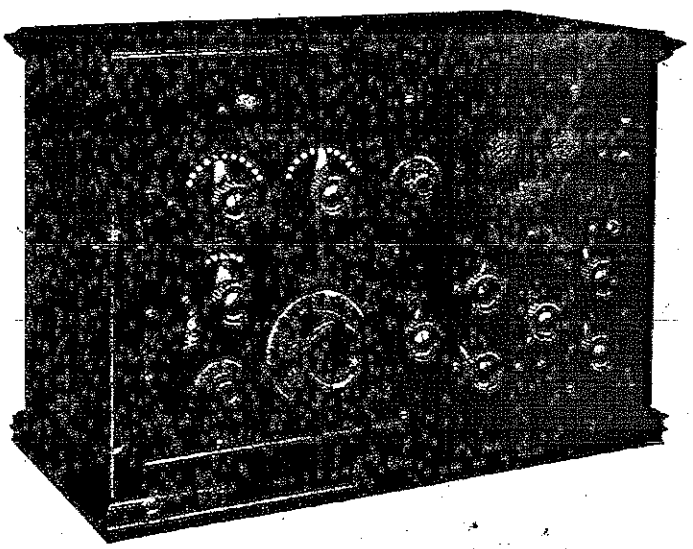
INSTRUCTIONS

for

Installation and Operation

of the

Federal



Type 59

RADIO RECEIVER

Federal Telephone & Telegraph Co.

Buffalo, New York

Printed in U. S. A.

The complete **Federal** Type 59 Receiver comes to you with the following parts:

One **Federal** Type 59 Receiver.
One **Federal** No. 53-W Headset with
One **Federal** No. 15 Universal Plug attached.

All these parts are required for the satisfactory operation of the receiver. You should, therefore, carefully examine the packing material in which the receiver is shipped before discarding and assure yourself that you have removed these several parts from their packing.

Reprinted 1976

INSTRUCTIONS
FOR THE INSTALLATION AND OPERATION
of the
Federal
TYPE 59 RECEIVER

THE RECEIVER: The **Federal** Type 59 receiver is of the double tuned circuit type supplied with one stage of radio frequency amplification and two stages of voice frequency amplification.

It is supplied with a number of control knobs for the tuning of the receiver and for the adjustment and control of the amplifier which is part of the receiver. Two major controls are provided for tuning. These are, the secondary condenser control knob—labelled "Secondary Wavelength," and the antenna inductance control knobs—labelled "Primary Inductance." The rotation of these knobs alters the tuning of the receiver and allows of the reception of the signals of any of the American or Canadian broadcasting stations operating on wavelengths between 225 and 550 meters.

In order that the receiver may operate with a wide variety of antennae, it is provided with an antenna circuit condenser—labelled "Primary Condenser"—which gives a rough adjustment of the antenna circuit to compensate for the type of antenna which is used. Once this switch is adjusted to suit the antenna with which the receiver is used, it will require little or no further manipulation.

Both the "Secondary Wavelength" and "Primary Inductance" controls must be adjusted for tuning to any station. The primary inductance is controlled by two switch knobs. The left one of these two switches provides means for approximate tuning, while the right switch provides means for the very gradual and precise tuning of the receiver. A third control, that of "Selectivity," provides means for the control of the selectivity of the receiver between very wide limits.

The four rheostat control knobs on the right hand side of the panel, control the brilliancy of the vacuum tube filaments. The "R. F. Amplification Control" knob makes possible the easy control of the degree of radio frequency amplification which is available in the receiver, while the A. F. "Amplification Selector" switch by the simple rotation of its knob automatically changes the degree of the audio frequency amplification which is being used in the receiver.

This receiver requires for its operation an antenna in the form of elevated wires, connection to the ground, four vacuum tubes properly chosen storage and dry batteries, and headset, loud speaking telephones or other sound reproducing mechanism. These are described in the following:

THE ANTENNA: To secure the best operation of this receiver, an outdoor antenna suspended well above the ground should be used. This antenna can be erected most simply as shown in Fig. 1. It should be supported as high above ground as possible, and its length should be not less than 70 feet, nor more than 150 feet where a single wire is used.

Several wires secured to wooden spars may, of course, be substituted for the simple single wire antenna, and where such an antenna is used, it may be somewhat shorter than the single wire antenna. It is advisable, however, that the antenna be as high above ground as possible,

and that the space between it and the ground be free of trees, shrubs or structures of any kind. It must be carefully insulated at its points of support by means of any of the commonly available antenna insulators, and when one end of it is supported in a tree or near a metal structure, the antenna conductor

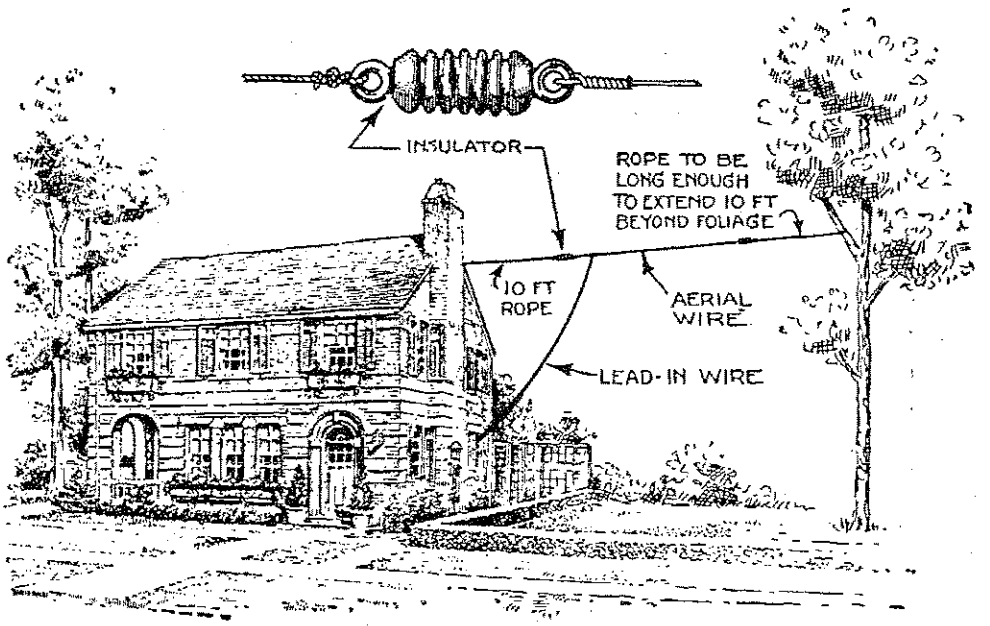


Fig. 1.

should not be less than ten feet away from the foliage of the tree or the metal of the structure. To this end it will be found best to use rope for supporting the antenna, so that the conductor of the antenna may be absolutely free from contact with the foliage, and be sufficiently removed from the influence of the metal structure.

A sturdy copper wire should be used for the antenna conductor. This should be not smaller in size than No. 16 B. & S. gauge, and the antenna should, if possible, be free of joints in the conductor. Where it is found impossible to make the antenna of one continuous piece of copper wire from its remote end to the apparatus, the joint should be carefully soldered and then protected against corrosion, by securely wrapping with tape. That part of the antenna conductor which connects the elevated portion of the antenna and the receiver, should be as short as it is possible to make it. Where it passes through the walls of the house, use should be made of porcelain or other insulating tube, and wherever it is supported it should be secured to porcelain or other insulators.

Where it is found impossible to erect a good outdoor antenna, the receiver may be used with antenna wires inside the building. Such an indoor antenna may be built by the use of wires strung around the room in which the receiver is located, the use of wires suspended in a room, or other space above the room in which the receiver is located or by the use of wires concealed in the partitions of the room or the building, or by any other means which make it possible for wires at an elevation above the receiver or at least well above the ground to be connected to the antenna terminal of the receiver. Such an antenna will be found to serve perfectly satisfactorily, but in general, it will be found that the indoor antenna will

invariably sacrifice something in distance of reception which might be realized by the use of an outdoor antenna. In either event, the higher the antenna wires above the ground and the further they are kept away from metal structures, buildings, power wires, etc., the greater will be the range of reception and the more satisfactory the operation of the receiver.

Where no other type of antenna can be installed, the electric lighting system or telephone wires may be found useful. In general, it is not advisable to connect the antenna binding post of the receiver directly to such wires, since both the telephone wires and power wires are carrying current at voltages which may be dangerous. Such connection, however, may be made with safety if the telephone or power line is connected to one terminal of a small mica dielectric condenser, such as the Federal .005 M. F. Condenser, the other terminal of which is connected to the antenna binding post of the receiver. The condenser should be located at the point where the power or telephone lines are exposed for connection and the connection between the condenser and the antenna posts of the receiver should then be made.

The use of these wires as antennas will always result in a serious sacrifice in the distance over which reception of signals can be accomplished, and their use should be avoided.

THE GROUND: The connection to the ground can best be made by providing a secure electrical contact to the water pipe, as near to the underground water pipe system as possible. For best operation it will be found that connection should be made to the pipe which leads from the water meter to the street, and this connection can be made most conveniently by means of a ground clamp as shown in Fig. 2. The connection from ground clamp to the receiver should be made with a sturdy copper conductor not smaller than No. 16 B. & S. gauge, run in as direct and short a line as possible.

It is advisable that this conductor be insulated, as is the antenna conductor, on porcelain insulators. Where it is impossible to make connection to the water system as described above, connection may be made to other portions of the water system, to gas pipes where they are available, heating system pipes or to the metal structure of the building. These are given in the order of their effectiveness, and it will be found that in any installation the cost and difficulty of making connection to the water system as described will be found well justified in the increased distance over which reception is possible.

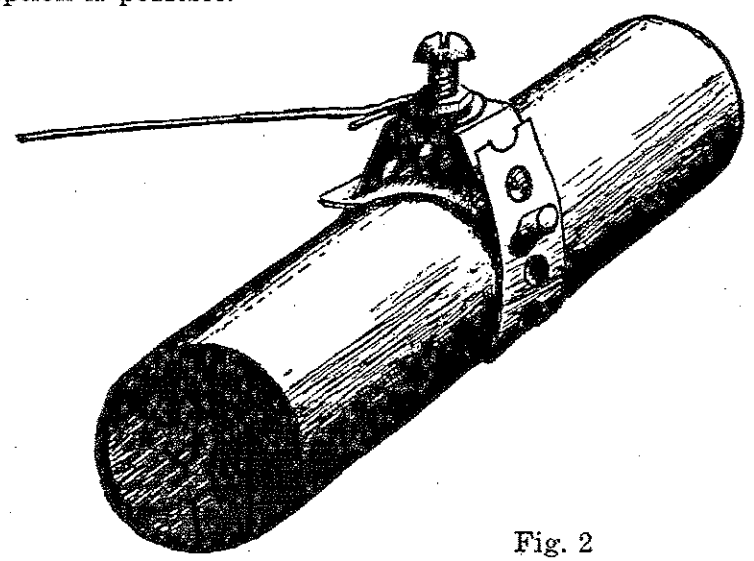


Fig. 2

It is to be borne in mind that in making connection by means of a ground clamp, it is necessary that the pipe to which connection is made, be cleaned of all corrosion, and that the bright metal be exposed to contact with the ground clamp; that the ground clamp be very tightly secured to the pipe, and the copper connecting wire be scraped bright and clean, and then very securely fastened to the ground clamp. The expenditure of care in the proper laying out of the antenna and ground system will repay itself many times in the increased range of reception and the greater reliability in the operation of the receiving apparatus.

THE VACUUM TUBES: The filament rheostats of this receiver are so designed as to allow the use of any of the many available types of vacuum tubes when used with either dry or storage batteries not exceeding six volts; and while this receiver will operate satisfactorily with various available types of tubes, it is recommended that for best operation the following choice of tubes be used. In the detector socket, which is the left front socket, the Radiotron U. V. 200 or other gas detector tube should be used. All other sockets should be supplied with Radiotron U. V. 201-A tubes or their equivalents.

Since the lack of positve electrical contact between the tube and socket spring will result in noisy operation, the contact surfaces of the tube contact pins should be carefully cleaned before inserting them into their respective sockets. This is a common source of annoying noise in the operation of the receiver which may be easily avoided by this simple expedient.

THE BATTERIES: For the operation of the Type 59 Receiver, two separate batteries are required, one for supplying the filaments of the vacuum tubes—commonly called the "A" battery—and one for supplying the plate circuits of the tubes—commonly called the "B" battery.

The type of "A" battery which will be used will depend upon the type of tube which is used. The purchaser of this receiver should determine for himself what type of battery he wishes to use with his tube. The rheostats with which the receiver is supplied are such that any type of battery having a voltage not in excess of six volts will serve to supply any type of tube, but it will usually be found most economical to use a battery, either storage or dry, having a voltage not greatly in excess of that required by the tubes.

It will be found that for the proper operation of the receiver, the connection between the "A" battery and the receiving set should be made with a conductor not smaller than No. 14 B. & S. gauge. The battery should be so located relative to the receiver, that these conductors need be no more than three feet long.

It is absolutely necessary for best results, to keep the storage "A" battery well charged at all times. Frequent charges for short periods are to be recommended, rather than allowing the battery to be discharged to the point where the set no longer functions normally. The ideal condition both for the operation of the set, as well as convenience, is obtained by the use of a home charging device, thus enabling the charging to be conveniently accomplished after any long period of discharge.

If it is found advisable to locate the storage battery at a great distance from the receiver, a much heavier conductor must be used. If the battery it is so located it will be found convenient to install the storage battery charging equipment in close proximity to the storage battery. Under these conditons, however, care must be taken to make it impossible for the receiver to be connected to the storage battery while it is

being charged, since if this occurs, either the tubes or the receiver, or both, will be burned out in the process. The installation of a double pole, double throw switch as shown in Fig. 3 will make this impossible and make the charging of the battery more convenient.

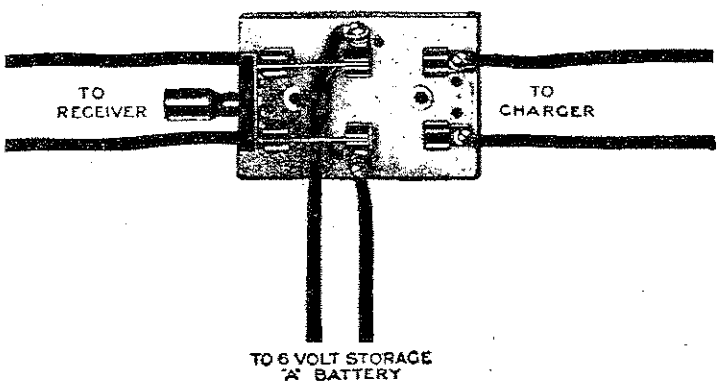


Fig. 3

Where dry "A" batteries are used, it will be found that the signal strength available from the receiver is largely dependent upon the condition of this battery, and care should be taken to replace the battery with a new one as soon as the strength of the signals received is found to be reduced. The user should note that the mere fact that the battery still has sufficient power to light the tube filament is no measure of its effectiveness for reception of signals, since a proper and rather high degree of brilliance is required for the reception of signals. The use of exhausted batteries connected in series so as to give the proper vacuum tube filament brilliance is to be avoided, since the life of such batteries is extremely limited and will require the very frequent adjustment of the receiver.

For the plate supply battery, dry or storage "B" batteries may be used. These batteries should be connected with one another as shown in Fig. 4. The terminals of these batteries are usually labelled as to the polarity, the positive terminal being marked with a plus (+) sign, while the negative is marked with a minus (—) sign. In some types of batteries the polarity is indicated by the colored terminal wires, the positive usually being red. In inter-connecting them, the positive terminal of each battery should be connected to the negative of each succeeding battery, and the negative terminal of this group of batteries should be connected to the "+A —B" terminal of the receiver. The positive terminal of this same battery should then be connected to the "+B DET" terminal and the positive terminal of the entire group to "+B Amp" terminal of the receiving set.

These inter-connecting wires should be just long enough to connect conveniently to the terminals on the receiver, and should be made with a conductor sturdy enough to be proof against breaking, due to flexure, but need not be made of as heavy a conductor as is used for the connection of the storage battery. These connecting wires should, however, be very carefully insulated from one another, since the voltage difference between them is rather high, and damage may result from accidental contact between them, unless care is taken in the installation. For the operation of the receiver, it is preferable that three batteries in series be used, giving a total voltage of approximately 60 volts. Either 40 or 80 volts may be used; there is, however, little to be gained by using more than 80 volts.

It will be found that unless the "B" batteries are maintained at proper voltage, the operation of the receiver will be unsatisfactory, since almost exhausted "B" batteries will result in noise in reception, either in the form of a rough hissing sound or in a musical whistle. When such noises make themselves evident, the "B" battery should be replaced with a fresh one and care taken to see that it is replaced frequently enough to avoid these noises.

THE PHONES: The **Federal** Type 59 Receiver may be used with either **Federal** STANDARD HEAD TELEPHONES or with a loud speaker. A telephone plug is supplied with the receiver for making connection between the phones or the loud speaking device, and the receiver itself. The receiver is supplied with a telephone jack suited to this plug, and connection is made by the mere insertion of the plug into the jack.

In additon to the telephone jack, the receiver is supplied with two telephone binding posts, to which either telephones or loud speaker may be connected in the event that these devices are equipped with connecting cords having pin, spade, or other types of terminals. The receiver is equipped with an amplification selector switch whereby the telephones or loud speaker are automatically transferred from the detector to either of the three degrees of A. F. amplification available in the receiver. This switch not only changes the amplification which is being applied to the signal as it is heard in the telephones or in the loud speaker, but automatically lights the filaments of the particular tubes, the operation of which is necessary for the particular degree of amplification desired.

It will be found that the use of a loud speaker connected to either the telephone terminals or telephone jack will serve quite satisfactorily for the reception of signals of comparatively nearby stations, but where the maximum possible range of reception is to be accomplished, **Federal** STANDARD HEAD TELEPHONES should be used.

TYPE 59 RECEIVER

SHOWING BATTERY CONNECTIONS WHEN USING 6 VOLT TUBES - SUCH AS UV-201A

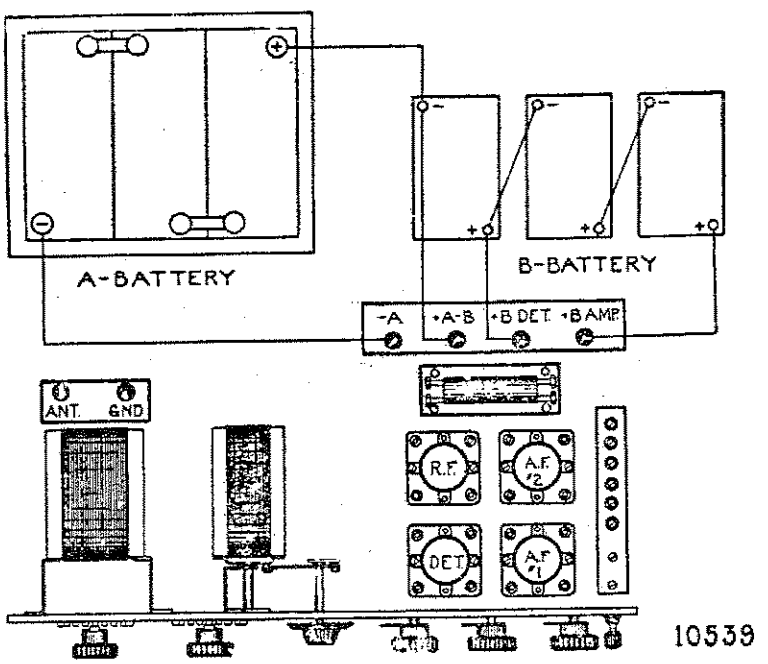
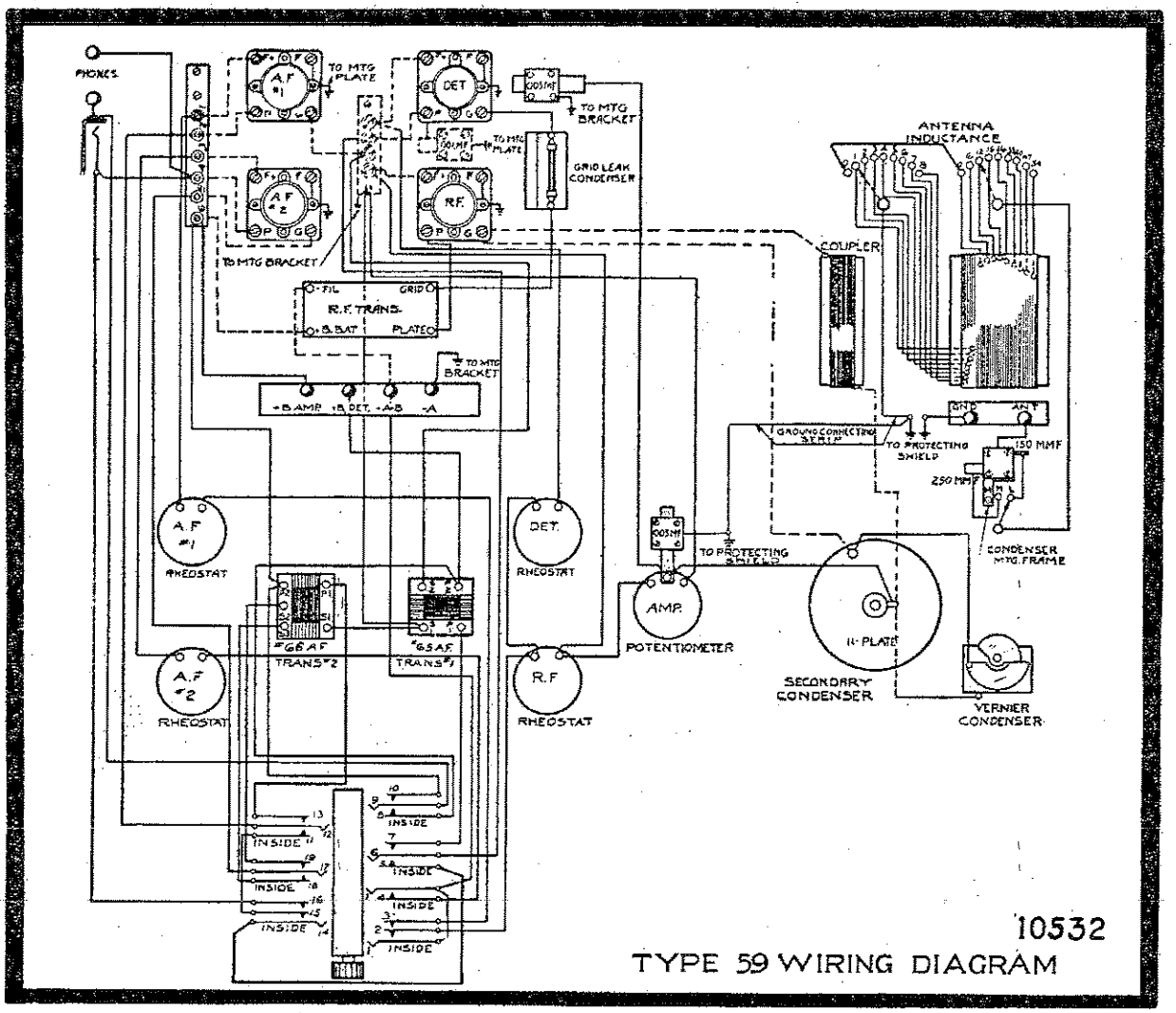


Fig. 4


PHONES
A.F #1
TO MTG PLATE
DET
.005MF
TO MTG BRACKET
A.F #2
R.F.
GRID LEAK CONDENSER
ANTENNA INDUCTANCE
COUPLER
TO MTG BRACKET
R.F. TRANS.
FIL
GRID
B BAT
PLATE
+B AMP
+B DET.
+A-B
-A
ANT
GROUND CONNECTING SCREW
TO PROTECTING SHIELD
150 MMF
250 MMF
CONDENSER MTG. FRAME
A.F #1 RHEOSTAT
DET. RHEOSTAT
AMP.
POTENTIOMETER
#68 A.F TRANS.#2
#65 A.F TRANS.#1
A.F #2 RHEOSTAT
R.F RHEOSTAT
SECONDARY CONDENSER
R-PLATE
VERNIER CONDENSER
INSIDE
10532
TYPE 59 WIRING DIAGRAM

The Installation of Set

The receiver should be located in such a position that the connection to the ground and the antenna wires be as short and direct as possible. It should be protected from moisture, excessive heat, dust and vibration, since all these things will make the operation of the device less satisfactory, and ultimately work it permanent harm. It will be found that the beauty of finish of the receiver and the dignity of its plainness will make it an acceptable part of any setting, and by the location of the receiver and the antenna and ground wires in a most accessible place, so that the receiver will perform to the utmost its function as an entertainment and an educational device of the highest order of usefulness.

Having located the receiver, the connection of the antenna and ground to the terminals on the receiver so labelled should be made. Then the connections from the storage battery to the two "A Bat." terminals should be made. It is essential that the positive terminal of the storage battery be connected to the receiver terminal marked "+A," and that the negative terminal of the battery connected to the terminal marked "—A." The storage battery terminals themselves will usually be found properly labelled, either with the words "Pos" or "Neg," "+" or "—", or with a red mark on the positive terminal.

It is to be noted in connecting the batteries that if the filament battery and plate battery are interchanged, the connection of the plate battery to the filament battery terminals will invariably burn out the vacuum tubes, so that great care should be taken to avoid this error.

If the procedure described above is followed, that is, if the "A" battery is first connected as described, then the Amplification Selector Switch rotated to position labelled "4" and the rheostats are turned in a clock-wise direction—the filaments should light and become more brilliant as the rheostats are turned more and more in the clock-wise direction. When the "A" battery has been so connected, the "B" battery should be connected. The connecting wire from the negative terminal of the "B" battery should be connected to the "—B" terminal of the receiver, which will be found to be identical with the "+A" terminal, and the connecting wire from the positve end of the group of "B" batteries should be connected to the "+B AMP" terminal of the receiver, and a connecting wire from the positive terminal of the battery whose negative terminal is already connected to the receiver, should be connected to the "+ DET." The operator should then listen to the sounds in the headset or loud speaker to assure himself that the "B" batteries are properly connected. This can be determined if the connection to the "+ AMP." terminal is opened and the connecting wire touched to the terminal. This should result in a loud noise in the telephone, as should the making and breaking of the connection between the "B" battery and the "+B DET" terminal of the receiver. If no noise is heard, the connection between the several batteries which constitute the "B" battery should be examined, as well as the connecting wires to the receiver, and assurance made that all connections are quite secure. If these connections have been properly made, the receiver is ready for operation.

Before adjusting the receiver, however, the operator should accustom himself to the fact that the rotation of any one of three rheostats in a clock-wise direction increases the brilliancy of the filaments of the vacuum tubes, while its rotation in a counter clock-wise direction reduces the brilliancy, and if the rotation is far enough in this direction, it will extinguish the filaments.

Adjustment of the Receiver

It will be found that the expenditure of a little effort in accustoming the operator to the manipulation of the controls will well justify itself in the greater range of the reception and absolute reliability of operation which can be accomplished with this receiver. It is, therefore, recommended that the following procedure be followed in tuning the Type 59 Receiver:

No attempt should be made to secure signals over long distances until the operator has learned to use the receiver on nearby stations, and for this reason it is suggested that the procedure given below be used when a nearby station is known to be in operation.

The position of the "Primary Condenser Switch" at the left of the panel is largely dependent upon the size of the antenna which is used with the receiver. Where an extremely long high outdoor antenna is used, the switch should be set on contact stud "L." Where a small indoor wire of not more than 20 or 30 feet in length is used, it should be set on contact stud "H"; while for a large indoor antenna or a small outdoor antenna, it should be set on position "M." When the receiver is first set up, it will be found that the operator can accustom himself to the tuning of the receiver most expeditiously if he will follow the instructions given below.

He should first adjust the vacuum tubes thus: The antenna wire should first be temporarily disconnected to facilitate the adjustment of the detector tube filament to its proper brilliancy. The telephone plug should be inserted in the telephone jack, or the headset should be connected to the telephone terminals. The amplification selector switch should be rotated to position "4" and the two rheostat knobs on the extreme right of the panel should be rotated until the vacuum tubes in the two right hand sockets are lighted at a reasonable brilliancy and the detector tube is illuminated. When a gas detector tube, such as the UV-200 is used, it will be found that as the detector rheostat is rotated in a clock-wise direction, a position will be found in which a very audible "hiss" is heard and that rotation beyond or back from this positon will cause the "hiss" to disappear. This rheostat should then be rotated in a counter clock-wise

FACE PLAN of TYPE 59 RECEIVER

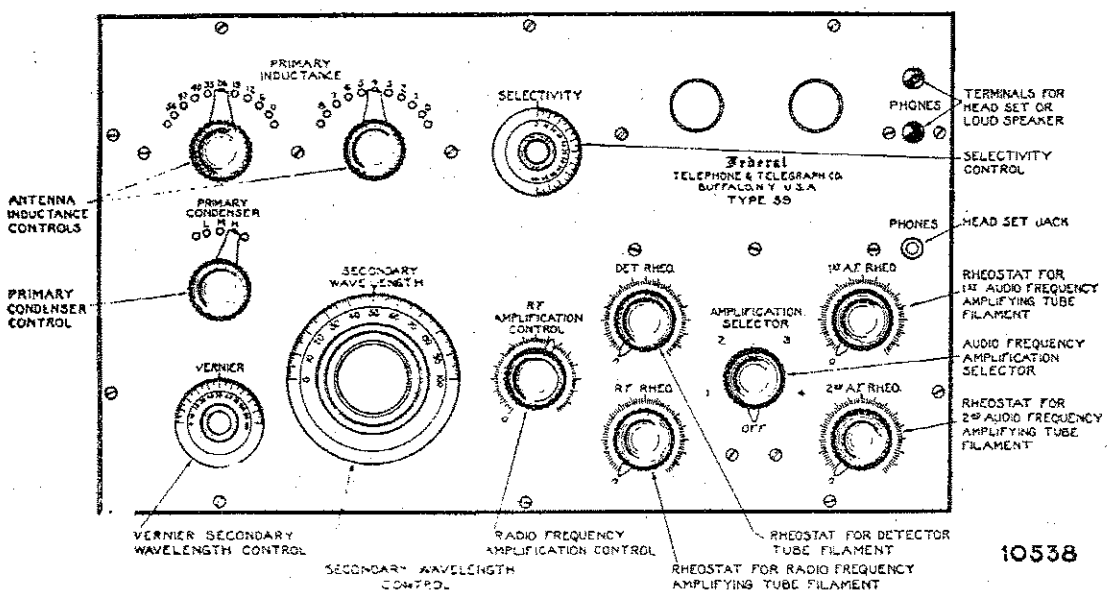


Fig. 5

direction until the "hiss," as heard in the headset barely disappears, and when in this condition the detector tube will be found to be extremely sensitive.

Having adjusted the detector tube filament, the "R. F. Amplification" Control should be rotated in a clock-wise direction through about three-quarters of the range of its rotation, and the Radio Frequency amplifying tube rheostat—"R. F. Rheo"—should be rotated in a clock-wise direction until a dull thud is heard and then rotated in a clock-wise direction well beyond this position. The amplifying system in the receiver is then ready for the reception of signals and requires only the adjustment of the tuning system to receive the desired signals. The "Selectivity" Control Knob should then be set at zero and the "Primary Inductance" switch knobs set at some mid position; the antenna reconnected to the set and the "Secondary Wavelength" control knob slowly rotated from zero to 100 degrees on the scale until a musical note is heard at some particular position of this control knob.

It will be found that the very slow rotation of the "Secondary Wavelength" dial will change the pitch of this musical note. This dial should then be adjusted until the pitch of the note is fairly low; then by the slow rotation of the "Vernier" dial, the pitch of the musical note should be made still lower until it becomes inaudible. The "R. F. Amplification" control knob should then be rotated in a counter clock-wise direction until a change in the residual sound in the headset is heard and the voice or music is clearly heard and at its greatest intensity. The two "primary inductance" switches should then be rotated until a position of maximum signal is found and the receiver is operating at its best tuning conditon.

It will probably be found that an increase of amplification can be secured after these preliminary adjustments have been made by a slight readjustment of the several rheostats and the "R. F. Amplification" control. This control should be rotated for a short distance in either direction and the position of maximum signal noted and at the same time the vernier should be slowly rotated so that the operator may be assured that the receiver is operating at maximum amplification.

The intensity of signals will not be seriously affected by the rotation of audio frequency amplifying tube rheostats (labelled "1st A. F. Rheo" and "2nd A. F. Rheo"), but once the signal is heard, the brilliancy of the filaments of the tubes controlled by these rheostats should be reduced until further reduction in brilliancy causes a reduction in signal. The operation of the tubes in this condition will give maximum possible tube life and require the least frequent charging or replacement of batteries.

It will be found in operation, that for the reception of signals over moderate distances that the variation of the "Secondary Wavelength," "Vernier" and "R. F. Amplification" control knobs are the only changes that need be made, but where maximum possible range and freedom from interference is to be secured, careful adjustment of the "Primary Inductance" switches and of the "Selectivity" control knob should be made every time a different station is tuned in. Once the signal is made audible by the manipulation of the "Secondary Wavelength," "R. F. Amplification" and "Vernier" control knobs, the selectivity control knob should be rotated to a position about half way toward the maximum of its scale and a readjustment of the R. F. amplification control, secondary wavelength control, vernier control and primary inductance control knobs should be made for maximum signal. This sequence of readjustments should be done again for a higher degree of selectivity as indicated by the selectivity control knob until any further increase in the selectivity and readjustment of controls

results in a serious reduction of signal. The receiver is then operating with maximum possible selectivity, compatible with a high degree of signal strength. If a higher degree of selectivity is made necessary through the presence of interfering signals the selectivity control knob should be further rotated toward the maximum of its scale and readjustments of the several controls made until the interfering signal disappears and only the desired signal remains.

While the procedure outlined above may appear involved, the manipulation of the controls as described will well repay the operator by the elimination of interfering signals and by the quiet and satisfactory operation of the set and the long range of reception; but where such minute adjustment as that of which this receiver is capable is not advisable a very casual adjustment of it will serve quite satisfactorily for local and even remote signals if no interfering signals are encountered.

For those users of the **Federal** Type 59 Receiver who wish to acquaint themselves with the circuit arrangements of the receiver, the attached circuit diagram is given.

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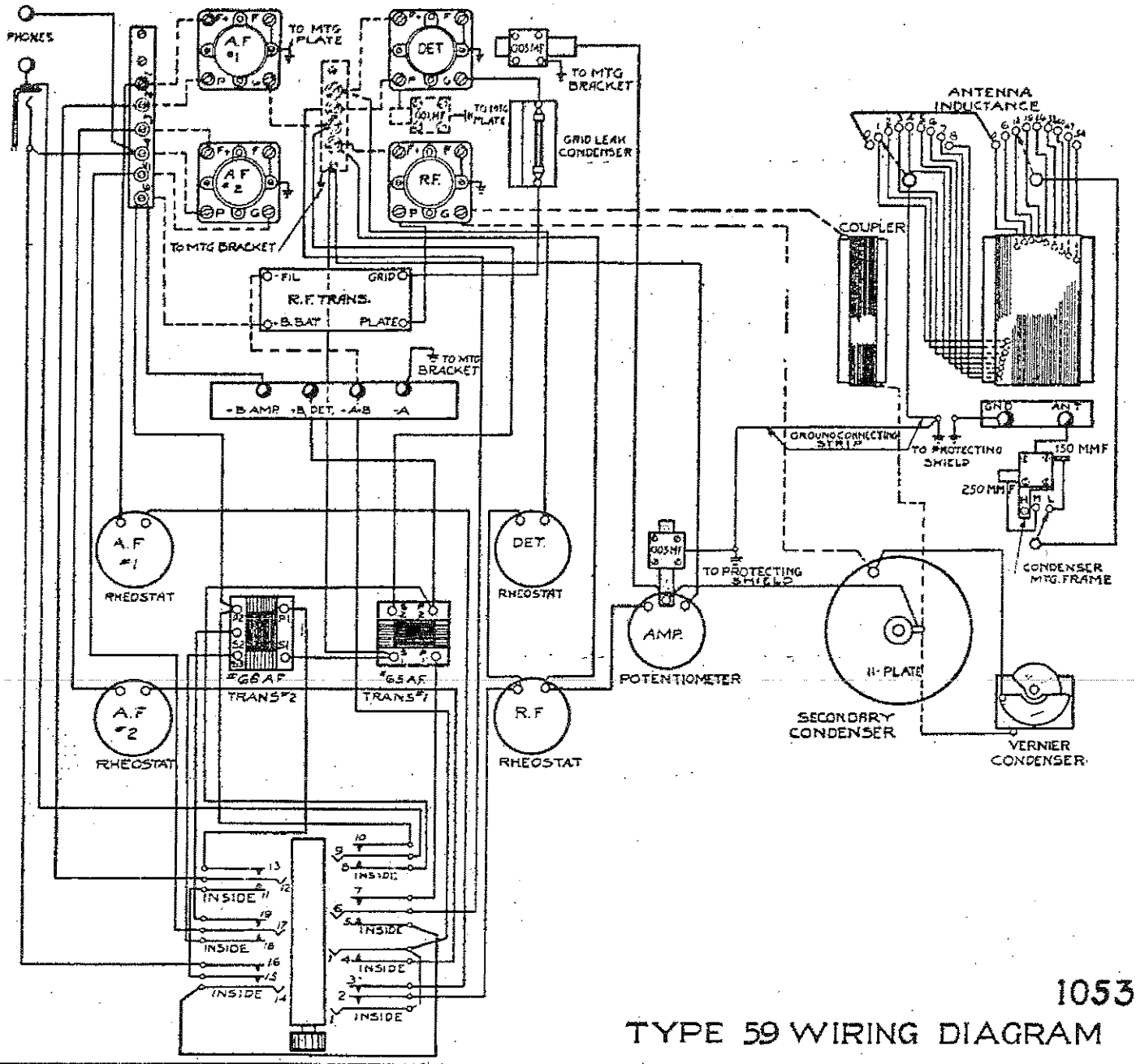

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TYPE 59 WIRING DIAGRAM