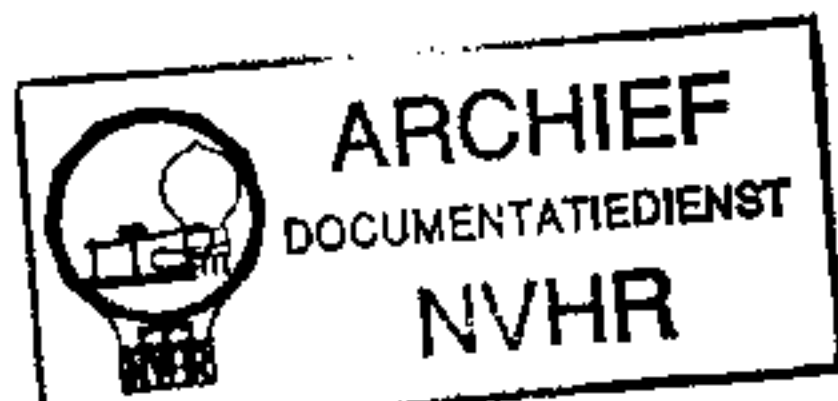
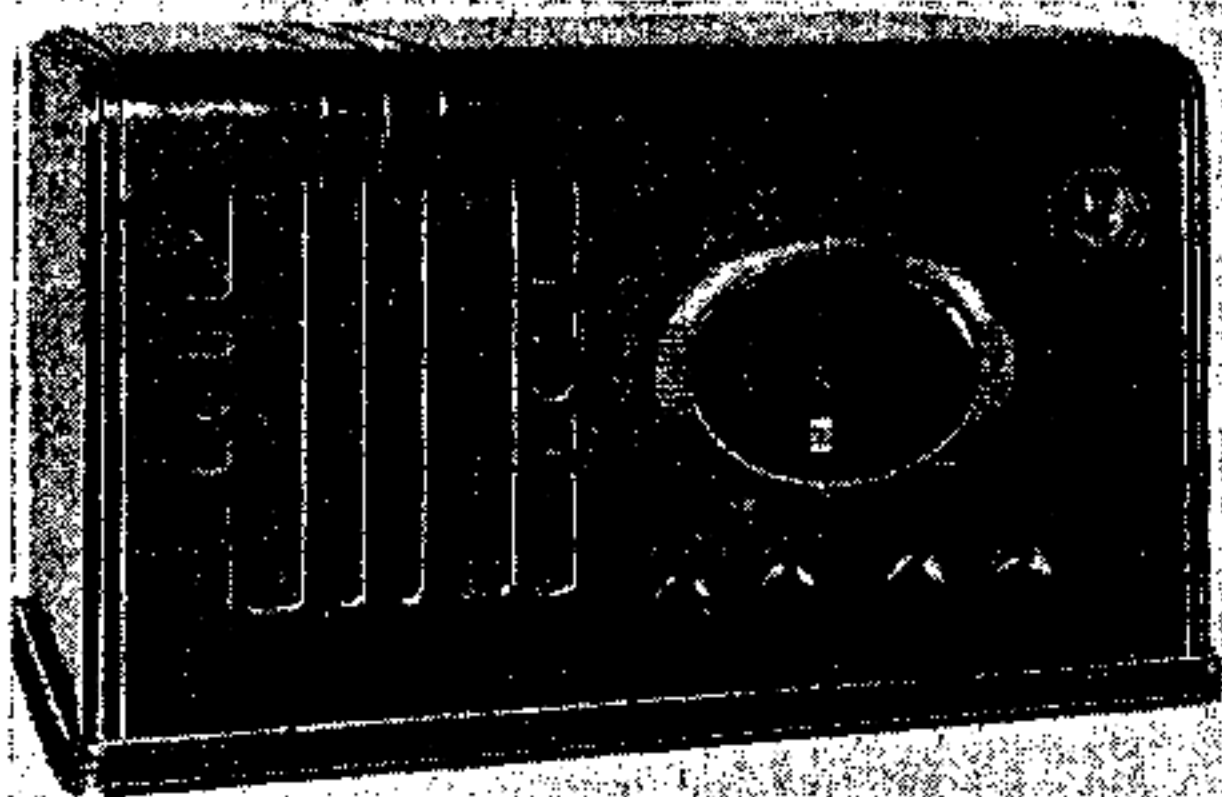


Ned. Ver. v. Historie v/d Radio



# BELMONT 800, 845

## AC/DC SUPERHETS



The Belmont 845 receiver.

**T**HE Belmont 800 and 845 receivers are two 6-valve (plus rectifier) 3-band superhets designed to operate from AC or DC mains of 100-260 V, 40-100 C/S in the case of AC. Both are table models and employ the same chassis, but this *Service Sheet* was prepared from a model 845.

The chassis is fitted with a cathode ray tuning indicator tube, and the tuning scale includes a coloured waveband indicator and a vernier pointer-setting dial. Except

for the tuning indicator, all the original valves were of the metal type, but they may all be replaced with glass types.

The chassis is basically designed so as to operate from 100 V mains, but resistances, including a "line cord," are provided for operation from 200-260 V mains.

*Release dates and original prices:* 800, June, 1937, £14 3s. 6d.; 845, August, 1936, £13 13s.

### CIRCUIT DESCRIPTION

Aerial input on MW is via isolating condenser C1, switch S1 and coupling coil L1 to inductively coupled band-pass filter. Primary coil L2 is tuned by C20; secondary coil L7 is tuned by C25. Coupling by coil L4, which really constitutes a portion of L2, wound close to L7.

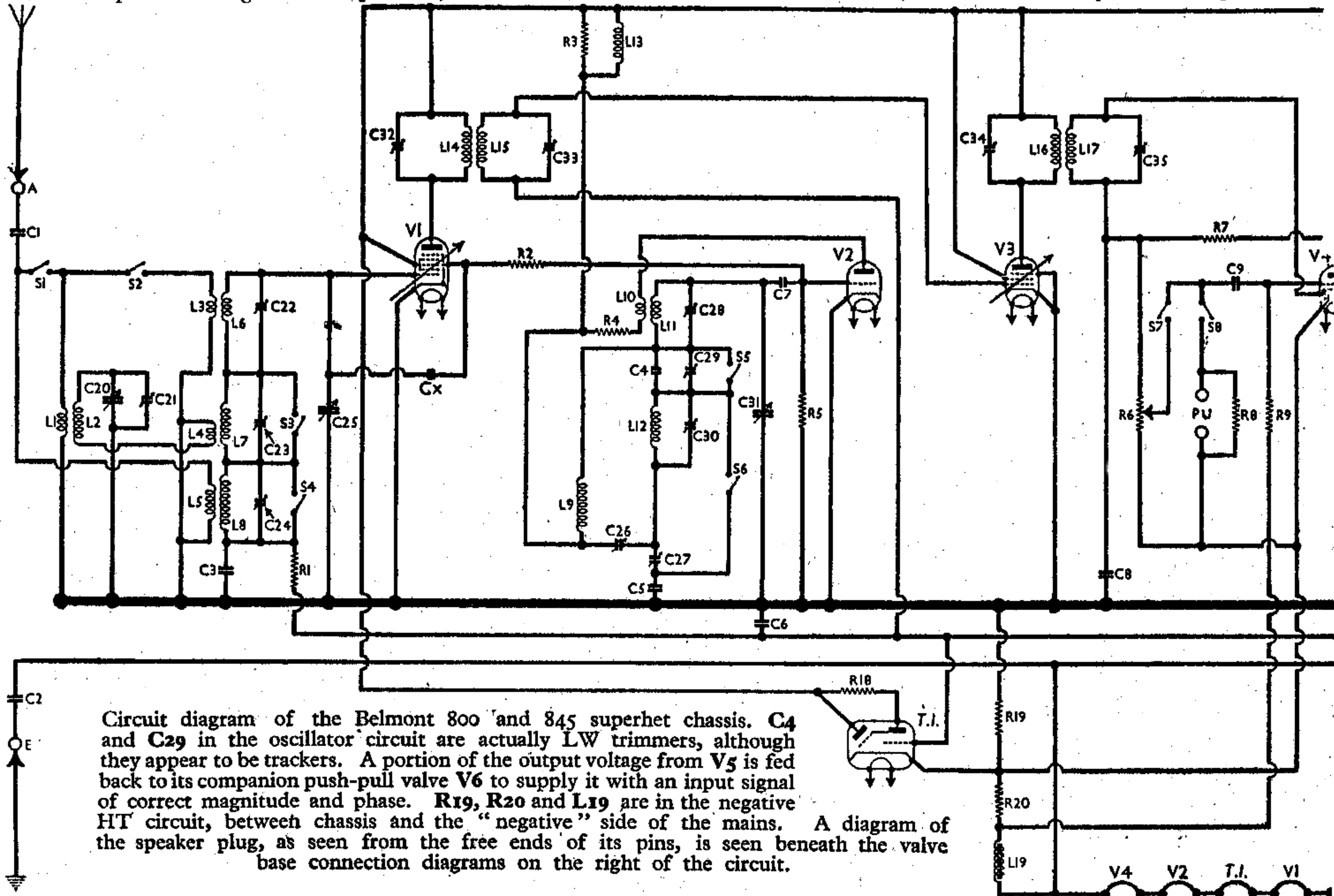
On SW, S1 and S2 close, and input is via C1 and coupling coil L3 to single tuned circuit L6, C25. On LW, S1 and S2 are open, and input is via C1 and coupling coil L5 to single tuned circuit L8, C25. Actually, L6, L7, L8 are connected in series and are all in circuit on LW, but the effect of L6 and L7 on LW is not very considerable. On MW, S4 short-circuits L8, and on SW, S3 and S4 short-circuit

L7 and L8. The LW coil L5 is permanently across the aerial circuit, and both L5 and L1 are across it on MW. On SW, L3, L1 and L5 are all connected across the aerial circuit.

First valve (V1, Ken-Rad metal 6L7) is heptode operating as mixer, working in conjunction with separate triode oscillator (V2, Ken-Rad metal 6C5) as frequency changer, with direct coupling via stopper resistance R2 between V2 control grid and V1 injector grid. A very small capacitive coupling CX is provided between V1 control and injector grids to neutralise "pulling" effects.

V2 control grid coils L11 (SW), L12 (MW) and L9 (LW) are tuned by C31. Parallel trimming by C28 (SW), C30 (MW) and C4, C29 (LW). Series tracking by C5 (SW), when S5 and S6 are closed; by C27 and C5 (MW), when S5 is closed; and by C26, C27 and C5 (LW), when all switches are open.

The arrangement of the circuits is unusual, particularly with regard to the position of the LW trimmers, but it will be seen that on SW and MW, with S5 closed, it follows normal practice except



Circuit diagram of the Belmont 800 and 845 superhet chassis. C4 and C29 in the oscillator circuit are actually LW trimmers, although they appear to be trackers. A portion of the output voltage from V5 is fed back to its companion push-pull valve V6 to supply it with an input signal of correct magnitude and phase. R19, R20 and L19 are in the negative HT circuit, between chassis and the "negative" side of the mains. A diagram of the speaker plug, as seen from the free ends of its pins, is seen beneath the valve base connection diagrams on the right of the circuit.



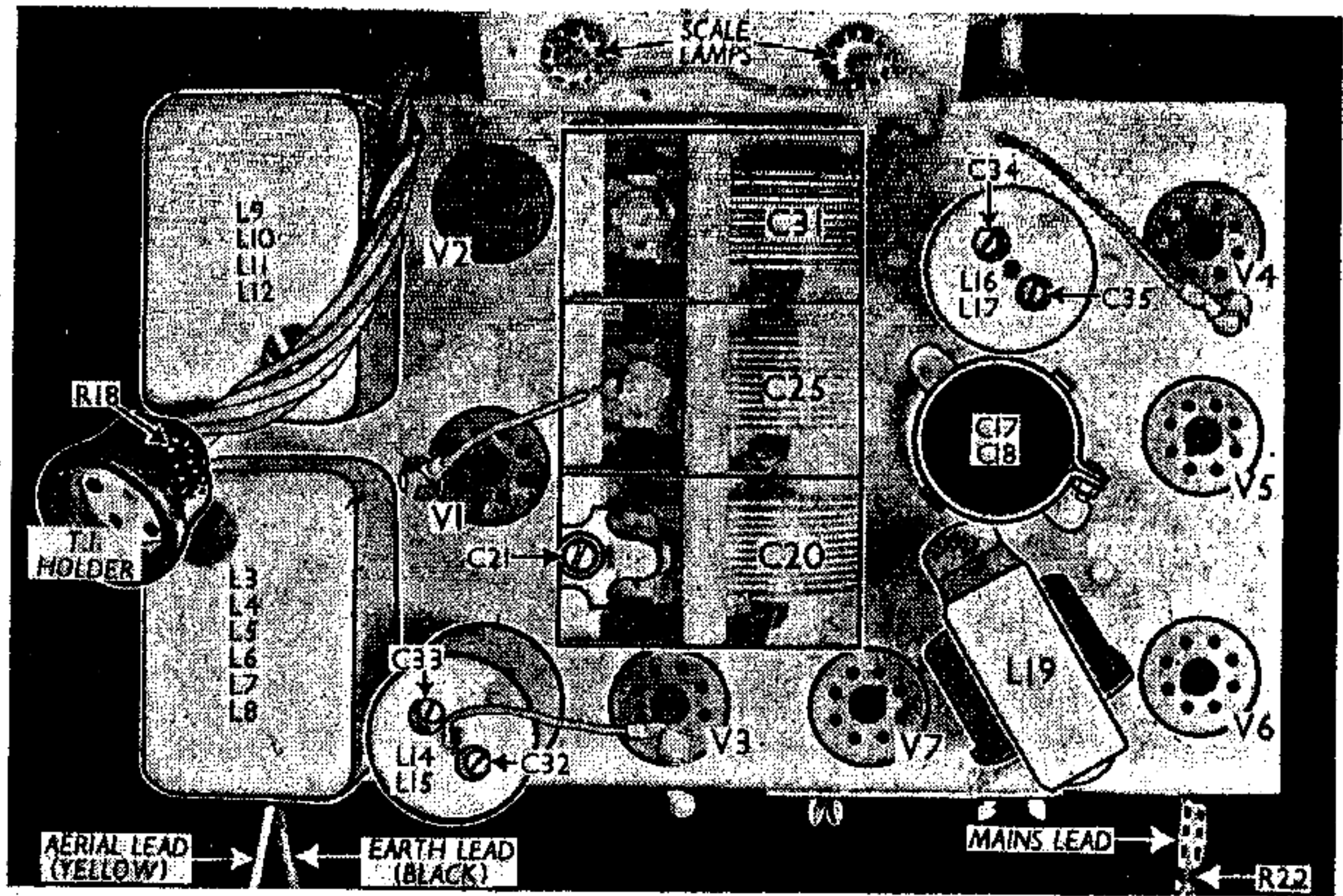
that L9 and C26 shunt L12 on MW, which effect can be allowed for in the design. On LW, C4, C29 can be considered as being connected across L9, C26 in the usual manner if the small effect of L12, C30 is allowed for.

Reaction coupling from anode is developed on all bands across the common impedance of the tracking condensers in the grid and anode circuits, but this effect is small on SW, and additional coupling is provided by the reaction coil L10. A choke coil L13 is connected across the HT feed resistance R3 to isolate the circuit from the HT positive line.

Third valve (V3, Ken-Rad metal 6K7) is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings C32, L14, L15, C33 and C34, L16, L17, C35.

**Intermediate frequency 465 KC/S.**

Diode second detector is part of double diode triode valve (V4, Ken-Rad metal 6Q7). Audio frequency component in rectified output is developed across manual volume control R6, which also operates as load resistance, and passed via switch S7, AF coupling condenser C9 and CG resistance R9 to control grid of triode section, which operates as AF amplifier. IF filtering by C8 in diode circuit and C10 in triode anode circuit. Provision for connection of a gramophone pick-up, with which an external volume control is required, between C9 and cathode, the sockets being shunted by R8.



Plan view of the chassis. The scale lamps are inside the tuning scale assembly.

DC potential developed across R6 is tapped off and fed back via R7 and other decoupling components as GB to mixer and IF valves, giving automatic volume control. Second diode of V4 is strapped to the AVC line. AVC line potential is also used as control voltage for cathode ray tuning indicator (T.I., Ken-Rad 6G5).

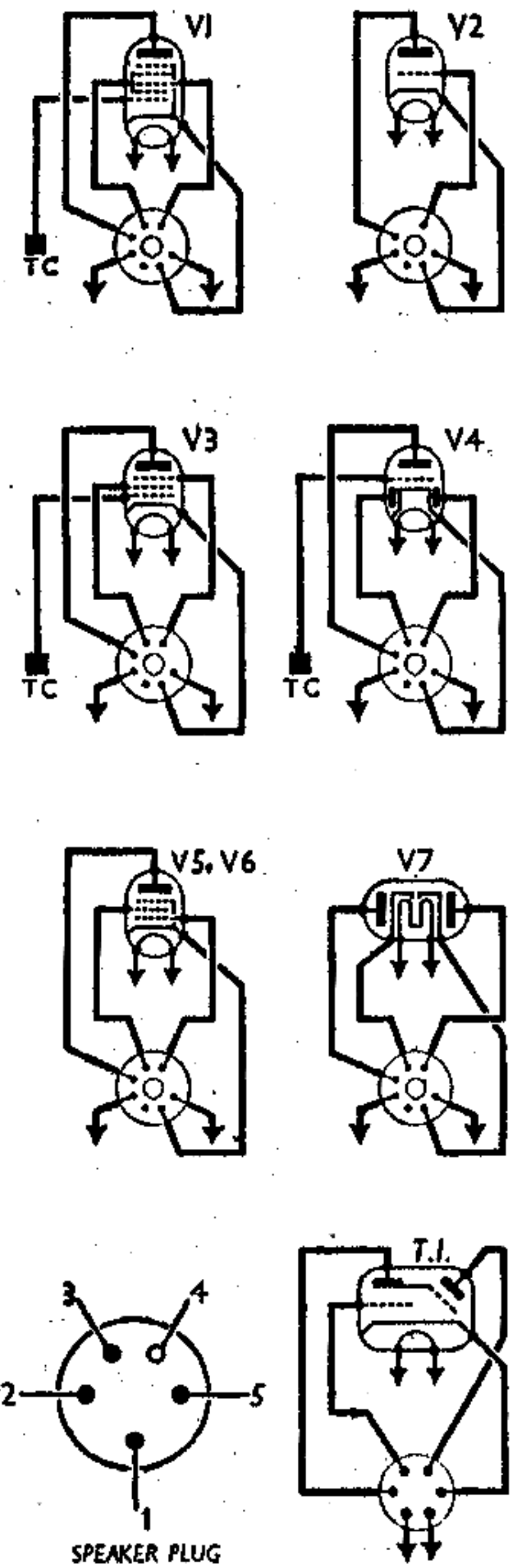
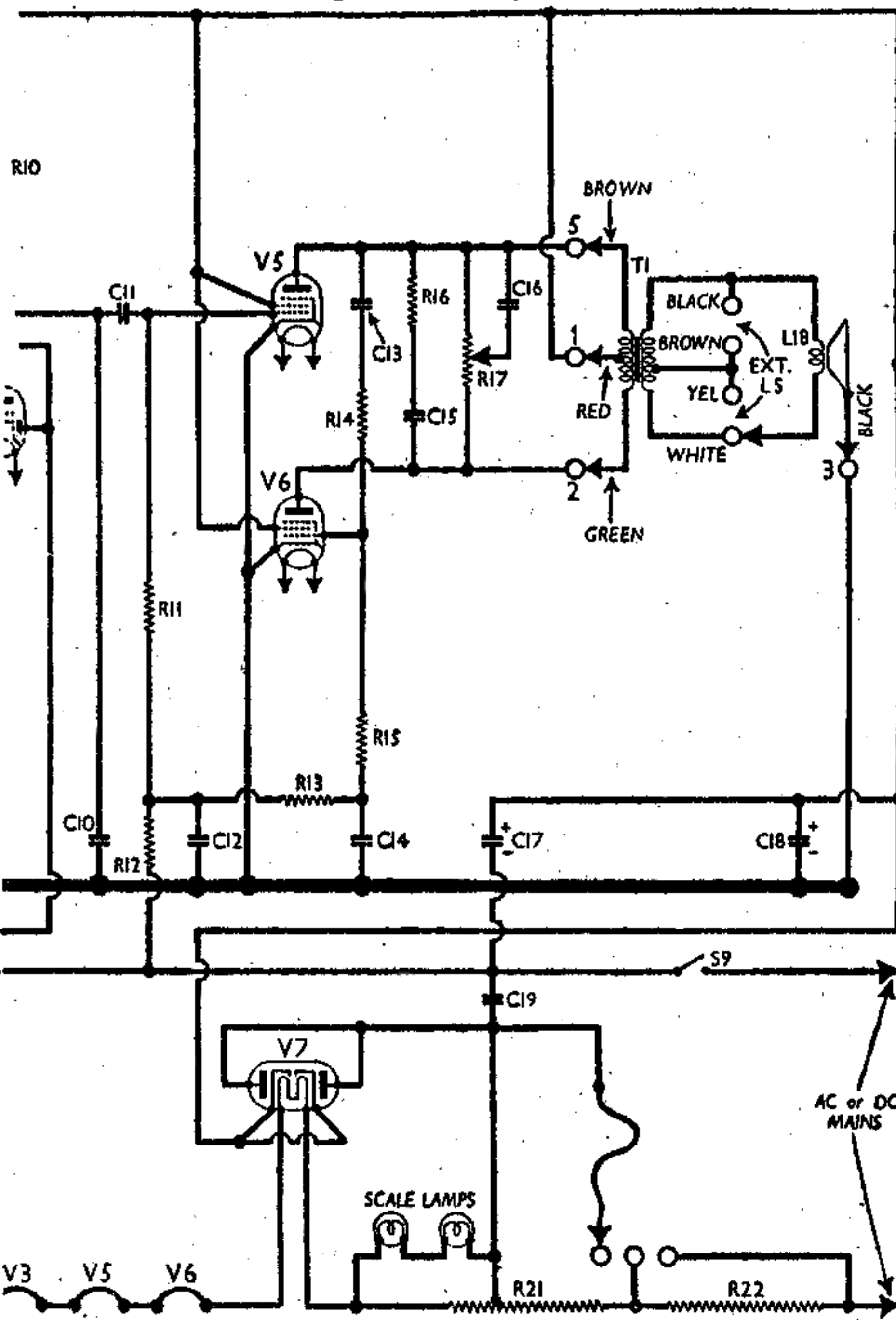
Resistance-capacity coupling by R10, C11 and R11 between V4 and input valve (V5, Ken-Rad metal 25A6) of the output stage which comprises two pentodes in push-pull. Output voltages from V5 anode appear across the potential divider C13, R14, R15, C14, and part of the potential is tapped off at the junction of R14 and R15, giving a step-down ratio equal to the gain of V5, and applied to the control grid of the second output valve (V6, Ken-Rad metal 25A6). Fixed tone correction by R16, C15 between anodes. Variable tone control by R17, C16 also between anodes. Provision for connection of low impedance external speaker across secondary of internal speaker input transformer T1, while internal speaker may be muted by withdrawing a plug.

Four sockets are provided from tapings on T1 secondary, and they bear the colours indicated in the circuit diagram. Matching might be facilitated by connecting an external speaker to black and brown, yellow and white or black and white, according to the impedance, while better overall matching may be obtained by shifting the internal speaker plug to yellow while using an external speaker.

When the receiver is operating with AC mains, HT current is supplied by indirectly heated rectifying valve (V7, Ken-Rad 25Z6), whose two sections are connected in parallel to act as a half-wave rectifier. Smoothing is effected by iron-cored choke L19, in negative HT lead to chassis, and electrolytic condensers C17, C18. The earth lead, which is isolated from mains by condenser C2, is returned directly to HT negative, not to chassis.

Valve heaters, together with scale lamps and ballast resistances R21, R22, which are used only for voltage adjustment purposes, are connected in series across mains input.

GB potentials for tuning indicator, V4 triode and V5, V6, and fixed GB for V1 and V3, are obtained from drop along L19, R20 and R19 in negative HT lead to chassis, that for V1 and V3 being fed via R6, R7 and the AVC line.





COMPONENTS AND VALUES

CONDENSERS		Values (μF)
C1	Aerial isolating condenser	0.01
C2	Earth isolating condenser	0.01
C3	V1 CG decoupling	0.05
C4	Osc. LW fixed trimmer	0.00004
C5	Osc. circ. SW tracker	0.003
C6	AVC line decoupling	0.02
C7	V2 CG condenser	0.00005
C8	IF by-pass	0.00026
C9	V4 triode CG condenser	0.01
C10	IF by-pass	0.00025
C11	V4 triode to V5 coupling	0.01
C12	V5 CG decoupling	0.25
C13	V5 to V6 coupling	0.01
C14	V6 CG decoupling	0.1
C15	Part fixed tone corrector	0.003
C16	Part variable tone control	0.01
C17*	HT smoothing condensers	26.0
C18*		26.0
C19	Mains RF by-pass	0.1
C20†	Band-pass pri. tuning	—
C21†	B-P pri. trimmer	—
C22†	Aerial circ. SW trimmer	—
C23†	B-P sec. trimmer	—
C24†	Aerial circ. LW trimmer	—
C25†	SW and LW aerial and band-pass sec. tuning	—
C26†	Osc. circuit LW tracker	0.0003
C27†	Osc. circuit MW tracker	0.000565
C28†	Osc. circuit SW trimmer	—
C29†	Osc. circuit LW trimmer	—
C30†	Osc. circuit MW trimmer	—
C31†	Oscillator circuit tuning	—
C32†	1st IF trans. pri. tuning	—
C33†	1st IF trans. sec. tuning	—
C34†	2nd IF trans. pri. tuning	—
C35†	2nd IF trans. sec. tuning	—
Cx	Small neutralising coupling	Very low

\* Electrolytic. † Variable. ‡ Pre-set.

DISMANTLING THE SET

**Removing Chassis.**—Remove the four control knobs (pull off); slacken the fly-nut beneath the tuning indicator holder, draw it towards the rear, and lift out the valve from its clip; remove the four screws (with large metal washers) holding the chassis to the bottom of the cabinet. The chassis may now be withdrawn from the cabinet, and if the plug at the front right-hand corner is withdrawn from its socket, the chassis may be removed altogether. When replacing, the tuning indicator should be adjusted in its runner so that its target can be seen conveniently from the front of the receiver, then tighten the fly-nut.

**Removing Speaker.**—Remove the chassis, and remove the four large wood screws holding the speaker to the sub-baffle. The speaker may then be freed from the chassis by withdrawing its connecting plug.

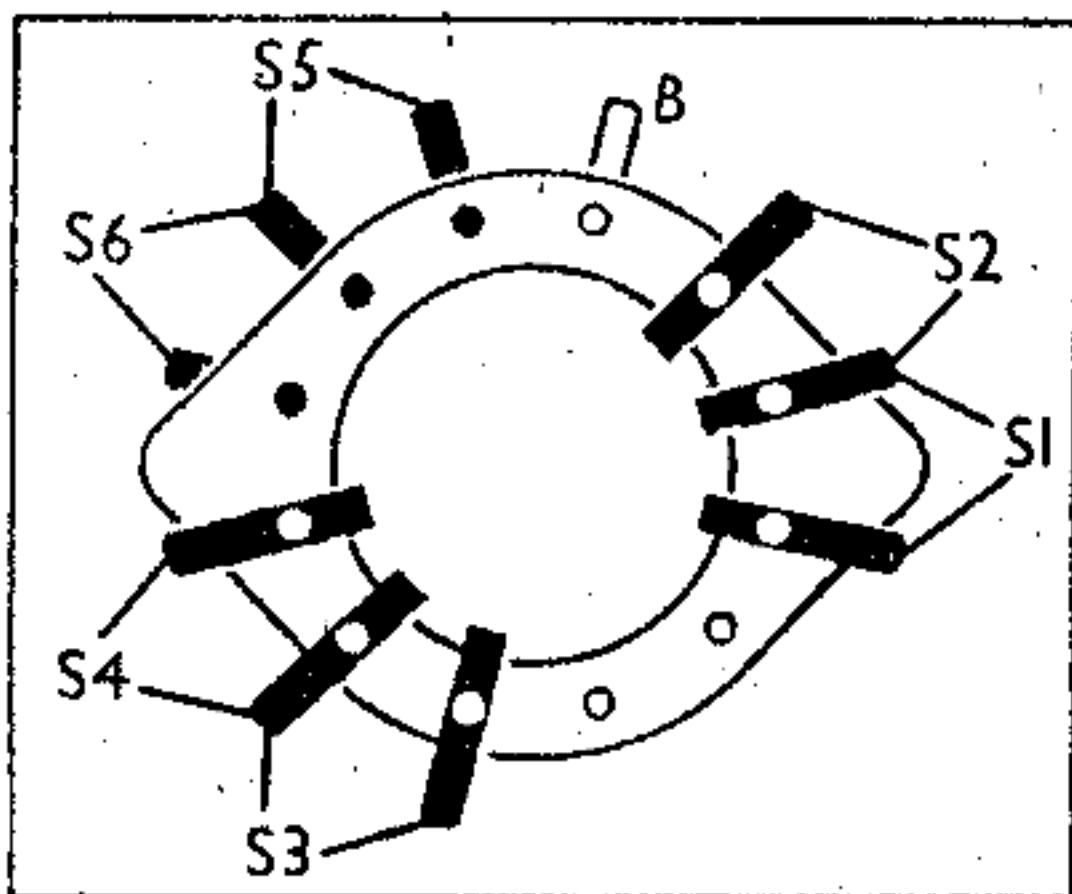


Diagram of the S1-S6 switch unit. It is drawn as seen when viewed from the rear of the underside of the chassis.

RESISTANCES		Values (ohms)
R1	V1 CG decoupling	100,000
R2	V1 injector grid stopper	100
R3	V2 anode HT feed	50,000
R4	Osc. SW reaction stabiliser	50
R5	V2 CG resistance	50,000
R6	Manual volume control; V4 diode load	1,000,000
R7	AVC line decoupling	3,000,000
R8	Pick-up shunt	100,000
R9	V4 triode CG resistance	3,000,000
R10	V4 triode anode load	150,000
R11	V5 CG resistance	500,000
R12	V5 CG decoupling	250,000
R13	V6 CG decoupling	250,000
R14	V5 to V6 coupling potential divider resistances	500,000
R15		75,000
R16	Part fixed tone corrector	10,000
R17	Variable tone control	300,000
R18	T.I. anode HT feed	1,000,000
R19	Auto GB resistances	50
R20		20
R21	200V heater circuit ballast	140*
R22	220V heater circuit ballast	250

\* Tapped at 40 Ω from V7 heater to shunt scale lamps.

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial MW coupling coil	37.0
L2	Band-pass pri. coil	4.0
L3	Aerial SW coupling coil	0.7
L4	Band-pass coupling coil	0.4
L5	Aerial LW coupling coil	85.0
L6	Aerial SW tuning coil	Very low
L7	Band-pass sec. coil	4.0
L8	Aerial LW tuning coil	16.0
L9	Osc. LW tuning coil	22.0
L10	Oscillator SW reaction	50.0
L11	Osc. SW tuning coil	Very low
L12	Osc. MW tuning coil	12.0
L13	V2 anode HT feed choke	24.0
L14	1st IF trans. { Pri. ...	9.0
L15		{ Sec. ...
L16	2nd IF trans. { Pri. ...	9.0
L17		{ Sec. ...
L18	Speaker speech coil	4.5
L19	HT smoothing choke	250.0
T1	Speaker in-put trans. { Pri., total	490.0
	{ Sec., total	0.5
S1-S6	Waveband switches	—
S7, S8	Radio/gram switches	—
S9	Mains switch, ganged R6	—

When replacing, the transformer should be at the bottom.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on DC mains of 211 V. The mains voltage adjustment plug was in the 220 V socket. The receiver was tuned to the lowest wavelength on the MW band, and the volume control was at maximum, but there was no signal input, the aerial and earth leads being joined together. Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being the negative connection. No

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 6L7	93	3.4	93	3.8
V2 6C5	93	3.0	—	—
V3 6K7	93	5.2	93	1.5
V4 6Q7	46	7.0-32	—	—
V5 25A6	87	20.0	93	3.4
V6 25A6	87	20.0	93	3.4
V7 25Z6	93†	—	—	—

† Cathode to chassis, DC.

readings can be given for the tuning indicator, and access to the inside of the holder is difficult. The target voltage would, of course, be 93 V; the anode voltage, and target and anode currents, would be very low.

GENERAL NOTES

**Switches.**—S1-S6 are the waveband switches, in a single rotary unit beneath the chassis. The unit is indicated in our under-chassis view, and shown in detail in the diagram in col. 1, where it is drawn as seen when viewed from the rear of the underside of the chassis. The table below gives the switch positions for the three control settings, starting from the fully anti-clockwise position of the control. A dash indicates open, and C, closed.

S7, S8 are the radio/gram change-over switches in a single two-position QMB toggle switch mounted on the rear chassis member, just above the pick-up sockets.

Switch Table

Switch	LW	MW	SW
S1	—	C	C
S2	—	—	C
S3	—	—	C
S4	—	C	C
S5	—	C	C
S6	—	—	C

S9 is the QMB mains switch, ganged with the volume control R6.

**Coils.**—The aerial and oscillator coils L3-L8 and L9-L12, but excluding L1, L2, are mounted on the chassis deck and screened by two rectangular metal covers. L1, L2 are separately mounted on an un-screened former beneath the chassis. The oscillator choke L13 is mounted beneath the chassis between the waveband switch unit and the tracking condensers.

The IF transformers L14, L15 and L16, L17 are in two further screened units on the chassis deck with their associated trimmers. L19 is also mounted on the chassis deck.

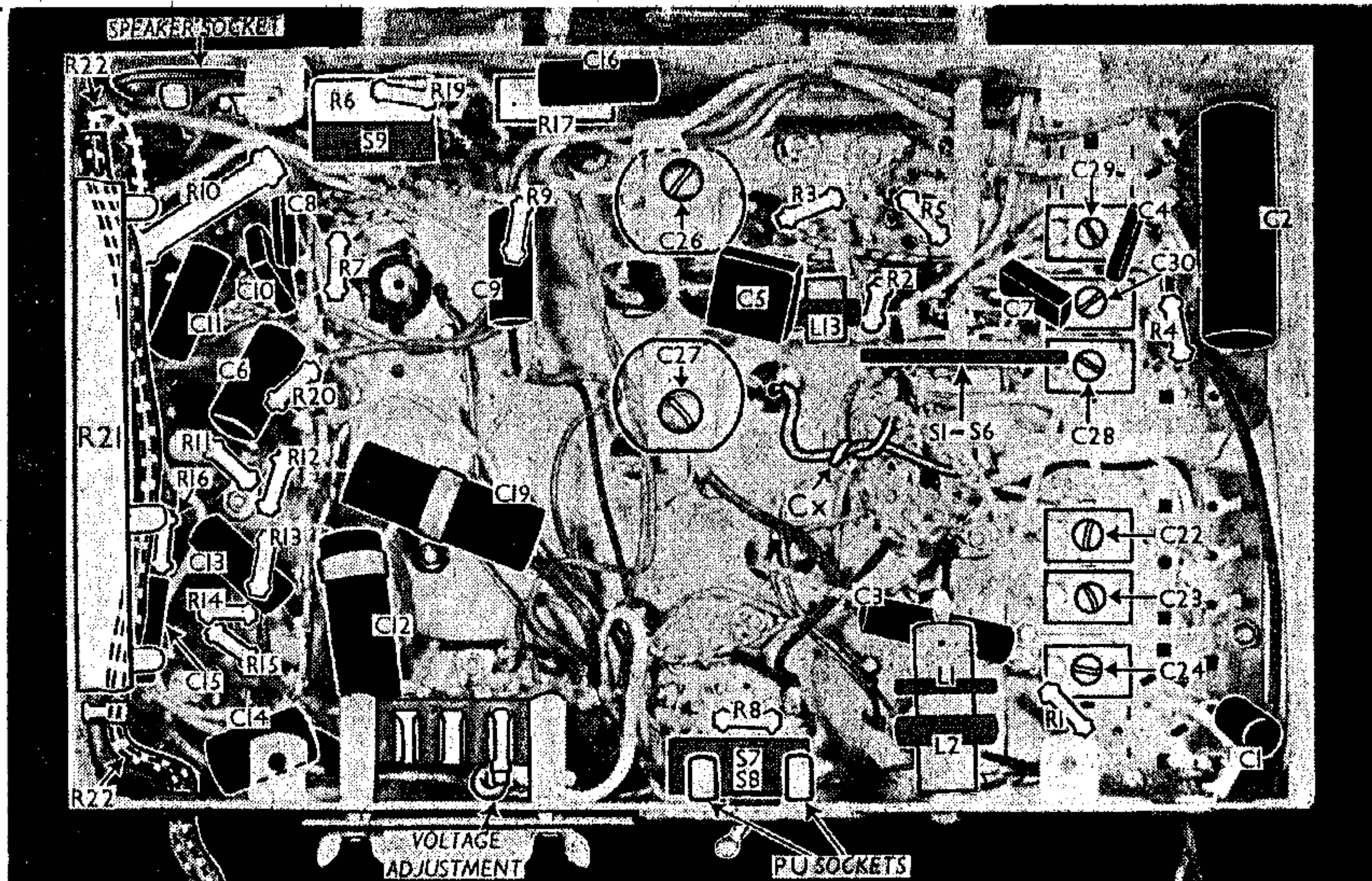
**Scale Lamps.**—These are two Tung-Sol lamps, with SBC holders and, in our chassis, spherical bulbs. They are rated at 6.8 V, and ours were marked T51. They are suspended in rubber grommets so that they project downwards into the inside of the enclosed scale assembly, and to reach ours it was necessary to remove the scale panel. This entailed removing the retaining screw and pointer and seven press studs (which can be pushed from the rear). If tubular bulbs were used they could be withdrawn from above without removing the scale.

**Condensers C17, C18.**—These are two 26 μF electrolytics in a single tubular metal container held by a clip to the chassis deck. Replacements need only be rated at 150-200 V working, as the receiver is designed to operate from 100 V mains. It should be noted that they have a common positive connection.

**Condenser Cx.**—This is a small neutralising capacity between the control grid and injector grid of V1. It consists of a piece of insulated wire, attached to pin 5 of V1 socket, wrapped round the lead from C25 about two turns.



Under-chassis view. The wave-band switch unit S1-S6 is indicated here and shown in detail in the diagram in col. 1 opposite. Cx, just below it, consists of twisted wires. R21, on the left chassis member, is a metal-cased "Muter" strip. Its three connecting tags are seen. R22 is in the mains lead. The speaker socket is indicated at the top left-hand corner.



**Gramophone Pick-up.**—Two sockets are provided for this at the rear of the cabinet, but an external volume control is required for gramophone operation. As radio/gram switching is provided the pick-up may be left permanently connected.

**External Speaker.**—Four sockets are provided on the speaker transformer T1, and, as indicated in the circuit diagram overleaf, one of them accepts a plug attached to one end of the speech coil L18. The makers' manual does not explain the function of these sockets, but an external speaker could be connected to them. A speaker of about 8 Ω impedance could be connected to the black and white sockets, and the internal speaker could if desired be muted by withdrawing its plug. A speaker of about 5 Ω could be connected to black and brown, or one of about 3 Ω to yellow and white. Good overall matching might be obtained if an external speaker were joined to black and brown, with the internal speaker plug transferred to yellow.

**Speaker Connections.**—The speaker leads are terminated at a five-pin plug which is inserted in a socket on the front chassis member. The connections are identified in our circuit diagram by numbers corresponding with those of the plug whose diagram appears inset just beneath the valve diagrams. Pin 4 is blank, but is used as a bearer on the socket. The speaker plug is drawn as seen from the free ends of the pins.

**Mains Voltage Adjustment.**—The receiver is designed to operate from 100 V AC or DC mains, but voltage dropping resistances are provided to permit the application of higher voltages. R21 is a "muter" strip resistor, designed to drop about 40 V, while R22 is a flexible line cord resistor, located in the mains lead, to drop about 100 V. Three sockets and a plug on a flying lead, accessible through

a hole in the rear chassis member but normally covered by a metal plate, thus permit adjustment for 110 V, 220 and 260 mains. These are mean values, the ranges of two of them: 190-240 V and 240-280 V, being stamped on the rear of the chassis, just over the sockets; the low voltage socket is unmarked, but when it is in use, R22 and most of R21 are short-circuited, the part left in circuit acting as a scale lamp shunt.

### CIRCUIT ALIGNMENT

**IF Stages.**—Switch set to MW, tune to 214 m on scale, and turn the volume control to maximum. Connect signal generator via a 0.1 μF condenser to control grid (top cap) of V3 and chassis. Feed in a 465 KC/S (645.16 m) signal, and adjust C35 and C34 for maximum output. Transfer signal generator lead from V3 to control grid (top cap) of V1 and adjust C33 and C32 for maximum output. Then re-adjust C34 and C35 if necessary.

**RF and Oscillator Stages.**—With the gang at minimum and maximum, the pointer should cover the unnumbered horizontal lines at both ends of the three scales. The pointer can be adjusted if the small knurled retaining screw at its centre is slackened. Transfer signal generator leads to the aerial and earth leads, via a suitable dummy aerial; this may consist of a 0.1 μF condenser in series with a 400 Ω resistance for the SW band, and of a 0.0002 μF condenser in series with a 20 Ω resistance for the MW and LW bands.

**SW.**—Switch set to SW, and turn the gang to minimum capacity. Feed in a 16.5 m (18.2 MC/S) signal, and adjust C28 for maximum output, taking care that the peak involving the lesser trimmer capacity is selected. Feed in a 17.6 m (17 MC/S) signal, tune it in, and adjust C22 for maximum output. Check calibration and sensitivity at 50 m (6 MC/S).

**MW.**—Switch set to MW, and turn the gang to minimum capacity. Feed in a 187 m (1,600 KC/S) signal, and adjust C30 for maximum output. Feed in a 214 m (1,400 KC/S) signal, tune it in, and adjust C23, then C21, for maximum output. Feed in a 500 m (600 KC/S) signal, tune it in, and adjust C27 for maximum output while rocking the gang for optimum results.

Readjust C30 at 187 m, and C23, C21 at 214 m, in turn, until no improvement can be obtained, and then check the sensitivity at 300 m (1,000 KC/S).

**LW.**—Switch set to LW, and turn the gang to minimum capacity. Feed in an 860 m (350 KC/S) signal, and adjust C29 for maximum output. Feed in a 925 m (325 KC/S) signal, tune it in, and adjust C24 for maximum output. Feed in a 2,000 m (150 KC/S) signal, tune it in, and adjust C28 for maximum output while rocking the gang for optimum results. Readjust C29 at 860 m, and C24 at 925 m, until no further improvement can be obtained.

Now repeat the whole of the MW procedure as previously outlined, and then repeat the LW adjustments. The two circuits are somewhat interdependent, and each must be checked after any adjustment to the other.