide limits.
is tuned to a specified frequency.
relationship between the two coils
d condition of coupling by an ad-
listance and of the angle between
axes of the two coils.
al is fed into the primary of the
tput of the secondary is measured
ter. The amplitude of the input
throughout the test. The fre-
nput is varied in steps over the
The output or ammeter readings
d plotted against the frequency.
ange is customarily 100 kc.–50 kc.
he resonant frequency.
sequence of operation (1 to 4)
ach placement of the coils that is

obviously takes a considerable
is laborious, and often fails to get
dent the desired information. It
esirable to develop demonstration

equipment by which the space relationship (orientation and distance) between two coupled coils could be readily varied at will, the coils would be tuned to a desired frequency, the frequency of the signal impressed across the circuit would be varied automatically in continual cycles over a range or swing of frequency that centers at the resonant frequency of the coupled coils, and at the same time the output would be *plotted* automatically against the frequency of the signal. This objective has been accomplished in the coupling demonstrator described in this article.

This demonstrator is rugged in its construction and simple in its operation. All students attending the subcourse Elements of Radio, in which the demonstrator is used, can operate it and obtain accurate results without any difficulty. The adjustments of coupling between the two coils can be made rapidly and smoothly without steps, by turning a pair of knobs. An r-f signal of constant amplitude and continuously varying frequency is fed into the coupled circuits. The frequency of the input is automatically increased at a uniform rate from minimum to maximum over a range of 80 kc. at 60 cycles a second. The relation between the tuned coupled circuit response and frequency is shown on the screen of the oscilloscope.

Consequently, the student can obtain, in a few minutes, the entire range of information that would take an hour or more for him to obtain by the orthodox method. Also, he can get a vivid visual portrayal of the changes in sensitivity and selectivity caused by varying the degree of cou-

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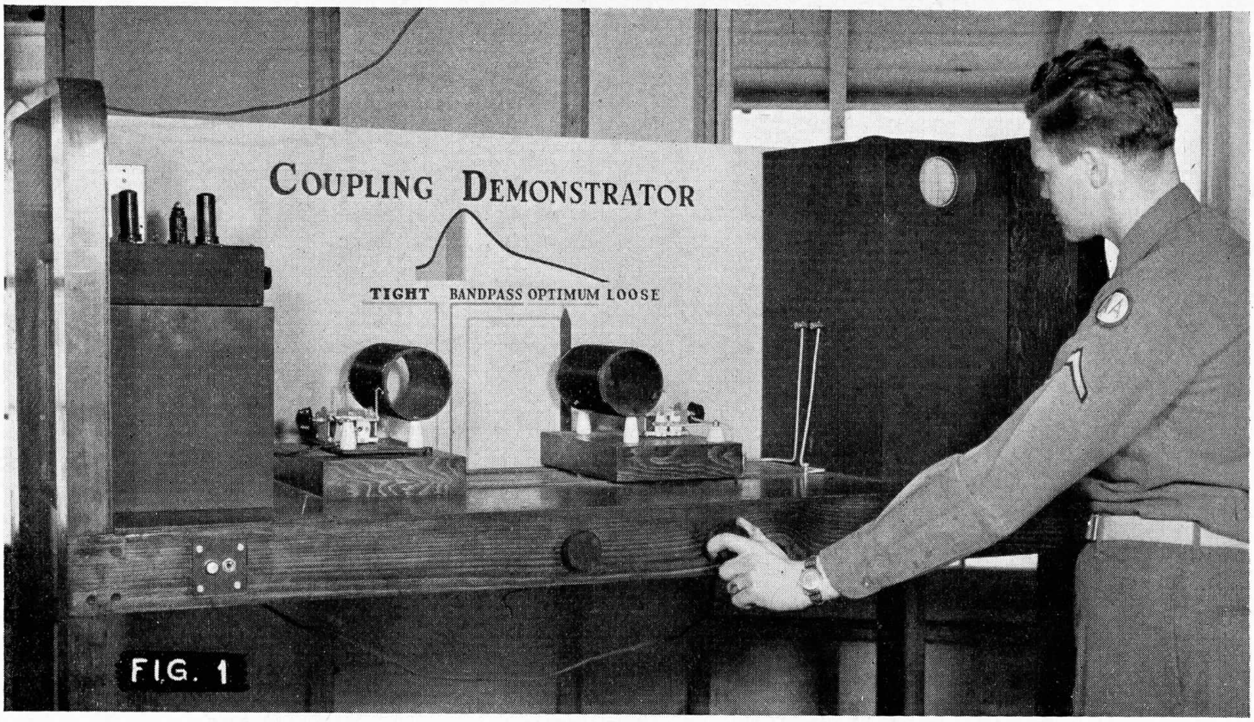


FIG. 1

pling. A typical pattern obtained on the oscilloscope with tight coupling is shown in figure 2.

General Construction and Operation of Demonstrator

The general construction of the demonstrator is illustrated in figure 1. Essentially the demonstrator consists of three principal parts, the power and signal supply, the coupled circuits, and the cathode ray oscilloscope with its associated circuits.

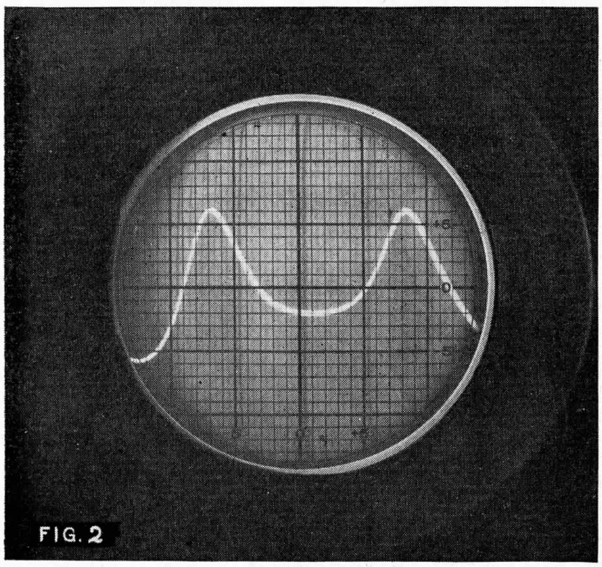


FIG. 2

The 60-cycle power supply is located in the black box at the left of the stand. In operation it is connected through a control switch to a 110-volt, 60-cycle source. A frequency modulated signal generator is fastened to the top of this box. The potentiometer controlling the frequency swing of the signal generator is preset and is not accessible to the students.

The tuned coupled circuits consists of 2 coils—a primary and a secondary—each provided with a tuning capacitor. The primary and secondary coils are of equal diameter, length, and number of turns, and purposely have been made relatively large.

The coil on the left in the illustration is the primary. It is fixed in position and can be rotated in a horizontal plane through an angle of 90°, so that it can be placed parallel or at right angles to the secondary coil or at any angle in between. This adjustment is made by means of the left-hand black knob, shown on the front of the stand in the illustration.

The secondary coil is mounted on a movable platform that can be slid up to or away from the fixed coil for a distance of 25 inches or five times the diameter of the coil. The position of the secondary coil is controlled by the black knob at the right under the hand of the operator in the illustration.

The oscilloscope circuit, consisting of an amplifier, a detector and a 3-inch cathode ray oscilloscope, together with associated circuits, is housed in the black box at the right of the stand. The oscilloscope included in this demonstrator is a standard 3-inch commercial model. The horizontal, vertical, sensitivity, and focus controls are initially preset and ordinarily will not require any further adjustment. The housing prevents tampering by the students. The saw-tooth sweep is operated at 60 cycles.

The demonstrator is assembled on a stand constructed from 2″ x 4″ stock and plywood panels. The illustration painted on the rear panel of the demonstrator is color coded to show the variations in sensitivity for changes in coupling coefficient. A pointer mounted on the secondary tuned circuit sweeps across the illustration as the circuit is moved back and forth along its track. At any given setting the pointer indicates the relative sensitivity for that degree of coupling. The indications painted on the back panel are a means of checking the results obtained.

Circuit Design of the Demonstrator

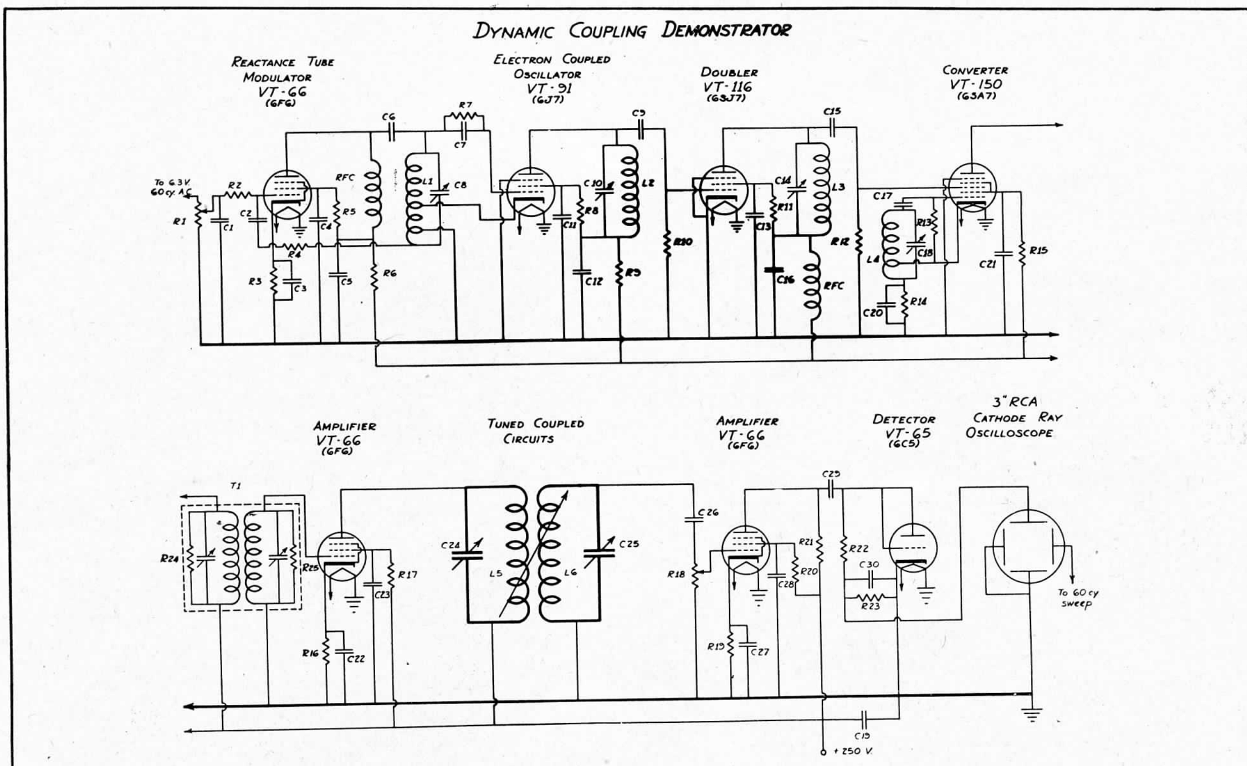
In the design of the demonstrator the following conditions were established:

1. The coupled circuits under study would be operated at approximately 425 kc.

2. The frequency swing of the input signal would be such that the output would effectively progress from zero through maximum to zero. It is found that a swing of approximately 20 percent, or from 40 kc. below to 40 kc. above the resting frequency would provide a suitable pattern on the scope, that is, one having a wide frequency sweep and a high-voltage response.

The power supply is a conventional unit supplying 5 and 6.3 volts a.-c. and 250 volts d.-c. The input power is 110 volts, 60 cycles.

A signal generator employing an electron coupled oscillator and using a VT–91 has been chosen as the basic circuit (fig. 3). The oscillator tank



C1	.001 mfd. paper
C2	35 mmf. mica
C3	16 mfd. electrolytic
C4,C6,C11,C12,C15,C16,C20,C21,C23,C28,C29,C30	.005 mfd. mica
C5	18 mfd. electrolytic
C7,C9,C26	250 mmf. mica
C8,C10,C14,C18	200 mmf. variable (CA-332)
C13	.003 mfd. mica
C17	100 mmf. mica
C19,C27	.25 mfd. paper
C22	.05 mfd. paper
C24,C25	200 mmf. variable
R1,R18	500,000 ohm pot. 1 W
R2	50,000 ohm, ½W
R3,R16,R19	2,000 ohm, 2W
R4	5,000 ohm, ½W
R5,R20	50,000 ohm, 1W

R6,R9,R17	20,000 ohm, 1W
R7,R13	20,000 ohm, ½W
R8	25,000 ohm, 1W
R10,R11,R12	100,000 ohm, 1W
R14	500 ohm, 1W
R15	10,000 ohm, 1W
R21	10,000 ohm, 2W
R22,R23	250,000 ohm, 1W
R24,R25	50,000 ohm, 1W
RFC	2.5 mh. radio frequency chokes
T1	455 kc. I.F. transformer
L1	51 turns 2″ dia. gnd tap 16 t. from bottom, cathode tap 25 t. from bottom
L2	21 turns, 1½″ dia.
L3	14 turns, 1″ dia.
L4	18 turns, 3/8″ dia tap 5 turns from gnd end.
L5,L6	87 turns, 4″ dia.

(All coils close wound on bakelite forms with exception of L4 which is air wound and self supporting.)

FIG. 3

circuit (L1–C8) has a high C/L ratio for frequency stability and is tuned to 3 mc. Because of this high C/L ratio in the tank, the reactance modulator (VT–66) is made to operate as a variable inductance. The modulating frequency for the reactance modulator is 60 cycles and is obtained from a 6.3-volt winding on the power transformer. Potentiometer, R1, is placed across the 6.3-volt winding and is used to control the amount of modulation. It is adjusted to the setting that gives the desired broadness on the scope, that is, the desired width of the response curve. Due to circuit and equipment considerations it was determined that the maximum swing obtainable with this arrangement was 20 kc. To obtain the desired frequency swing of at least 80 kc., the oscillator output is doubled twice—once in the oscillator and once in the doubler stage. The output of the doubler stage (VT–116) is therefore 12 mc. and the swing has now been increased proportionately to 80 kc. The resting frequency (12 mc.) and the total deviation (plus or minus 40 kc.) of the doubler output were initially determined by measurement. A sensitive wavemeter was used for this purpose. Symmetry of modulation was initially determined by feeding in varying d.-c. potentials to the reactance tube modulator and plotting voltage versus frequency output. Equal frequency shifts for both positive and negative potentials indicated symmetry.

In the converter stage (VT–150) the signal is reduced to 425 kc., the 80 kc. swing being retained. The oscillator section of the converter is made to operate at 12.425 mc. Transformer T1 is a standard i–f transformer that has been loaded with resistors to broaden its response characteristics in order to pass the frequency-modulated signal with a minimum of distortion. The final amplifier serves to increase the level of the signal before it is fed into the tuned circuit.

The signal produced in the secondary of the tuned circuit is amplified by a VT–66 and then rectified (VT–65) before being applied to the oscilloscope. Rectification is employed to eliminate the r–f trace and effectively present a single line trace on the scope screen. The amplitude of the pattern on the scope is adjusted by means of the signal level control R18.

MEETING IN RHEIMS

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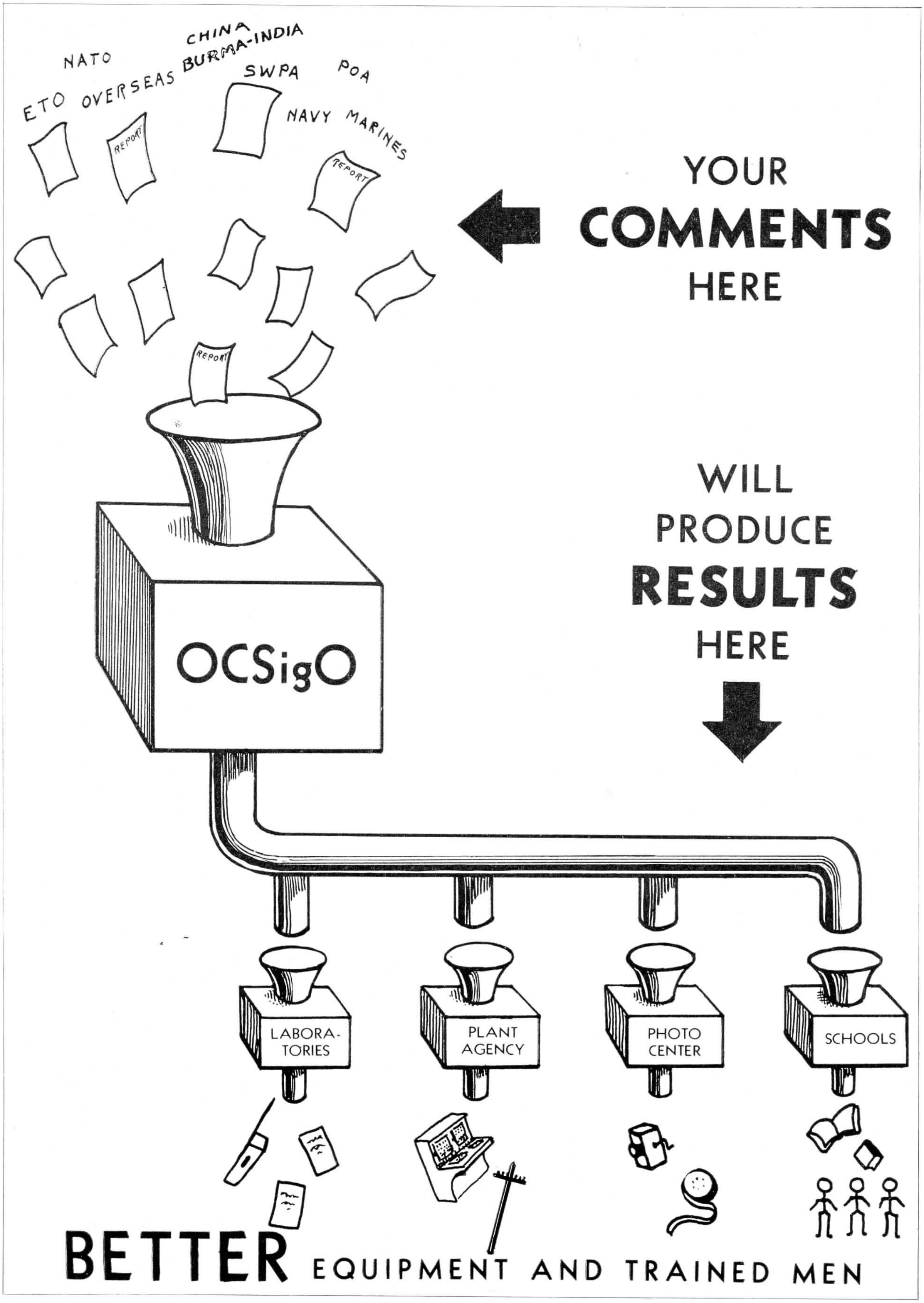
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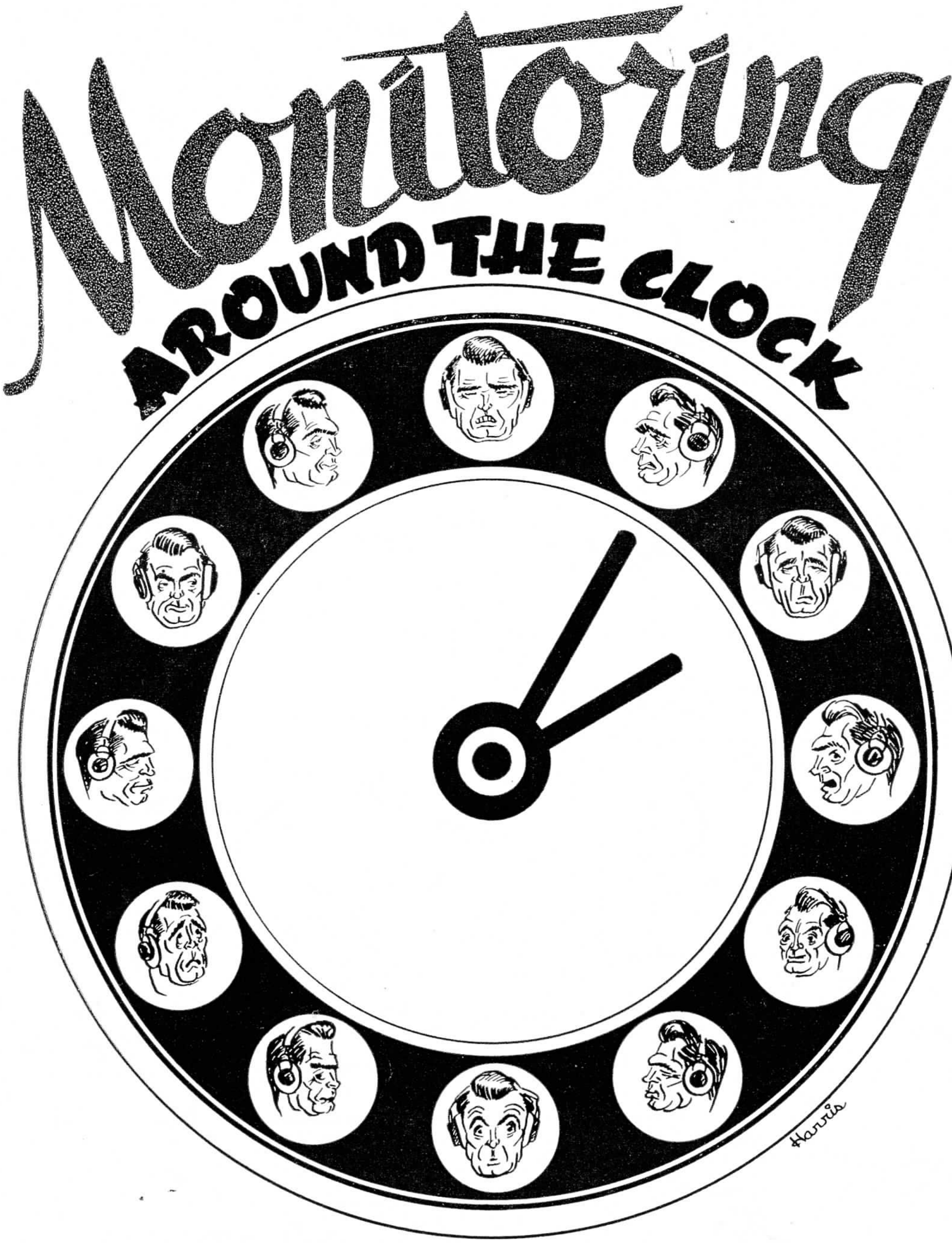

THE MONITORING OPERATOR HEARS THESE VIOLATIONS MOST OFTEN

1. Unnecessary transmissions
2. Omissions of K or $\overline{\text{AR}}$
3. Incorrect requests for repetition during transmission
4. Unauthorized procedure
5. Less than 8 E's in error sign
6. Incorrect use of prosigns
7. Amateur or Commercial prosigns
8. Improper reply to request for repetition
9. Use of $\overline{\text{IMI}}$ for 8 E's or INT
10. Use of E, EE, etc., for receipt
11. Omission of last word sent correctly after **error sign**
12. Incorrect testing

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