

- 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 Wave-length

- 9.—Set the GRID VARIOMETER dial to correspond with the desired wave-length. See wave-length 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 Wave-length

- 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 wave-length 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 WAVE-LENGTH CONTROL circuit is adjusted to the same wave-length as the desired signal, and the TICKLER is adjusted to the point of greatest amplification.

Tuning for Signals of Known Wave-Length

- 1.—Set the INDUCTANCE switch for the desired wave-length range. See wave-length chart, page 19.
- 2.—Set the CONDENSER dial to the position corresponding to the wave-length desired. See wave-length 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 antenna 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	2280
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 Wave-length

- 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 conditions. 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 wave-length. 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 wave-length of incoming signals or of any local oscillating circuit may be determined by noting the grid variometer dial setting and referring to the wave-length 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 wave-length 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 wave-length 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 wave-length of the modulated C. W. signal and the wave-length 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

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

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

The proper setting of the Grid Variometer for a given wave-length may be found by referring to the Wave-length 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 turning 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.

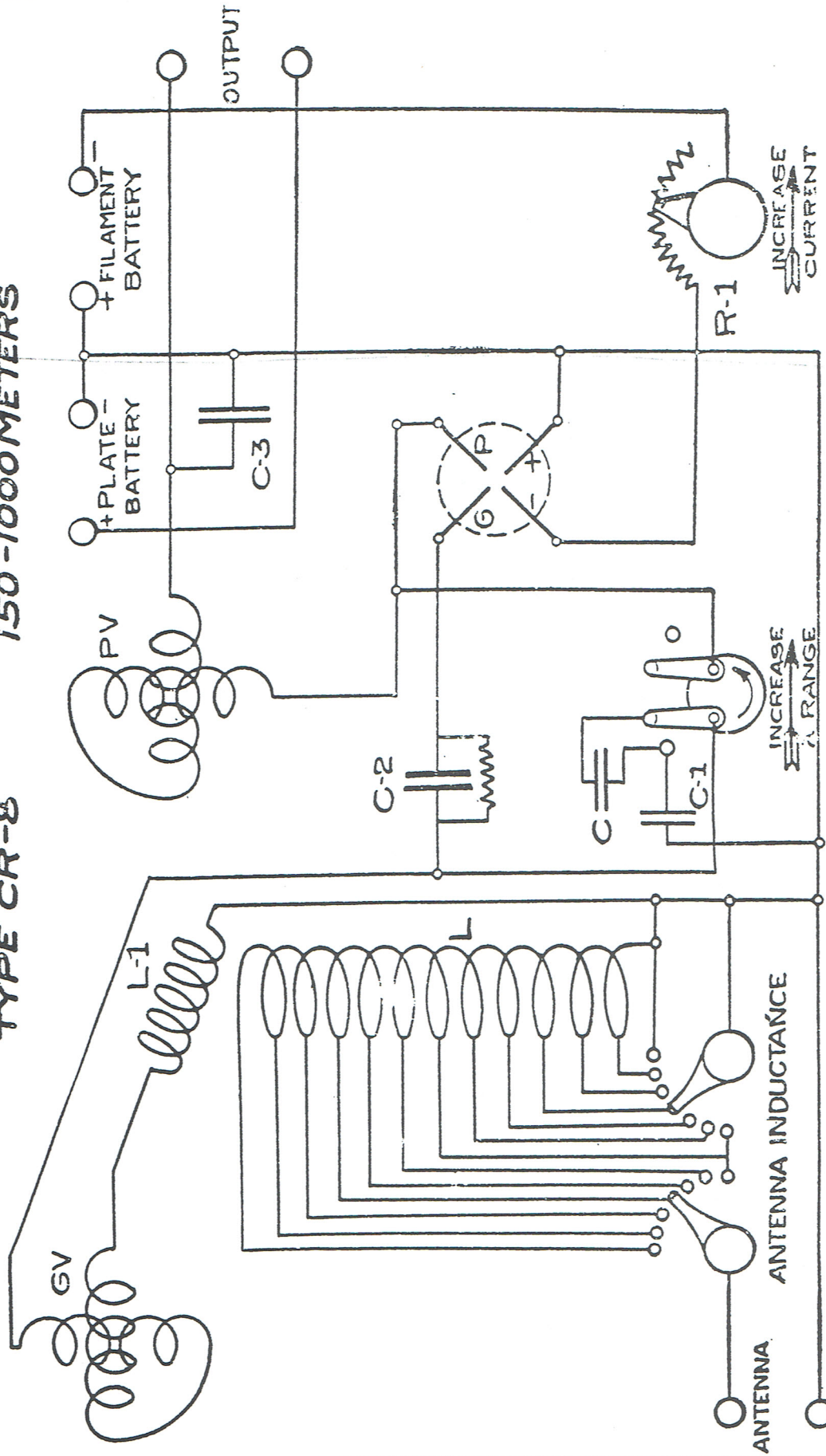
(c) If vacuum tube filament fails to light, or flickers, remove the tube and clean the ends of its four contactors with a file or sand-paper.

(d) Grinding noises are caused by:

- 1.—Faulty Connections.
- 2.—Defective Plate Batteries.
- 3.—Defective Vacuum Tubes.

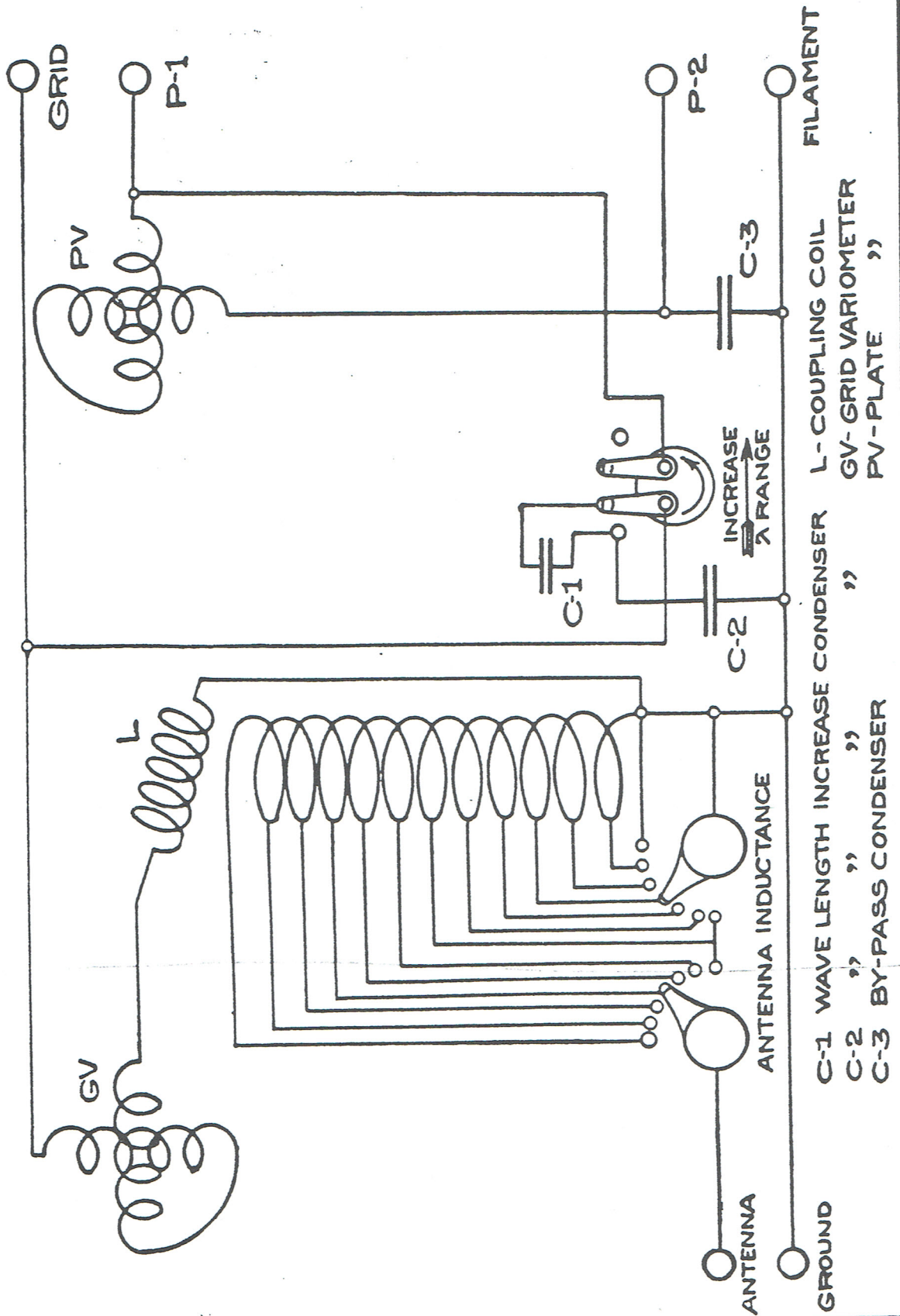
Unlike static disturbances, these noises persist when the antenna is disconnected, and they may be eliminated by tightening binding posts, cleaning the ends of the vacuum tube contactors, or replacing defective tubes or batteries.

**INTERNAL WIRING DIAGRAM
FOR
GREBE SHORT-WAVE REGENERATIVE RECEIVER
TYPE CR-8 150-1000 METERS**

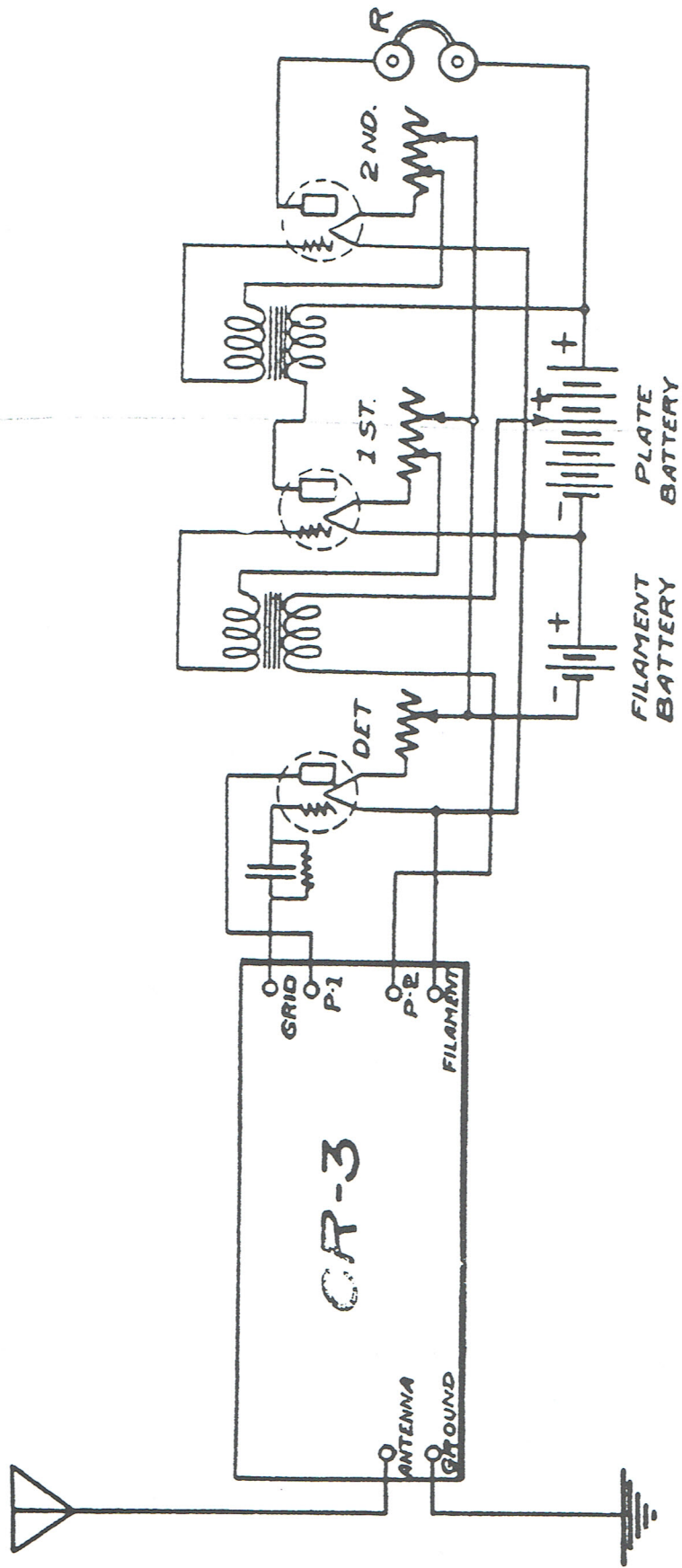


- C & C-1 WAVE LENGTH INCREASE CONDENSER
- C-2 GRID CONDENSER & LEAK
- C-3 BY-PASS CONDENSER
- L-1 COUPLING COIL
- GV- GRID VARIOMETER
- PV- PLATE ?

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



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



Complete wiring diagrams for both the Type CR-8 and Type CR-3 are shown. A careful study of the circuits will prove helpful in the operation of the receivers.

TYPE CR-3:—The operation of the Type CR-3 is essentially the same as the CR-8, with the exception that the detector is not included in the set. Four terminals are provided for externally connecting the detector unit. Refer to the diagram for proper connections. The combination of the Type CR-3 Receiver with the Type RORD detector-amplifier represents a complete receiving station equipment, the detector-amplifier unit being also available for use with other receiving circuits.

The Type CR-8 Receiver in combination with the Type RORK Two-Stage Amplifier unit is a complete station equipment in which the two stages of amplification are available for use with other receiving circuits.

Diagrams and instructions covering the receiver-amplifier combinations are given in the "Instructions for the Installation and Operation of Amplifier and Detector-Amplifier Units."