

1922

INSTRUCTIONS
FOR
OPERATING



RADIO RECEIVING
INSTRUMENTS-

INTRODUCTION



THIS Booklet is intended as a guide to the proper installation and operation of Grebe Radio instruments.

In the succeeding pages we have described the auxiliary apparatus needed with each of our instruments. This has been followed by suggestions for the proper installation of antenna and receiving equipment illustrated with sketches where necessary. General instructions are given for the operation of the two types of receiving circuits, as well as specific directions covering each of the units.

Circuit diagrams, wavelength charts and calibration curves will be found for each instrument and every effort has been made to present the subject in a brief yet thorough manner.

One copy of this instruction book is supplied without charge with each instrument. Additional copies may be obtained from Grebe Radio dealers at a charge of 25 cents each.

A. H. GREBE & CO.

INCORPORATED

RICHMOND HILL

NEW YORK

AUXILIARY APPARATUS

The following accessories are required with the Type CR-5 and Type CR-8 Receivers:—

- 1.—Detector Vacuum Tube.
- 2.—Filament Lighting Battery.
- 3.—Plate Battery.
- 4.—Telephone head-set.

The filament lighting battery is preferably a six volt storage battery with a capacity of about 40 Ampere Hours.

The plate battery should be a unit arranged with taps for varying the voltage from 16½ to 22½. If a detector tube which requires more than 22½ Volts has been selected, an additional 22½ Volt unit is required. The larger size plate battery is to be preferred, as its life is much longer than that of the smaller type and it is not likely to give trouble on account of inter-cell chemical action.

A good pair of telephones must be used, if the maximum results are to be obtained from the receiver.

For the CR-9 Receiver or the "CR-5-RORK," "CR-8-RORK," CR-3-RORD" combinations the following additional equipment must be supplied.

- 1.—Two amplifier vacuum tubes.
- 2.—Two 22½ Volt Plate battery units.

With these receiving combinations, three vacuum tubes must be supplied with filament lighting current and it is therefore advisable to use a storage battery having a capacity of 80-100 Ampere Hours.

Where the signals are to be made audible to a number of persons at one time, a loud speaking device may be connected in circuit as shown in the diagrams.

The tools and supplies listed below will be found useful in making proper installation of the radio station.

- 1 6-inch side cutting pliers.
- 1 4-inch slim screw-driver.
- 1 8-inch medium screw-driver.
- 1 hand-drill—3/16" chuck.
- 1 each of Nos. 33, 27, 18 and 14 twist drills.
- 1 small alcohol blow torch.
- ½ lb. strip solder.
- 1 small can soldering paste.
- 25 feet No. 14 rubber covered wire.
- 15 feet No. 18 duplex lamp cord.

VACUUM TUBES

DETECTOR TUBES:

The type of tube now in most general use is classed as a soft or gas content tube and requires a critical adjustment of both plate voltage and filament current. They are extremely sensitive when properly adjusted. The variation of the filament current is accomplished by means of a rheostat placed in series with the filament lighting battery. In the Grebe Receivers and Amplifiers this rheostat is calibrated in ohms and may be readily reset after the proper position has once been determined. The plate voltage is variable in steps of $1\frac{1}{2}$ Volts by attaching the positive plate battery lead from the receiver to the proper terminal of a variable plate battery. This position must be found by experiment. The majority of detector tubes operate on voltages between $16\frac{1}{2}$ and $22\frac{1}{2}$, and this range is covered by the variations provided on the various types of plate batteries.

AMPLIFIER TUBES:

Amplifier tubes are not critical in adjustment when compared with detector tubes and they will

operate successfully on plate voltages of 40 to 80 Volts. Where a detector and two stage amplifier combination is used, three $22\frac{1}{2}$ Volt units may be connected in series and connections to the receiver are made in a manner which permits the use of the full voltage on the amplifier tubes while a variable portion of the same battery is used for the detector tube. Where extremely loud signals are desired plate voltages of 100 or over may be used without damaging the amplifier tubes but the use of this voltage increases tube noises and is therefore not desirable when receiving signals with the telephone head set.

Defective Tubes: A detector tube which is not critical as to plate voltage and filament current is usually defective. A good detector tube will give greatly increased signal strength with a certain plate potential and filament brilliancy.

An amplifier tube which requires a critical plate voltage or filament current adjustment will not give consistently satisfactory results as an amplifier. Tubes of this character will generally be found useful as detectors.

ANTENNA AND GROUND SYSTEM

The essentials of a good antenna are height, proper physical dimensions, isolation from surrounding objects, effective insulation and good construction.

In planning the antenna it must be remembered that its physical dimensions bear a certain definite relation to the wave-lengths to be received. While an antenna designed for 200 metre reception will give good results on all wavelengths up to 3000 metres, an antenna designed for 3000 metres cannot be successfully used for receiving 200 metre wavelengths. It is therefore necessary to construct the antenna for the shortest wave-length to be used.

The Grebe Short-wave and Intermediate-wave receivers have a lower limit of 150 metres, and the best antenna for this wavelength will ordinarily be 100 feet in length, measured from the instrument to the farthest end.

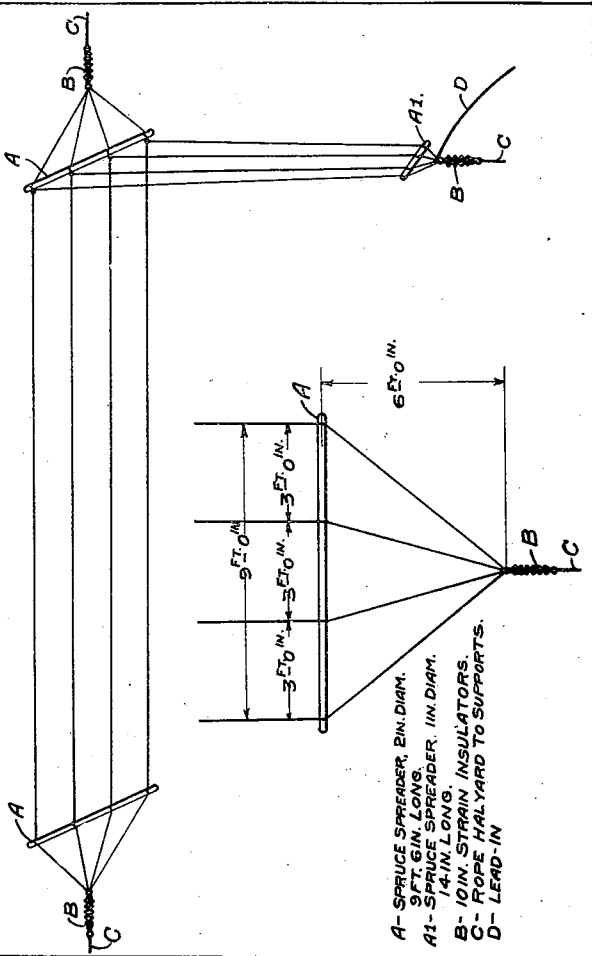
Hard drawn copper wire, No. 12 or 14 B & S Gauge, is satisfactory for antenna construction; however, stranded silicon bronze wire is more durable and will stand greater strains. For ordinary receiving purposes one wire is sufficient, but a four wire antenna is recommended. The

spreaders for separating the wires at the ends may be made of any light wood, such as spruce. The lead-in wires should be attached to each of the horizontal wires, either at the end or at the exact centre and they may be separated by a small spreader, located at the lower end near the lightning switch. Where space is limited, a single lead-in wire may be used. Great care should be exercised in making connections and where it is necessary to join wires they should be soldered together.

One large insulator, placed between the bridle and the point of support, is sufficient. Better insulation is obtained by this method than results from individually insulating each wire from the spreader. See subsequent pages for details of antenna construction.

The Fire Underwriters require the installation of a lightning switch or protective device and this should be done as a precautionary measure. The approved type of lightning-switch is a single-pole, double-throw, 600 volt, 100 ampere, knife switch, mounted on a composition base. Lightning switches are required to be mounted on the outside of the building and the ground connection may be made to an iron pipe driven several feet into the ground. This connection should be made with weather proof copper wire, No. 6 B & S or larger.

CONVENTIONAL TYPE
OF
ANTENNA CONSTRUCTION



Where only receiving apparatus is to be used, lightning protection may be obtained by the use of a vacuum-gap protective device. This device should be installed in place of the lightning switch and should be permanently connected to both the antenna and ground wires.

The effectiveness of the antenna system depends largely upon the character of the ground connection. The most practical ground connection is the water supply system. Where this is not available, pipes connected with the heating or gas systems may be used. Ground clamps, for attaching the ground wire from the receiver to the pipes, are obtainable at any electrical supply house. The pipe should be carefully scraped to remove all paint or corrosion before attaching the clamp.

Where the above mentioned means of ground connection are not available, wires or plates may be buried in the earth and connected to the apparatus. Such wires or plates should include an area of at least thirty square feet. The ground connection used for the lightning switch is not sufficient for this use but the buried wires or plates may, however, be used for the lightning switch ground. A counterpoise consisting of at least the same number of wires as are used in the antenna may be suspended beneath the antenna and used in place of a ground connection for the receiving apparatus.

INSTALLATION OF APPARATUS

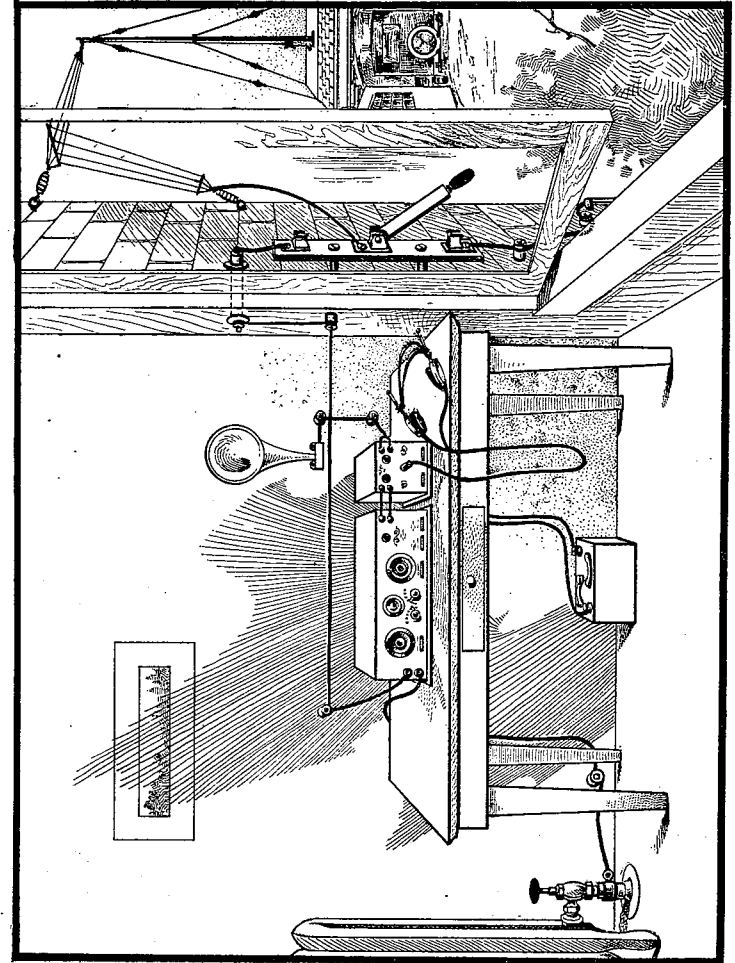
The apparatus should be so placed as to permit of the shortest possible leads from the receiver to the point where the antenna lead-in enters the building. Sufficient space should be provided between the instruments and the edge of the desk or table to allow the operator to rest his fore-arms when adjusting the controls.

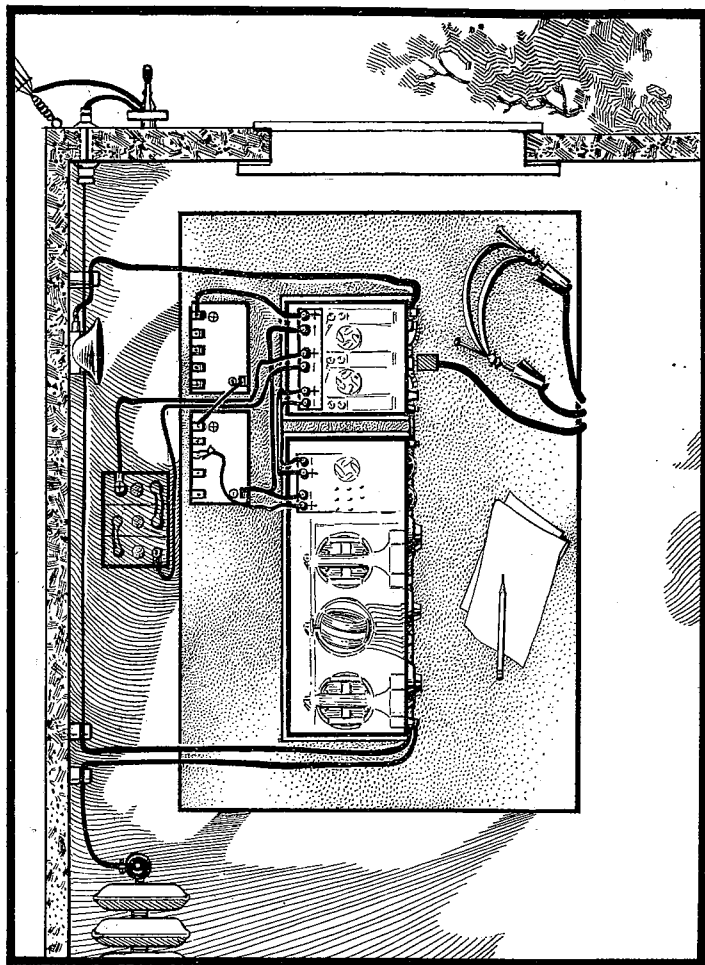
The antenna lead from the lightning switch should pass through the wall within a porcelain tube or special lead in insulator, and if not insulated itself should be supported away from the walls by means of small wall insulators. The ground connection lead does not require any special insulation; ordinary No. 14 rubber covered copper wire is well adapted for this purpose.

Vacuum tubes should not be put into place until it has been ascertained that all battery connections have been correctly made. This will avoid the accidental destruction of the tubes.

The filament lighting battery may be placed on the floor directly beneath the apparatus and the wires connecting this battery with the instrument should be at least No. 14 B & S copper wire; properly insulated.

The plate batteries will be most accessible if





placed directly in back of the receiver so that the wires leading therefrom may be readily passed through the holes in the cabinets provided for that purpose. Where detectors and amplifiers are used together, "Eureka" clips may be used to change from one battery connection to another.

Where the CR-5 or CR-8 Receivers are used alone, the telephone tips are directly connected to the terminals marked "OUTPUT" and where the CR-9 Receiver or the various Receiver-Amplifier Combinations are used the telephone tips will be connected to the special telephone plug.

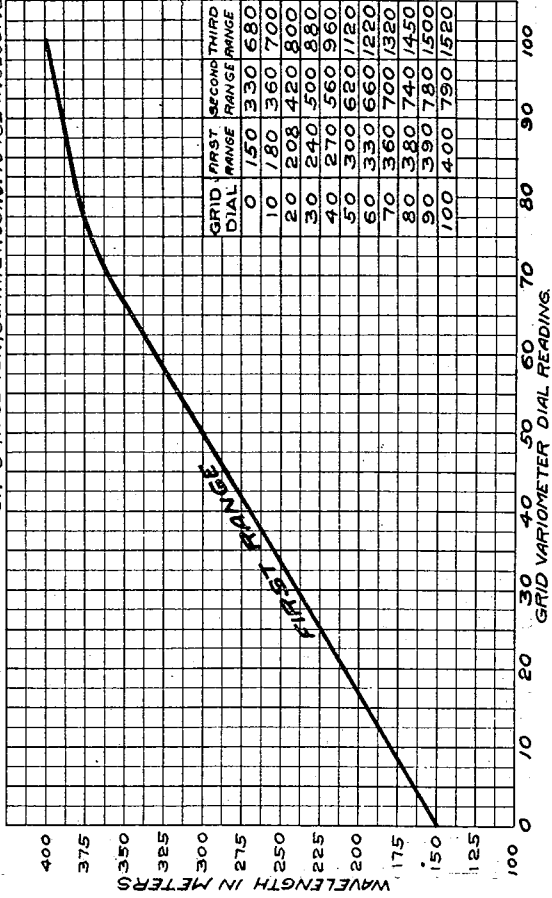
TUNING METHOD FOR THREE CIRCUIT RECEIVERS TYPES CR-3 and CR-8

While excellent results may be obtained with approximate adjustments, the additional effort required for careful tuning is justified by the greatly improved reception, and in order to obtain maximum signals it is necessary to tune each of the three circuits to the wavelength of the desired signal. In all, there are five separate adjustments to be made.

- 1.—Primary circuit (Antenna Inductance).
- 2.—Secondary circuit (Grid Variometer).

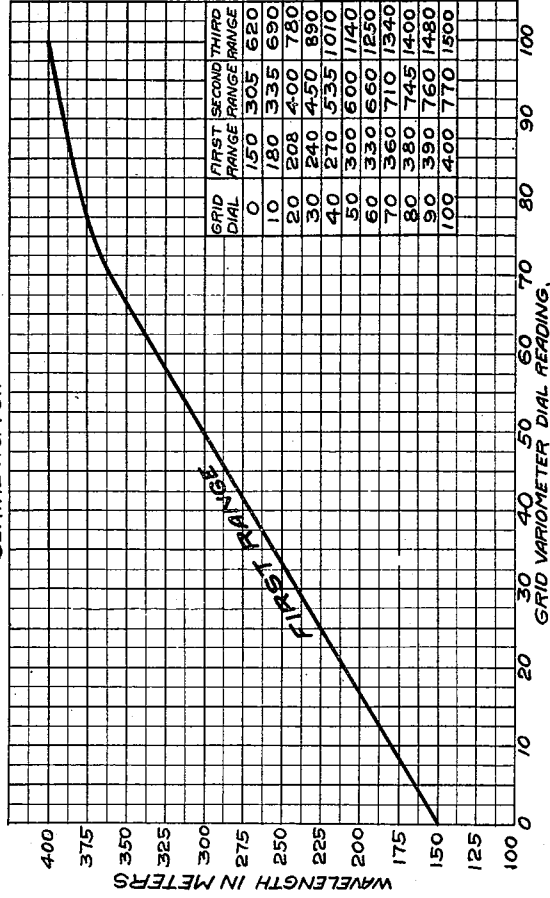
**WAVELENGTH CURVE
FOR
GREBE SHORT-WAVE REGENERATIVE RECEIVER
TYPE CR-8, & CR-3.**

THIS CHART APPLIES TO TYPE CR-8 RECEIVER, SERIAL NOS. 101 TO 287 INCLUSIVE
CR-3 RECEIVER, SERIAL NOS. 101 TO 132 INCLUSIVE.



**WAVELENGTH CURVE
FOR
GREBE SHORT-WAVE REGENERATIVE RECEIVER.
TYPE CR-8 & CR-3.**

THIS CHART APPLIES TO TYPE CR-8 RECEIVERS BEGINNING WITH
SERIAL NO. 401.



- 3.—Coupling (Coupler).
- 4.—Plate circuit (Plate Variometer).
- 5.—Detector (Vacuum tube).

Failure to make all the adjustments results in:

- 6.—Inaudibility of weak or distant signals.
- 7.—Instability of audible signals.
- 8.—Distortion of radiophone speech or music, due to improper amplification.

Tuning for Signals of Known Wavelength

- 9.—Set the GRID VARIOMETER dial to correspond with the desired wavelength. See wavelength chart pages 14 and 15.
- 10.—Set the COUPLER dial to either 50 position.
- 11.—Starting from the zero position gradually increase the PLATE VARIOMETER dial to the point where oscillations occur. (This condition is recognized by a soft hissing sound in the telephones.)
- 12.—Adjust the ANTENNA INDUCTANCE switches to a combination which causes the cessation of oscillations. If a Variable Antenna Series Condenser is used, adjust the switches to a combination which will cause the oscillations to cease upon rotation of the condenser dial to some point between 70 and 90.

- 13.—The desired signal should now be audible in the telephones and final adjustments may be made with the GRID VARIOMETER, and COUPLER. The use of the tangent wheel verniers is essential in making these final adjustments.

Tuning for Signals of Unknown Wavelength

- 14.—Set the COUPLER on either 50 position.
- 15.—Make approximate adjustment of the ANTENNA INDUCTANCE switches, setting them at a higher rather than a lower wavelength than is expected.
- 16.—Using both hands, simultaneously rotate the GRID and PLATE VARIOMETER dials over the entire scales. The dials should be rotated so as to keep the circuits on the verge of oscillating (Refer to 11.)
- 17.—When the desired signal has been located on the GRID VARIOMETER dial, rotate the COUPLER dial toward zero until the signal is barely audible and adjust the Primary circuit as indicated in 12.
- 18.—Make a final adjustment on the COUPLER dial.

TUNING METHOD FOR TWO CIRCUIT RECEIVERS

The tuning of this type of receiver is more simple than the three circuit type. Maximum signal strength is obtained only when the WAVELENGTH CONTROL circuit is adjusted to the same wavelength as the desired signal, and the TICKLER is adjusted to the point of greatest amplification.

Tuning for Signals of Known Wavelength

- 1.—Set the INDUCTANCE switch for the desired wavelength range. See wavelength chart page 19.
- 2.—Set the CONDENSER dial to the position corresponding to the wavelength desired. See wavelength chart page 19. This chart is calibrated for an antenna having a capacity of .0004 Mfd. and a slight compensation above or below the indicated settings will be necessary when antennae of other capacities are used.
- 3.—Starting at zero gradually increase the TICKLER dial reading to a position just below the oscillating point. (The oscillat-

**WAVELENGTH CHART
FOR
GREBE INTERMEDIATE-WAVE REGENERATIVE RECEIVER
TYPES CR-9 & CR-5
USED WITH ANTENNA OF .0004 MFD. CAPACITY.**

ANTENNA SERIES CONDENSER SCALE	POINTS ON PRIMARY INDUCTANCE SWITCH Q.									
	1	2	3	4	5	6	7	8	9	10
100	280	450	650	970	1320	1620	1960	2240	2800	3020
90	268	427	623	925	1268	1550	1875	2140	2680	2895
80	255	407	598	885	1210	1495	1790	2045	2565	2770
70	242	388	570	843	1160	1430	1710	1950	2450	2650
60	227	365	543	802	1105	1370	1630	1855	2330	2530
50	215	340	517	760	1050	1310	1550	1760	2220	2410
40	203	317	490	717	995	1245	1465	1660	2100	2285
30	190	295	465	676	940	1185	1385	1565	1985	2165
20	178	273	438	635	888	1125	1305	1470	1870	2040
10	163	252	411	593	835	1062	1220	1372	1755	1920
0	150	230	385	550	780	1000	1140	1280	1640	1800

ing condition is indicated by a soft hissing sound in the telephones.)

- 4.—The desired signal should now be audible in the telephones and final adjustments may be made with the tangent wheel verniers.

Tuning for Signals of Unknown Wavelength

- 5.—Set the INDUCTANCE switch in the position corresponding to the range in which the signal is expected.
- 6.—Using both hands simultaneously adjust the CONDENSER and TICKLER dials over the entire range, maintaining the proportion necessary to keep the receiver on the verge of the oscillating condition. If the signal occurs below 10 on the CONDENSER dial, move the INDUCTANCE Switch to the next lower point, and if the signal occurs above 90, move the INDUC-TANCE switch to the next higher point.

SPECIAL TUNING INSTRUCTIONS

SPARK SIGNALS:

The reception and amplification of spark signals will be most satisfactory when the regenerative action is controlled to a degree which will produce maximum amplification without causing an oscillating condition in the circuits. When the oscillating condition is reached, the tone of the spark signal will be destroyed and reception through interference will become almost impossible.

MODULATED C. W. SIGNALS:

Modulated C. W. Signals, including I. C. W., Buzzer Modulated C. W. and Voice, may be received in a like manner, but a special condition may be obtained by allowing oscillations to take place in the receiver, producing the exact frequency of the incoming wavelength. This is known as the "zero beat" method and in this condition amplification is greatly increased due to the augmented feed-back of energy from the plate to the grid circuit. It is only possible to make use of this method while the incoming frequency remains constant and its successful application requires considerable skill.

C. W.:

In the reception of continuous waves the plate circuit feed back is to be increased to a point where oscillations are constantly taking place and this condition must be maintained throughout the entire tuning operations.

RECEIVERS USED AS WAVEMETERS

The wavelength of incoming signals or of any local oscillating circuit may be determined by noting the grid variometer dial setting and referring to the wavelength chart. This applies to the CR-8 Receiver and the CR-3 RORD combination. Where the CR-3 Receiver is used in conjunction with non-standard detecting apparatus, the readings will be inaccurate. The wavelength of local oscillating circuits may be obtained with the CR-5 or CR-9 Receivers by shunting the antenna and ground binding posts, noting the Condenser dial reading, and referring to the wavelength chart.

ELIMINATION OF INTERFERENCE:

The most successful means for reducing spark interference while receiving modulated C. W. signals is the use of the zero beat method described above. This will cause the spark signal to become distorted and suppressed while greatly increasing the amplification of the desired signal.

WAVELENGTH CHART FOR

GREBE INTERMEDIATE-WAVE REGENERATIVE RECEIVER TYPES CR-9 & CR-5.

USED AS OSCILLATOR-TERMINALS "ANTENNA & GROUND" SHUNTED.

ANTENNA SERIES CONDENSER SCALE	POINTS ON PRIMARY INDUCTANCE SWITCH, Q.									
	1	2	3	4	5	6	7	8	9	10
100	370	605	880	1260	1720	2200	2580	3020	3800	4000
90	350	575	830	1200	1630	2080	2440	2880	3600	3990
80	328	545	780	1140	1530	1965	2300	2730	3400	3590
70	308	515	735	1080	1440	1850	2160	2580	3190	3370
60	287	485	685	1010	1350	1740	2030	2440	2980	3160
50	268	457	640	960	1255	1620	1890	2200	2770	2940
40	247	422	590	900	1160	1510	1750	2140	2560	2740
30	226	398	545	840	1070	1390	1610	2000	2350	2530
20	205	365	500	780	970	1280	1475	1860	2140	2320
10	185	340	450	720	880	1160	1340	1700	1940	2100
0	165	310	405	660	790	1050	1200	1360	1720	1900

Eliminating interference from spark and modulated C. W. signals while receiving C. W. Signals.

As the oscillating condition is a pre-requisite in the reception of C. W. signals, it follows that spark signals are more readily suppressed than are the modulated C. W. signals. Where the carrier wavelength of the modulated C. W. signal and the wavelength of the desired signal are almost identical it will only be possible to suppress the undesired signal by changing the frequency of the desired signal to the point where the carrier wave frequency of the modulated C.W. signal is beyond audibility. In the Types CR-3 and CR-8 receivers, an additional freedom from spark interference is to be gained by the use of the coupling adjustment.

The elimination of C. W. Signals while receiving spark signals is easily accomplished by reducing the PLATE VARIOMETER or TICKLER dial setting until the oscillations cease, unless the C. W. station is very powerful and located nearby.

**INSTRUCTIONS FOR THE INSTALLATION
AND OPERATION OF
GREBE TYPE CR-8 AND CR-3
SHORT-WAVE REGENERATIVE
RECEIVERS**

INSTALLATION:—The Receiver should be placed in a position convenient for operating control.

Connect the Antenna and ground leads to the terminals so marked.

Connect a 6 Volt Storage Battery to the terminals marked "Filament Battery."

Connect a 22½ Volt Battery unit to the terminals marked "Plate Battery."

NOTE:—Make certain that all battery leads are connected to the proper terminals and that the polarities are not reversed.

Connect the telephones, or amplifier unit, to the terminals marked "Output."

Turn the rheostat wheel to the "off" position and place the vacuum tube in the socket. The rheostat may now be rotated to 2.

OPERATION:—To tune the receiver to a given

wavelength, the Antenna Inductance Switches and the Grid Variometer must all be adjusted to that wavelength, and the Wavelength Range Wheel set in the position indicating the upper limit of the wavelength band in use.

The figures opposite the contacts of the Antenna Inductance Switches represent the number of turns in the antenna circuit. Divide the wavelength desired by 14 to find the approximate number of turns to use.

The proper setting of the Grid Variometer for a given wavelength may be found by referring to the Wavelength Chart.

The Plate Variometer Dial controls the regenerative action and its proper setting for spark signals is best determined by advancing the dial until the signal is of maximum audibility without distortion. For C. W. signals, the dial must be advanced beyond this point, i. e., until oscillations occur,—a condition easily recognized by a soft hissing sound in the telephones. The Coupler should be set at 50 for preliminary tuning and finally adjusted to tune out interfering signals.

As many signals are inaudible until the regenerative action takes place, it is advisable to adjust the Grid and Plate Variometers

simultaneously, and make final adjustment of Antenna Inductance for maximum signal strength. The tangent-wheel verniers are indispensable in accurately tuning all weak signals, especially C. W. and telephones.

LOCATION OF FAULTS:—

(a) If adjustment of Plate Variometer fails to produce regeneration, adjust filament current, plate voltage, or both.

(b) If adjustment of Plate Variometer produces regeneration but no appreciable increase in signal strength, adjust Antenna Inductance, Coupling, or both.

(c) If vacuum tube filament fails to light, or flickers, remove the tube and clean the ends of its four contactors with a file or sand-paper.

(d) Grinding noises are caused by:

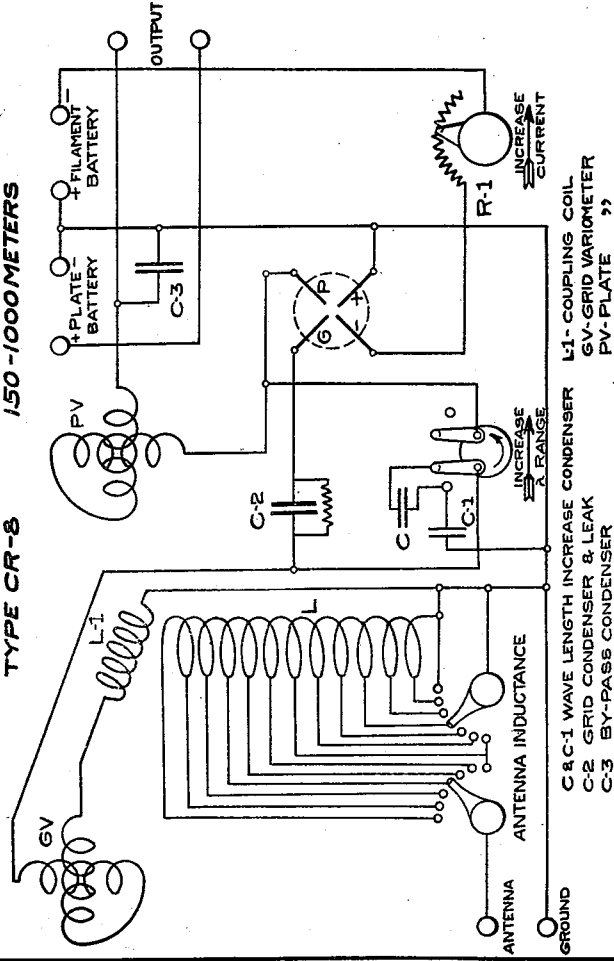
1.—Faulty Connections.

2.—Defective Plate Batteries.

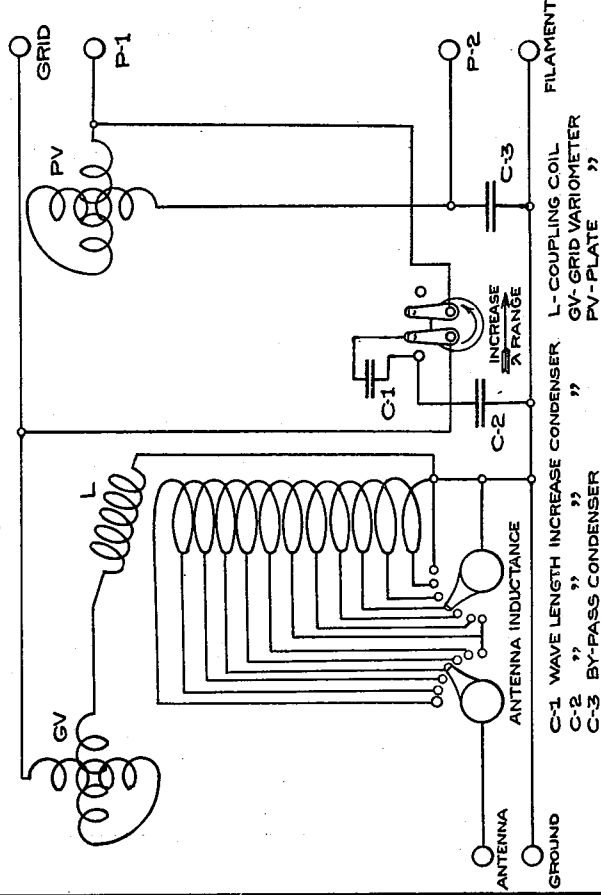
3.—Defective Vacuum Tubes.

Unlike static disturbances, these noises persist when the antenna is disconnected, and they may be eliminated by tightening binding posts, cleaning the ends of the vacuum tube contactors, or replacing defective tubes or batteries.

**INTERNAL WIRING DIAGRAM
FOR
GREBE SHORT-WAVE REGENERATIVE RECEIVER
TYPE CR-8**



**INTERNAL WIRING DIAGRAM
FOR
GREBE SHORT-WAVE REGENERATIVE RECEIVER
TYPE CR-3**



**INSTRUCTIONS FOR THE INSTALLATION
AND OPERATION OF
GREBE TYPE CR-9 AND CR-5
INTERMEDIATE-WAVE REGENERATIVE
RECEIVERS**

INSTALLATION:—The receiver should be placed in a position convenient for operating control.

Connect the Antenna and Ground leads to the terminals so marked.

Connect a 6 Volt Storage Battery to the terminals marked "Filament Battery."

Connect two 22½ Volt Battery units in series. Connect the junction of these batteries to the terminal marked "Detector." Connect the ends of these batteries to the remaining terminals marked "Amplifier."

NOTE:—Make certain that all the battery leads are connected to the proper terminals and that the polarities are not reversed. Connect the telephone terminals to one of the plugs supplied with the set.

Turn all three rheostat wheels to the "off" position and place the vacuum tubes in the

sockets. Insert the telephone plug into the jack marked "Detector," and turn the detector rheostat wheel to 2.

OPERATION:—Combinations of antenna inductance and antenna series capacity, as indicated by the Inductance Switch and the Condenser Dial, result in the wavelengths shown for these combinations on the Wavelength Chart. The Tickler Dial controls the regenerative action and its proper setting for spark signals is best determined by advancing the dial until the signal is of maximum audibility without distortion. For C. W. signals the dial must be advanced beyond this point, i. e., until oscillations occur, a condition easily recognized by a soft hissing sound in the telephones.

As many signals are inaudible until regenerative action takes place, it is advisable to adjust the Condenser and Tickler Dials simultaneously. The Vernier Wheels are essential in accurately tuning all weak signals, especially C. W. and telephones.

After tuning and detector adjustments have been made, the telephone plug may be changed to the 1st Stage Amplifier position and the corresponding rheostat adjusted for maximum signal strength. The same procedure is followed in adjusting the

second stage. When it is desired to use a loud-speaker this instrument should be connected to the terminals marked "Loud Speaker," and the telephone plug inserted into the second stage jack just far enough to light all three filaments.

When it is desired to use the amplifier section in conjunction with external tuning and detector apparatus, connect the output of the external detector to the other plug supplied with the set. Also connect the filament leads of the external detector to the terminals marked "External Filament." Thus, when the plug is inserted into the jack marked "External Detector," the automatic control device will cause the external filament to be lighted and the filament of the detector tube in the CR-9 to be extinguished.

LOCATION OF FAULTS:—

(a) If adjustment of Tickler fails to produce regeneration but no appreciable increase in signal strength, adjust Condenser.

(b) If vacuum tube filaments flicker or fail to light remove the tubes and clean the ends of their contactors with a file or sandpaper. If this does not eliminate the trouble, it may be necessary to adjust the filament control blades of jacks.

NOTE:—Remove ALL plate battery connections before making these adjustments, to prevent short circuit resulting in the burning out of vacuum tube filaments.

(c) If both stages fail to produce amplification, the trouble may be traced to faulty plate batteries, or the reversal of the filament battery leads. Defective tubes cause the majority of other troubles. It is desirable to try the tubes in various combinations for detector, 1st and 2nd stages.

Grinding noises are caused by:

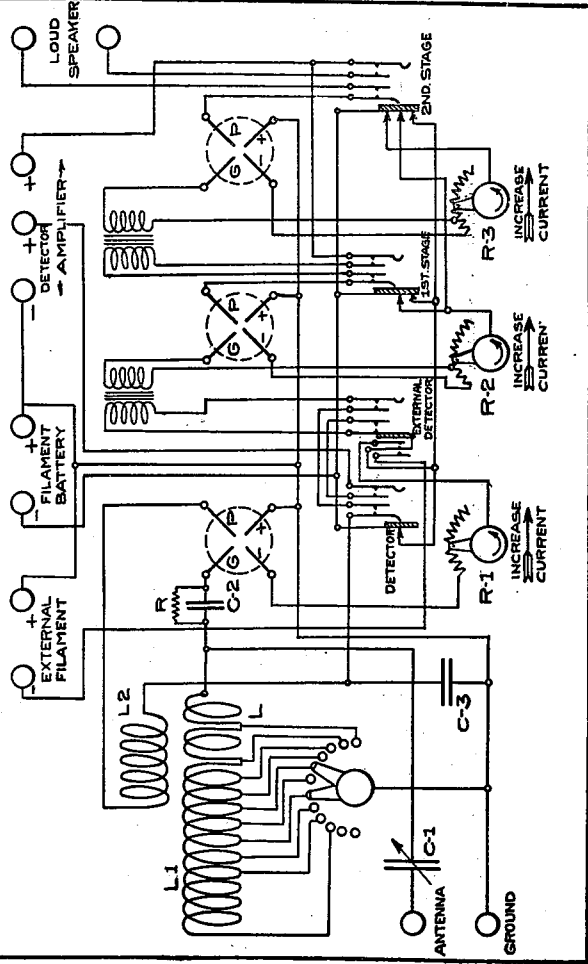
- 1.—Faulty connections.
- 2.—Defective plate batteries.
- 3.—Defective vacuum tubes.

Unlike static, these noises persist when the antenna has been disconnected and they may be eliminated by tightening binding posts, cleaning the ends of vacuum tube contactors, or replacing defective tubes or batteries.

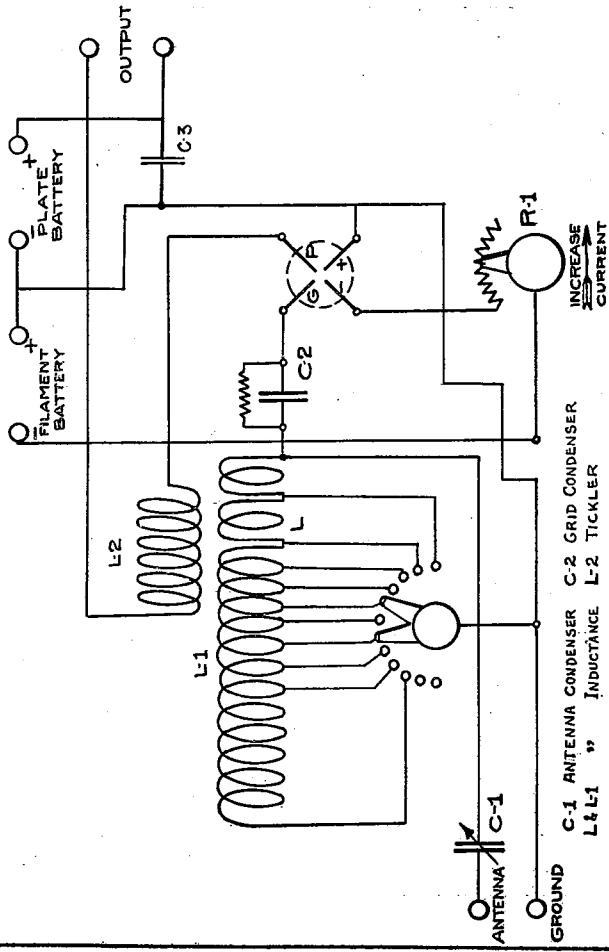
Complete wiring diagrams for both the type CR-9 and CR-5 are shown. A careful study of these circuits will prove helpful in the operation of the receivers.

TYPE CR-5:—The operation of the CR-5 Receiver is essentially the same as the Type

**INTERNAL WIRING DIAGRAM
FOR
GREBE INTERMEDIATE-WAVE REGENERATIVE RECEIVER
TYPE CR-9**



**INTERNAL WIRING DIAGRAM
FOR
GREBE INTERMEDIATE-WAVE REGENERATIVE RECEIVER
TYPE CR-5.**



- C-1 ANTENNA CONDENSER
- C-2 GRID CONDENSER
- L-1 " INDUCTANCE
- L-2 TICKLER

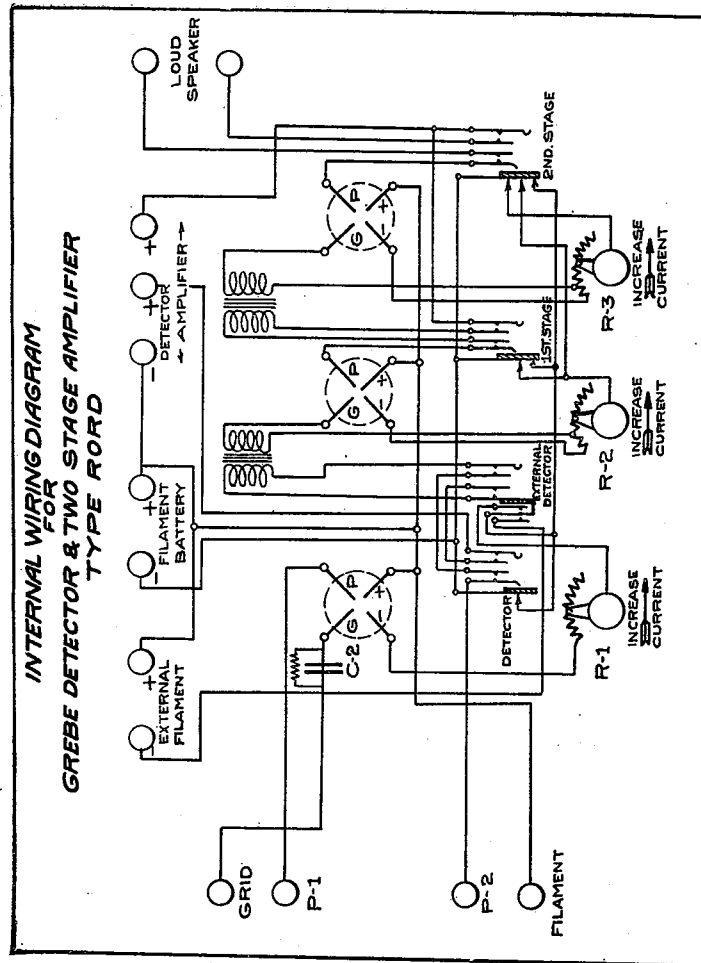
CR-9 with the exception that the amplifiers are not included. Refer to the diagrams for proper connections.

The Type CR-5 Receiver in combination with the Type Rork Two-stage amplifier is equivalent to the Type CR-9. Diagrams and instructions covering the Receiver-amplifier combinations are given in the "Instructions for the Installation and Operation of Amplifier and Detector-Amplifier units."

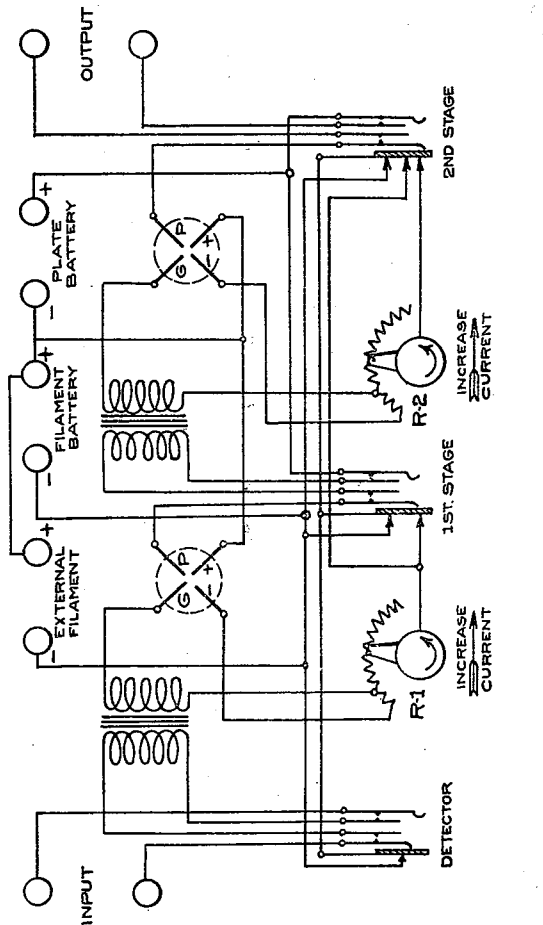
**INSTRUCTIONS FOR THE INSTALLATION
AND OPERATION OF
GREBE TYPE RORK AND RORD DETECTOR
AND DETECTOR-AMPLIFIER UNITS**

**INSTALLATION OF THE TYPE RORD
DETECTOR AND TWO-STAGE AMPLIFIER**

The Detector-Amplifier unit should be placed as close to the receiver as possible in order to avoid lengthy leads. The four terminals on the left are provided for externally connecting the amplifier with the receiver. (See diagram of terminal block connections).



INTERNAL WIRING DIAGRAM
FOR
GREBE TWO STAGE AMPLIFIER
TYPE - RORD.



Connect a 6 volt battery to the terminals marked "Filament Battery."

Connect two 22½ volt battery units in series. Connect the junction of these batteries to the terminal marked "Detector." + Connect the ends of these batteries to the terminals marked "Amplifier."

NOTE:—Make certain that all battery leads are connected to the proper terminals and that the polarities are not reversed.

Connect the telephone terminals to one of the plugs supplied with the unit.

Turn all the rheostat wheels to the "Off" position, and place the vacuum tubes in the sockets.

Insert the telephone plug in the jack marked "Detector" and turn the detector rheostat wheel to 2.

OPERATION OF THE TYPE RORD DETECTOR AND TWO-STAGE AMPLIFIER

After tuning and detector adjustments have been made, the telephone plug may be changed to the 1st stage amplifier position and the corresponding rheostat adjusted for maximum signal strength. The same procedure is followed in adjusting the 2nd stage.

When it is desired to use a loud speaker, this

instrument should be connected to the terminals marked "Loud Speaker" and the telephone plug inserted in the second stage jack just far enough to close the filament circuit of all three tubes.

When the amplifier section is used with external tuning and detecting apparatus, connect the output of the external apparatus to a telephone plug. Also connect the filament leads to the terminals marked "External Detector." Thus, when the plug is inserted in the jack marked "External Detector" the automatic control device will cause the external detector tube filament to light and the detector tube filament in the Rord will be extinguished.

LOCATION OF FAULTS:—

(a) If vacuum tube filaments flicker or fail to light, remove the tubes and clean the ends of the contactors with a file or sandpaper. If this does not eliminate the trouble, it may be necessary to adjust the automatic control jacks.

NOTE—Remove All Plate Battery connections before making jack adjustments to prevent short circuit resulting in the burning out of vacuum tube filaments.

(b) If both stages fail to produce amplification, the trouble may be traced to faulty plate batteries, or the reversal of the filament battery leads. Defective tubes cause a majority of other

troubles. It is desirable to try the tubes in various combinations for detector, 1st and 2nd stage.

(c) Grinding Noises are caused by:—

- 1.—Faulty connections.
- 2.—Defective plate batteries.
- 3.—Defective vacuum tubes.

Unlike static, these noises persist when the antenna is disconnected. They may be eliminated by tightening all terminals, cleaning vacuum tube contactors or replacing defective tubes or batteries.

INSTALLATION OF TYPE RORK TWO-STAGE AMPLIFIER

Connect a six volt storage battery to the terminals marked "Filament Battery."

Connect two 22½ Volt battery units in series; connect the ends of these two batteries to the terminals marked "Plate Battery."

NOTE:—When this amplifier is used with the Grebe Type CR-5 or CR-8 Receiver, a connection may be made from the junction of the two 22½ Volt batteries to the + Plate Battery Terminal on the receiver. With this circuit a single plate battery is made to serve both units. No connection need be made to the—"Plate Battery" terminal on the receiver as this circuit is completed through the positive side of the Filament

Battery which is common to both Receiver and Amplifier. Connect the "Filament Battery" terminals of the receiver to the "External Filament" terminals of the amplifier. Connect the output or telephone terminals of the receiver to the terminals marked "Input" on the amplifier.

OPERATION OF THE TYPE RORK TWO STAGE AMPLIFIER

For operation of this unit refer to instructions under "Operation of Type Rord Detector and Two-Stage Amplifier, but disregard third paragraph which relates to the use of the "External Detector plug."

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