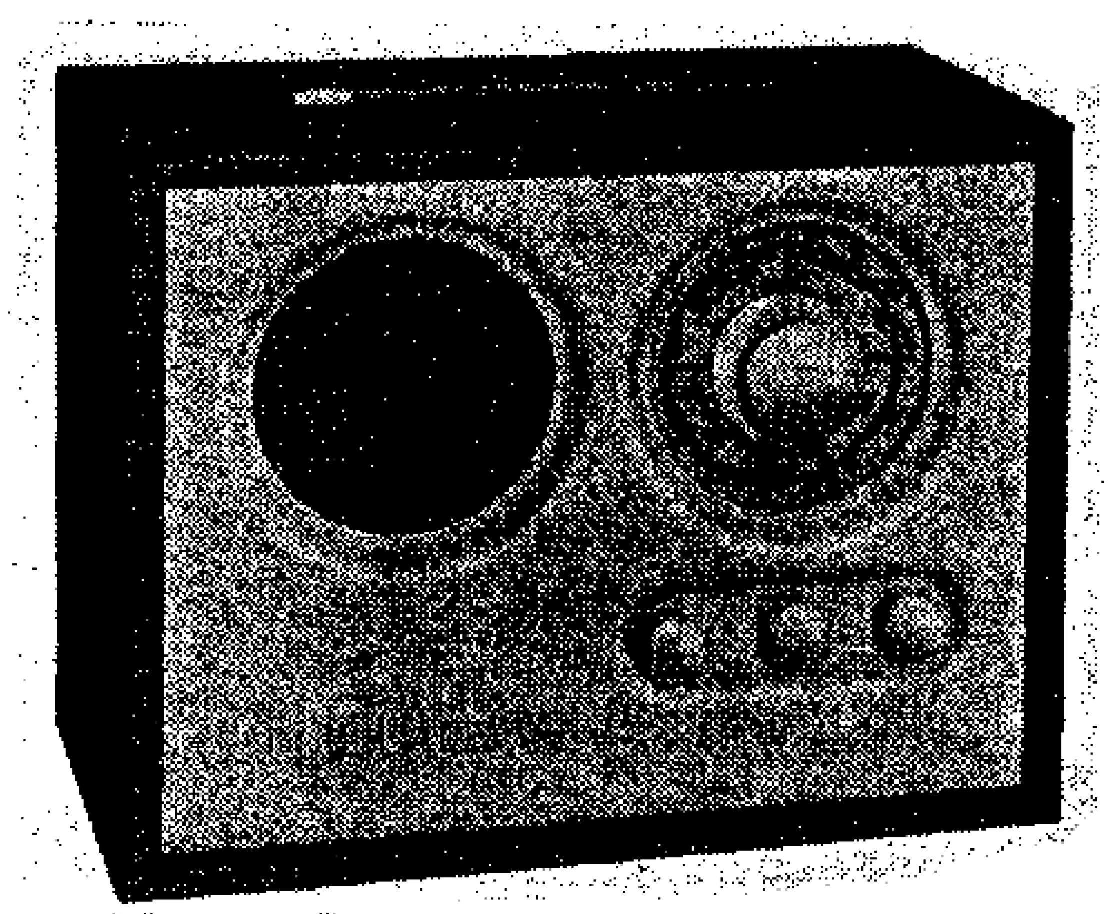
DOUBLE DECCA

POST-WAR MODEL 46



DESIGNED to operate from A.C. or D.C. mains or from self-contained batteries, the Double Decca 46 is a 4-valve (plus metal rectifier) 3-band portable superhet. A loaded frame aerial provides the signal input on M.W. and L.W., and an external aerial is used on S.W. The mains voltage range is 100-250 V. The S.W. range is 16-50 m.

The introduction of a metal rectifier and the permanent series connection of valve filaments have greatly simplified the design as compared with pre-war sets of the same type, reducing heat dissipation, mains/battery change-over switching, and wide-range voltage adjustment complexity. As the plug-in frame aerial and the speaker are attached to the chassis, this can be removed from the cabinet as a working unit.

Release date and original price: May, 1946; £15, complete with batteries, plus £3 4s. 6d. purchase tax.

CIRCUIT DESCRIPTION

Input from frame aerial winding **L2** is tuned by loading coils **L1** (M.W.) and **L4** (L.W.), with **C32**, which precede heptode valve **(V1, Osram X14)** operating as frequency changer with electron coupling.

For S.W. operation only, provision is made for the connection of an external aerial which is coupled via capacitor **C1** to single tuned circuit **L3, C32.** The earth socket is isolated from the mains by **C3.**

V1 oscillator grid coils **L5** (S.W.), **L6** (M.W.) and **L7** (L.W.) are tuned by **C33;** parallel trimming by **C34** (M.W.), and **C35** (L.W.); series tracking by **C8** (S.W.), **C10** (M.W.) and **C12** (L.W.). Reaction coupling from anode, via capacitor **C14,** is obtained from the common impedance of trackers on all bands, with additional inductive coupling by **L8** (S.W.) and **L9** (M.W.).

Second valve **(V2, Osram Z14)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C5, L10, L11, C6** and **C17, L12, L13, C18.**

Intermediate frequency 380 kc/s.

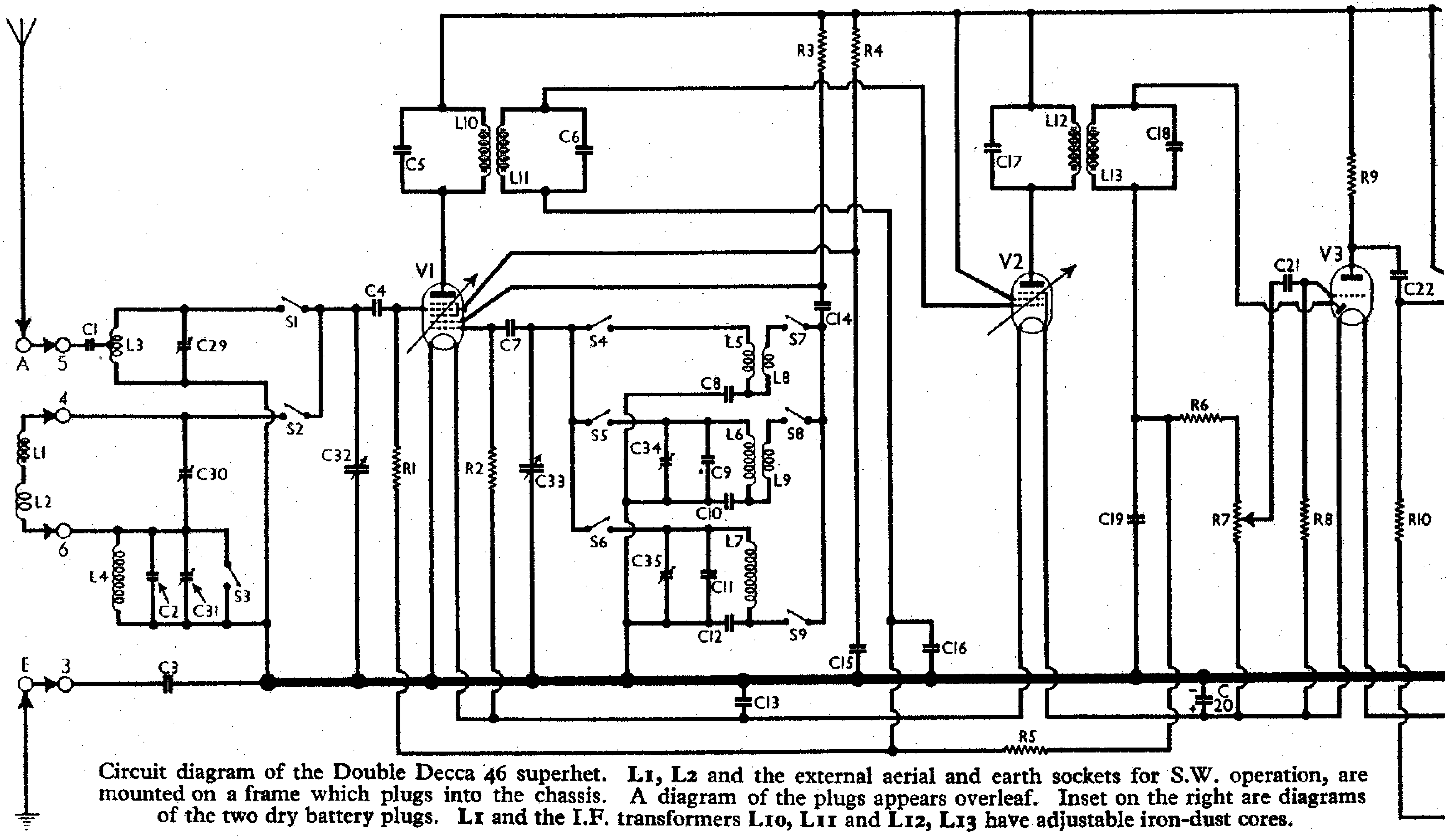
Diode second detector is part of single diode triode valve **(V2, Osram HD14).** Audio frequency component in rectified output is developed across manual volume control **R7,** which also acts as diode load resistor, and passed via **C21** to C.G. of triode section, which operates as A.F. amplifier. I.F. filtering by **C19** and **R6** in diode circuit.

D.C. potential developed along **R6, R7** is tapped off and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control.

Resistance-capacitance coupling by **R9, C22** and **R10** between **V3** triode and pentode output valve **(V4, Osram N15).** Fixed tone correction in anode circuit by **C23.**

Power Supplies

The change-over from battery to A.C. or D.C. mains operation, or vice versa, is



Circuit diagram of the Double Decca 46 superhet. L1, L2 and the external aerial and earth sockets for S.W. operation, are mounted on a frame which plugs into the chassis. A diagram of the plugs appears overleaf. Inset on the right are diagrams of the two dry battery plugs. L1 and the I.F. transformers L10, L11 and L12, L13 have adjustable iron-dust cores.

accomplished by a manually operated switch unit comprising switches **S10 (B), S11 (M), S12 (M)** and **S13 (B and M).** The suffix letters indicate that their switches close for battery operation **(B)** or mains operation **(M). S13** closes in both positions.

For battery operation, **S10** short-circuits **R11,** and **S13** closes the L.T. circuit, connecting a 7.5 V dry battery to the series connected filament circuit. (Each filament requires approximately 1.5 V, and there are two of them in **V4**.) The H.T. battery is connected permanently to the H.T. positive and negative lines, and G.B. potential for **V4** is obtained from the drop along **R13, R14** in the negative H.T. lead to chassis.

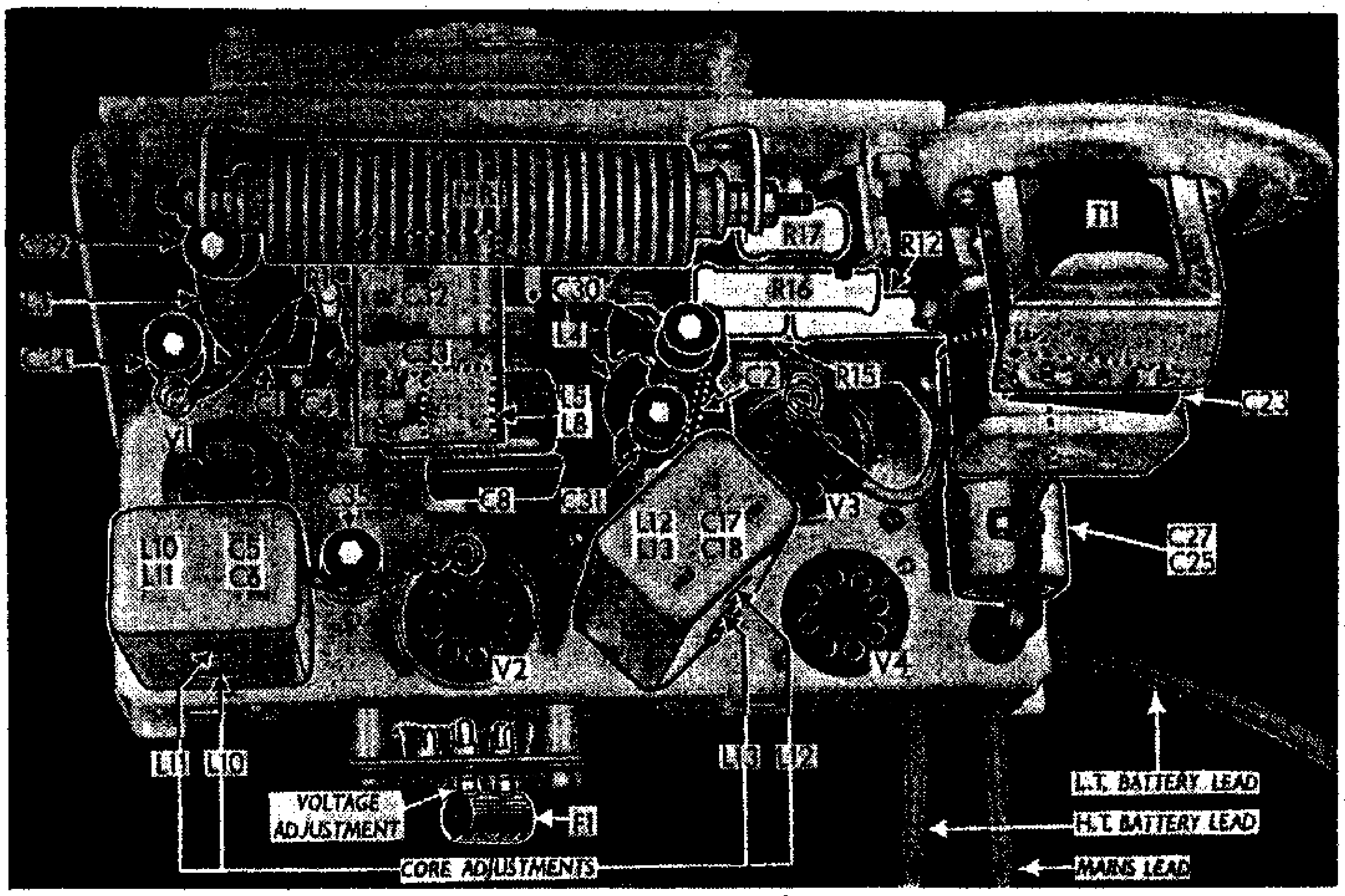
For mains operation, **S12** closes to connect the mains. H.T. current is then supplied via the metal rectifier **(MR1, S.T.C. SenTerCel HS 25/10),** which rectifies A.C. or acts as a low resistance on D.C. mains. Smoothing is effected by resistors **R15, R16, R17** and electrolytic capacitors **C27, C28,** and the H.T. output from **C27** is fed via **S11** to **V4** anode circuit and then via **R11, C25** to H.T. positive line, **S10** now being open; and to chassis via the G.B. resistor **R13.**

Current for the filament circuit is taken from the H.T. circuit via the ballast resistor **R12,** a large capacitance electrolytic **C24** providing, with **R12,** additional smoothing. Both the H.T. and L.T. currents flow through **R13.**

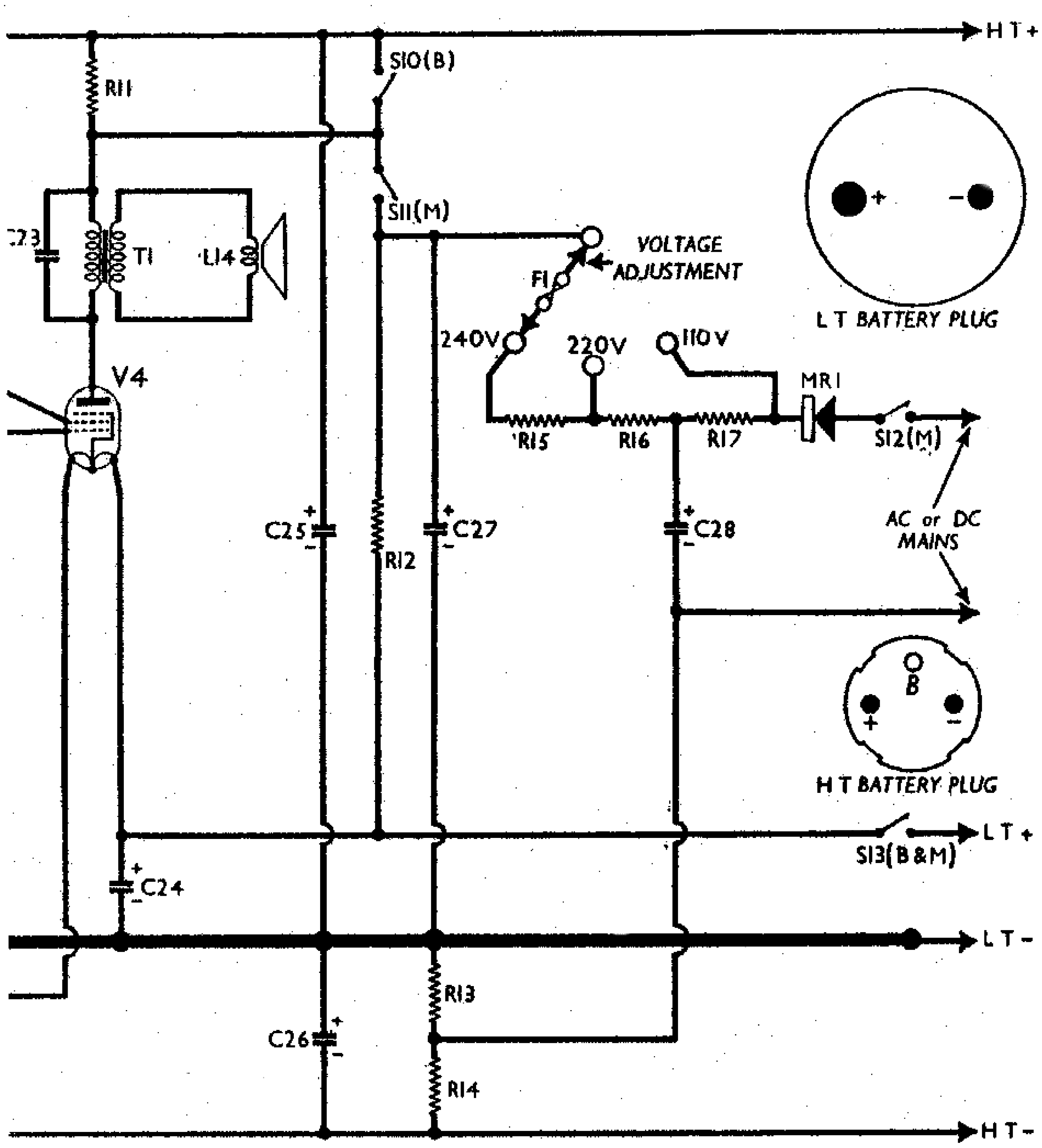
Although the H.T. and L.T. batteries remain connected during mains operation, when they "float" across their respective circuits, their presence is not necessary, and the set operates normally on A.C. or D.C. whether they are connected or not. Their retention in circuit, however, simplifies the change-over switching considerably.

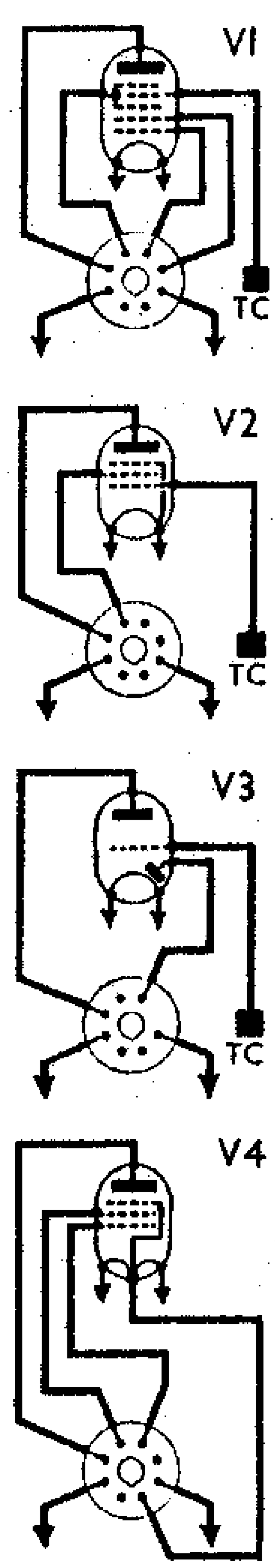
A secondary effect of their retention is that if the mains supply fails, or if the mains are disconnected by removal of the mains plug, the set continues to operate.

Mains voltage adjustment is effected by tapping down the smoothing resistors **R15, R16, R17,** the rectifier always being between one side of the mains and the voltage adjustment, irrespective of the setting of the latter. Fuse **F1** is carried in the voltage adjustment link.



Plan view of the chassis. L3 is seen mounted on the front member, but the L5, L8 unit is almost hidden beneath the gang. L4 is shown here by cutting away part of the platform upon which C30 and C31 are mounted. The frame aerial plugs into two sockets which can be seen on the rear member, just below the two I.F. transformer units.





COMPONENTS AND VALUES

	CAPACITORS	Values (μF)
C1	Aerial S.W. coupling ...	0·00004
C2	Aerial L.W. fixed trimmer	0·000085
C3	Earth isolating capacitor	0·05
C4	V1 pent. C.G. capacitor...	0·0001
C5	} 1st I.F. transformer tuning capacitors ... {	0·0001
C6		0·0001
C7	V1 osc. C.G. capacitor ...	0·0005
C8	Osc. circuit S.W. tracker	0·005
C9	Osc. circ. M.W. fixed trimmer	0·00003
C10	Osc. circuit M.W. tracker	0·00067
C11	Osc. circ. L.W. fixed trimmer	0·00017
C12	Osc. circuit L.W. tracker	0·00026
C13	V1 filament R.F. by-pass	0·25
C14	V1 osc. anode coupling...	0·0005
C15	V1 S.G. decoupling ...	0·01
C16	A.V.C. line decoupling ...	0·01
C17	} 2nd I.F. transformer tuning capacitors ... {	0·0001
C18		0·0002
C19	I.F. by-pass capacitor ...	0·00015
C20*	V3 filament decoupling	20·0
C21	A.F. coupling to V3 triode	0·002
C22	A.F. coupling to V4 ...	0·01
C23	Fixed tone corrector ...	0·005
C24*	V1–V4 filament smoothing	200·0
C25*	H.T. smoothing capacitor	16·0
C26*	V4 G.B. by-pass ...	20·0
C27*	} H.T.smoothing capacitors {	16·0
C28*		8·0
C29‡	Aerial circ. S.W. trimmer	—
C30‡	Aerial circ. M.W. trimmer	—
C31‡	Aerial circ. L.W. trimmer	—
C32†	Aerial circ. tuning ...	—
C33†	Oscillator circuit tuning	—
C34‡	Osc. circ. M.W. trimmer	—
C35‡	Osc. circ. L.W. trimmer	—

* Electrolytic. † Variable. ‡ Pre-set.

RESISTORS		Values (ohms)
R1	V1 pent. C.G. resistor ...	4,000,000
R2	V1 osc. C.G. resistor ...	220,000
R3	V1 osc. anode H.T. feed	22,000
R4	V1 S.G. H.T. feed ...	68,000
R5	A.V.C. line decoupling ...	6,800,000
R6	I.F. stopper	100,000
R7	Manual volume control	1,000,000
R8	V3 C.G. resistor ...	10,000,000
R9	V3 triode anode load ...	1,000,000
R10	V4 C.G. resistor ...	2,000,000
R11	Part H.T. smoothing ...	5,000
R12	Filament circuit ballast...	2,200
R13	V4 automatic G.B. resistors ...	50
R14		250
R15	Mains voltage adjustment resistors ...	400
R16		1,220
R17		200

OTHER COMPONENTS		Approx. Values (ohms)
L1	M.W. tuning coil ...	0·6
L2	Frame aerial winding ...	1·6
L3	Aerial S.W. tuning coil ...	Very low
L4	L.W. tuning coil	7·6
L5	Osc. S.W. tuning coil ...	Very low
L6	Osc. M.W. tuning coil ...	5·4
L7	Osc. L.W. tuning coil ...	13·5
L8	Osc. S.W. reaction coil ...	0·6
L9	Osc. M.W. reaction coil ...	0·6
L10	1st I.F. trans. Pri. ...	6·7
L11	1st I.F. trans. Sec. ...	6·7
L12	2nd I.F. trans. Pri. ...	6·7
L13	2nd I.F. trans. Sec. ...	6·2
L14	Speaker speech coil ...	2·8
T1	Speaker input trans. Pri. ...	360·0*
	Speaker input trans. Sec. ...	0·3
S1–S9	Waveband switches ...	—
S10–S12	Mains/battery changeover switches	—
S13	L.T. circuit switch ...	—

* Celestion speaker; if Rola, 600 Ω.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on (a) a new H.T. battery reading 90 V on load; (b) A.C. mains of 230 V, using the 220 V mains tapping. In both cases the readings were practically identical, except those for V4. Two sets of readings are therefore given for this valve: one (marked by an asterisk) for battery operation, and the other (marked by a dagger) for mains operation.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 X14	87	0·62	38	0·7
	Oscillator 67	1·0		
V2 Z14	87	0·9	87	0·22
V3 HD14	20	0·03	—	—
V4 N15	85*	5·5	87	1·0
	107†	7·0	90	1·2
MR1	200‡	—	—	—

* Battery operation.
† Mains operation.
‡ Rectifier output to chassis, D.C.

The receiver was tuned to the lowest wavelength on the M.W. band and the volume control was at maximum, but there was no signal input.

Voltages were measured on the 400 V scale of a model 7 Avometer, chassis being the negative connection.

GENERAL NOTES

Switches.—S1-S9 are the waveband switches ganged in two rotary units beneath the chassis. These are indicated in our under-chassis view by numbers **1** and **2** in circles, with arrows to indicate the directions in which they are viewed in the diagrams in col. 3, where the units are shown in detail as seen in an inverted chassis. The table below gives the switch positions for the three control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C**, closed.

Waveband Switch Table

Switch	L.W.	M.W.	S.W.
S1	—	—	C
S2	C	C	—
S3	C	—	—
S4	—	—	C
S5	—	C	—
S6	C	—	—
S7	—	—	C
S8	—	C	—
S9	C	—	—

S10-S13 are the mains/battery changeover switches in another rotary unit beneath the chassis. This is indicated in our under-chassis view, and shown in detail in the diagram in col. 4, where it is drawn as seen when viewed from the rear of an inverted chassis.

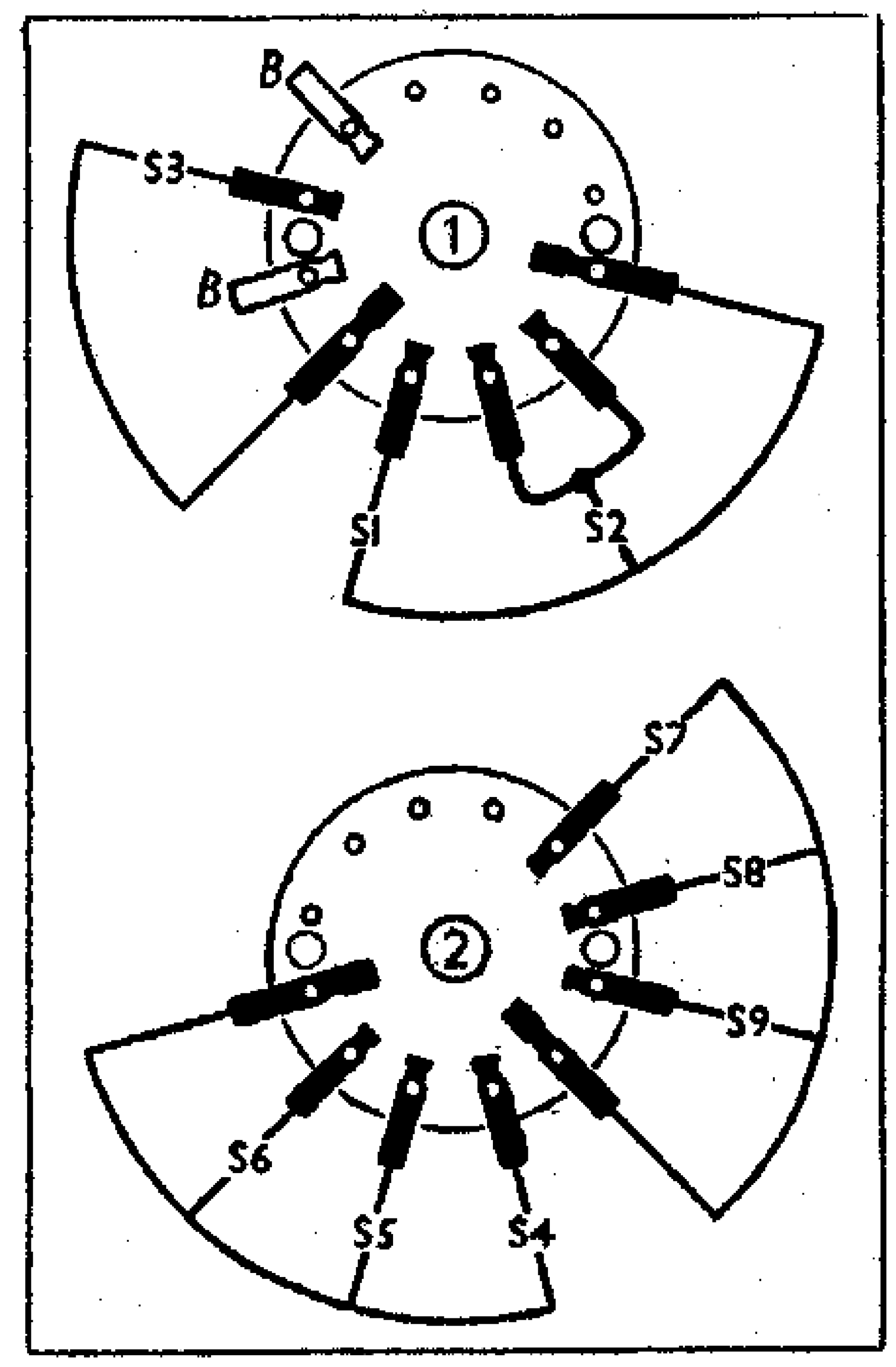
The suffix letters in parenthesis indicate that they close for battery operation **(B)** or mains operation **(M)**. The control has three positions: anti-clockwise position of the control, battery operation; centre, off; clockwise position, mains operation.

Coils.—The frame winding **L2** is embedded in a canvas cover supported on wooden cross-struts. On the struts are mounted also the iron-dust cored M.W. loading coil **L1**, the **A** and **E** sockets for S.W. operation and two 3-pin plugs for connection to the receiver chassis.

The points of interconnection between frame and chassis are numbered 3, 4, 5 and 6 in the circuit diagram, and the corresponding pins on the frame are shown in the diagram below, where the two lower corners of the frame are drawn, showing the plug as seen from the free ends of the pins.

The remaining aerial coils **L3** and **L4** and the S.W. oscillator coil unit **L5, L8** are on the chassis deck. They are indicated in our plan view of the chassis, but they cannot be seen clearly because they are obscured by other components. **L3** is at the front of the deck beneath the metal rectifier, **L4** is beneath the panel carrying the trimmers **C30, C31**, and the **L5, L8** unit is beneath the tuning gang.

The I.F. transformers **L10, L11** and **L12, L13** are in two screened units on the chassis deck with their associated tuning capacitors.

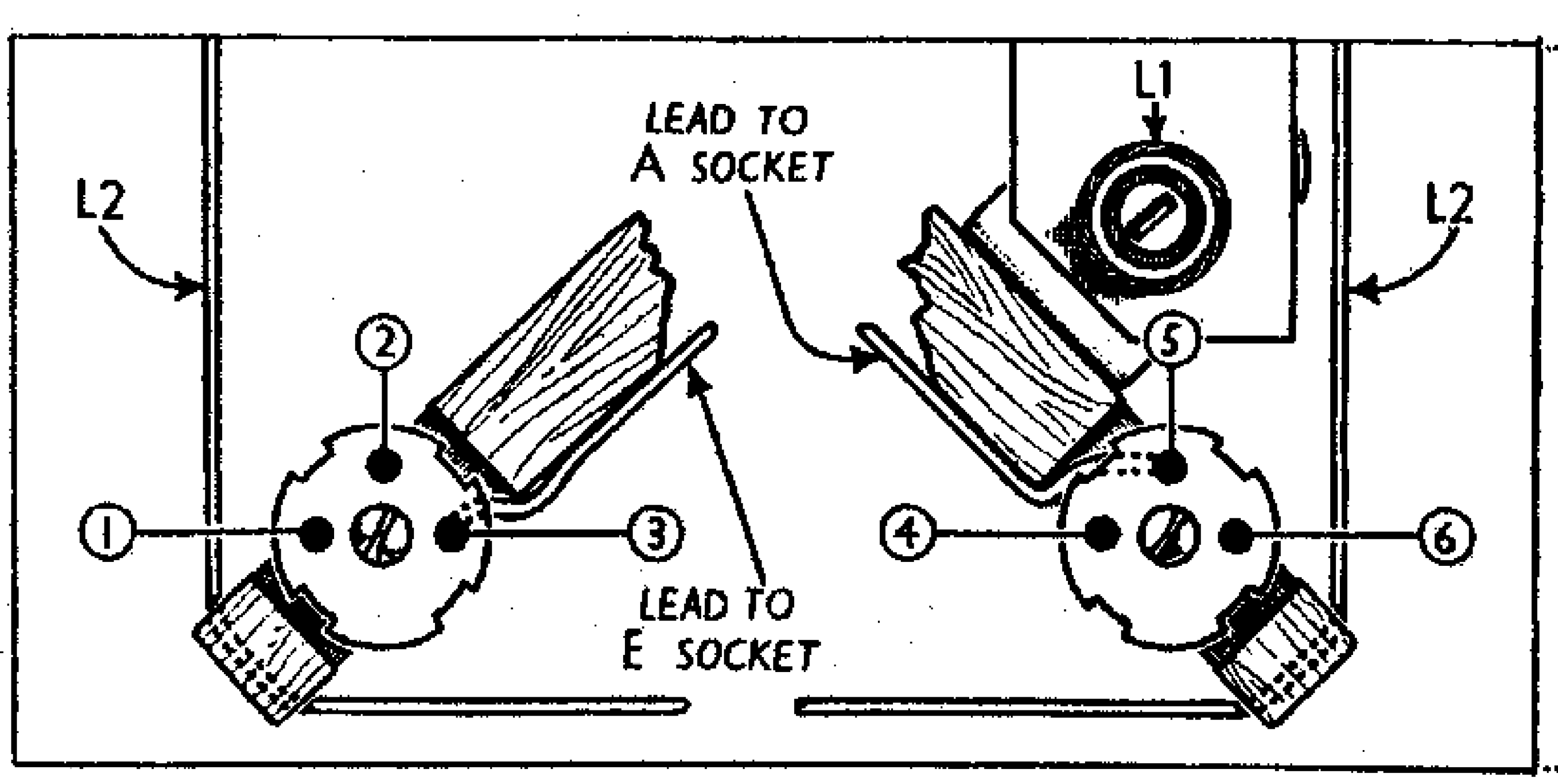


Diagrams of the two waveband switch units, drawn as seen in an inverted chassis when viewed in the directions of the arrows in our under-chassis illustration. *B* indicates a blank tag.

Electrolytic Capacitors.—C20 and **C26** are both T.C.C. "Picopack" miniature electrolytics, rated at 20 μF, 12 V D.C. working. The polarity of **C20** should be noted, the positive side going to **V2, V3** filaments. **C24** is a large capacitance electrolytic shunted directly across the series-connected filaments. Our sample was a Hunts J61, rated at 200 μF, 15 V D.C. working.

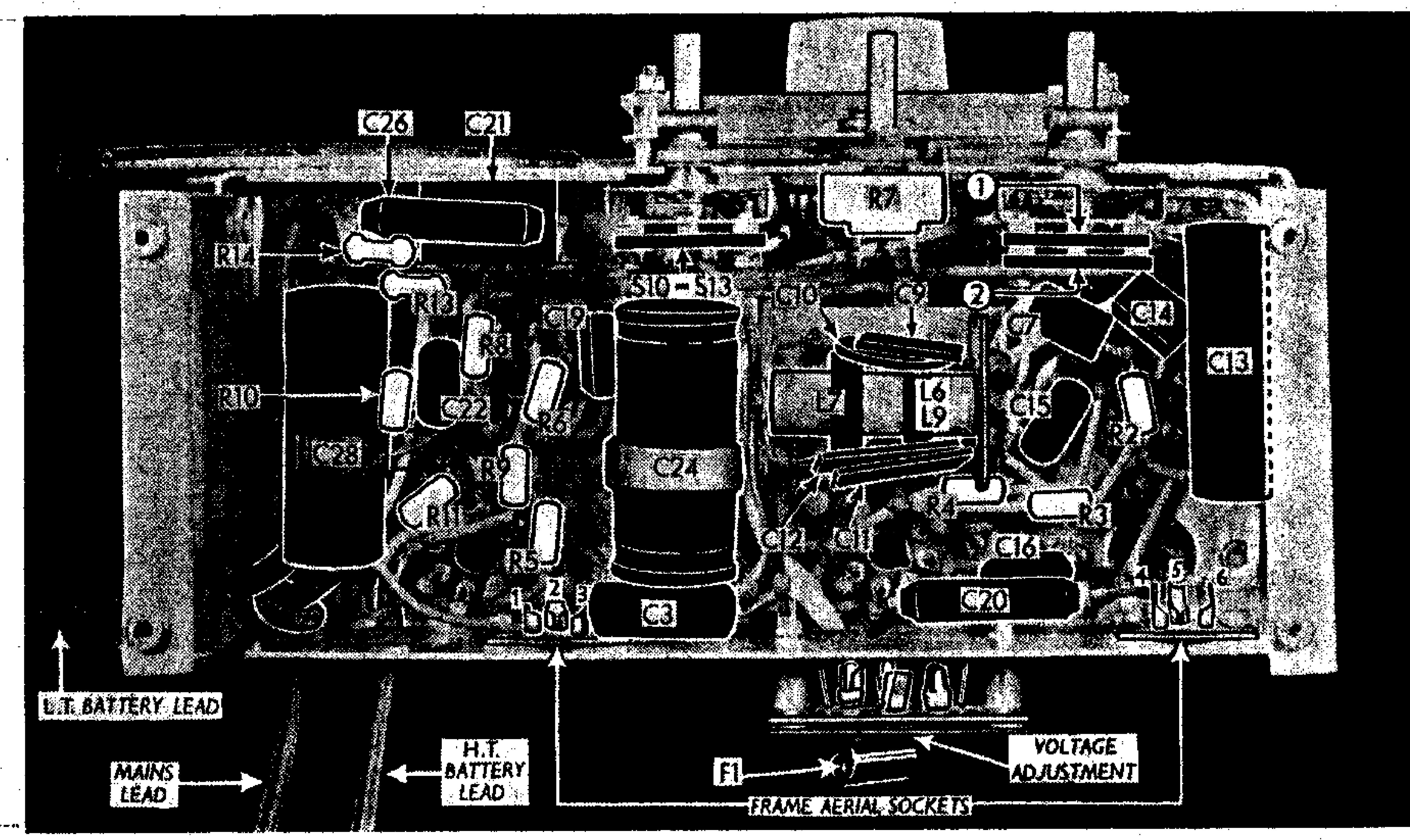
The H.T. smoothing capacitors **C25, C27** and **C28** are in two further units. **C25** and **C27** are in a single tubular unit on the chassis deck, beneath the speaker, the two positive connections being brought out to the tags at each end, the case forming the common negative connection. Ours was a Hunts type J47 rated at 16 μF + 16 μF, 350 V D.C. working. **C28** is an 8 μF electrolytic in a tubular cardboard container beneath the chassis. Ours was a Dubilier type BR850, rated at 500 V D.C. working.

Fuse F1.—The fuse takes the form of a 2-pin plug for mains voltage adjustment, mounted on a panel at the rear of the chassis. If the two pins are unscrewed



Sketch of the lower corners only of the frame aerial assembly, showing the pin numbers of the two connecting plugs and the position of L1. It is viewed from the front: *i.e.*, the free ends of the pins.

Under-chassis view. The two waveband switch units (marked 1 and 2 in circles and the S10-S13 unit are indicated here and shown in detail in separate diagrams elsewhere. The frame aerial socket lugs are numbered to agree with the sketch in cols. 1 and 2.



a couple of turns, a small fuse-wire carrier can be slipped out of the body of the plug, and if the fuse wire has blown it can be replaced by winding a new length of wire round the two rivets on the carrier. The wire should be 32 S.W.G. tinned copper.

Batteries.—The batteries supplied with our sample were both Ever Ready products fitted with non-reversible connecting sockets. The L.T. battery was an "Alldry" 31 unit rated at 7.5 V, and

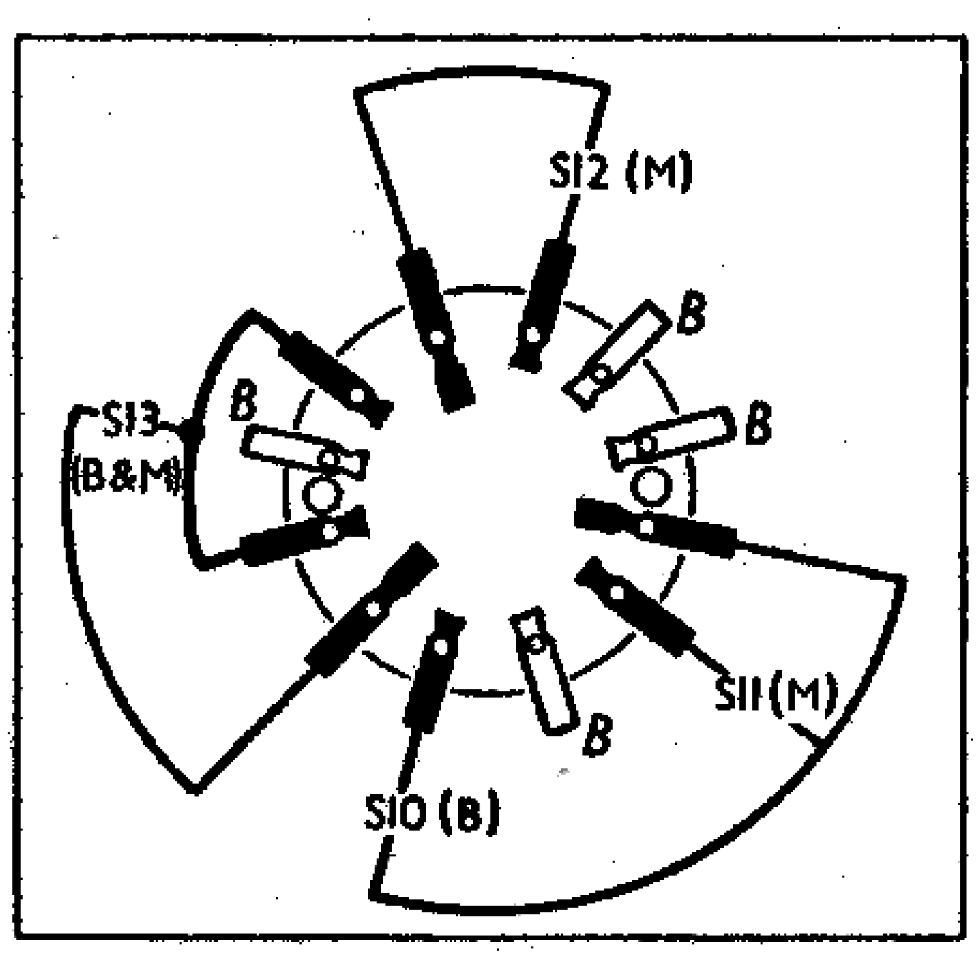


Diagram of the battery/mains/off switch unit **S10-S13** drawn as seen from the rear of an inverted chassis. Switches marked **(B)** close for battery operation, and those marked **(M)** for mains. *B* indicates a blank tag.

the H.T. battery was a "Batrymax" type B107, of layer construction requiring about half the depth of the normal H.T. battery.

Plugs terminate the battery leads on the receiver, and as the set will work on mains without the batteries connected, parking sockets are provided for these plugs on the side of the cabinet, and it is important to use them when batteries are not carried, as they could cause short-circuits by coming into contact with the chassis.

The L.T. plug has two pins, the larger-diameter one being the positive. The H.T. plug has three pins, of which two only are used. Diagrams of the two plugs are inset in the circuit diagram showing their connections. They are drawn as seen when viewed from the free ends of the pins.

Alternative Valves.—The valves fitted in our sample receiver were all of Osram manufacture, but the makers' instruction folder quotes equivalent type numbers in the American 1.4 V series as alternative replacements.

In positions **V1**, **V2** and **V3** the American 1A7G, 1N5G and 1H5G may be plugged in directly, but if in the case of **V4** the original valve was an Osram N15, as it was in our case, the substitution of the recommended alternative, which is a 3Q5G, requires a modification to the receiver to correct the grid bias potential.

This consists simply of short-circuiting each of the existing bias resistors, connecting the H.T. negative battery lead and the earthy mains lead directly to chassis. This must also be done if an Osram KT16 or N16 is used, as these are equivalent to the 3Q5G. If a change is made the other way, from one of these to an N15, then **R13**, **R14** and **C26** must be added.

DISMANTLING THE SET

Removing Chassis.—Remove the three small control knobs (recessed grub screws);

remove the cloth seals on the underside of the carrying case covering the chassis fixing bolts;

remove the four roundhead fixing bolts, when the complete chassis and speaker may be withdrawn as a single unit, care being taken not to catch the plates of the metal rectifier on the carrying handle bolt which projects from the top of the cabinet.

The frame aerial should be unplugged from the chassis before removing the valves, and if it is desired to gain access to the underside of the chassis the metal cover plate must be removed (two self-tapping screws).

When replacing, do not forget to cover the chassis fixing bolts with squares of cloth.

CIRCUIT ALIGNMENT

I.F. Stages.—Connect signal generator loosely to control grid (top cap) of **V2** and chassis. Turn the gang to minimum, the volume control to maximum, and short-circuit **C33.** Feed in a 380 kc/s (789.4 m) signal, and adjust the cores of **L12** and **L13** for maximum output, keeping signal generator output low to avoid A.V.C. action. Transfer signal generator leads to control grid (top cap) of **V1** and chassis, still with loose coupling, and adjust the cores of **L10** and **L11** for maximum output.

R.F. and Oscillator Stages.—With the gang at maximum, the pointer should coincide with the horizontal line dividing the M.W. scale from the L.W. and S.W. scales. It may be adjusted if the grub screw in the coupling on the gang spindle is slackened.

S.W.—Transfer signal generator leads to **A** and **E** sockets, via a 400 Ω resistor, and switch set to S.W. Tune to 20 m on scale, feed in a 20 m (15 Mc/s) signal, and adjust **C29** for maximum output while rocking gang for optimum results. Check sensitivity and calibration at 30 m (10 Mc/s) and 50 m (6 Mc/s).

M.W.—Clip aerial lead of signal generator to frame aerial covering, switch set to M.W., tune to 214 m on scale, feed in a 214 m (1,400 kc/s) signal, and adjust **C34**, then **C30**, for maximum output. Tune to 500 m on scale, feed in a 500 m (600 kc/s) signal, and adjust the core of **L1** for maximum output. Repeat the 214 m adjustments, and check at 300 m (1,000 kc/s).

L.W.—Switch set to L.W., tune to 1,200 m on scale, feed in a 1,200 m (250 kc/s) signal, and adjust **C35**, then **C31**, for maximum output. Check calibration and sensitivity at 1,875 m (160 kc/s).

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