Digitized by Google

W42.29:26

SETS

UNDAMPED WAVE RADIO TELEGRAPH TYPES SCR-127 AND SCR-130

Radio Communication Pamphlet No. 26

(SECOND EDITION)

PREPARED IN THE OFFICE OF THE CHIEF SIGNAL OFFICER

January, 1921

WASHINGTON
GOVERNMENT PRINTING OFFICE
1922

Digitized by Google

WAR DEPARTMENT

Document No. 1056

Office of The Adjutant General

Digitized by Google

WAR DEPARTMENT,
WASHINGTON, *January 21, 1921.*

The following publication, entitled "Sets, Undamped Wave Radio Telegraph, Types SCR–127 and SCR–130," is published for the information and guidance of all concerned.

[062.1, A. G. O.]

BY ORDER OF THE SECRETARY OF WAR:

PEYTON C. MARCH,
Major General, Chief of Staff.

OFFICIAL:
P. C. HARRIS,
The Adjutant General.

Digitized by Google

Digitized by Google

TABLE OF CONTENTS.

Digitized by Google

Digitized by Google

SETS, UNDAMPED WAVE RADIO TELEGRAPH,

TYPES SCR-127 AND SCR-130.

PURPOSES OF SETS.

These sets are designed to transmit and receive undamped wave radio telegraphy. The SCR–127 set is intended for communication between mounted organizations. The entire equipment is carried on pack animals. The SCR–130 set is intended for communication between organizations equipped with ample motor or wagon transport. The two sets have the same antennæ and set box, but differ in the means provided for transportation and in the source of electric current. They have sufficient power to assure communication between points 60 miles or less distant. Their transmitting wave-length range is from 550 to 1,100 meters; the receiving wave-length range is from 350 to 1,100 meters.

DESCRIPTION OF SETS.

Antennæ equipment.

The antenna equipment consists of a sectional mast, antenna wire, counterpoise wire, guy ropes, and ground stakes. The masts consist of 14 sections, each 4 feet 2 inches long. Including the coupling tube, the sections are 5 feet 2 inches over all. Ten sections are used for the mast itself, three sections for a tent furnished with the set, and one section is a spare. The standard antenna is of the umbrella type with six radiating wires, each 75 feet long, suitably insulated at the open ends and held as nearly horizontal as possible by guy-rope extensions 90 feet long, the outer ends of which are made fast to ground stakes. The standard counterpoise has six radiating insulated wires, each 90 feet long, laid out on the ground under the antenna wires. Both antenna and counterpoise wires are carried on hand reels for convenience in packing and quick reeling and unreeling in setting up and taking down the mast.

Shelter tent.

This tent is similar in dimensions and construction to the standard "common" wall tent issued by the Quartermaster's Department, but is made of lighter material and is not provided with ridge pole or uprights. In erecting the tent the extra sections furnished with the mast should be used as the ridge pole and uprights as follows: One mast section, one plug, and one extension piece for the ridge; and one

Digitized by Google

mast section, one extension piece with spike for each upright. This is shown in figure 3–A.

A device is provided for use in insulating the antenna when the shelter tent is used in damp weather, consisting of a square piece of sheet rubber with small marginal holes for lacing into the ventilator at either end of the tent, and a tube attached to the center for admitting the antenna lead. When in use, a sufficient slack should be left in the antenna lead to form a drip loop outside of the tent, and if found necessary a piece of heavy insulated wire can be used as a leading-in wire.

Set box.

The set box contains the vacuum tubes, condensers, and other parts necessary in a radio set. The front of the box forms a shelf for the key and for writing when the box is open. The box is supported on removable legs. Figure 1 shows the panel with the front of the box lowered to the operating position.

The wave-length variometer is located in the lower right-hand corner of the set box. It is equipped with a pointer and wave-length scale, which is direct reading. The scale is marked at intervals of 25 meters. There is a locking device shown at A′ (fig. 1) which can be used to lock the variometer at any desired setting.

The antenna-tuning variometer is located in the lower left-hand corner of the panel. It is shown at B′ (fig. 1) and its slow-motion knob at C′ (fig. 1). The slow-motion knob which moves the variometer by means of gears may be used for making fine tuning adjustments. This knob may be meshed with the gears at will by pushing it in toward the panel, and released by pulling it out. When the gears are meshed, there is sufficient friction so that the variometer is practically locked in position but may be moved easily by means of the small knob. The antenna variometer and wave-length variometers are located at opposite ends of the box in order to obtain minimum reaction between the two circuits, due to their mutual induction.

The Transmit-Receive switch is located in the center of the panel. It is thrown to the right to transmit, and to the left to receive. The filament circuits are open when the Transmit-Receive switch is open.

The receiving condensers are located in the central portion of the panel (D′ and E′, fig. 1). Both primary and secondary condensers are provided with slow-motion knobs (F′ and G′, fig. 1).

The antenna-coil switch (H′, fig. 1) for changing taps is located directly above the primary antenna circuit condenser. It is a two-position dial switch and the positions are marked "Short wave" and "Long wave." The coil has sufficient inductance when the switch

Digitized by Google

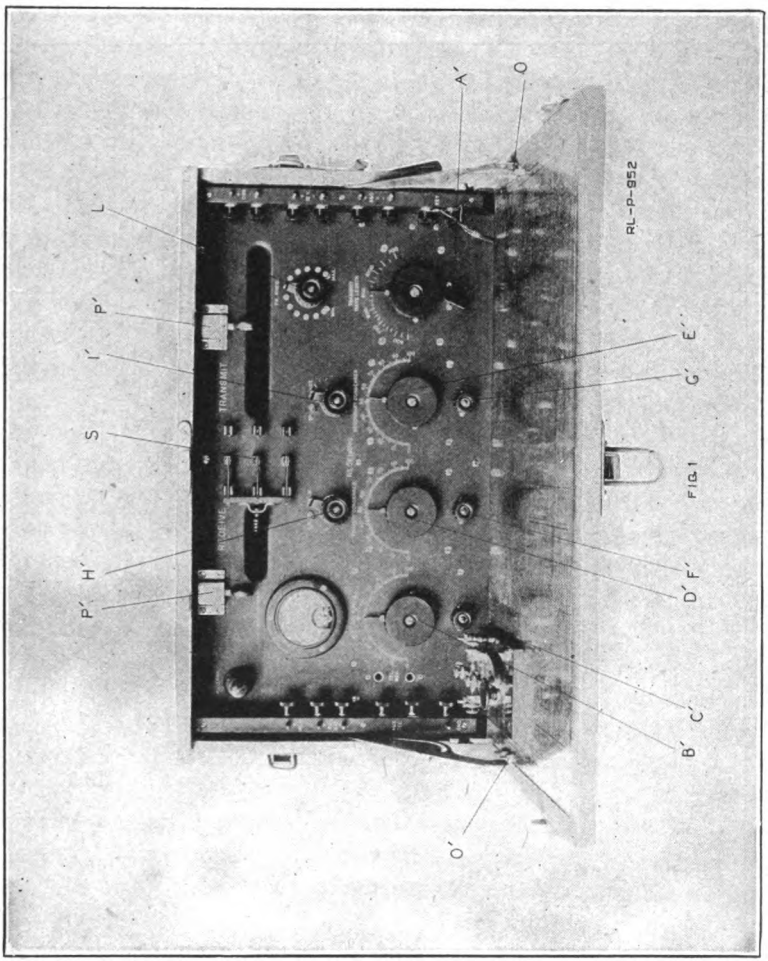
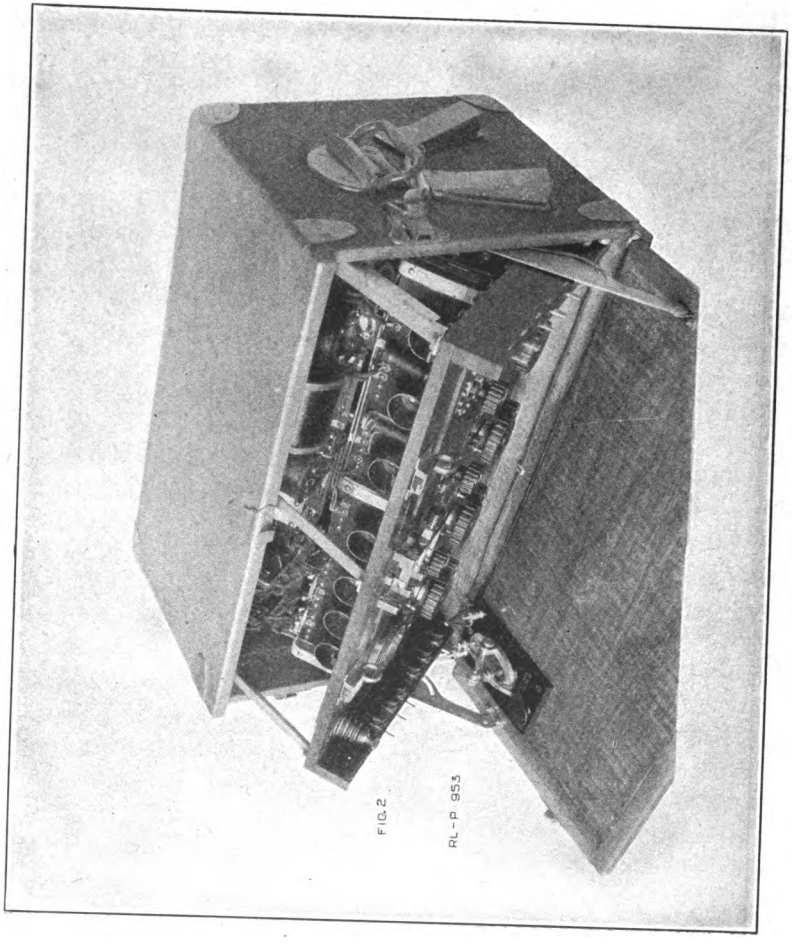


FIG. 1

77392°—22——2

Digitized by Google



Digitized by Google

is in the long-wave position to tune to 1,100 meters on a smaller antenna than the one usually supplied.

The tickler-coil switch is located directly above the secondary condenser (I′, fig. 1). When the switch is in the position marked "SP," the tickler coil is shorted.

The receiving-tubes filament rheostat (L, fig. 1) is provided for compensating for the drop in the filament battery voltage as the batteries become exhausted. It is also useful in regulating the filament current of VT–5 tubes for the best reception. It is only in the circuit when a separate receiving filament battery is used.

The connections to the power equipment for the transmitter are all arranged in a vertical row at the right-hand end of the set box. The two-bottom binding posts marked "Key" are to be connected across the leads of the key. Both pins for plug connectors and binding posts for wire connections are provided for making connections from the set box to either the hand generator and battery box or to a storage battery and dynamotor. The plugs and cords for connecting to the hand generator and battery box or to a storage battery and dynamotor are supplied with the set. The low-voltage side of the hand generator is connected to the 12-volt terminals and the high-voltage side to the 350-volt terminals. When a storage battery and dynamotor are used, the 12-volt battery is connected to the 12-volt terminals and the motor side of the dynamotor to the dynamotor terminals. The generator side is connected to the 350-volt terminals. One blade of the Transmit-Receive switch is arranged to close the battery circuit to the dynamotor when the switch is in the transmitting position.

The power supply for the receiver is connected to the binding posts on the left-hand end of the set box when VT–5 tubes are used. The + fil. battery and —40 volts are common. Cords with plugs are provided for making the connections from the battery box to the set box.

The panel may be pulled forward at the top, as shown in figure 2, for placing tubes in the sockets and manipulating the switches S_3 and S_6 (fig. 8). The panel is held in place by catches at the top of the panel.

All of the apparatus inside the set box is mounted on the panel or on an aluminum frame which is attached to the panel. The entire set may be removed from the box. In order to remove the set from the box the two brackets which support the shelf must be removed from the shelf and the shelf dropped down until the lower edge of the panel will clear the key. To remove the set, first disconnect the leads to the key, then pull the top of the panel forward as shown in figure 2, raise the panel up about one-fourth inch, and pull the entire panel forward.

Digitized by Google

Power equipment.

The SCR–127 set uses a special hand generator as the source of power for the transmitter and three No. 6 dry cells in series for lighting the filaments of VT–5 tubes in the receiver. The SCR–130 set uses storage battery for lighting the filaments of both transmitting and receiving tubes and to drive a dynamotor for furnishing the plate current to the transmitting tubes. Dry batteries, type BA–8, are used for the 40–volt plate battery on the receiver.

The VT–5 tubes draw about 0.25 of an ampere from the No. 6 dry cells and about 2 milliamperes from the plate battery. The VT–1 tubes (used in SCR–130 set) draw 1.1 amperes from the storage battery and about 2.5 milliamperes from the plate battery.

The filament current required for the four VT–2 tubes in the transmitter is approximately 5.5 amperes. The plate current required by the transmitting tubes is approximately 200 milliamperes at 350 volts.

Hand generator (set SCR–127 only).

The hand generator is a double commutator shunt-wound D. C. generator, which generates 8 volts on the low-voltage side and 350 volts on the high-voltage side when the load is on. The armature is driven through a gear system by two handles, which should be turned at a rate of approximately 35 revolutions per minute. The direction of rotation of the handles must be as shown by the arrow on the top of the gear case.

The voltage is kept constant by means of a vibrating regulator which is mounted under the metal cover on the side of the generator. The regulator will maintain a constant voltage when the handles are turned at any speed between 35 and 60 revolutions per minute. No speed indicator is necessary, because the generator speed can vary through such wide limits without affecting the voltage. The regulator is set for the proper voltage and should not be changed.

The gearing is a combination planetary worm and spur type of high efficiency when in proper alignment. The high-speed shafts have ball bearings and the gears run in grease or oil, so as to reduce the friction as much as possible. The gears should never be taken apart unless absolutely necessary to replace worn or broken parts and then only by an experienced person. The gears and ball bearings must be lubricated by a nonfluid oil, which must be free from acid or water to prevent rusting.

The canvas cover supplied with the generator should be kept on at all times when the generator is not in use.

Dynamotor (set SCR–130 only).

The dynamotor, type DM–1, is a machine which changes a low-voltage direct current to a direct current at high voltage. The low-

Digitized by Google

voltage current is supplied by a 12-volt storage battery. The machine transforms this into a direct current having 350 volts. This type dynamotor is manufactured by Westinghouse. Its normal rate of rotation is 2,550 revolutions per minute. It supplies the power to the transmitting tubes of the set.

SETTING UP AND OPERATION OF SETS.

Setting up antenna.

At least five men are needed to erect the antenna. Three men are at the end of the antenna wires and guy ropes, two men raising the mast and adding the sections. The following directions should be observed:

Select clear space in which the antenna is to be erected. This clear space should be at least 225 feet in diameter. Unpack mast and antenna equipment and place in center of the space where the mast is to be erected. Take the top section (the one which has no iron pipe projecting from either end) and place the mast cap in one end of it. (The mast cap has eight sockets, which will hold the metal balls on the end of the antenna wires. It should have the antenna lead-in wire permanently fastened to it.) Attach the six antenna wires to the mast cap by means of the ball and sockets provided. Unreel and lay out on the ground the six antenna wires and the guy ropes fastened to them. The antenna wires are the smaller sized wires. They extend out radially from the mast. They should divide the circle in equal parts—that is, they should make angles of 60° with each other.

Place a man at every other guy rope, at the end of the guy rope. It is the duty of these three men to keep the mast upright as the sections are added. They do this by keeping the correct strain on the guy ropes, walking toward the mast as necessary. Select the eight other sections to be added (all alike) and the bottom section. (This has an insulator screwed on the bottom of it. If it is not screwed on, this should be done before adding the sections to the mast.) The mast will contain, when erected, 10 sections in all, 8 besides the top and bottom sections.

Add the sections, one man raising the mast directly upward and the other man adding the sections. Keep the mast upright, giving any directions that may be necessary to the men at the end of the guy ropes to do this. Having added all the sections, including the bottom one, allow the mast to rest on the ground. The two men at the mast then go out to the end of a guy rope and drive a stake in the ground and by means of the metal tent slide tighten the guy to the proper tension. This is done for each of the six guy ropes. Be careful that the mast is upright and that it is not bent. Make any changes in the strain on the guys necessary to do this.

Digitized by Google

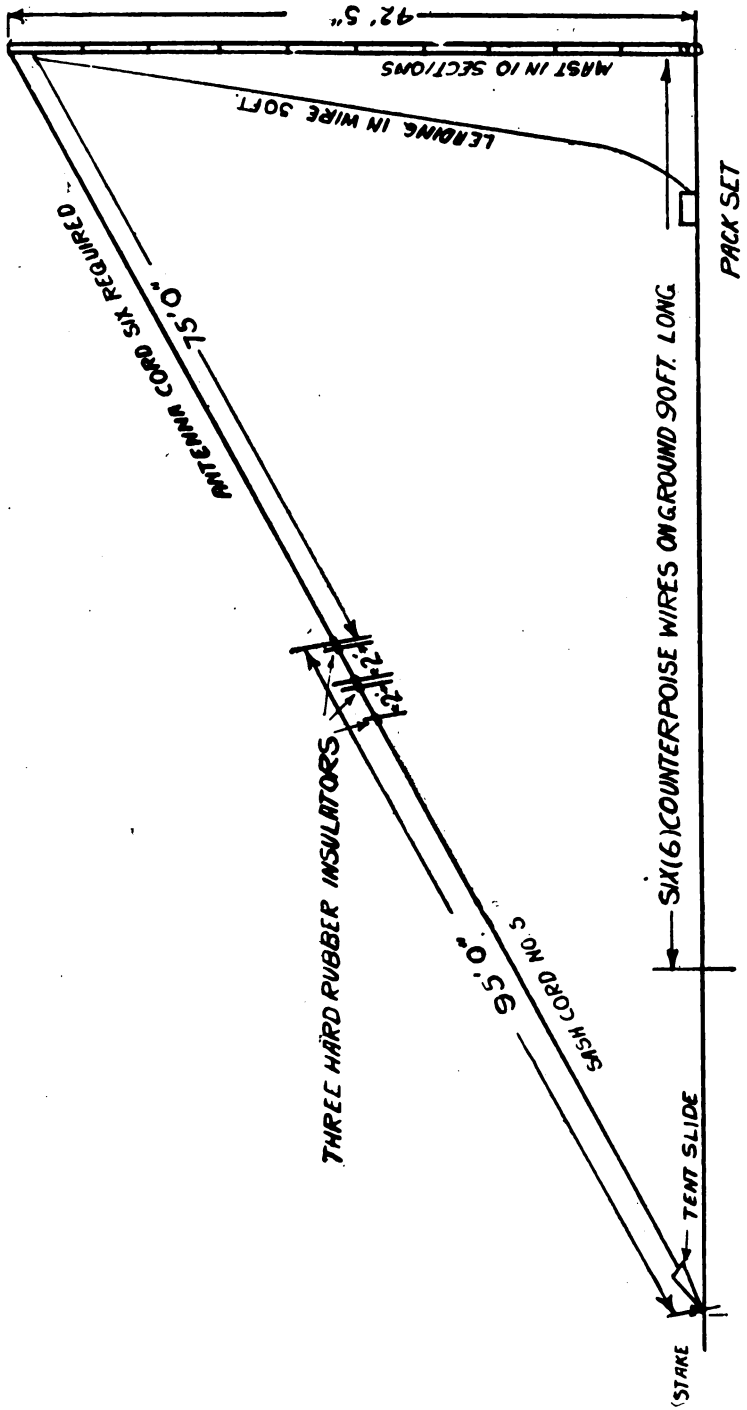


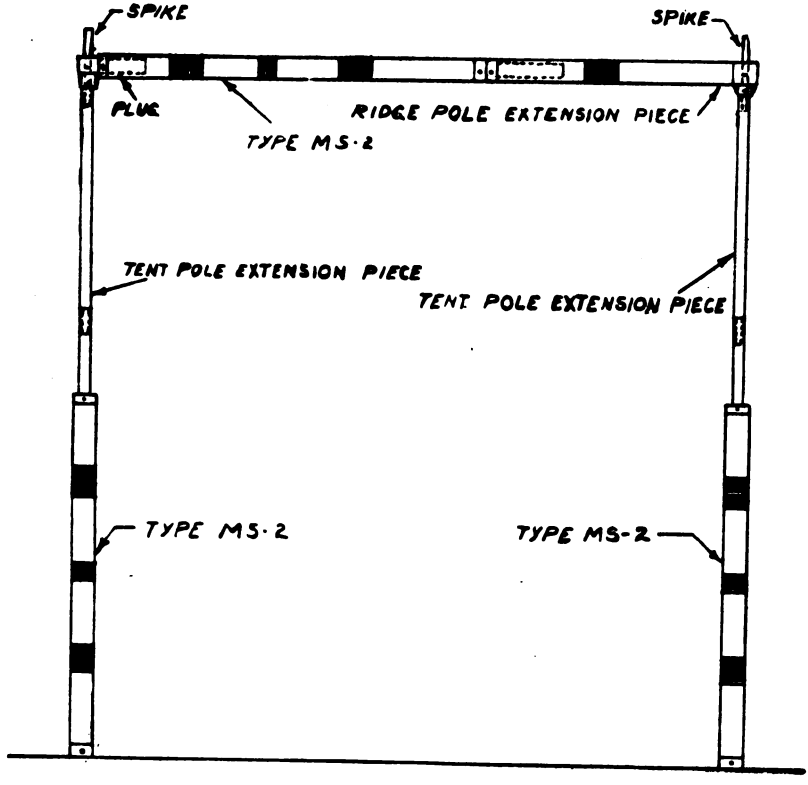
FIG. 3

R L - P 1416

Digitized by Google

It is to be noted that on each guy rope there is an insulator between it and the antenna wire to which it is fastened. The rope is also divided by insulators. It is absolutely necessary that the antenna wires be well insulated. The antenna wires must not touch an object such as a tree, building, etc. The lead-in wire hangs down beside the mast.

Having erected the antenna, place the counterpoise connecting block on the ground near the mast. (This is fitted with holes in which the ends of the counterpoise wire are plugged.) A short wire



RL—P—1417 FIG. 3A.

leading to the set box is attached to it. Reel out the six counterpoise wires to their full extent. They rest on the ground, each directly under an antenna wire. No further insulation is necessary in addition to the insulation on the wire itself. The counterpoise connecting block should be raised off the ground, if necessary, to properly insulate it. Figure 3 shows the antenna properly erected.

Battery box.

The battery box (shown in fig. 4) is divided into 8 compartments, 4 in the front and 4 in the back of the box. The square compartment

Digitized by Google

on the left front contains the terminals for the battery connections. The compartments in the front, covered by a black lid, hold the BA–8 (square) batteries. To connect these batteries observe the following rules: Having removed the lid, take a BA–8 battery and cut off the middle (green) wire as close to battery as possible. Put the battery in the front compartment, sealing wax side to front, and *red* terminal wire *up*. Slip the black terminal wire through the small hole in the end of the compartment near the bottom. Fasten the black terminal wire to the clip or binding post marked "Black (—)." Fasten the red terminal wire to the clip marked "40 V. Red (+)."

Take a second BA–8 battery and having cut off the *green wire* place it in the other compartment alongside the first battery. Put it in with the sealing wax side to the rear and the *black* terminal up. Slip the red terminal wire through the small hole in the end of the compartment near the bottom. Fasten it to clip on binding post marked "Red (+)." Fasten the black terminal wire to the clip marked "40 V. Black (—)."

Place the two spare batteries in the compartment alongside the two batteries in use. Be careful that the wires of the spare batteries do not touch each other. Place the black lid over the compartment.

Dry batteries No. 6 (SCR–127 set only).

These batteries are used only in the SCR–127 set. They belong in the two long compartments in the rear of the box. Only three are in use, the others are spare. To connect these batteries, connect the center terminal of one to the outer terminal of the second and the center terminal of the second to the outer terminal of the third. Now connect a short wire leading from the binding post marked "Zinc (—)" to the outer terminal of the first battery. Connect a wire leading from the binding post marked "Carbon (+)" to the center terminal of the third battery. Place the spare batteries in the compartment alongside those in use. Clamp all the batteries down by means of the sticks provided.

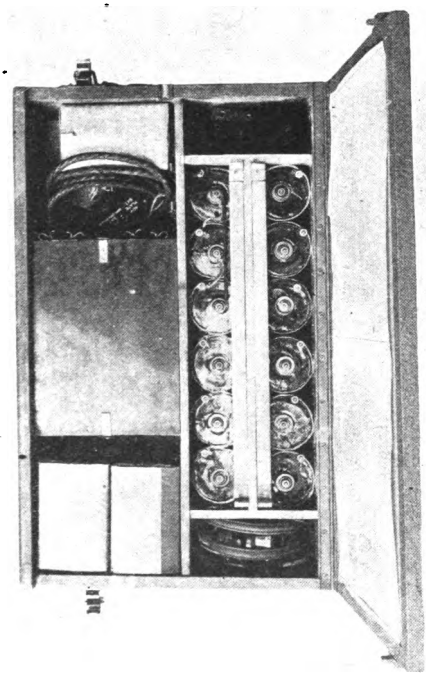
Generator (set SCR–127 only).

Mount the generator on the stand provided and attach the handles. The handles are placed to extend in a straight line one opposite to the other. The machine is turned by two men. The speed should be greater than 35 revolutions per minute and not greater than 60 per minute.

Set box.

Place set box on legs provided for it. Open the front of the box by pulling out after releasing the catches on both sides and top. *Pull the Receiver-Transmit switch directly outward so that it makes*

Digitized by Google

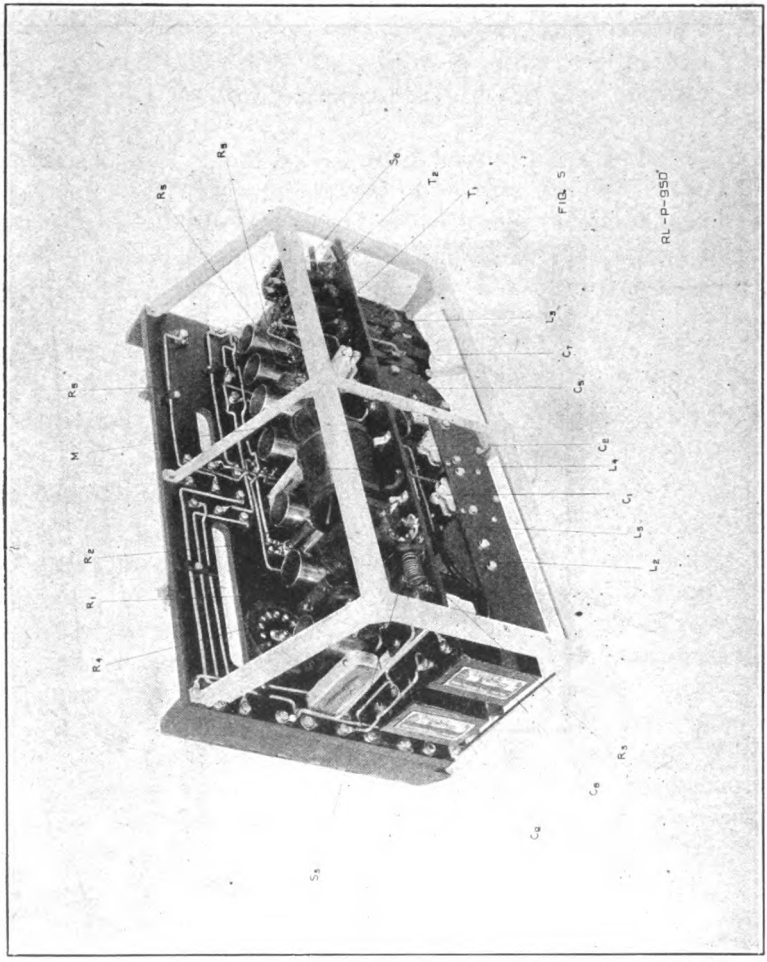


RL-P-955

FIG. 4

77392°—22——3

Digitized by Google



Digitized by Google

neither contact. The panel of the set tilts forward by pulling down and outward two catches mounted on the panel. Tilt it forward and place in each of the four sockets to the right a VT–2 tube. Place in each of the three sockets to the left a VT–5 or VT–3 tube for the SCR–127 set, and a VT–1 tube for the SCR–130 set. Close the panel. Connect the two leads of the key to the two lower right-hand terminals marked "Key." Connect the antenna lead-in wire to the upper left terminal marked "Antenna." Connect the lead-in wire from the counterpoise to the lower left terminal marked "GND." Take care to see that the lead-in wire is not wrapped around or touching the mast or the set box. It may be necessary to move the set box slightly to insure this condition.

Other connection for SCR–127 set.

On the right-hand side of the set box are pairs of plugs marked "Dyn.," "12 V.," and "350 V." The Dyn. plugs are not to be used. Take the connecting cord marked "350 V." and connect the one end to the 350 V. terminals on the set box and the other end to the plug on hand generator marked "350 V." Take the connecting cord marked "8 V." on one end and "12 V." on the other end and connect the end marked "12 V." to the 12 V. plugs on set. Connect the 8 V. end to the 8 V. plug on the opposite side of generator.

On the left side of the set box are three plugs marked "40 V. and Fil. Bat." Take the connecting cord marked "40 V. Plate Bat. and Fil. Bat." and connect it to the plugs. Connect the wire from the + 40 V. plug to the unused part of the binding post in the battery box marked "+ 40 V. Red." Connect the wire from the common middle plug of the connecting cord to the unused part of the binding post marked "— 40 V. Black." Take the wire connected to the — Fil. Bat. plug and connect it to the unused part of the binding post marked "Zinc —." The "carbon" binding post and the "— 40 V. Black" binding post in the battery box must be connected by a short length of wire.

Plug in your phones in either of the holes marked "Tel. Rec." Again tilt the panel forward and *close* the small knife switch (fig. 5, S_3) at the rear right-hand corner and throw the double-throw switch (fig. 5, S_6), mounted in the corresponding position on the left, *away* from the operator. (These need never again be changed while using the set as described.) Close the panel and the set is connected ready for operation when the Receive-Transmit switch is thrown to the proper side.

Other connections for SCR–130 set.

On the left-hand side of the set box are three pairs of plugs marked "Dyn.," "12 V.," and "350 V." Take the connecting cord marked "350 V." on one end and having tinned copper terminals on the

Digitized by Google

other end and connect one end to the set box plugs marked "350 V." Connect the tinned copper terminals to the 350-volt (generator) side of the dynamotor. Be sure to connect the positive (+) and negative (—) wires to the correct terminals.

Take the wire marked "Dyn." on one end and having tinned copper terminals on the other and connect one end to the set box plugs marked "Dyn." and connect the other end to the 12-volt (motor) side of the dynamotor. Be sure to connect the positive (+) and negative (—) wires to the correct terminals.

Connect three 4-volt batteries (type BB–14, lead) in series by means of the cords provided. Take the connector cord marked "12 V." on one end and having lead covered copper lugs on the other end, connect one end to the set box plugs marked "12 V." and the lugs to the terminals of the storage batteries.

On the left side of the set box are three plugs marked "40 V." and "Fil. Bat." Take the connecting cord marked "40 V. Plate Bat. and Fil. Bat." and connect it to the plugs. Connect the wire from the + 40 V. plug to the unused part of the binding post in the battery box marked "+ 40 V. Red." Connect the wire from the common middle plug of the connecting cord to the unused part of the binding post marked "— 40 V Black." The other wire is not used, because power for the receiving tube filaments is obtained from the storage battery. Wrap the end with tape so that it will not short circuit or come in contact with the other leads.

Plug in your phones in either of the holes marked "Tel. Rec." Again tilt the panel forward and *open* the small knife switch (fig. 5 S_3) at the rear right-hand corner and throw the double-throw switch (fig. 5 S_6), mounted in the corresponding portion on the left, *toward* the operator. (These need never again be changed while using the set as described.) Close the panel and the set is connected ready for operation when the Receive-Transmit switch is thrown to the proper side.

OPERATING INSTRUCTIONS.

The antenna tuning, the primary condenser, and the secondary condenser are variable. They should be varied when necessary by turning the small knob placed immediately beneath the larger knob. Do not attempt to vary them by turning the large knobs without first pulling outward the small knob below. The Transmit Wave Length is also variable. Throw the locking lever below it to the right before attempting to move it. When on the desired wave length, it is locked by throwing the locking lever to the left.

To transmit.

Set the Transmit Wave Length pointer to the desired wave length and lock it there by throwing the lever beneath it.

Digitized by Google

Turn the hand generator (SCR–127 set) at a speed of 35 to 60 revolutions per minute. (On the SCR–130 set the dynamotor will start when the switch is thrown.) Throw the Transmit-Receive switch to its transmitting position and note if the four tubes on the right are lighted. Close the key and turn the Antenna Tuning knob back and forth slowly until the greatest reading is obtained on the ammeter mounted on the set marked "Antenna Current." This reading should be greater than 0.7 ampere. It is to be noted that in transmitting, only the Transmit Wave Length and Antenna Tuning knobs are used.

To receive.

Turn the Fil. Rheo. knob all the way over to the left (Min.). Throw the Transmit-Receive switch to the receiving position and turn the Fil. Rheo. knob until the filaments of the three tubes to the left become cherry red. Place telephone receivers on head and test the tubes by throwing the SP–Het. knob from one side to the other. If the tubes are working all right a click should be heard in the receiver. If no click is heard, turn the Fil. Rheo. knob farther to the right and work the SP–Het. knob. Do this until a click is heard in the receiver. This shows that your set is oscillating properly. (Note: Filament rheostat is in circuit in SCR–127 set only.)

If receiving from a similar set, or any undamped wave set, turn the SP–Het. knob to the Het. side and leave it there. If it is desired to receive from station using spark (damped wave), the switch is thrown to the SP side.

If it is desired to receive wave lengths of from 350 to 550 meters, the S. W.–L. W. switch should be placed on S. W. (short waves). To receive wave lengths of from 500 to 1,100 meters, put the S. W.-L. W. switch on the L. W. side.

To tune, vary the primary condenser and the secondary condenser until the signals are heard on the telephone. Turn the knobs *slowly*. Only experience can teach how to get a desired signal. If no results are obtained after trying several minutes, it may be necessary to search the field. To do this, set the primary condenser at 0 and slowly move the secondary condenser through its whole range. Then move the primary condenser to 5 and slowly move the secondary condenser through its whole range. Repeat this until the desired signals are heard.

Hints and suggestions.

If the set fails to work, carefully examine all connections which *you* have made.

Interchange the receiving tubes until you have found the combination that works best. Some work better in one socket than in another. That is, some tubes are better detectors than others. One of the tubes is connected as a detector.

Digitized by Google

Do not try to take the set apart in any way or attempt to change any of the connections.

In transmitting, if any of the four tubes fail to light it may be due to a bad connection in the socket or a dirty contact pin. Clean the contact pin and replace the tube properly in the socket. If this does not remedy the defect, try a new tube. In exchanging tubes *always* pull the Transmit-Receive switch so that it makes no contact.

In receiving, all three of the tubes will light or none of them will, because their filaments are connected in series. If they fail to light, it is due to a bad tube or poor connection. Examine and clean your connection. If necessary, find by trial the defective tube and replace it.

The instruction contained in figure 6 for the care of the P–11 head set should be carefully observed.

When the SCR–130 set is first installed and no radiation can be secured after the proper connections have been made, the fault may be due to the reversal of the dynamotor polarity. To remedy this, reverse the leads from the dynamotor to the operating chest (set box), i. e., attach + lead to — terminal and — lead to + terminal.

(SCR–127 SET ONLY.)

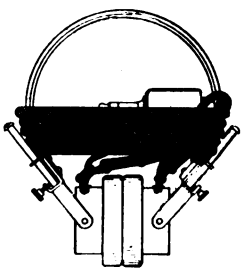
If none of the transmitting tubes light, then the generator either does not build up or the circuit is open. Test the generator voltage. If the generator does not build up, remove the cover from the regulator and clean the contact on the vibrator carefully with a piece of sandpaper. If the generator still does not build up, connect the dry cells which are used for the receiving tube filament battery to the low-voltage terminals of the generator for an instant. Do not leave the cells connected. It only requires an instant to magnetize the field of the generator so that it will build up. If the trouble is not in the generator, test the voltage on the 12-volt binding posts on the set box. If the voltage is there, then clean the blades of the Transmit-Receive switch. If the tubes still do not light, remove the set from the box and examine the filament circuit for a broken connection.

CARE OF HAND GENERATOR (SCR–127 SET).

The large gear case is packed with grease which should never require renewal during the life of the machine. However, a hole is provided on one side near the top. The old grease can be washed out with gasoline and new grease supplied through this hole. About 1½ pints of grease are required.

At one end of the machine is a gear casing containing two gears, the smaller of which is on the armature shaft. These gears need only

Digitized by Google



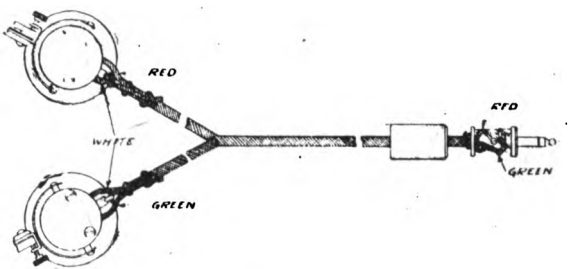


FIG 2.

NOTES

AFTER THE TYPE P-11 RECEIVER IS ASSEMBLED, THE POLES OF THE PERMANENT MAGNETS ARE GROUND IN ORDER TO OBTAIN THE PROPER CLEARANCE UNDER THE DIAPHRAGM. THIS GRINDING IS REQUIRED BECAUSE THE STANDARD PARTS USED CANNOT OTHERWISE BE ASSEMBLED WITH SUFFICIENT ACCURACY. IT IS EXTREMELY IMPORTANT THAT THE RECEIVERS SHOULD NEVER BE TAKEN APART

IF IT BECOMES NECESSARY TO REMOVE THE CORD CONNECTIONS FROM EITHER THE TELEPHONES OR THE PLUG, THE WIRES MUST BE REPLACED ACCORDING TO THE COLOR SCHEME SHOWN IN FIG. 1. ALL THE TELEPHONE JACKS ARE CONNECTED WITH THE SPRING POSITIVE WITH RESPECT TO THE SLEEVE, SO THAT WHENEVER THERE IS A CONTINUOUS CURRENT FLOWING THRU THE RECEIVERS, ITS DIRECTION IS SUCH THAT THE FLUX SET UP WILL BE IN THE SAME DIRECTION AS THE FLUX FROM THE PERMANENT MAGNETS. IF THE CORDS ARE REMOVED AND REPLACED IN THE WRONG DIRECTION, THE PERMANENT MAGNETS WILL BE PARTIALLY DEMAGNETIZED, AND THE EFFICIENCY OF THE TELEPHONE RECEIVERS SERIOUSLY IMPAIRED

FIGURE 2 SHOWS THE STANDARD PRACTISE OF WRAPPING TELEPHONE RECEIVERS TO FIT CARRYING COMPARTMENTS. THIS METHOD IS CHOSEN BECAUSE IT PROTECTS BOTH DIAPHRAGMS AND TERMINALS. THIS METHOD SHOULD ALWAYS BE USED WHEN PUTTING AWAY TELEPHONE HEAD SETS.

RL-P-956

FIG. 6

Digitized by Google

a small amount of grease for lubrication. The ball bearing for the large upper gear and the bearing at each end of the armature is packed in grease, which only need be renewed at long intervals. Access to the bearings can only be obtained by disassembling the lower part of the machine.

The first experimental models of the generator provide no means of access to the brushes and commutators, so the lower part of the machine must be taken apart to get at them. The improved machines to be manufactured in quantity provide plates on the sides of the machines to facilitate getting at the brushes and commutators.

The lower part of the machine can be taken apart most easily by following the directions given below.

(*a*) Unscrew cover of side gear casing, which is fastened by 14 screws.

(*b*) Holding the flywheel stationary, unscrew the nut securing the large upper gear. Draw off this gear and unscrew the large clamping nut under it.

(*c*) Still holding the flywheel stationary, unscrew the nut securing the small lower gear. Draw off this gear and unscrew the large clamping nut under it. The inner half of the gear casing can now be removed.

(*d*) Still holding the flywheel stationary, unscrew the nut securing the flywheel. Then draw off the flywheel.

(*e*) The end plates are removed by unscrewing three screws and then prying off the plates. The armature bearings are in the end plates, so the armature will rest on its field pole pieces when the end plates are removed.

(*f*) If the generator is one of the improved type, the armature can now be withdrawn.

(*g*) If the generator is one of the first experimental models, the entire generator must be withdrawn from the casing. The single screw securing the connection-plug receptacle on each side is removed, the receptacles pulled out and disconnected, and the leads pushed back inside the casing. Three screws on each side of the casing and one on the bottom of the casing are removed. The entire generator can now be drawn out, allowing access to the brushes and commutators. The two long bolts extending through the machine are removed to allow removal of generator end plate if necessary to take out armature.

The generator is reassembled by following the above directions in the reverse order. Great care should be taken that all parts go together in exactly the same relative positions as they were originally.

CARE OF DYNAMOTOR (SCR–130 SET).

The bakelite panel in the dynamotor-carrying box should be kept clean.

Two oil holes are provided on the panel, through which the bearings are lubricated. A light machine oil should be supplied at the rate of a few drops for each hour of continuous operation.

A 20-ampere fuse is connected in the motor circuit. The fuse will blow for any undue load on the generator.

A D. P. S. T. switch affords a convenient method of opening the high-voltage circuit if for any reason it is desired to cut this voltage off from the set box panel.

Digitized by Google

If the generator fails to build up, it is probably due to a dirty commutator. The commutators of both the motor and generator should be kept clean and smooth by applying fine sandpaper and a piece of absorbent cloth. The commutators require no lubricant.

PRINCIPLES EMBODIED IN THE SETS.

Transmitter.

The transmitter is of the vacuum-tube type, Signal Corps VT–2 tubes being used. One tube is employed as an oscillator and three tubes in parallel are used to amplify the power from the oscillating tube. The characteristics of the power amplifier type of vacuum-tube transmitters are such that this type of circuit is particularly well suited for portable field sets. The adjustments are a minimum, and as the wave length of the oscillating circuit is varied by a single variable inductance, the other constants of the oscillating circuit are fixed, the variable inductance is provided with a pointer and scale reading directly in wave lengths. No wave meter is needed with this set. The antenna is not connected directly in the oscillating circuit or to it, but is connected to the plate circuit of the amplifying tubes by means of a transformer. The grids of the amplifying tubes are connected in parallel and are connected across one of the condensers in the oscillating circuit. The voltage across this condenser is impressed upon the grids of the amplifier tubes, thereby developing a voltage in the plate circuit which causes an alternating current of the same frequency to flow in the plate circuits of the amplifying tubes. The three tubes in parallel permit three times as large a current to flow through the primary of the transformer as could be obtained with one tube. The power supplied to the antenna is also three times as much, in this case, as would be supplied by one tube. The transformer is adjusted so that the effective antenna resistance as reflected in the common plate circuit of the tubes is such as to develop the maximum power output of the tubes. This output is limited by the heat developed at the plates of the tubes. The antenna is tuned with the oscillating plate circuit by means of a single variometer. The antenna circuit does not affect the wave length. The maximum deflection of the pointer on the ammeter is obtained when the antenna is tuned to the wave length of the current in the oscillating circuit.

A simplified diagram is shown in figure 7A; the complete circuit diagram being shown in figure 7. The oscillating circuit which acts as an exciter for the grids of the power amplifier tubes may be considered as an alternating-current generator. The frequency of the alternating current generated is determined by the constants of the oscillating circuit, in the same way as the frequency of an alter-

Digitized by Google

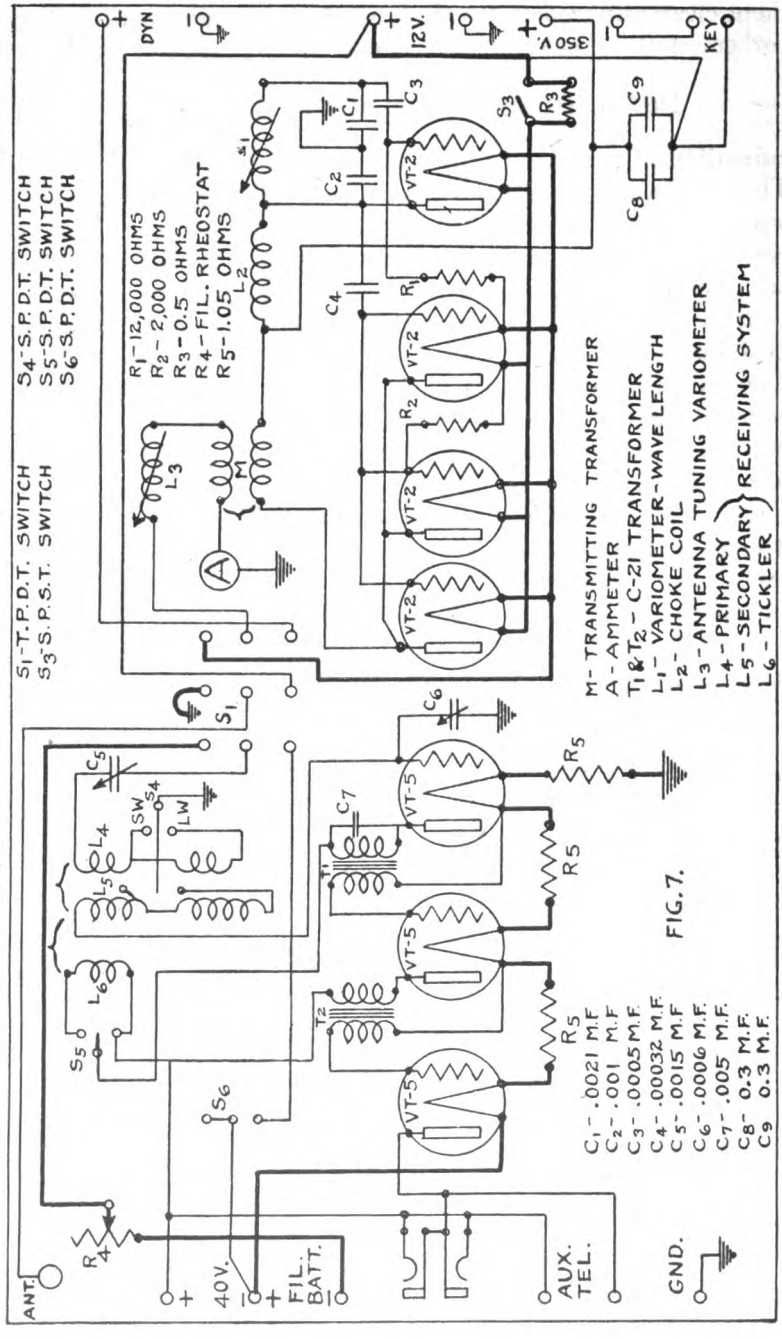
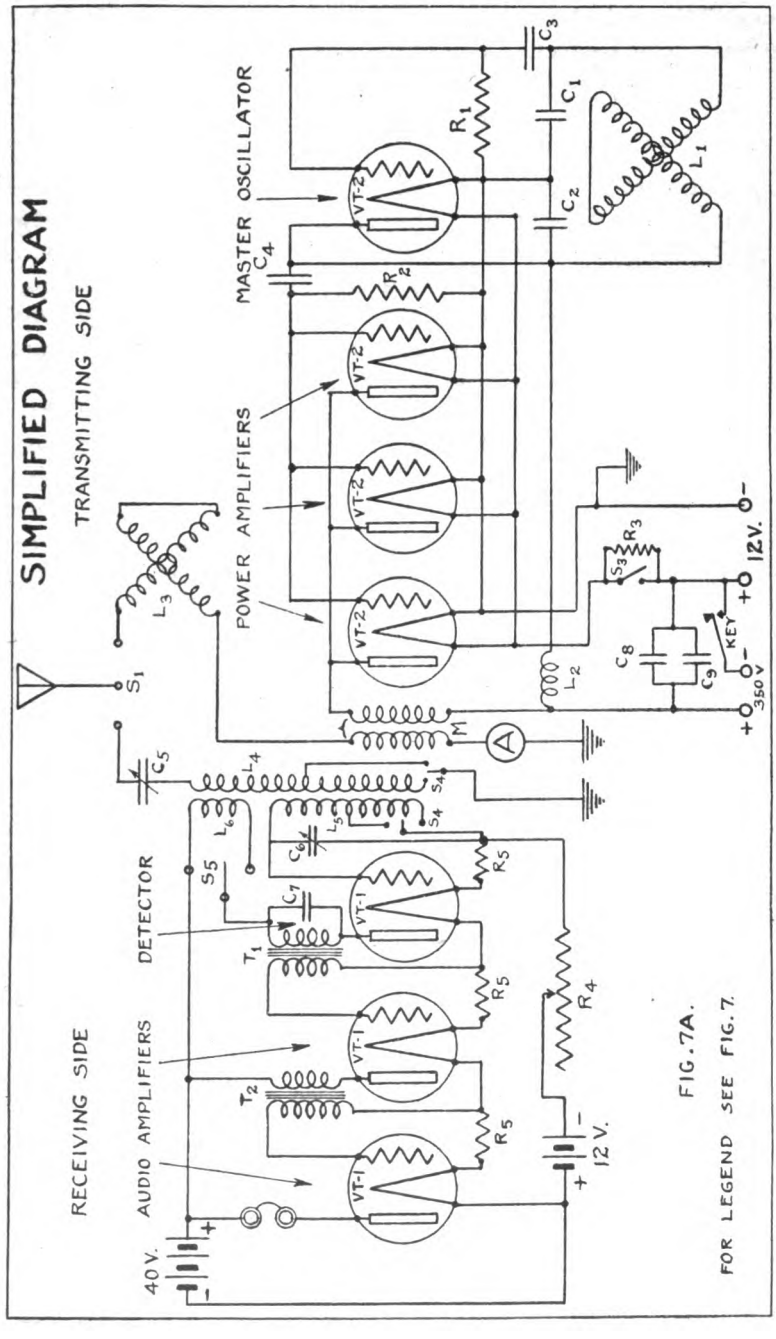


FIG. 7.

Digitized by Google



Digitized by Google

nator is determined by the number of poles and revolutions per minute of the rotor. The frequency of wave length is determined by the values of the inductance L_1 and the condensers C_1 and C_2 which are in series. The frequency is, approximately:

$$f = 2\pi \sqrt{L \frac{C_1 C_2}{C_1 + C_2}}$$

The power necessary to maintain the oscillations in this circuit is furnished by one VT–2 tube. The condenser C_1 is connected between the grid and filament of the tube so that the voltage across the condenser is applied between the grid and filament. This voltage, because of the amplifying power of the tube, causes a greater voltage to act in phase with it across the condenser C_2 than is developed across this condenser by the oscillating current. The oscillating current reaches a value such that the losses due to the resistance of the circuit equal the power supplied by the tube. The power supplied by the oscillating tube to the circuit at high frequency is supplied to the plate circuit of the tube as direct current. The direct current flows from plate to filament and the variations of grid voltage cause variations in the resistance offered by the plate-filament circuit to the flow of this current. The choke coil L_2 maintains this current at a constant value; therefore the variations in the plate current flow through the condenser C_2. The voltage developed across C_2 then acts on the oscillating circuit to cause a current to flow, which is in proper phase to cause a further variation in the voltage applied between the grid and filament. The condenser C_3 serves to prevent the direct-current voltage supplied to the plate from reaching the grid. Since the alternating current passes through the condenser C_3, and since the grid-filament circuit of the tube conducts current in one direction only, a charge will accumulate on the condenser C_3. If no means were provided to rid the condenser of this charge it would soon reach a value which would cause the grid to have such a large negative voltage with respect to the filament that the plate current would be blocked and the tube would cease to operate. The resistance R_1 is provided to take care of this charge and allows it to leak off at a rate which maintains a steady negative voltage on the grid of the proper value to insure efficient operation of the tube. The values of the capacities, inductances, and resistance are shown in figure 7. The variometer L_1 is used to change the wave length of the oscillating current. This variometer has an inductance range of 0.5 m. h. to 0.12 m. h. C_1, C_2, and C_3 are small mica condensers. C_3 is inside the bakelite panel and can not be seen in the picture (fig. 5).

The three VT–2 tubes have their grids connected together and the plates connected together. The filaments are also connected to a common lead which connects to the filament of the oscillator tube.

Digitized by Google

The alternating current in the plate circuit of the amplifier tubes induces a current in the antenna circuit through the transformer M. The transformer is not tuned on the primary side. There is no variable coupling between the plate circuit of the amplifier and the antenna. The coupling is made as close as possible. The primary of the transformer has a high inductance, so that it acts as a choke coil to limit the plate current of the amplifier tubes when the antenna is detuned. The ratio of the primary turns to secondary turns is determined by the ratio of the antenna resistance to the internal impedance of the tube; this ratio is made suitable for the antenna which is supplied with the set. The grids of the amplifier tubes are connected through the condenser C_4 to the plate of the oscillator tube. Since the filaments of the amplifiers and oscillator are connected to a common lead, the alternating voltage across the condenser C_2 is applied through the condenser C_4 to the grids of the amplifier tubes. C_4 serves to prevent the direct-current voltage to the plate of the oscillator tube from reaching the grids of the amplifier tubes. The grid-filament circuit of the amplifier tubes permits current to flow only on the half of the cycle which makes the grids positive with respect to the filaments, and therefore the condenser C_4 becomes charged so that the grids become negative with respect to the filaments. The resistance R_2 has the correct value to keep the negative potential on the grids at a value which causes the tubes to operate on the part of their characteristic curves where the tubes operate efficiently as amplifiers.

The antenna circuit includes the secondary of the transformer, variometer for tuning, and the radiofrequency ammeter. The variometer L_3 is shown in figures 5 and 8. The inductance range of the variometer is sufficient to take care of variations in the capacity of the antenna which may occur due to soil conditions, etc.

Receiver.

The receiver consists of antenna circuit, tuned secondary circuit, vacuum-tube detector, and two-stage audiofrequency amplifier. A fixed tickler coupling with a short-circuiting switch provides for the reception of either damped or undamped signals. The receiver is designed primarily for the reception of undamped waves, and is designed so that the minimum number of adjustments is necessary for its operation.

The antenna circuit consists of a coil having one tap and a continuously variable air condenser connected in series between the antenna and ground connections. The coil L_4 and the condenser C_5 are shown in figures 5 and 8. The antenna inductance switch is shown at S_4.

Digitized by Google

The secondary circuit consists of a a coil L_5 and a continuously variable air condenser C_6, connected in parallel between the grid and filament of the detector tube.

Magnetic coupling between the antenna and secondary circuits is obtained by the mutual inductance between the entire secondary and primary coils. The coils are arranged so that the proper degree of coupling may be obtained by rotating the secondary coil longitudinally about the center of its axis. The motion is limited, but is ample for the necessary adjustment. The coupling is carefully adjusted for the best reception on undamped waves over the entire range of wave lengths and fixed so that it can not be changed from the panel. The coupling is not the most efficient for damped waves when adjusted for undamped wave reception, but it is not made variable because the set will be most frequently used on undamped waves and, as stated above, it is desired to make the operation as simple as possible.

The detector tube is made to oscillate by means of a coil L_6 which is connected in its plate circuit and inductively coupled to the secondary receiving coil. The inductive feed back is not variable, but is designed so that the feed back is sufficient to keep a VT–1 or VT–5 tube oscillating. The tickler coil is located inside of the secondary coil. The tickler coil may be short circuited for damped wave reception by means of the switch S_5.

Two stages of audio frequency amplification are provided. The coupling between successive stages is obtained through iron-core transformers. The primary windings of the transformers are connected in series with the plate battery in the plate-filament circuits. The first transformer primary is connected in series with the tickler coil in the plate circuit of the detector tubes. There is a condenser C_7 which serves as a by-pass for the radiofrequency current. The secondaries of the transformers (T_1 and T_2) are connected between the grids and filaments of the amplifier tubes. The two telephone jacks (*j*) are in parallel in the plate circuit of the second amplifier tube. Auxiliary binding posts are connected across the jacks for using receivers without plugs.

Power circuits.

The filaments of the transmitting tubes are in parallel across the 12-volt binding posts. The negative side is closed by one blade of the Transmit-Receive switch S_1. The resistance of 0.5 ohm, R_3, must be shorted by the switch S_3 when using the hand generator, which supplies 8 volts. It must be open when using a 12-volt storage battery. The receiving-tube filaments are in series. Either VT–1 or VT–5 tubes may be used in this set. When the set box is to be used with the SCR–127 Cavalry pack set, VT–5 tubes are used and the filament current is supplied by three No. 6 dry cells in series.

Digitized by Google

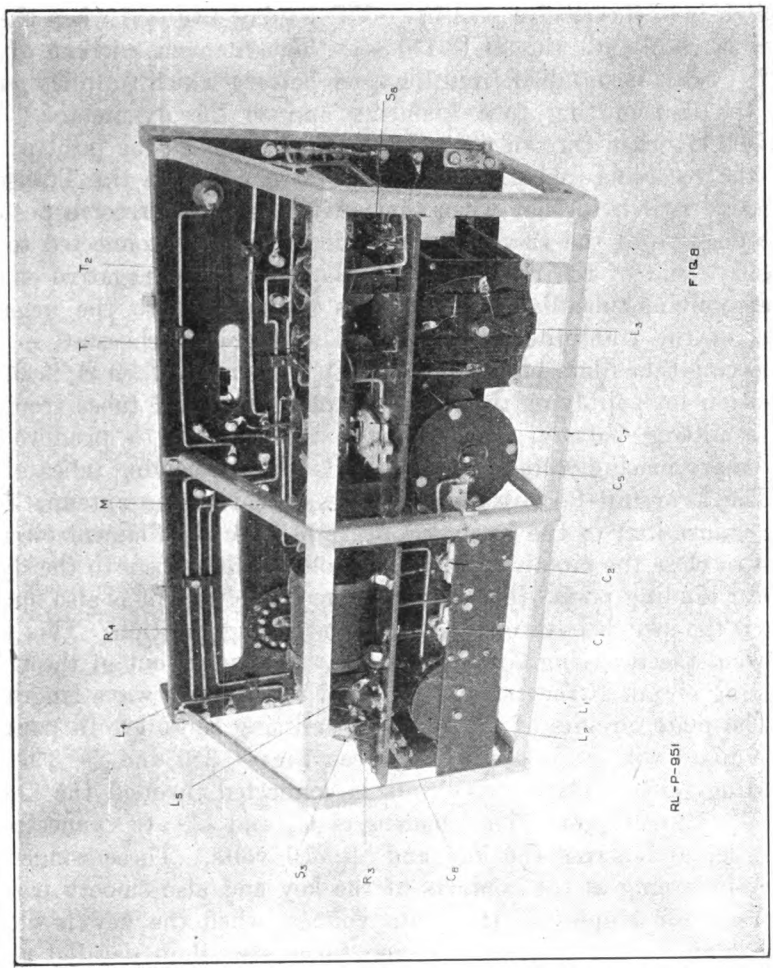


FIG.8

Digitized by Google

When VT–5 tubes are used the dry cells are connected to the binding posts on the left-hand end of the set box which are marked "+ and − filament battery." The switch S_6 must be thrown away from the panel and pressed firmly in the holding clips in order that it will be held in the open position. The filament rheostat R_4 is in series with the receiving-tube filaments when S_6 is in the open position, as it must be when VT–5 tubes are used. The filament circuit is closed by one blade of the Transmit-Receive switch when the switch is in the receive position. VT–1 tubes are used when the set box is used with the SCR–130 set. The filament current of the VT–1 tubes is supplied from the same battery which supplies power to the transmitting tube filaments and to the dynamotor. The switch S_6 when thrown toward the panel connects the positive end of the receiving-tube-filament circuit to a point on the Transmit-Receive switch so that when that switch is in the receive position the positive of the 12-volt transmitting battery is connected to the positive end of the receiving-tube filaments. The negative end of the receiving-tube-filament circuit is grounded, also the negative side of the transmitting battery. The filament rheostat in the receiving-tube-filament circuit is not in the circuit when S_6 is in the position for supplying the filament current to VT–1 tubes from the transmitting battery. The resistances R_5 serve to produce the necessary biasing voltages for the grids of the receiving tubes.

The Transmit-Receive switch serves to throw the antenna from the transmitter to the receiver, open and close the filament circuits, and to close the circuit from the 12-volt binding posts to the dynamotor binding posts. The secondary receiving circuit is also opened when the switch is thrown to the transmitting position. This is to prevent the receiving circuit from drawing energy out of the transmitting circuit if they should be tuned to the same wave length.

The plate circuits of the four transmitting tubes are in parallel. The plate voltage is applied between the − 350 and + 350 volt binding posts. The − 350 volts is connected through the key to the + 12-volt post. The condensers C_8 and C_9 are connected in parallel and across the key and + 350 volts. These condensers prevent arcing at the contacts of the key and also smooth out the commutator ripples in the plate voltage when the key is closed. The plate circuits of the receiving tubes are all in parallel across the + filament battery, − 40-volt binding post, and the + 40-volt binding post.

Digitized by Google

TRANSPORTATION SCR-127 SET.

The set is normally packed on three mules. The following is a packing list:

NO. 1 MULE.

1 generator, type GN-29.
2 cranks, type GC-1.
1 stand, type GS-1.
1 hood, type BG-9; for generator.
4 bolts, type M-2; for generator stand.
2 plates, type M-3; for generator stand.
6 mast sections, type MS-2.
1 frame, type M-1.
1 cincha band, type ST-7.
2 straps, type ST-8 (three straps connected to ring).
2 straps, with snap hooks at each end.

NO. 2 MULE.

1 set box BC-7, including following parts:
  4 tubes, type VT-2.
  3 tubes, type VT-5.
  3 adapters, type FT-65.
  1 instruction pamphlet.
4 legs for set box, type BC-7.
1 box, type BC-102, including following parts:
  1 cord, type CD-87; 350-volt leads, generator to set box.
  1 cord, type CD-86; 8-volt leads, generator to set box.
  1 cord, type CD-88; three-conductor, set box to dry batteries.
  5 tubes, type VT-2 (spare).
  6 tubes, type VT-5 (spare).
  1 adapter, type FT-65 (spare).
  4 batteries, type BA-8 (2 spare).
  12 batteries, dry, No. 6 ignition closed-circuit type (9 spare).
  2 head sets, type P-11.
4 mast sections, type MS-2.
1 frame, type M-1.
1 cincha band, type ST-7.
2 straps, type ST-8 (three straps connected to ring).
2 straps, with snap hooks at each end.

NO. 3 MULE.

1 bag, type BG-6, including following parts:
  1 mast cap, type MP-4; complete with 50 feet of antenna lead-in wire.
  1 antenna, type AN-4; six 75-foot lengths antenna cord, complete with insulators and guy ropes.
  1 counterpoise, type CP-3; six 90-foot lengths counterpoise wire.
  13 reels, type RL-3; 6 for antenna, 6 for counterpoise, 1 for antenna lead-in.
  1 cord, type CD-89; set box to counterpoise, block type BL-2 on one end.
  2 connectors, type M-6; spares for antenna wires.
  1 insulator, type IN-4; electrose, mast bottom.

Digitized by Google

1 bag, type BG–6; including following parts:
  1 bag, type BG–7, containing—
    2 hammers, type HM–1.
    6 stakes, type GP–2.
  1 tool roll, type BG–10, containing—
    1 wrench, 4-inch, single end, $\frac{7}{16}$-inch opening.
    1 file, 4-inch, bastard, warding.
    1 file, 6-inch, bastard.
    1 knife, Empire No. 1013.
    1 pliers, round nose, 6-inch, side cutting.
    1 pliers, 6-inch, side cutting.
    1 handle, file.
    1 screw driver, 2-inch blade.
    1 screw driver, 4-inch blade.
    1 wrench, 9-inch, double end, $\frac{7}{8}$-inch and $1\frac{1}{16}$-inch opening.
    1 spool wire, copper, spare.
  1 tent, type TN–1, with following parts rolled up inside—
    1 insulating device, type IN–13, for tent.
    14 stakes, wood, for tent.
    2 ropes, tent guys.
    1 plug, for tent adapter.
  1 voltmeter, type I–10.
  2 pounds wire, type W–7.
  1 pound tape, friction $\frac{3}{4}$-inch.
1 mast section, type MS–1.
2 mast sections, type MS–2.
1 mast section, type MS–3.
1 ridge pole extension piece, for tent adapter.
2 tent pole extension pieces with spike in end, for tent adapter.
1 frame, type M–1.
1 cincha band, type ST–7.
2 straps, type ST–8 (three straps connected to ring).
2 straps with snap hooks at each end.

PARTS LIST OF SCR–127 SET.

(Arranged by equipment.)

1 equipment, type PE–28; power:
  1 generator, type GN–29.
  2 cranks, type GC–1.
  1 stand, type GS–1.
  1 hood, type BG–9; for generator.
  4 bolts, type M–2; for generator stand.
  2 plates, type M–3; for generator stand.
1 equipment, type RE–21; radio:
  1 set box, type BC–7; u. w. radio telegraph.
  4 legs for set box, type BC–7.
  1 cord, type CD–87; 350-volt leads, generator to set box.
  1 cord, type CD–86; 8-volt leads, generator to set box.
  1 cord, type CD–88; 3-conductor, set box to dry batteries.
  1 box, type BC–102; for batteries and accessories.
  9 tubes, type VT–5; 3 in use, 6 spares.
  4 adapters, type FT–65; 3 in use, 1 spare.
  12 batteries, dry, No. 6 ignition closed-cirucit type, 3 in use, 9 spare.

Digitized by Google

1 equipement, type RE–21; radio—Continued.
4 batteries, type BA–8; 2 in use, 2 spare.
9 tubes, type VT–2; 4 in use, 5 spare.
2 head sets, type P–11.
1 voltmeter, type I–10.
1 tool roll, type BG–10.
1 wrench, 4-inch, single end, $\frac{7}{16}$-inch opening.
1 file, 4-inch, bastard, warding.
1 file, 6-inch, bastard.
1 knife, Empire No. 1013.
1 pliers, round nose, 6-inch, side cutting.
1 pliers, 6-inch, side cutting.
1 handle, file.
1 screw driver, 2-inch blade.
1 screw driver, 4-inch blade.
1 wrench, 9-inch, double end, $\frac{7}{8}$-inch and $1\frac{1}{16}$-inch opening.
1 spool wire, copper, spare.
2 pounds wire, type W–7.
1 pound tape, friction, $\frac{3}{4}$-inch.
1 equipment, type A–1–A; antenna:
1 mast section, type MS–1.
12 mast sections, type MS–2; 8 for mast, 3 for tent, 1 spare.
1 mast section, type MS–3.
1 insulator, type IN–4; electrose.
1 mast cap, type MP–4; complete with 50 feet of antenna lead-in wire (Spec. 3055–A).
1 antenna, type AN–4; six 75-foot lengths antenna cord, complete, with insulators and guy ropes.
1 counterpoise, type CP–3; six 90-foot lengths counterpoise wire.
1 cord, type CD–89; set box to counterpoise, block type BL–2 on one end.
13 reels type RL–3; 6 for antenna, 6 for counterpoise, 1 for antenna lead-in.
6 stakes, type GP–2.
2 hammers, engineers, 2 pounds, 2 face.
2 bags, type BG–6.
1 bag, type BG–7.
2 connectors, type M–6; spares for antenna wires
1 adapters, set of, for tent, 4 pieces.
3 frames, type M–1.
3 cincha bands, type ST–7.
6 straps, type ST–8 (three straps connected to ring).
6 straps, with snap hooks at each end.
1 equipment, type LE–1; tent:
1 tent, type TN–1.
14 stakes, wood, for tent.
2 ropes, guy, for tent.
1 insulating device.

TRANSPORTATION SCR–130 SET.

The following list shows how the material is to be packed for transportation:

9 batteries, type BB–14; lead, storage, 4-volt, 3 in use, 6 spare.
1 case, type BC–25–A, containing 1 dynamotor, type DM–1.

Digitized by Google

1 set box, type BC–7, including following parts:
- 4 tubes, type VT–2.
- 3 tubes, type VT–1.
- 1 instruction pamphlet.

1 box, type BC–102, including the following parts:
- 1 cord, type CD–91; 350-volt leads, dynamotor to set box.
- 1 cord, type CD–92; 12-volt leads, dynamotor to set box.
- 1 cord, type CD–88; 3-conductor, set box to dry batteries.
- 1 cord, type CD–90; 12-volt leads, set box to storage batteries.
- 3 cords, type CD-38; connecting storage batteries in series (1 spare).
- 4 tubes, type VT-1 (spare).
- 5 tubes, type VT-2 (spare).
- 4 batteries, type BA-8 (2 spare).
- 2 head sets, type P-11.

1 bag, type BG-6, including following parts:
- 1 mast cap, type MP-4; complete with 50-foot antenna lead-in wire.
- 1 antenna, type AN-4; six 75-foot lengths antenna cord, complete with insulators and guy ropes.
- 1 counterpoise, type CP-3; six 90-foot lengths counterpoise wire.
- 13 reels, type RL-3; 6 for antenna, 6 for counterpoise, 1 for antenna lead-in.
- 1 cord, type CD-89; set box to counterpoise, block type BL-2 on one end.
- 2 connectors, type M-6; spares for antenna wires.
- 1 insulator, type IN-4; electrose, mast bottom.

1 bag, type BG-6, including following parts:
- 1 bag, type BG-7, containing:
  - 2 hammers, type HM-1.
  - 6 stakes, type GP-2.
- 1 tent, type TN-1, with following parts rolled up inside:
  - 1 insulating device, type IN-13; for tent.
  - 14 stakes, wood, for tent.
  - 2 ropes, tent guys.
  - 1 plug, for tent adapter.
- 1 voltmeter, type I-10.
- 1 pliers, combination, 6-inch.
- 1 screw driver, 2½-inch blade.
- 2 pounds wire, type W-7.
- 1 pound tape, friction, ¾-inch.
- 1 mast section, type MS-1.
- 12 mast sections, type MS-2.
- 1 mast section, type MS-3.
- 1 ridge-pole extension piece, for tent adapter.
- 2 tent-pole extension pieces with spike in end for tent adapter.
- 4 legs for set box, type BC-7.
- 6 straps, type ST-5; for bundling mast sections.

PARTS LIST OF SCR–130 SET.

(Arranged by equipment.)

1 equipment, type PE-7; power:
- 9 batteries, type BB-14; lead, storage, 4-volt; approximately 100 ampere-hours at 10-ampere discharge rate; 3 in use, 6 spare.
- 1 case, type BC-25-A, carrying, for dynamotor.
- 1 dynamotor, type DM-1.

Digitized by Google

1 equipment, type RE-22; radio:
- 1 set box, type BC-7; u. w. radio telegraph.
- 4 legs for set box, type BC-7.
- 1 cord, type CD-91; 350-volt leads, dynamotor to set box.
- 1 cord, type CD-92; 12-volt leads, set box to dynamotor.
- 1 cord, type CD-90; 12-volt leads, set box to storage battery.
- 1 cord, type CD-88; 3-conductor, set box to dry batteries.
- 3 cords, type CD-38; connecting storage batteries in series, 2 in use, 1 spare.
- 1 box, type BC-102; for batteries and accessories.
- 7 tubes, type VT-1; 3 in use, 4 spare.
- 4 batteries, type BA-8; 2 in use, 2 spare.
- 9 tubes, type VT-2; 4 in use, 5 spare.
- 2 head sets, type P-11.
- 1 voltmeter, type I-10.
- 1 pliers, 6-inch combination.
- 1 screw driver, 2½-inch blade.
- 2 pounds wire, type W-7.
- 1 pound tape, friction, ¾-inch.
- 6 straps, type ST-5; for bundling mast sections.

1 equipment, type A-1-A; antenna:
- 1 mast section, type MS-1.
- 12 mast sections, type MS-2; 8 for mast, 3 for tent, 1 spare.
- 1 mast section, type MS-3.
- 1 insulator, type IN-4; electrose.
- 1 mast cap, type MP-4; complete with 50 feet of antenna lead-in wire.
- 1 antenna, type AN-4; six 75-foot lengths antenna cord complete with insulators and guy ropes.
- 1 counterpoise, type CP-3; six 90-foot lengths counterpoise wire.
- 1 cord, type CD-89; set box to counterpoise, block type BL-2 on one end.
- 13 reels, type RL-3; 6 for antenna, 6 for counterpoise, 1 for antenna lead-in.
- 6 stakes, type GP-2.
- 2 hammers, engineers, 2-pound, 2-face.
- 2 bags, type BG-6.
- 1 bag, type BG-7.
- 2 connectors, type M-6; spares for antenna wire.
- 1 adapters, set of, for tent, 4 pieces.

1 equipment, type LE-1; tent:
- 1 tent, type TN-1.
- 14 stakes, wood, for tent.
- 2 ropes, guy, for tent.
- 1 insulating device.

SIGNAL CORPS PAMPHLETS.

(Corrected to February, 1922.)

RADIO COMMUNICATION PAMPHLETS.

(Formerly designated Radio Pamphlets.)

No.

1. Elementary Principles of Radio Telegraphy and Telephony (edition of 4–28–21) (W. D. D. 1064).
2. Antenna Systems.
3. Radio Receiving Sets (SCR–54 and SCR–54–A) and Vacuum Tube Detector Equipment (Type DT–3–A).
5. Airplane Radio Telegraph Transmitting Sets (Types SCR–65 and 65–A).

Digitized by Google

No.
9. Amplifiers and Heterodynes (W. D. D. 1092).
11. Radio Telegraph Transmitting Sets (SCR-74; SCR-74-A)
13. Airplane Radio Telegraph Transmitting Set (Type SCR-73).
14. Radio Telegraph Transmitting Set (Type SCR-69).
17. Sets U. W. Radio Telegraph (Types SCR-79-A and SCR-99) (W. D. D. 1084).
20 Airplane Radio Telephone Sets (Types SCR-68; SCR-68-A; SCR-114; SCR-116; SCR-59; SCR-59-A; SCR-75; SCR-115).
22. Ground Radio Telephone Sets (Types SCR-67; SCR-67-A (W. D. D. 1091).
23. U. W. Airplane Radio Telegraph Set (Type SCR-80).
24. Tank Radio Telegraph Set (Type SCR-78-A).
25. Set, Radio Telegraph, Type SCR-105 (W. D. D. 1077).
26. Sets, U. W. Radio Telegraph (Types SCR-127 and SCR-130) (W. D. D. 1056) (edition of November, 1921).
28. Wavemeters and Decremeters, W. D. D. 1094.
30. The Radio Mechanic and the Airplane.
40. The Principles Underlying Radio Communication (edition of May, 1921) W. D. D. 1069.

WIRE COMMUNICATION PAMPHLETS.

(Formerly designated Electrical Engineering Pamphlets.)

1. The Buzzerphone (Type EE-1).
2. Monocord Switchboards of Units Type EE-2 and EE-2-A and Monocord Switchboard Operator's Set Type EE-64 (W. D. D. 1081).
3. Field Telephones (Types EE-3; EE-4; EE-5).
4. Laying Cable in the Forward Area (formerly designated Training Pamphlet No. 3).
6. Trench Line Construction (formerly designated Training Pamphlet No. 6-a).
7. Signal Corps Universal Test Set Type EE-65 (edition of December, 1921) (W. D. D. 1020).
10. Wire Axis Installation and Maintenance within the Division (W. D. D. 1068).

TRAINING PAMPHLETS.

1. Elementary Electricity (edition of 1-1-21 (W. D. D. 1055).
4. Visual Signaling.
5. The Homing Pigeon, Care and Training (W. D .D. 1000).
7. Primary Batteries (formerly designated Radio Pamphlet No 7).
8. Storage Batteries (formerly designated Radio Pamphlet No. 8).

FIELD PAMPHLETS.

1. Directions for Using the 24-CM. Signal Lamp (Type EE-7).
2. Directions for Using the 14-CM. Signal Lamp (Type EE-6).

ADDITIONAL COPIES
OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
10 CENTS PER COPY

Digitized by Google

Digitized by Google