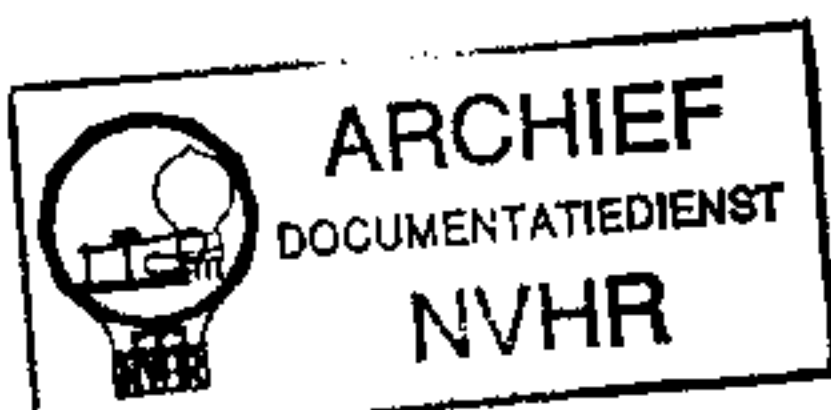


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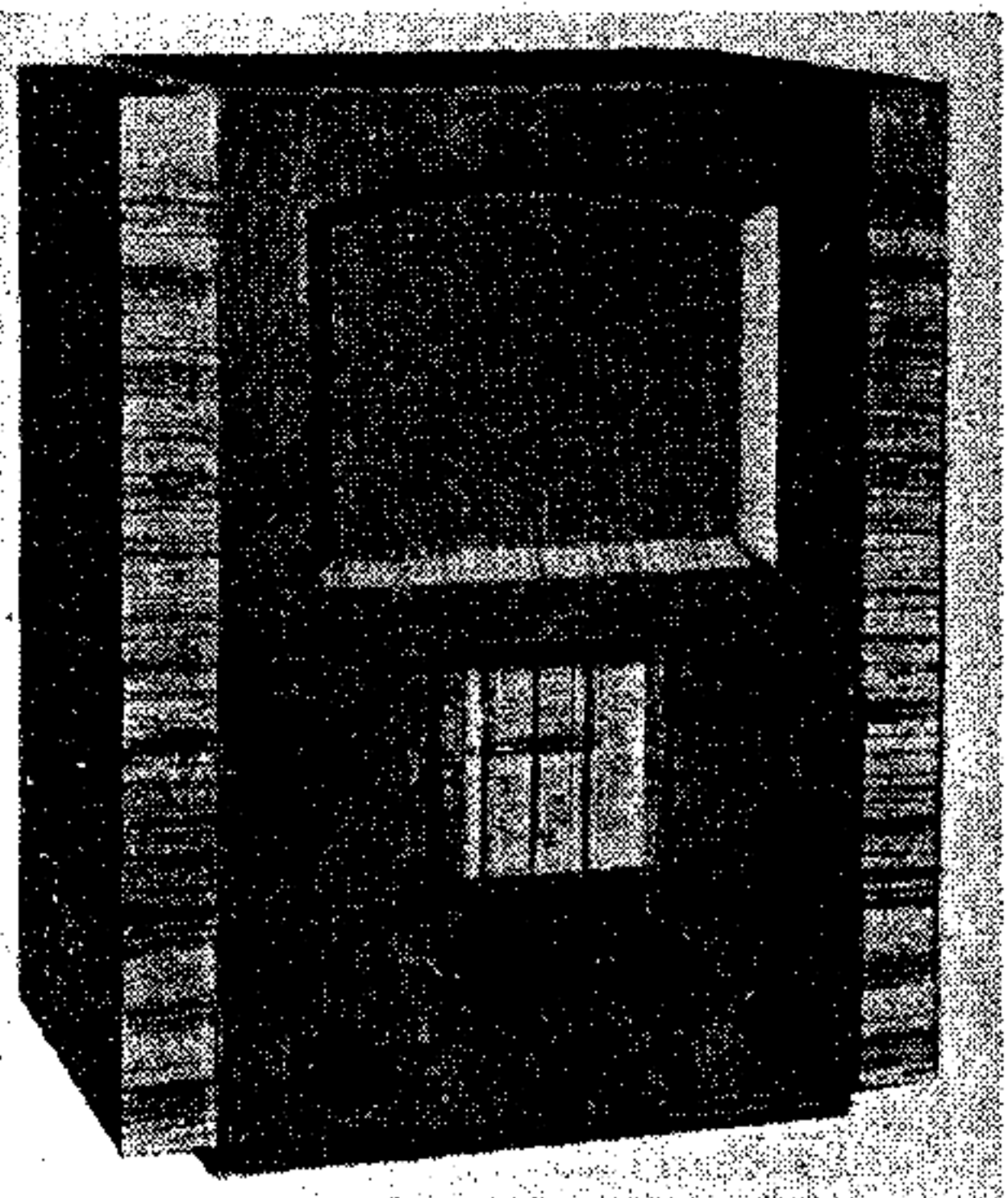
I.E.E.T.



# BUSH SSW37

## SUG37 AND RG37

REVISED ISSUE OF  
SERVICE SHEET No. 196



The Bush table model SSW37.

**T**WO short-wave bands, referred to in this *Service Sheet* throughout as SW1 and SW2, are covered, in addition to the normal MW and LW bands, in the Bush SSW37 superhet. The SW ranges are 17-53 m (SW1) and 75-200 m (SW2).

The receiver comprises five valves (plus rectifier), including an RF stage, and is designed for operation from AC mains of 200-250 V, 40-100 c/s. It is fitted with an internal plate aerial, and has provision for the connection of an external speaker and a gramophone pick-up. A plug and socket device permits the internal speaker to be muted.

An identical chassis is employed in the SUG37 console and RG37 radiogram, while a fourth model is the RG37 fitted with an automatic record changer. All four models are covered by this *Service Sheet*, but it was prepared from a model SSW37.

Release date, all models: September, 1936.

Original prices: SSW37, £15 15s.; SUG37, £21 0s.; RG37, £31 10s.; RG37 Auto, £36 15s.

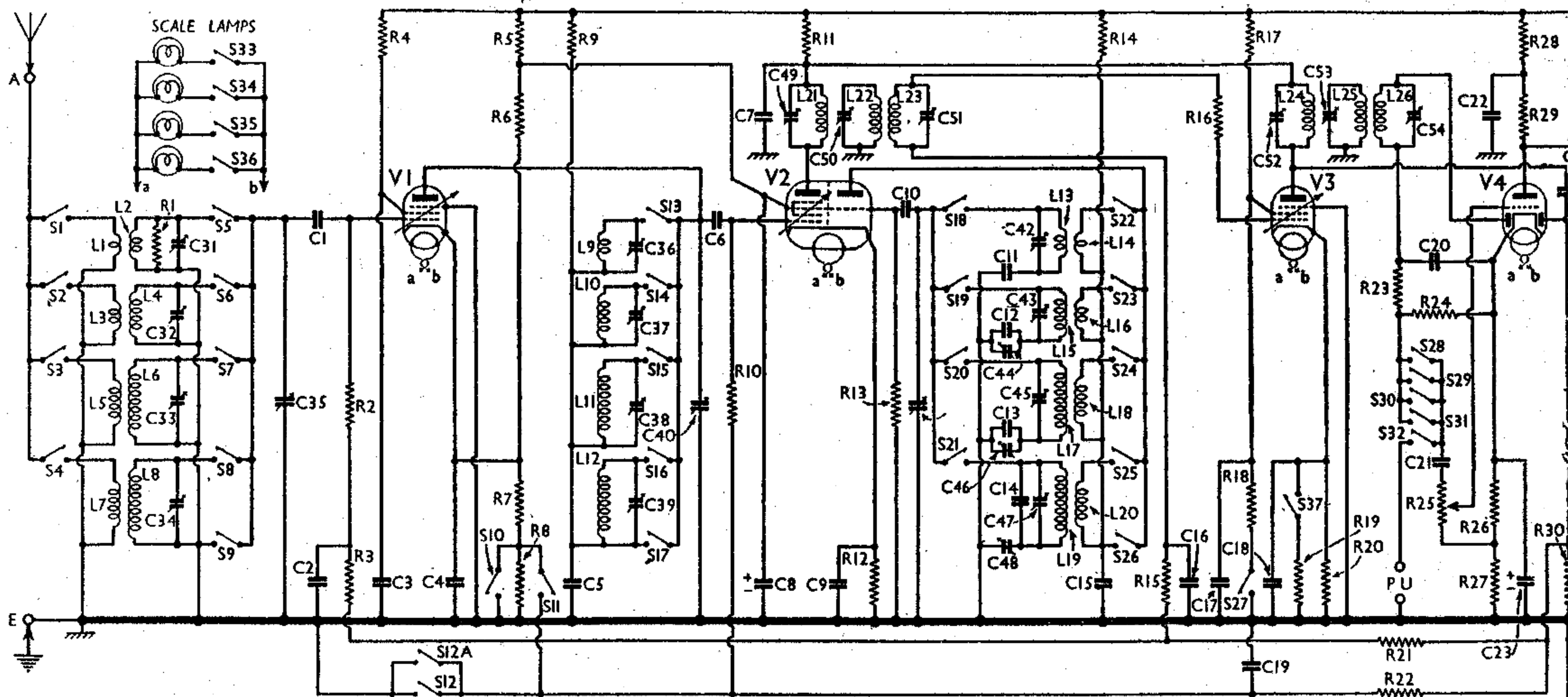
### CIRCUIT DESCRIPTION

Aerial input via coupling coils L1 (SW1), L3 (SW2), L5 (MW), L7 (LW), to single tuned circuits L2, C35 (SW1), L4, C35 (SW2), L6, C35 (MW) and L8, C35 (LW) which precede variable-mu pentode RF amplifier (V1, Mullard metallised VP4B).

Tuned-anode couplings by L9, C40 (SW1), L10, C40 (SW2), L11, C40 (MW) and L12, C40 (LW) between V1 and triode hexode valve (V2, Mullard metallised TH4) which operates as frequency changer with internal coupling.

Triode oscillator grid coils L13 (SW1), L15 (SW2), L17 (MW) and L19 (LW) are tuned by C41; parallel trimming by C42 (SW1), C43 (SW2), C45 (MW) and C14, C47 (LW); series tracking by C11 (SW1), C12, C44 (SW2), C13, C46 (MW) and C48 (LW). Reaction is applied from anode via coils L14 (SW1), L16 (SW2), L18 (MW) and L20 (LW).

Third valve (V3, Mullard metallised VP4B) is a variable-mu RF pentode operating as intermediate frequency amplifier with triple-tuned transformer



Circuit diagram of the Bush SSW37 four-band superhet. Inter-circuit switches which connect together the upper ends of tuning coils, excepting those in use, are not shown in the diagram. S37 is the sensitivity switch, which opens for local reception to increase the fixed GB potential applied to V3. On gram, S27 closes to connect a 1,000 Ω resistor R18 between V3 screen and chassis, as one of the radio muting devices. Each of the IF transformers consists of three tuned circuits. The chassis employed in the SUG37 and RG37 models is identical, although a different speaker is used in the radiograms as explained overleaf.

couplings C49, L21, C50, L22, L23, C51 and C52, L24, C53, L25, L26, C54.

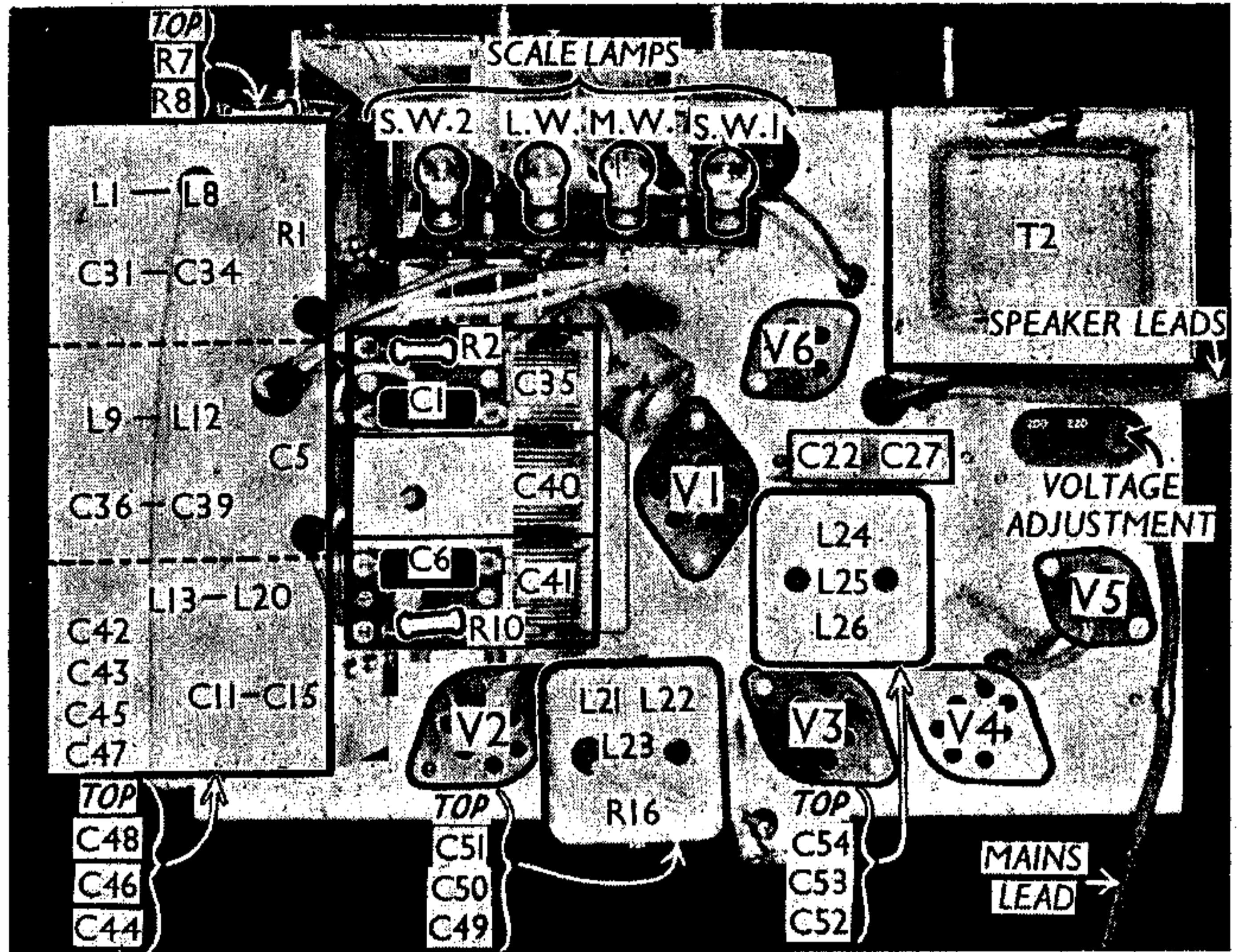
Intermediate frequency 465 kc/s.

Two-position sensitivity control by S37 which connects R19 in parallel with R20 in the more sensitive position, or disconnects it in the less sensitive position, modifying the fixed GB potential applied to V3.

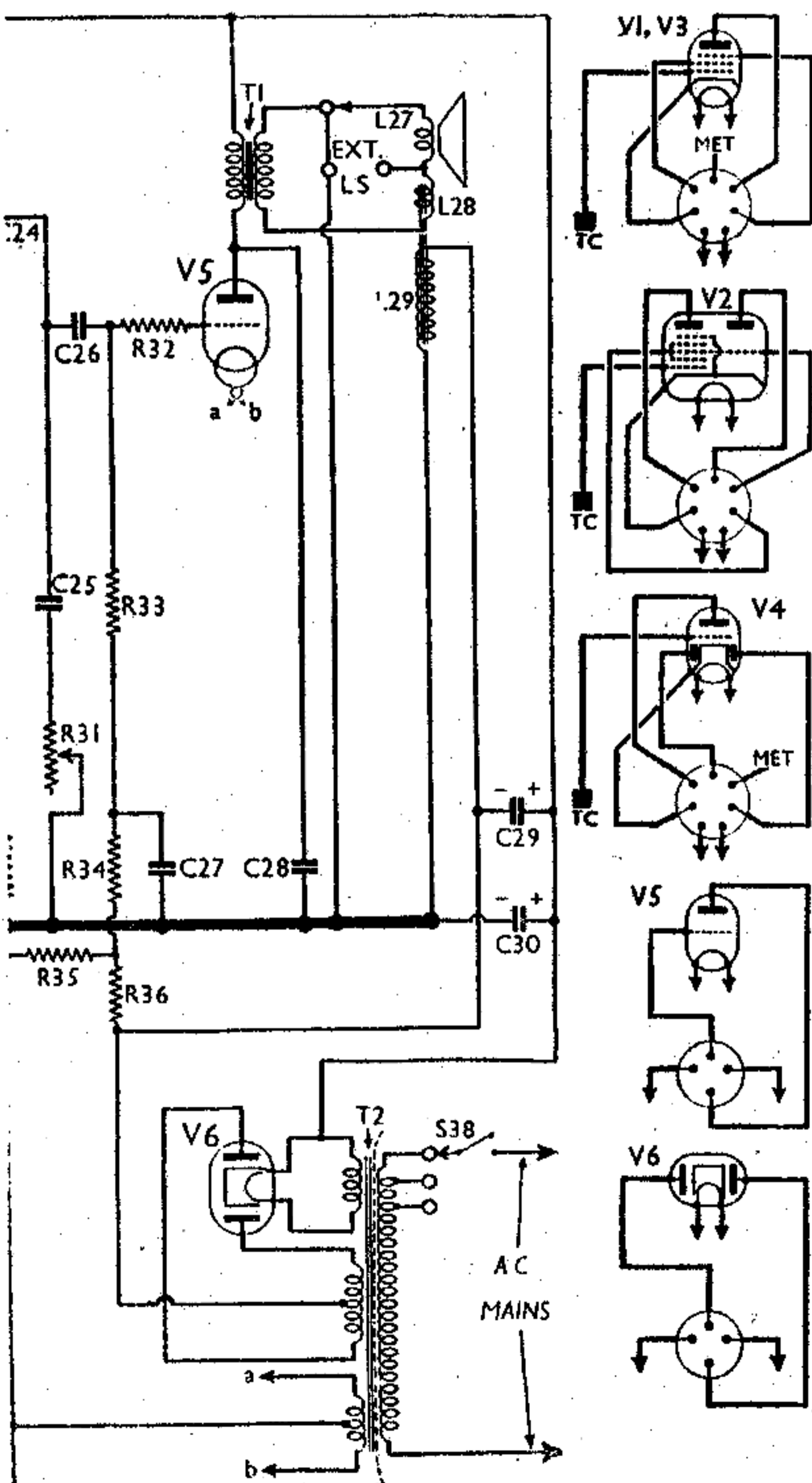
Diode second detector is part of double diode triode valve (V4, Mullard metalised TDD4). Audio frequency component in rectified output is developed across load resistor R24 and passed via one of the switches S28-S31, according to which band is in use, AF coupling condenser C21 and manual volume control R25 to control grid of triode section, which operates as AF amplifier. IF filtering by C20 and R23.

Provision for connection of gramophone pick-up across R25 via S32 and C21. As the pick-up circuit is switched, the pick-up may be left permanently connected. When the receiver is switched to gram, S28-S31 all open, and S27 closes to connect a resistor R18 of low value between V3 screen and chassis, to mute radio. At the same time, other switches, S9, S17, S26, close for the same purpose.

Second diode of V4, fed from V3 anode via C24, provides DC potential which is developed across load resistor R30 and fed back through decoupling circuits as GB to RF, FC and IF valves, giving automatic volume control. Delay voltage is obtained from drop along resistors R26, R27 in V4 cathode circuit.



Plan view of the chassis. The compartment containing the tuning coils and trimmers is seen on the left, and the positions of the oscillator circuit trackers is approximately indicated. The interior of this unit is shown in an end-view illustration overleaf.



Resistance-capacity coupling by R29, C26 and R33, via grid stopper R32, between V4 triode and directly-heated filament triode output valve (V5, Mullard ACO44). Variable tone control by C25, R31 in coupling circuit, between V4 triode anode and chassis. Provision for connection of low-impedance external speaker directly across speech coil L27, while a plug and socket device permits the internal speaker to be muted if desired. Fixed tone correction by C28 in anode circuit.

HT current is supplied by indirectly-heated cathode full wave rectifying valve (V6, Mullard IW4/350). Smoothing by speaker field L29, in negative HT lead to chassis, and dry electrolytic condensers C29, C30. GB potential for V5 is obtained from the junction of resistors R35 and R36, which form a potential divider across L29. The control grid circuit is decoupled by R34, C27.

VALVE ANALYSIS

Valve voltages and currents given in the table above are those measured in our receiver when it was operating on mains of 230 V, using the 240 V tapping on the mains transformer. The receiver was

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 VP4B	250	0.9	170	0.3
V2 TH4	215	4.2	80	0.7
	160	8.3		
V3 VP4B	215	4.6	95	1.7
V4 TDD4	105	2.4	—	—
V5 ACO44	260	34.0	—	—
V6 IW4/350	305†	—	—	—

† Each anode, AC.

tuned to the lowest wavelength on the medium band and the volume and sensitivity controls were at maximum (the latter in the "Normal" position), but there was no signal input.

Voltages were measured on the 1,200 V scale of an Avometer, with chassis as negative.

COMPONENTS AND VALUES

RESISTORS	Values (ohms)
R1	Aerial SW1 damping ... 10,000
R2	V1 CG resistor ... 500,000
R3	V1 CG decoupling ... 1,000,000
R4	V1 SG HT feed ... 100,000
R5	V2 hexode SG HT potential divider ...
R6	
R7	V1 fixed GB resistors ...
R8	
R9	V1 anode decoupling ... 10,000
R10	V2 hex. CG resistor ... 500,000
R11	V2 hex. anode decoupling ... 5,000
R12	V2 fixed GB resistor ... 100
R13	V2 osc. CG resistor ... 30,000
R14	V2 osc. anode decoupling ... 15,000
R15	V3 CG decoupling ... 1,000,000
R16	V3 grid stopper ... 250
R17	V3 SG HT feed ... 100,000
R18	Radio muting shunt ... 1,000
R19	V3 fixed GB resistors ...
R20	
R21	AVC line decoupling resistors ...
R22	
R23	IF stopper ... 50,000
R24	V4 signal diode load ... 500,000
R25	Manual volume control ... 500,000
R26	V4 GB and AVC delay voltage resistors ...
R27	
R28	V4 triode anode decoupling ... 10,000
R29	V4 triode anode load ... 50,000
R30	V4 AVC diode load ... 1,000,000
R31	Variable tone control ... 50,000
R32	V5 CG stopper ... 50,000
R33	V5 CG resistor ... 250,000
R34	V5 CG decoupling ... 500,000
R35	V5 GB potential divider ...
R36	

CONDENSERS		Values (μF)
C1	V1 CG condenser ...	0.0001
C2	V1 CG decoupling ...	0.1
C3	V1 SG by-pass ...	0.1
C4	V1 cathode by-pass ...	0.1
C5	V1 anode decoupling ...	0.1
C6	V2 hex. CG condenser ...	0.0001
C7	V2 hex. anode decoupling ...	0.1
C8*	V2 hex. SG by-pass ...	2.0
C9	V2 cathode by-pass ...	0.1
C10	V2 osc. CG condenser ...	0.00005
C11	Osc. SW1 tracker ...	0.0043
C12	Osc. SW2 tracker ...	0.0015
C13	Osc. MW tracker ...	0.0004
C14	Osc. LW trimmer ...	0.0001
C15	V1 osc. anode decoupling ...	0.05
C16	V3 CG decoupling ...	0.1
C17	V3 SG by-pass ...	0.1
C18	V3 cathode by-pass ...	0.1
C19	V2 AVC line decoupling ...	0.1
C20	IF by-pass ...	0.0001
C21	AF coupling to V4 triode ...	0.005
C22	V4 triode anode decoupling ...	0.5
C23*	V4 cathode by-pass ...	25.0
C24	V4 AVC diode feed ...	0.0001
C25	Tone control condenser ...	0.02
C26	V4 to V5 AF coupling ...	0.03
C27	V3 CG decoupling ...	0.5
C28	V5 anode by-pass ...	0.001
C29*	HT smoothing condensers	8.0
C30*		16.0
C31†	Aerial SW1 trimmer ...	—
C32†	Aerial SW2 trimmer ...	—
C33†	Aerial MW trimmer ...	—
C34†	Aerial LW trimmer ...	—
C35†	Aerial circuit tuning ...	—
C36†	V1 anode SW1 trimmer ...	—
C37†	V1 anode SW2 trimmer ...	—
C38†	V1 anode MW trimmer ...	—
C39†	V1 anode LW trimmer ...	—
C40†	V1 anode circuit tuning ...	—
C41†	Osc. circuit tuning ...	—
C42†	Osc. circ. SW1 trimmer ...	—
C43†	Osc. circ. SW2 trimmer ...	—
C44†	Osc. circ. SW2 tracker ...	—
C45†	Osc. circ. MW trimmer ...	—
C46†	Osc. circ. MW tracker ...	—
C47†	Osc. circ. LW trimmer ...	—
C48†	Osc. circ. LW tracker ...	—
C49†	1st IF trans. pri. tuning ...	—
C50†	1st IF trans. tert. tuning ...	—
C51†	1st IF trans. sec. tuning ...	—
C52†	2nd IF trans. pri. tuning ...	—
C53†	2nd IF trans. tert. tuning ...	—
C54†	2nd IF trans. sec. tuning ...	—

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

**DISMANTLING THE SET**

**Removing Chassis.**—Remove the five control knobs (recessed grub screws) from the front of the cabinet; remove the four bolts (with washers) holding the chassis to the bottom of the cabinet; free the speaker leads from the two cleats holding them to the side of the cabinet.

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial SW1 coupling coil	0.15
L2	Aerial SW1 tuning coil	Very low
L3	Aerial SW2 coupling coil	0.1
L4	Aerial SW2 tuning coil ...	0.25
L5	Aerial MW coupling coil	0.6
L6	Aerial MW tuning coil ...	2.3
L7	Aerial LW coupling coil ...	14.0
L8	Aerial LW tuning coil ...	7.25
L9	V1 anode SW1 tuning ...	Very low
L10	V1 anode SW2 tuning ...	0.25
L11	V1 anode MW tuning ...	2.3
L12	V1 anode LW tuning ...	7.25
L13	Osc. SW1 tuning coil ...	Very low
L14	Osc. SW1 reaction coil ...	0.15
L15	Osc. SW2 tuning coil ...	0.2
L16	Osc. SW2 reaction coil ...	0.1
L17	Osc. MW tuning coil ...	1.55
L18	Osc. MW reaction coil ...	1.25
L19	Osc. LW tuning coil ...	2.25
L20	Osc. LW reaction coil ...	1.85
L21	1st IF trans.	Pri. ... 7.0
L22		Tert. ... 7.0
L23		Sec. ... 7.0
L24	2nd IF trans.	Pri. ... 7.0
L25		Tert. ... 7.0
L26		Sec. ... 7.0
L27	Speaker speech coil ...	1.6
L28	Hum neutralising coil ...	0.1
L29	Speaker field coil ...	1500.0
T1	Speaker input trans. { Pri. ... 280.0	
		{ Sec. ... 0.5
		{ Pri., total ... 20.0
T2	Mains trans. { Heater sec. ... 0.1	
		{ Rect. heat sec. ... 0.1
		{ HT sec., total ... 350.0
S1-27	Waveband switches	—
S28-32	Radio-gram switches	—
S33-36	Scale lamp switches	—
S37	Noise suppression switch	—
S38	Mains switch, ganged R25	—

The chassis may now be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

To free the chassis entirely, unsolder from the connecting panel on the speaker the four leads connecting it to chassis.

When replacing, connect the speaker leads as follows, numbering the tags on the connecting panel from top to bottom:

- 1, black;
- 2, yellow;
- 3, 4, no connection to chassis;
- 5, red;
- 6, blue.

**Removing Speaker.**—Unsolder from the connecting panel on the speaker the seven leads connecting it to chassis and the external speaker panel; remove the nuts and washers from the four screws holding the speaker to the sub-baffle.

When replacing, the transformer should be on the right; the four leads from chassis should be connected as described previously; the three leads from the external speaker panel should be connected as follows, still numbering the tags from top to bottom:

- 1, black (with black from chassis);
- 3, green;
- 4, brown.

**GENERAL NOTES**

**Switches.**—S1-S36 are the wavechange, scale-lamp and pick-up switches, ganged in four rotary units located inside and in front of the coil unit. The units are indicated in our end-on chassis view, and are shown in detail in diagram in col. 4, where they are drawn as seen when looking at the underside of the chassis, in the directions of the arrows in the end-on chassis view.

Actually, contact plates are fitted to all four rotors, for inter-switch shorting. The extra switches thus formed are not shown in our circuit diagram, since they do not perform fundamental switching operations, and would add too much complication. The only exceptions are the switches S11 and S12A which are shown in the first unit.

The table below gives the switch positions for the five control settings, starting from fully anti-clockwise position of the control. A dash indicates open, and C, closed.

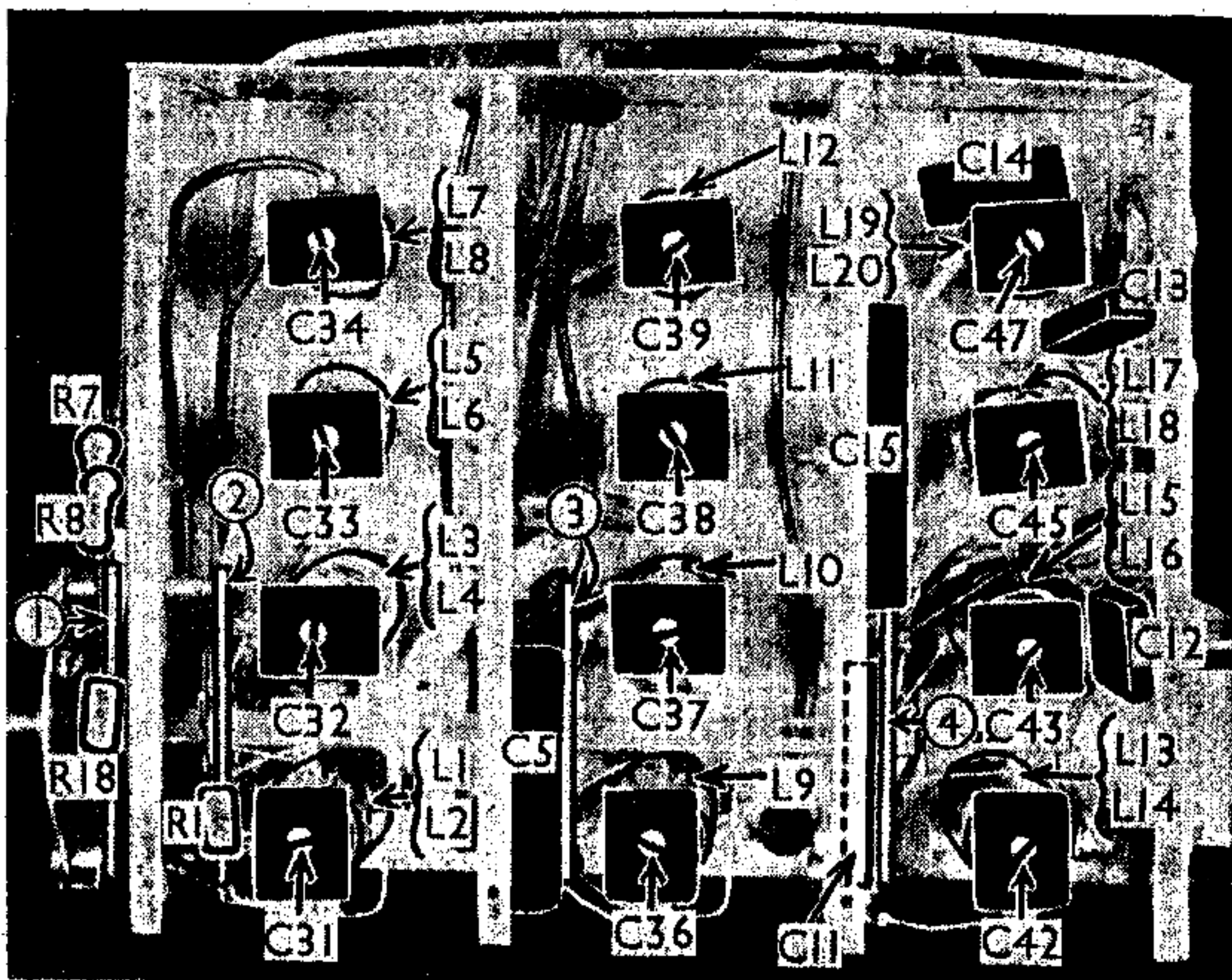
**Switch Table**

Switch	LW	MW	SW2	SW1	Gram
S1	—	—	—	○	—
S2	—	—	—	—	—
S3	—	—	—	—	—
S4	○	—	—	—	—
S5	—	—	—	—	—
S6	—	—	—	—	—
S7	—	—	—	—	—
S8	○	—	—	—	—
S9	—	—	—	—	—
S10	—	—	—	—	—
S11	—	—	—	—	—
S12	—	—	—	—	—
S12A	—	—	—	—	—
S13	—	—	—	—	—
S14	—	—	—	—	—
S15	—	—	—	—	—
S16	○	—	—	—	—
S17	—	—	—	—	—
S18	—	—	—	—	—
S19	—	—	—	—	—
S20	—	—	—	—	—
S21	○	—	—	—	—
S22	—	—	—	—	—
S23	—	—	—	—	—
S24	—	—	—	—	—
S25	○	—	—	—	—
S26	—	—	—	—	—
S27	—	—	—	—	—
S28	—	—	—	—	—
S29	—	—	—	—	—
S30	—	—	—	—	—
S31	○	—	—	—	—
S32	—	—	—	—	—
S33	—	—	—	—	—
S34	—	—	—	—	—
S35	—	—	—	—	—
S36	○	—	—	—	—

S37 is the QMB suppressor switch, at the rear of the chassis, which is closed when the knob is depressed.

S38 is the QMB mains switch, ganged with the volume control R25.

**Coils.**—All the RF and oscillator coils are in a three-compartment screened unit, from which the side cover-plate is removable. This has been removed in our side-



End-on view of the chassis, showing the coil unit, after the cover-plate has been removed, revealing the twelve tuning coils and trimmers in their three screened compartments. Arrows indicate the directions in which the waveband switch units are viewed in the diagrams in col. 4.

chassis view to show the positions of the coils, trimmers and other components included in the unit. The first section (on the left) contains L1-L8 in four pairs; the second section, L9-L12 and the third, L13-L20 in four pairs. Each pair, or single coil, is on a separate tubular former, with a trimmer at its front (looking at the side of the chassis).

The three variable trackers C44, C46 and C48 are in the oscillator (right hand) section of the unit, but are adjusted from the rear of the chassis, and their relative positions, as read from top to bottom, are indicated in our plan chassis view.

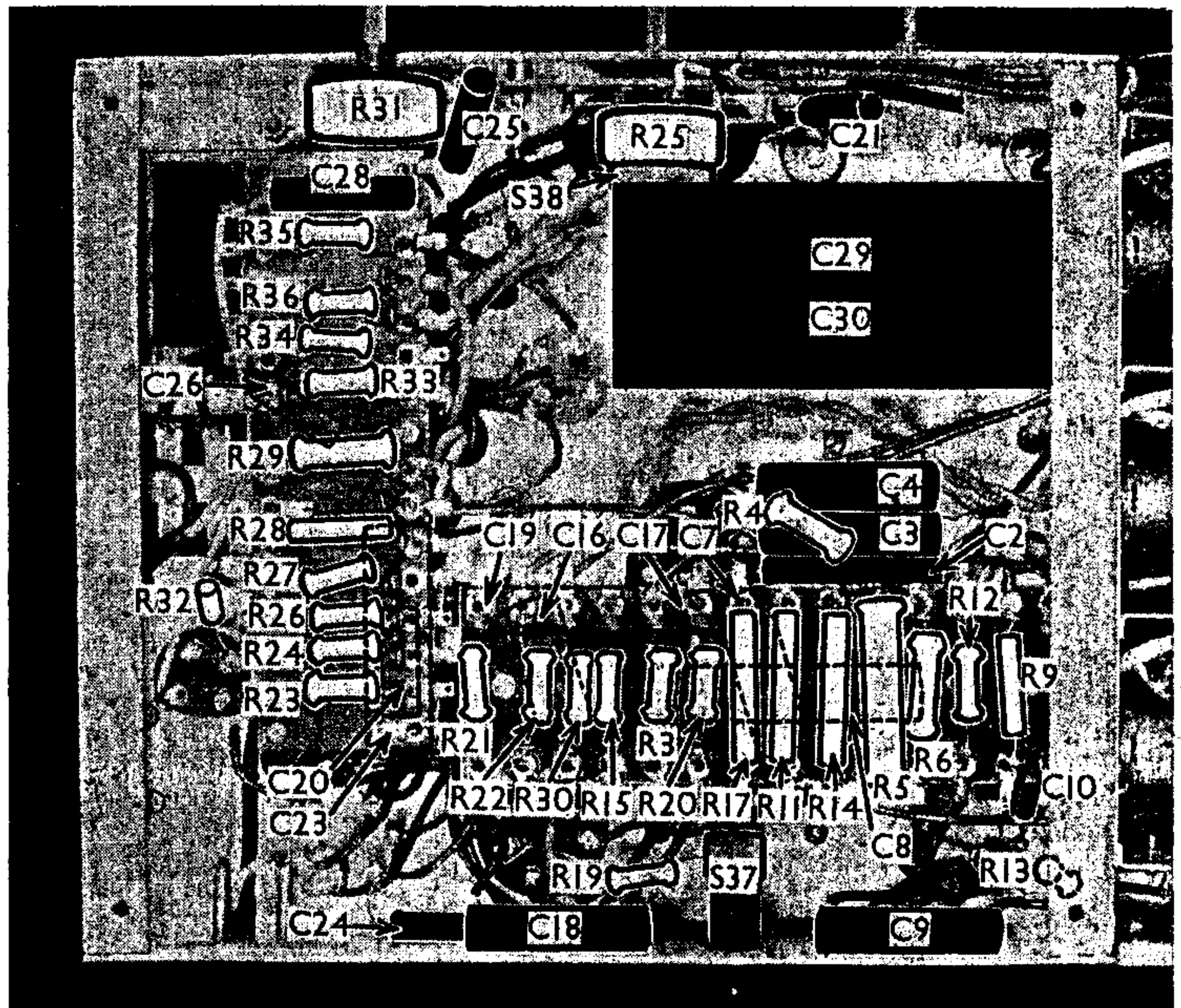
The IF transformers, L21-L23 and L24-L26, are in two screened units on the chassis deck, and the trimmers are adjusted through holes in the back of the cans, their relative positions, from top to bottom, being indicated in the plan chassis view.

**Scale Lamps.**—These are four Ever-Ready 6.2 V, 0.3 A MES types, switched into circuit on the various wavebands by S33-S36, in the main switch unit. On gram all lamps are out.

**External Speaker.**—Two sockets are provided on a panel fitted to the top of the rear of the cabinet for a low impedance (2Ω) external speaker. A plug and socket device serves to disconnect the internal speaker when desired.

**Condensers C22, C27.**—These are two 0.5 μF paper types in a single metal cased unit on the chassis deck. The case is common to one side of each condenser. The other connections are to tags projecting through holes in the chassis deck. That going to the junction of R28, R29 belongs to C22, and that to the junction of R33, R34, to C27.

**Condensers C29, C30.**—These are two dry electrolytics in a single carton be-



Under-chassis view. Part of the under-side of the coil unit can be seen on the right. Most of the small components are mounted in two compact assemblies

neath the chassis, having a common positive (red) lead. The brown lead is the negative of C29 (8 μF) and the black lead the negative of C30 (16 μF).

**Chassis Divergency.**—In some early models, R27 was omitted, the bottom ends of R25 and R26 going direct to chassis.

**Radiogram Modification.**—The chassis in the radiogram models RG37 and RG37 Auto is identical with that in the table model SSW37. The speaker, however, is different. In the table model a Rola F7 speaker is used, but in the radiograms it is a Rola G12, with a higher speech coil impedance. The impedance of an external speaker should be 10Ω.

### CIRCUIT ALIGNMENT

**IF Stages.**—Connect signal generator leads to control grid (top cap) of V2 and chassis, switch set to LW, turn the gang to maximum capacity, turn the volume control to maximum, and depress the sensitivity switch knob.

Feed in a 465 kc/s (645.16 m) signal, and adjust C54, C53, C52, C51, C50 and C49 for maximum output, reducing the signal input as the circuits come into line.

**RF and Oscillator Stages.**—Transfer signal generator leads, via a suitable dummy aerial, to A and E sockets. The dummy aerial may consist of an inductance of 20 μH, a capacity of 0.0002 μF and a 15Ω resistor in series for MW and LW; and a 400Ω non-inductive resistor for the SW bands. With the gang at maximum capacity, the pointer should register with the 550 m and 2,000 m calibration marks on the scale.

**SW1.**—Switch set to SW1, tune to 18 m on scale, feed in an 18 m (16.67 Mc/s) signal, and adjust C42 for maximum output, selecting the peak involving the lesser trimmer capacity. Then adjust C31 and C36 for maximum output.

**SW2.**—Switch set to SW2, tune to 80 m on scale, feed in an 80 m (3.75 Mc/s) signal, and adjust C43 for maximum output, selecting the peak involving the lesser trimmer capacity. Then adjust C32 and C37 for maximum output.

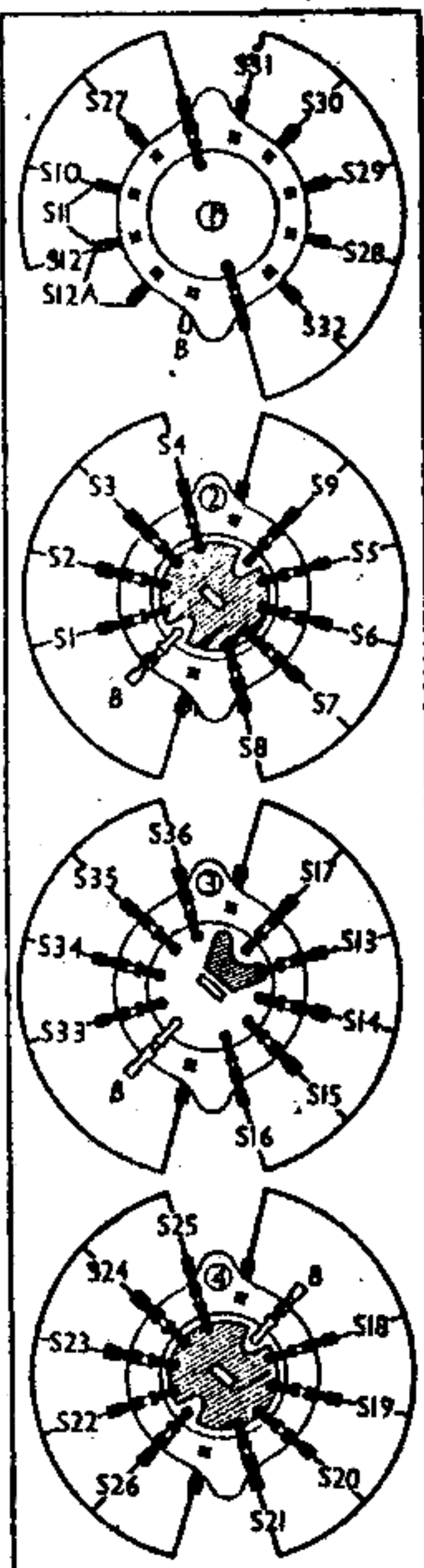
Feed in a 150 m (2 Mc/s) signal, tune it in, and adjust C44 for maximum output until the calibration is optimum. Return to 80 m, and re-check.

**MW.**—Switch set to MW, tune to 200 m on scale, feed in a 200 m (1,500 kc/s) signal, and adjust C45 for maximum output, selecting the peak involving the lesser trimmer capacity. Feed in a 300 m (1,000 kc/s) signal, tune to 300 m on scale, and adjust C33 and C38 for maximum output.

Feed in a 500 m (600 kc/s) signal, tune it in, and adjust C46 for maximum output while rocking the gang for optimum calibration. Return to 300 m and re-check.

**LW.**—Switch set to LW, tune to 1,000 m on scale, feed in a 1,000 m (300 kc/s) signal, and adjust C47 for maximum output. Tune to 1,500 m on scale, feed in a 1,500 m (200 kc/s) signal, and adjust C34 and C39 for maximum output.

Feed in an 1,800 m (166.6 kc/s) signal, tune it in, and adjust C48 for maximum output while rocking the gang for optimum calibration.



Diagrams of the four waveband, pick-up and scale lamp switch units, which are mounted in the coil unit assembly. They are viewed here in the directions indicated by the arrows in our interior view of the assembly in cols. 1 and 2, where they are identified by numbers in circles. Switches formed by rotor plates in units 2 and 4 are omitted.