A4
RECEIVER
TECHNICAL NOTES

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TELEPHONE: WELWYN GARDEN 800

Preface

IT is too early yet to issue a service manual for the A4 receiver; but in the meantime the following "Technical Notes" are provided to assist Dealers. They must be regarded as provisional only and are intended simply to give an idea of the circuit of the set, the position of the various components, and so on.

Chief Engineer.

THE CIRCUIT

The Murphy A4 is a 4-valve set working on the supersonic principle. The accompanying schematic diagram (fig. 1 page 6) shows the circuit.

The first valve, V1, is a combined oscillator and first detector. It is a pentode ; oscillations are set up between the " screen " or auxiliary grid and the anode (by the coils L9, L11, etc., and condenser C1C). The incoming signals are tuned by the band-pass filter L3, L7 and condensers C1A and C1B, and go to the control grid of V1. This amplifies them, and in the anode circuit they are mixed with the local oscillations and rectified, the result being an I.F. signal at 117k/c.

The coils L13 and L14 are tuned to this frequency and form the first I.F. transformer : V2 is a multi-mu valve acting as I.F. amplifier. Its output is passed on by the second I.F. transformer L15, L16 to the second detector V3: both I.F. transformers are really band-pass filters.

You will see that gramophone working is possible by using the jack provided. On inserting the plug, V3 becomes an amplifier with about 3V bias ; when used as second detector it is biassed to 6V, and becomes an anode bend rectifier. Note that the leads from plug to pick-up should not be disconnected nor should a condenser be inserted in series, because this would cause an open grid circuit and may thus damage the valve.

V3 is resistance coupled by R8 to the power valve V4. R9 is a decoupling resistance, R10 the grid leak of V4, and R11 and R12, with C25, form an H.F. filter to reduce in value the radio or I.F. voltage in the output.

V4 is the power valve—a pentode—and C27 and R13 form a tone-correcting circuit. R13 is made variable, and acts as tone control.

The actual controls of the set are thus four in number :—

(1) Upper central knob : Ganged tuning condenser.
(2) Left-hand knob : Volume control.
(3) Central Knob : Tone control.
(4) Right-hand knob : On-off and wave-change switch.

There are one or two special points about the diagram which call for attention.

First, the condenser C7, between grid and anode of V1. It was found that although the local oscillation is set up between anode and screen of V1 a little of the energy got through to the grid and so back to the aerial, causing radiation. To avoid this C7, which is really a neutralising condenser, is introduced. C7 is not an ordinary condenser at all : but the two leads concerned are held together for an inch or so. You will see this between the assemblies V.919 and W.907 below the chassis.

Second, R7, the volume control. This is the usual grid bias control for a multi-mu valve ; but to make sure that it is powerful enough for very strong stations, the far end of the variable resistor is taken back to the aerial terminal, so when the volume control is turned to minimum, we not only put large bias on V2, but we also put a low resistance across the aerial coils, and so cut down the input.

Third, C21 and C26. These are just R.F. bypass condensers to keep R.F. out of the output circuit.

Fourth, supply circuits. The H.T. smoother is of the usual type ; C28 and C30 are electrolytic condensers. The choke and the field coil (which acts as second choke) are put in the negative side, so that bias can be got from resistors R14 to R17 across the field coil.

PRACTICAL LAYOUT

Now as to the practical layout of the set. It differs from the A3 and A8 in one important respect. The loud-speaker is not part of the chassis, but is fixed to the cabinet. The field and speech coil leads are flexible, with plug and socket connections to the chassis.

Fig. 2 is a plan of the chassis. It shows the components that are above the base, and also the fittings on the back edge. Note carefully the peculiar order of the valves, to avoid mistakes in fitting new ones. The actual valves used are :—

Left hand	V4	AC/PEN.
Second	V1	AC/PEN.
Third	V2	AC/SGVM.
Right hand	V3	AC/HL.
Back Right hand	V5	Marconi U12. Rectifier.

On turning the chassis over, we get the " worms-eye " view shown in Fig. 3. Most of this is clear enough ; but there are three component assemblies that call for special notice, and we also give separate illustrations of them.

W.907. This is a block of ten condensers and ten resistors. Fig. 4 shows how it is arranged, looking at the left side where the tags show. The numbers on the condensers and resistors show where they are in the circuit, by referring to the schematic (Fig. 1).
The arrow heads show where all the external connections go to, so that by the aid of this diagram one can change the assembly and put in a spare without error in re-wiring. (The common point of eight of the condensers is earthed to the case).

V.919. This lies between V1 and V4. Its connections are shown in Fig. 5.

V.920. This lies between V3 and V5, and is shown in detail in Fig. 6.

Returning to Fig 3, note the position of C7 which, as already explained, is formed by running two leads together for an inch or so. The trimmers C2, C4, C8 for medium waves and C3, C5 and C9 for long waves are also shown.

The I.F. trimmers C13, C14, C17, C18 are on the back edge of the chassis, *and are on no account to be touched*, as they can only be set by special methods in the factory.

VOLTAGES AND CURRENTS

The following are the voltages and currents in the various valves, etc. Except where stated otherwise, voltages are to chassis, and are those obtained with a " 1000 ohms-per-volt " meter :—

Mains transformer HT sec. (i.e., grid or anode socket of rectifier to—side of C28 : 300V *A.C.*)

Across C28 (neither side earthed) 320V D.C.
C30+tag : 200 v.
V4 Anode : 180 to 200 v. 30 mA.
V4 Screen : 200 v. about 5mA.
V3 Anode : (gram. plug not in, no signals) 130-150 v. 0.2 mA.
V2 Anode : (Vol. Control at max) 200 v. 7-8 mA.
V2 Screen (Vol. Control at max.) 80 v. 1.5 mA.
V2 Grid : —2 to —40 v., as vol. control varied.
V1 Anode : 100 v. 1.5—2 mA.
V1 Screen : 40 v.
Consumption from supply mains 54 watts.

DISMANTLING

To remove the chassis from the cabinet, first take off all control knobs. Then loosen the two screws at the top of the wooden back (they cannot be removed altogether) ; pull out the top and lift a little, and the back will come off.

Take out the loud-speaker plugs from the sockets on the left, and also the field plugs from the socket-strip on the mains transformer. Then with a $\frac{1}{4}$" Whitworth box spanner remove the three hex-headed holding down screws. This must be done working from below, with the set projecting over the edge of the bench.

The chassis will now slide out.

If it is desired to remove the loud-speaker, first take out the chassis as above. Then turn the cabinet on its face, and remove the four screws in the two metal plates on the cross-bar holding it. The speaker is then free.

Note that the Number of the set is given on the nameplate fixed to the cabinet back ; it is *repeated* on the chassis itself (see Fig. 2). If by any chance you have two sets down together, see that each chassis goes back into its own cabinet. This is important ; for the tuning *indicator* is on the *cabinet*, and the *scale* on the *chassis:* if the chassis is assembled in a cabinet that does not belong to it, the calibration may be wrong.

TRIMMING

It is important to realise that the I.F. trimmers, C13, C14, C17, C18 cannot be adjusted without special apparatus.

We are going into this matter and hope before long to complete the design of special apparatus for this set and the A8, in a form and at a price suitable for our Dealers : but till then, any A4 receiver with faulty I.F. trimming must be returned to factory.

For trimming the other circuits of the A4, the following apparatus is required :—

(1) D.C. milliameter, 0-1 mA, with adaptor for valve.

(2) An insulated screwdriver. The blade should be either covered with sleeving or wrapped with insulating tape for about an inch from the tip, leaving only 1/16th" of the tip of the blade exposed.

Trim as follows :—

(1) Put the milliameter in the anode circuit of V3. Do all the adjustment by watching the meter, not by listening.

(2) Tune a fairly strong station between 220—230 m : identify it definitely, and look up its wave-length in " World Radio." Compare with the reading on the set. If it is correct, go on at once to (3) below.

If not correct, adjust the tuning control to exactly the right wave-length of the station, and then trim on C8 till you get the biggest meter reading.

(3) Trim C2 to increase the reading, if possible.

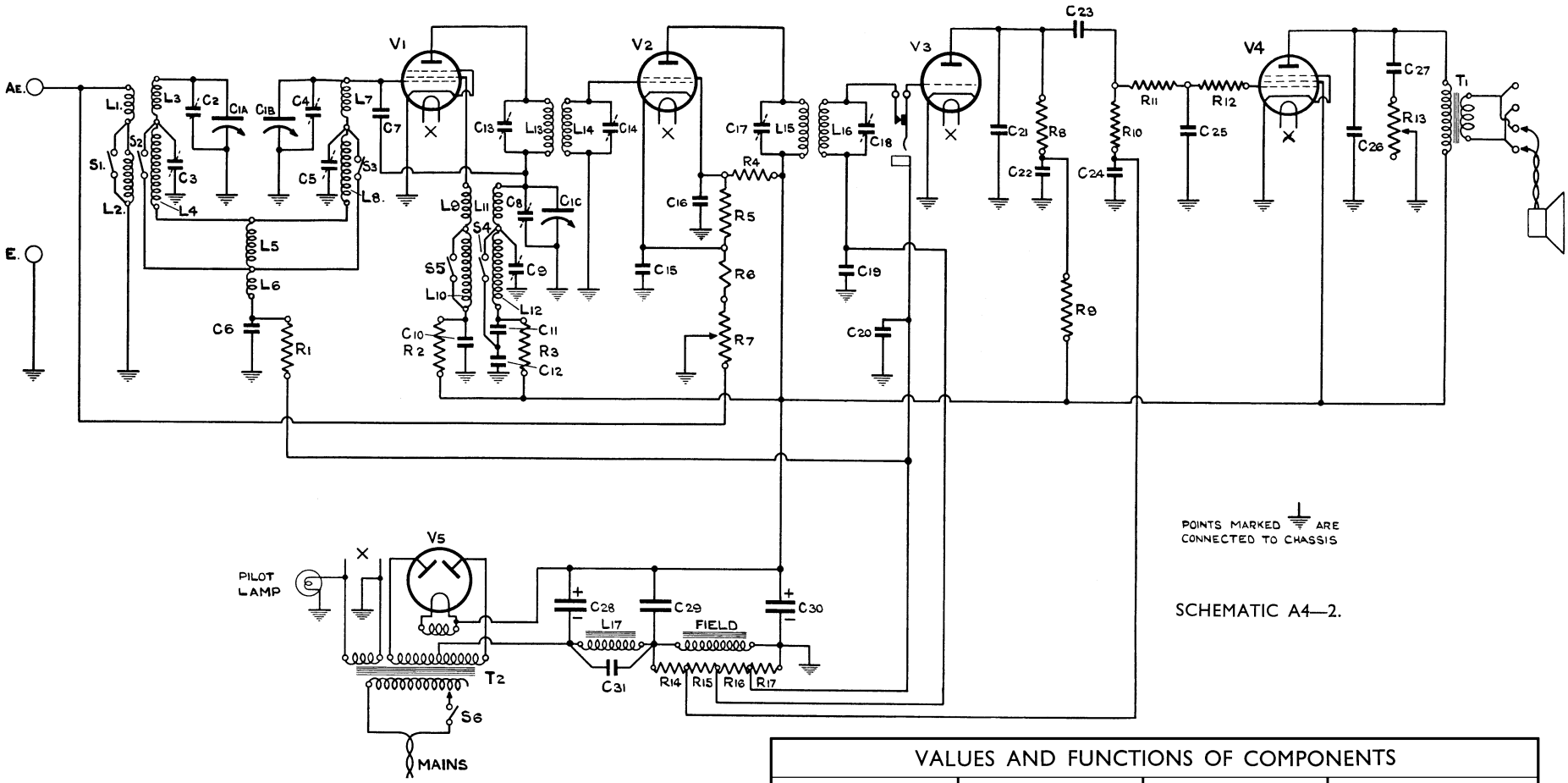
(4) Do not touch the main tuning control. Trim C4 to best output : go back to C2 and see if it needs further adjustment and go on checking C2 and C4 alternately till you get no improvement.

(5) Switch to long waves. Get on to Oslo, or the nearest station you can to 1,000 metres. Check its wave-length in " World Radio " against the setting : if correct, go on to (6). If not, set the tuning to the right wave-length, and trim o n C9 to max. Meter reading.

(6) Leave the tuning control set, and do as in (3) and (4) above, but working on C3 and C5 instead of C2 and C4.

If the test signal is sufficiently strong to deflect the m.a. needle beyond the calibrated portion of the scale, rotate the volume control in an anti-clockwise, direction to bring the needle to a useful part of the scale.

The point of exact resonance, i.e., the highest meter reading, is quite critical, consequently care is necessary if accuracy is to be obtained.



SCHEMATIC A4—2.

FIG. 1

RESISTANCE of TRANSFORMER WINDINGS, Etc.

T1	PRIMARY 700 Ω		SPEECH COIL 2 Ω	
	SECONDARY 0.15 Ω		FIELD COIL 2000 Ω	
T2	WINDING	50 ~ 200v.	50 ~ 100v.	25 ~ 200v.
	PRIMARY	200 v 35 Ω 230 v 38 Ω 250 v 42 Ω	100 v 8.2 Ω 110 v 9 Ω	200 v 45 Ω 230 v 53 Ω 250 v 58 Ω
	RECT. HEATER	.72 Ω	.72 Ω	1.22 Ω
	X	.5 Ω	.5 Ω	.85 Ω
	H.T. SECONDARY 1	256 Ω	256 Ω	380 Ω
	H.T. SECONDARY 2	330 Ω	330 Ω	380 Ω

VALUES AND FUNCTIONS OF COMPONENTS

CONDENSERS

No.	VALUE
C1A	GANG .0005
C1B	GANG .0005
C1C	GANG .0005
C2	5/70 M.MFDS.
C3	5/70 M.MFDS.
C4	5/70 M.MFDS.
C5	5/70 M.MFDS.
C6	.1 M.FD.
C7	SEE FOOT NOTE
C8	2½/15 M.MFDS.
C9	5/70 M.MFDS.
C10	.1 M.FD.
C11	1373 M.MFDS.
C12	2000 M.MFDS.
C13	70/140 M.MFDS.
C14	70/140 M.MFDS.
C15	.1 MFD.

CONDENSERS

No.	VALUE
C16	.1 MFD.
C17	70/140 M.MFDS.
C18	70/140 M.MFDS.
C19	.5 MFD.
C20	.1 MFD.
C21	.001 MFD.
C22	1.0 MFD.
C23	.025 MFD.
C24	1.0 MFD.
C25	.0002 MFD.
C26	.002 MFD.
C27	.025 MFD.
C28	4.0 MFD.
C29	1.0 MFD.
C30	8.0 MFD.
C31	.1 OR .4 MFD.

RESISTANCES

No.	VALUE
R1	50,000 Ω
R2	300,000 Ω
R3	50,000 Ω
R4	20,000 Ω
R5	20,000 Ω
R6	200 Ω
R7	8,000 Ω
R8	50,000 Ω
R9	25,000 Ω
R10	150,000 Ω
R11	100,000 Ω
R12	100,000 Ω
R13	50,000 Ω
R14	400,000 Ω
R15	20,000 Ω
R16	15,000 Ω
R17	15,000 Ω

VALVES

No.		TYPE
V1	OSC & 1ST DET.	AC/PEN
V2	I.F.	AC/SGVM MET.
V3	2ND DET.	AC/HL
V4	POWER	AC/PEN
V5	MAINS RECT.	MARCONI U12

SWITCHES

No.	FUNCTION
S1	CLOSE FOR S.W.
S2	CLOSE FOR S.W.
S3	CLOSE FOR S.W.
S4	CLOSE FOR S.W.
S5	CLOSE FOR S.W.
S6	CLOSE FOR ON.

C7—This Condenser consists of two pieces of connecting wire bound together for approx. 1½".

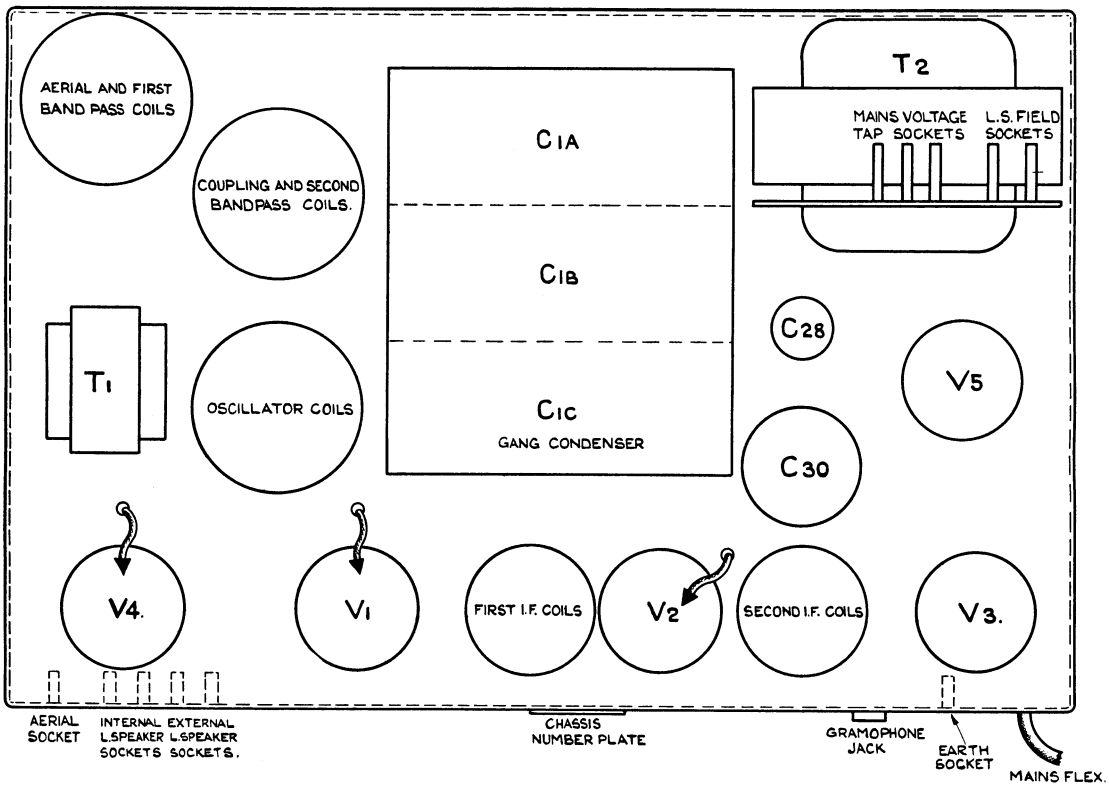


FIG. 2

PLAN OF CHASSIS

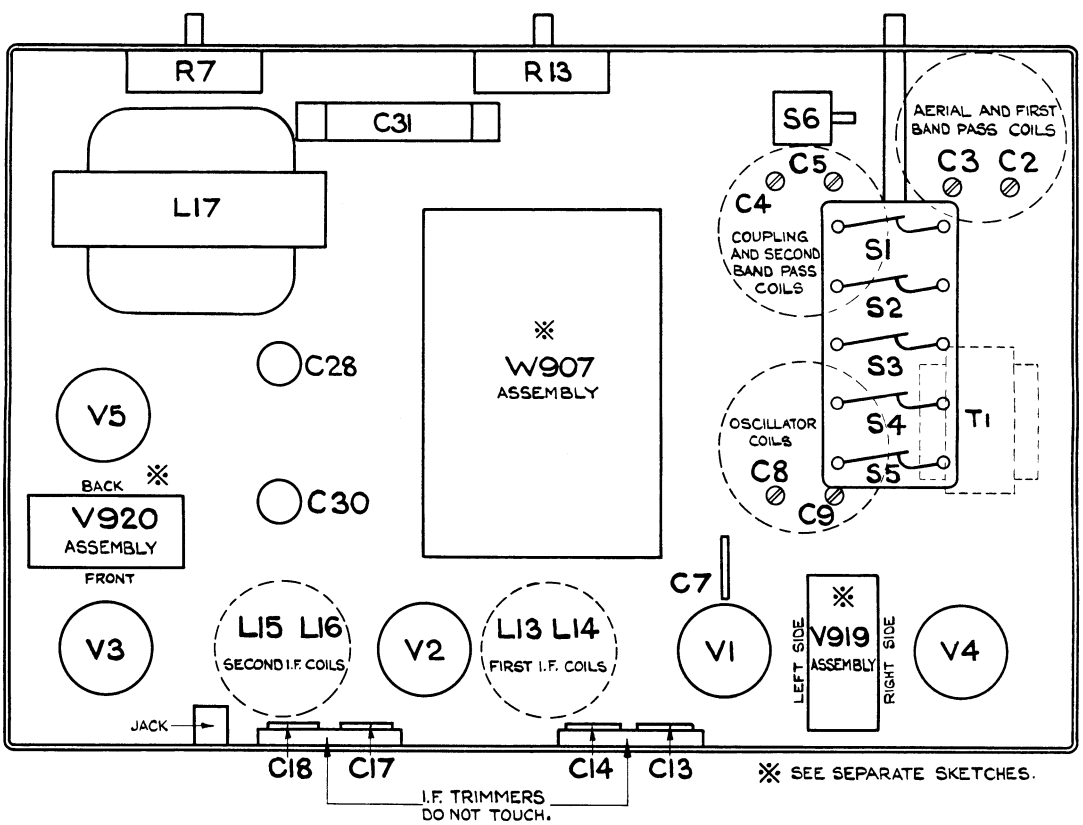
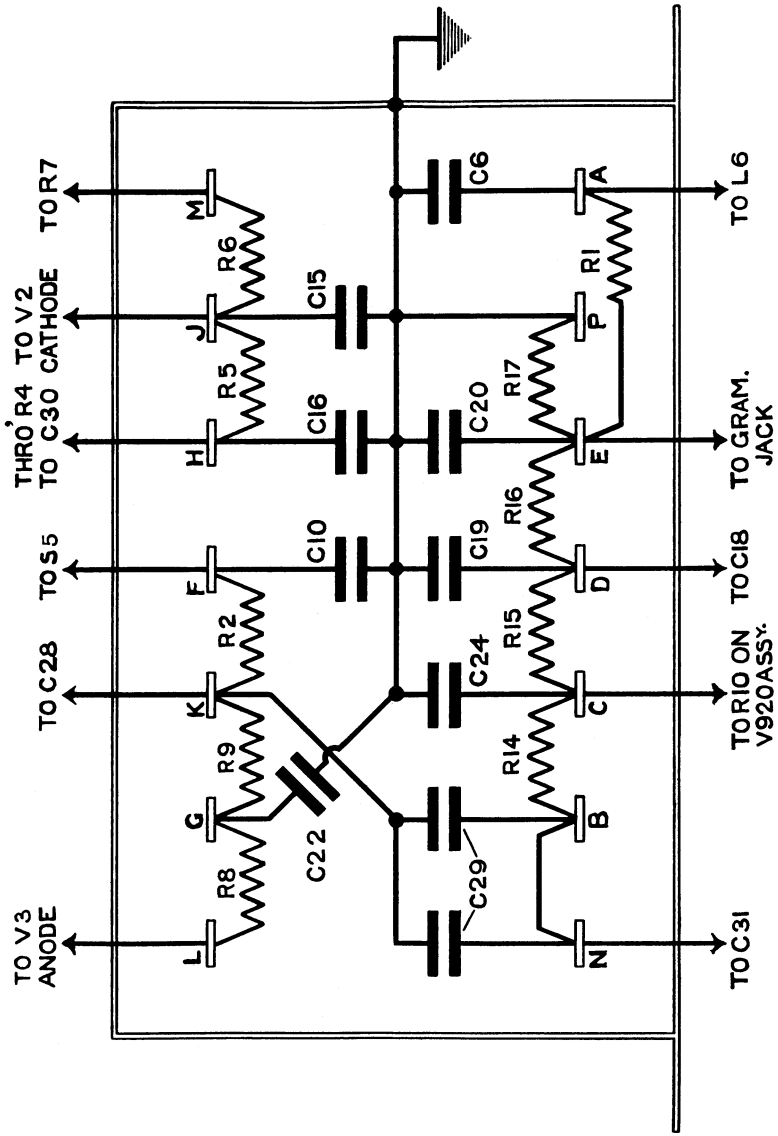


FIG. 3

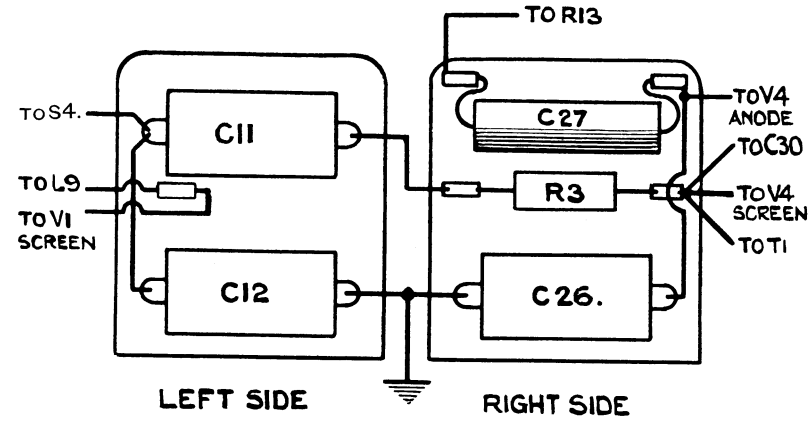
UNDERSIDE OF CHASSIS



W907 CONDENSER AND RESISTANCE ASSEMBLY

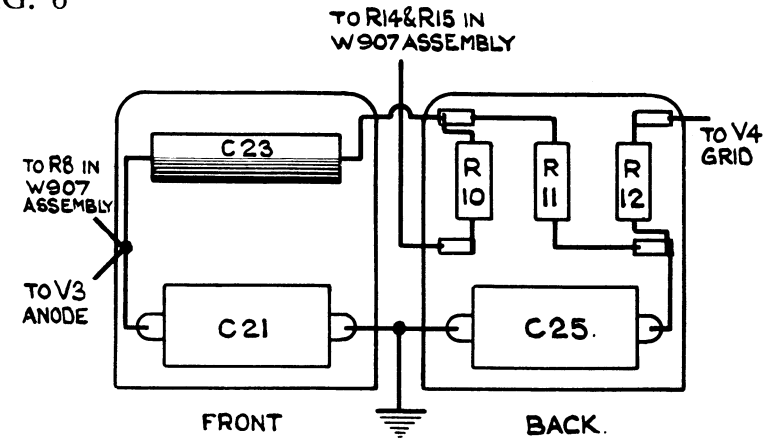
FIG. 4

FIG. 5



V919 ASSEMBLY

FIG. 6



V920 ASSEMBLY