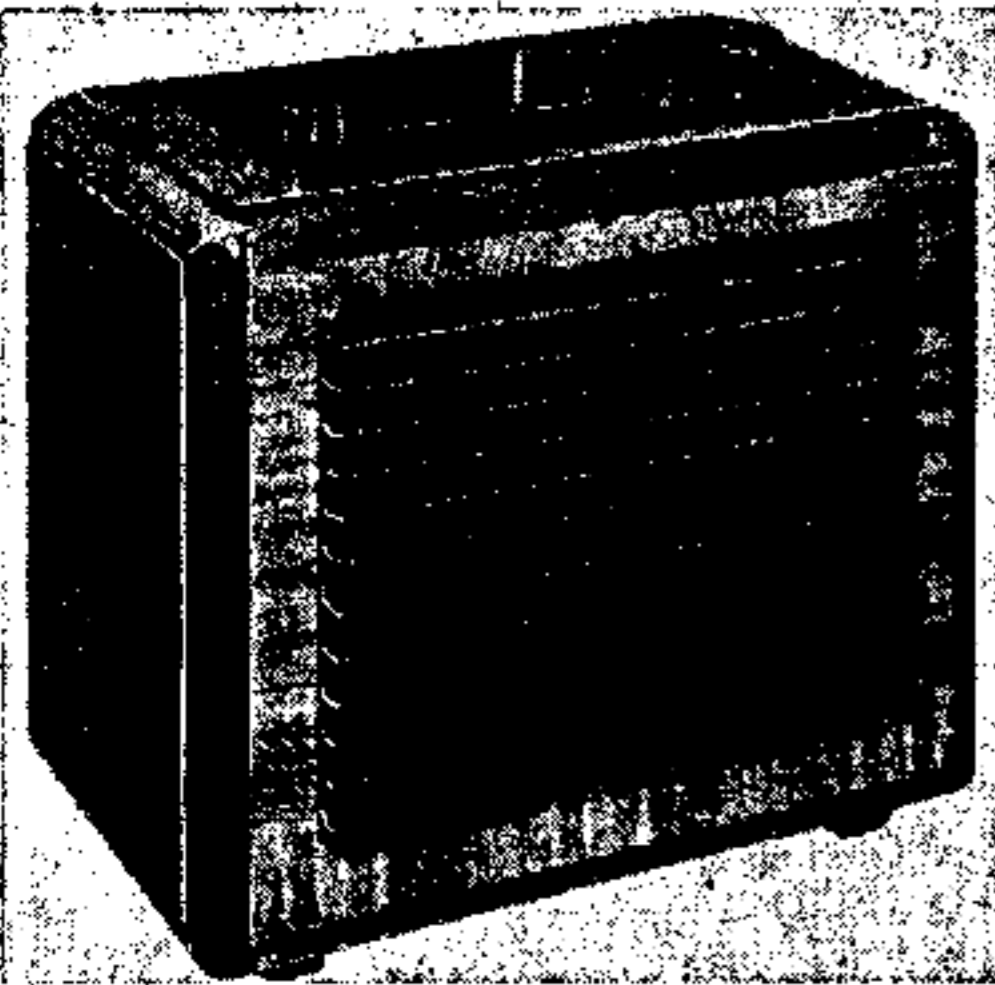


Ned. Ver. v. Historie v/d Radio

# BEETHOVEN BABY GRAND



**A**LTHOUGH it is a "Midget" type, the Beethoven Baby Grand has separate chassis for the main receiver and power unit. It is a 4-valve (plus rectifier) 3-band superhet, designed for AC or DC mains of 100-250 V. The SW range is 16-50 m. Release date and original price: February, 1940; £7 7s.

### CIRCUIT DESCRIPTION

Aerial input, from attached lead, is via C2 (SW) or L1 (MW and LW) to single-tuned circuits L2, C20 (SW), L3, C20 (MW) and L4, C20 (LW), which precede triode hexode valve (V1, Mullard metallised ECH33) operating as frequency changer with internal coupling.

Oscillator grid coils L5 (SW), L6 (MW) and L7 (LW) are tuned by C22. Parallel trimming by C23 (SW), C24 (MW) and C25 (LW); series tracking by C26 (MW) and C27 (LW). Reaction coupling by L8 (SW) and by common impedance of C27, R7 in grid and anode circuits.

Second valve (V2, Mullard metallised EF39) is a variable- $\mu$  RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings.

Intermediate frequency 450.5 kc/s. Diode second detector is part of double diode triode valve (V3, Mullard metallised EBC33). Audio frequency component in rectified output is developed across manual volume R10, which also operates as load resistance, and passed via C10 to CG of triode section.

DC potential developed across R10 is fed back

through decoupling circuit as GB to FC and IF valves, giving AVC.

Resistance-capacity coupling by R13, C12, R14 between V3 triode and pentode output valve (V4, Mullard CL4). Fixed tone correction by C13, L14, R19 in anode circuit.

On AC mains, HT current is supplied by half-wave rectifying valve (V5, Mullard GY31), which behaves on DC mains as a low resistance. Resistance-capacity HT smoothing by C14, R21, C15, R20, C16.

Valve heaters, together with ballast resistors R23 (on 100 V mains) and R24 (line cord, 230 V mains) are connected in series across mains input. V2 heater is shunted by R18. Scale lamp, shunted by R15, is in series with "negative" mains input lead.

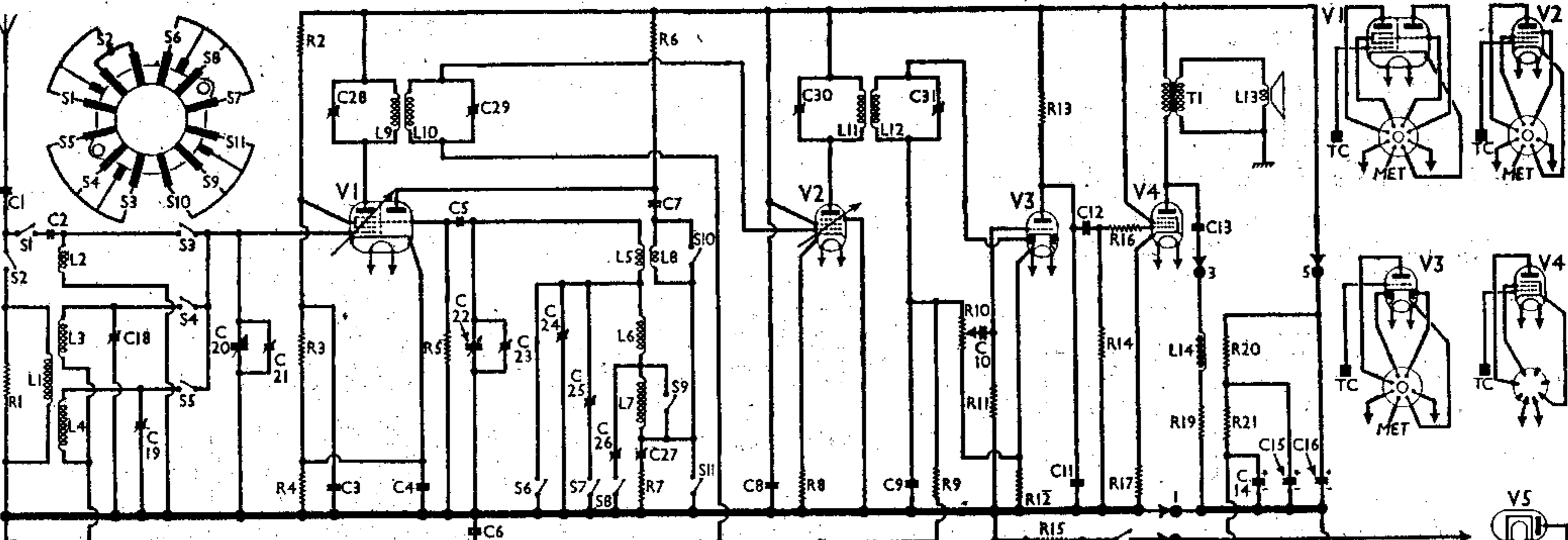
### COMPONENTS AND VALUES

CONDENSERS		Values ( $\mu$ F)
C1	Aerial isolator ...	0.0009
C2	Aerial SW coupling ...	0.00004
C3	V1 SG decoupling ...	0.05
C4	V1 cathode by-pass ...	0.02
C5	V1 osc. CG condenser ...	0.000065
C6	AVC line decoupling ...	0.1
C7	V1 osc. anode coupling ...	0.02
C8	HT circuit RF by-pass ...	0.1
C9	IF by-pass ...	0.00015
C10	AF coupling to V3 triode ...	0.01
C11	IF by-pass ...	0.00075
C12	AF coupling to V4 ...	0.02
C13	Part of tone corrector ...	0.1
C14*	HT smoothing condensers	16.0
C15*		32.0
C16*		4.0
C17	Mains RF by-pass ...	0.1
C18†	Aerial MW trimmer ...	0.000035
C19†	Aerial LW trimmer ...	0.000035
C20	Aerial circuit tuning ...	—
C21	Aerial SW trimmer ...	—
C22	Oscillator circuit tuning ...	—
C23	Oscillator SW trimmer ...	—
C24	Oscillator MW trimmer ...	0.000035
C25	Oscillator LW trimmer ...	0.00012
C26	Oscillator MW tracker ...	0.000307
C27	Oscillator LW tracker ...	0.00022
C28	1st IF trans. pri. tuning ...	—
C29	1st IF trans. sec. tuning ...	—
C30	2nd IF trans. pri. tuning ...	—
C31	2nd IF trans. sec. tuning ...	—

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

RESISTORS		Values (ohms)
R1	Aerial circuit shunt ...	20,000
R2	V1 SG and fixed GB potential divider ...	40,000
R3		40,000
R4		100
R5	V1 osc. CG resistor ...	30,000
R6	V1 osc. anode HT feed ...	6,000
R7	Osc. circuit damping ...	100
R8	V2 fixed GB resistor ...	100
R9	AVC line decoupling ...	2,000,000
R10	Manual volume control; signal diode load ...	500,000
R11	V3 triode CG resistor ...	2,000,000
R12	V3 triode GB resistor ...	3,000
R13	V3 triode anode load ...	120,000
R14	V4 CG resistor ...	500,000
R15	Scale lamp shunt ...	50
R16	V4 grid stopper ...	120,000
R17	V4 GB resistor ...	160
R18	V2 heater shunt ...	100
R19	Part of tone corrector ...	1,000
R20	HT smoothing resistors	600
R21		600
R22	V5 surge limiter ...	100
R23	100 v mains heater ballast ...	150
R24	230 v mains heater ballast ...	650

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial coupling coil ...	25.0
L2	Aerial SW tuning coil ...	0.1
L3	Aerial MW tuning coil ...	3.0
L4	Aerial LW tuning coil ...	30.0
L5	Osc. SW tuning coil ...	0.1
L6	Osc. MW tuning coil ...	5.0
L7	Osc. LW tuning coil ...	9.0
L8	Oscillator SW reaction ...	0.5
L9	1st IF trans.	Pri. ... 10.0
L10		Sec. ... 10.0
L11	2nd IF trans.	Pri. ... 10.0
L12		Sec. ... 10.0
L13	Speaker speech coil ...	3.0
L14	Tone corrector choke ...	40.0
T1	Output trans. { Pri. ... 300.0	
	{ Sec. ... 0.4	
S1-S11	Waveband switches	—
S12	Mains switch, ganged R10	—



Circuit diagram of the Beethoven Baby Grand AC/DC superhet. The leads (shown by arrows) and tags (solid circles), connecting the receiver to the power unit are numbered 1 to 5. Inset at top left is a diagram of the waveband switch unit, as seen from the front of the chassis after removing the speaker.

**VALVE ANALYSIS**

Valve voltages and currents given in the table below are those quoted by the makers. Voltages were measured on the 250 V scale of 1,000 ohms-per-volt meter, chassis being negative, while the set was tuned to 250 m. There was no signal input.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 ECH33	185	1.2	80	2.7
	Oscillator,			
	145	6.5		
V2 EF39	185	12.0	190	4.0
V3 EBC33	54	0.5	—	—
V4 CL4	177	40.0	190	6.5
V5 CY31	235†	—	—	—

† Cathode to chassis, DC.

**DISMANTLING THE SET**

**Removing Power Unit.**—Remove nut and back-plate at either end of unit, and withdraw the unit. The leads from chassis may now be unsoldered if desired.

**When replacing,** the plain lead with no knot goes to tag 1 (seen in our illustration of the unit); one knot, tag 2; the next tag is blank; sleeved lead, tag 3; two knots, tag 4; three knots, tag 5.

**Removing Receiver Chassis.**—Remove power unit;

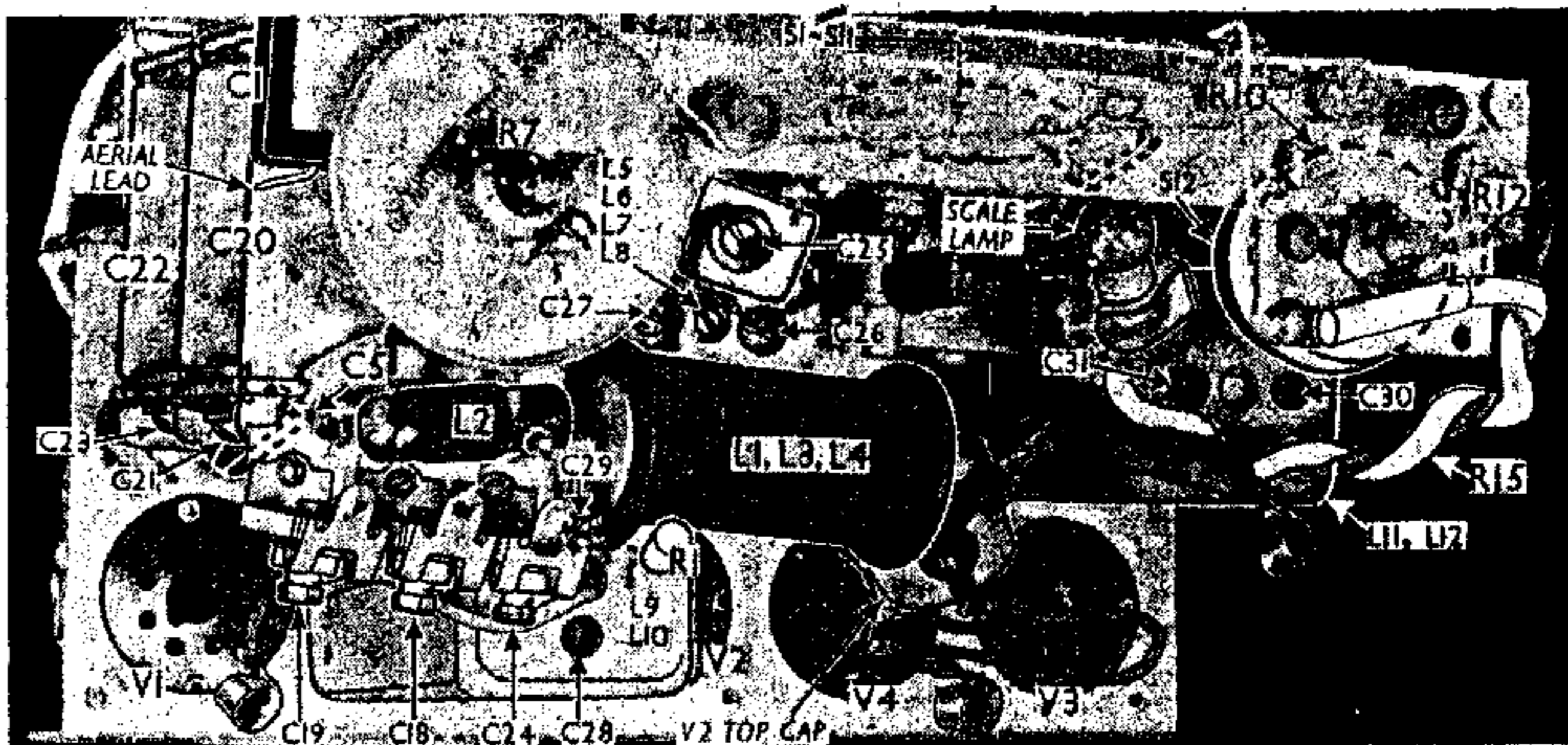
remove the two control knobs (recessed grub screws);

remove two screws (with back-plates) holding part of chassis to front of cabinet;

remove two screws (with nuts and back-plates) holding wooden shelf to battens on sides of cabinet;

drop receiver down, and withdraw, unsoldering aerial lead from C1.

If two further screws (with back-plates) are now removed from the wooden shelf, the shelf can be detached from beneath the chassis.



Three-quarter end view, taken from above the chassis deck. R7, L5-L8 and the switch unit S1-S11 can be seen from the front only, after removing the speaker. R15 is a piece of line cord. A diagram of the S1-S11 unit, viewed from the front, is inset in the circuit diagram overleaf. The tuning scale has been removed as it obscured several components.

S12 is the QMB mains switch, gauged with the volume control R10.

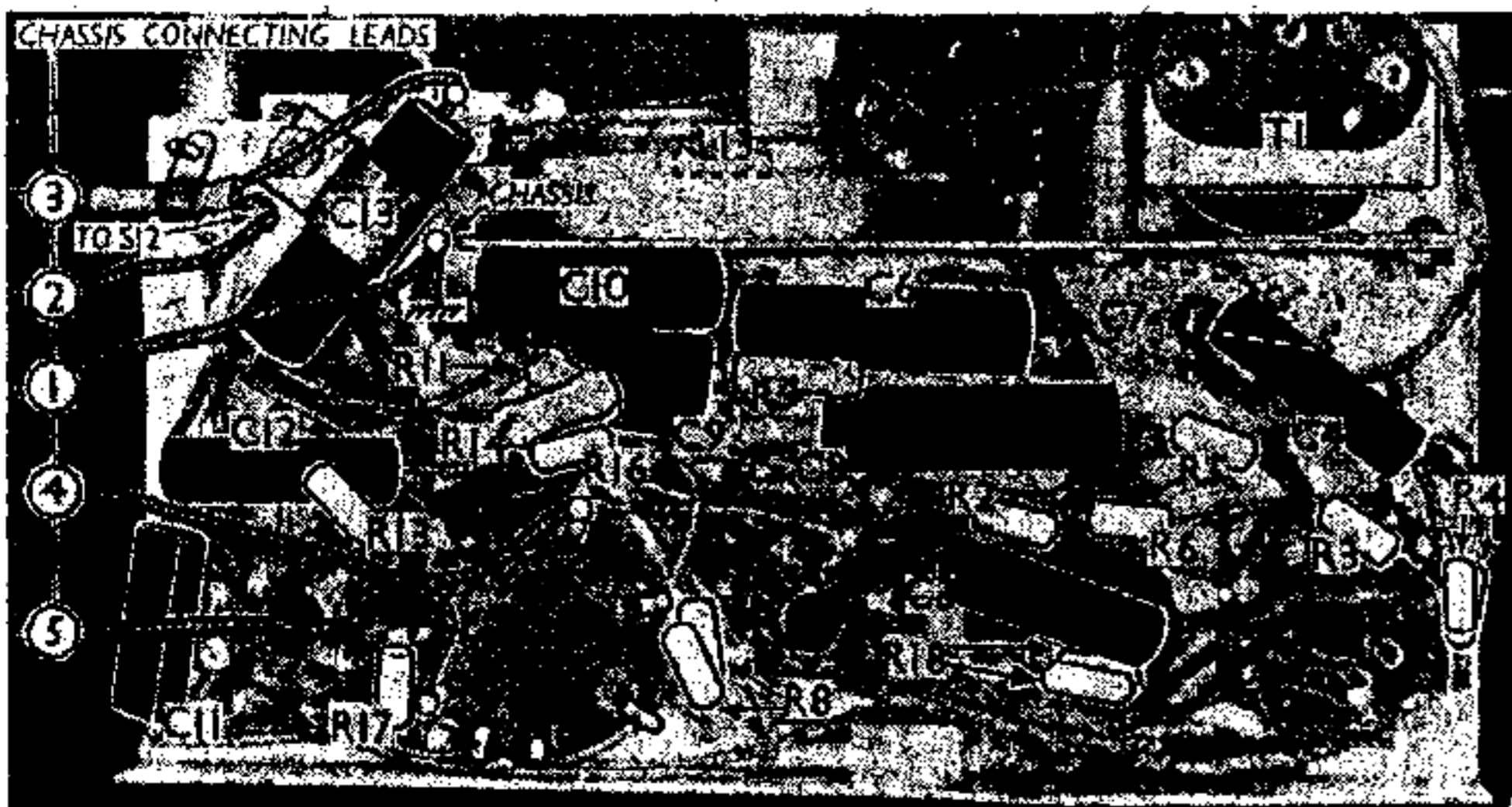
**Coils.**—The positions of the aerial coils L1-L4 are quite clearly seen in the plan view. The oscillator coils L5-L8 cannot be seen, but the screw from which they are suspended is indicated in the plan view. The associated pre-set condensers C25, C26, C27 are grouped round this screw. R7 is beside the coil assembly. The tone corrector choke L14 is mounted with R19 on the separate power unit. It is rated at 1.4 Henries.

**Scale Lamp.**—This is a "Revita" MES type, with a small spherical bulb, rated at 6.2 V, 0.3 A.

**Chassis Divergencies.**—Apart from the differences described under "Resistors," we found in our chassis that the resistors actually used for R4, R8 and R18 were coded 180 Ω each, so that a pair in each case would be 90 Ω, within the usual tolerance limits.

With the exception of V4, all the valves in our chassis were fitted with international octal bases, but in some chassis, valves with Continental bases are fitted. Their types are ECH3, EF9, EBC3 and CY1. The valves themselves are the same in either case, but they are available with alternative bases.

**Aerial Lead.**—In common with most midget types, this receiver has a length of aerial wire attached to it. When not in use, the wire is wound round a flat bobbin fitted beneath the cabinet, and it enters the receiver through a hole in the cabinet base.



Underside view of the receiver chassis. The terminating points of all the leads going to the power unit are clearly indicated.

**GENERAL NOTES**

**Switches.**—S1-S11 are the waveband switches, gauged in a single rotary unit mounted just above the speaker magnet. An arrow, which indicates its position in our plan view, shows the direction in which the unit is viewed in the diagram inset in the top left-hand corner of the circuit diagram overleaf, where it is shown in detail.

The table below gives the switch positions for the three control settings, starting with the control lever in its left-hand (SW) position. A dash indicates open, and C, closed.

**Switch Table**

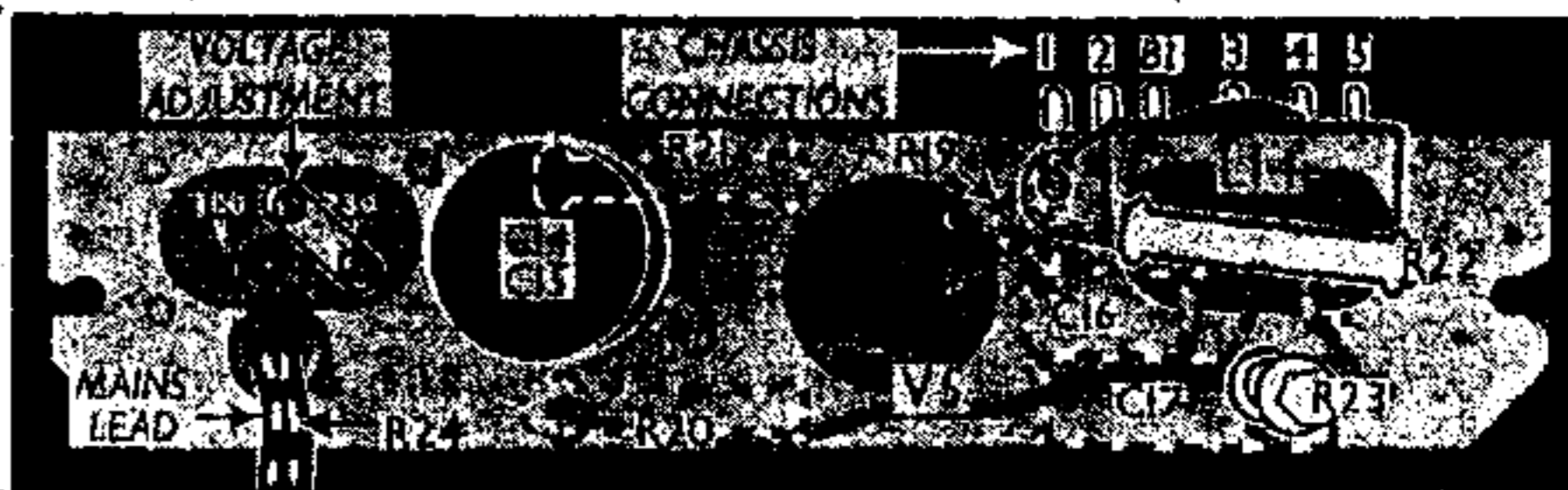
Switch	SW	MW	LW
S1	○	—	—
S2	—	○	○
S3	○	—	—
S4	—	○	—
S5	—	—	○
S6	○	—	—
S7	—	—	○
S8	—	○	—
S9	—	—	○
S10	—	—	○
S11	○	—	—

It is shunted by a 50 Ω resistor made up from a piece of line cord.

**Inter-chassis Connections.**—The main receiver chassis is connected by five flexible leads to five of the six tags on the separate power unit. These are coded by numbers in the circuit diagram and chassis illustrations, and in the latter the actual points to which they are connected are clearly shown, except in the case of the lead numbered 2, which disappears through a hole in the receiver chassis to reach S12. One power unit tag is blank.

**Resistors.**—Several 100 Ω resistors (R4, R8, R18) are made up of two ½-watt resistors in parallel. R22 may not be present in some chassis. R23 is heater ballast on 100 V mains, while R24 (the line cord) is that for 230 V mains. One is short-circuited while the other is in use. For R15, see under "Scale Lamp." R13 may be 250,000 Ω.

Plan view of the power unit. Components underneath are shown dotted. The third (unnumbered) chassis connecting tag is blank.



**CIRCUIT ALIGNMENT**

**IF Stages.**—Connect signal generator leads to control grid (top cap) of V1 and, via a 0.1 μF condenser, to chassis. Leave V1 top cap in position. Feed in a 450.5 kc/s (666 m) signal, and adjust C31, C30, C29 and C28 for maximum output.

**RF and Oscillator Stages.**—With the gang at minimum, the pointer should cover the 200 m mark on the scale. Transfer one signal generator lead from V1 top cap to aerial connection on C1. The procedure now follows stage sequence, instead of the normal waveband sequence.

Switch set to SW, turn the gang to minimum, feed in a 15.39 m (19.5 Mc/s) signal, and adjust C23 for maximum output. Leaving gang at minimum, feed in a 200 m (1,500 kc/s) signal, and adjust C24 for maximum output. Switch set to LW, feed in a 910 m (330 kc/s) signal, and adjust C25 for maximum output.

Switch set to MW, tune to 550 m on scale, feed in a 550 m (545 kc/s) signal, and adjust C26 for maximum output, rocking the gang for optimum results. Switch set to LW, tune to 2,000 m on scale, feed in a 2,000 m (150 kc/s) signal and adjust C27 for maximum output, rocking the gang for optimum results. Now readjust C24 at 200 m.

Switch set to SW, feed in a 20 m (15 Mc/s) signal, tune it in, and adjust C21 for maximum output. Switch set to MW, feed in a 250 m (1,200 kc/s) signal, tune it in, and adjust C18 for maximum output. Switch set to LW, feed in a 1,200 m (250 kc/s) signal, tune it in, and adjust C19 for maximum output.