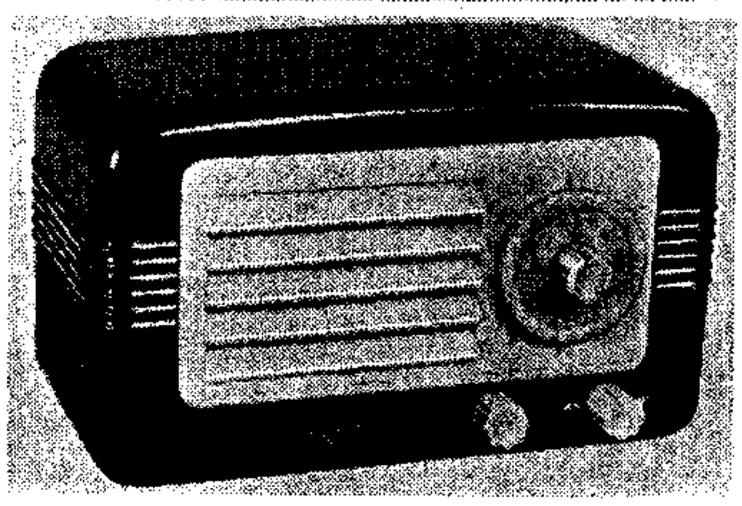
CHAMPION "PLANET"

A.C./D.C. MIDGET SUPERHET



OF "Midget" dimensions, the Champion "Planet" is a 4-valve (plus rectifier) 2-band receiver designed for A.C. or D.C. mains of 200-250 V, 40-60 c/s in the case of A.C.

A frame aerial winding is provided for M.W. stations, but an aerial is required for L.W. operation. Modifications that have occurred during the production run are described under "Chassis Divergencies" overleaf.

Release date and original price: May, 1946; £13 13s, plus £3 3s 8d purchase tax.

CIRCUIT DESCRIPTION

Tuned frame aerial input on M.W. by **L2, C24,** with provision for the connection of an external aerial via series capacitors **C1, C2,** which precedes triode hexode valve **(V1, Tungsram 6K8G)** operating as frequency changer with internal coupling. On L.W., external aerial input is via capacitative potential divider **C1, C2** and coil **L1** to single-tuned circuit **L3, C24.**

Triode oscillator anode coils **L6** (M.W.) and **L7** (L.W.) are tuned by **C27.** Parallel trimming by **C28** (M.W.), and **C26** (L.W.); series tracking by **C8** (M.W.) and **C9, C10** (L.W.). Reaction coupling by grid coils **L4** (M.W.) and **L5** (L.W.).

Second valve **(V2, Tungsram 6K7G)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C29, L8, L9, C30** and **C31, L10, L11, C32.**

Intermediate frequency 465 kc/s.

Diode second detector is part of double diode triode valve **(V3, Tungsram 6Q7G).** Audio frequency component in rectified output is developed across load resistor **R5** and passed via coupling capacitor **C15** and manual volume control **R6** to C.G. of triode section, which operates as A.F. amplifier. I.F. filtering by **C13** in diode circuit and **C16** in triode anode circuit.

Second diode of **V3,** fed from **V2** anode via **C14,** provides D.C. potential which is developed across load resistor **R10** and fed back through decoupling circuits as G.B. to I.F. valve on M.W., and also to F.C. valve on L.W., giving automatic volume control. Delay voltage, together with G.B. for triode section, is obtained from the drop along **R7** in **V3** cathode lead to chassis.

Resistance-capacitance coupling by **R8, C18** and **R12** between **V3** triode and pentode output valve **(V4, Tungsram 25A6G).** Fixed tone correction by **C19** in anode circuit.

On A.C. mains, H.T. current is supplied by I.H.C. rectifying valve **(V5, Tungsram 25Z6G),** which, with D.C. mains, behaves as a low resistance. Smoothing by **R11** and dry electrolytic capacitors **C17, C21.** Valve heaters, together with ballast resistor **R14,** which is tapped to provide a shunt for the scale lamp, are connected in series across mains input. Mains R.F. filtering by **C22.**

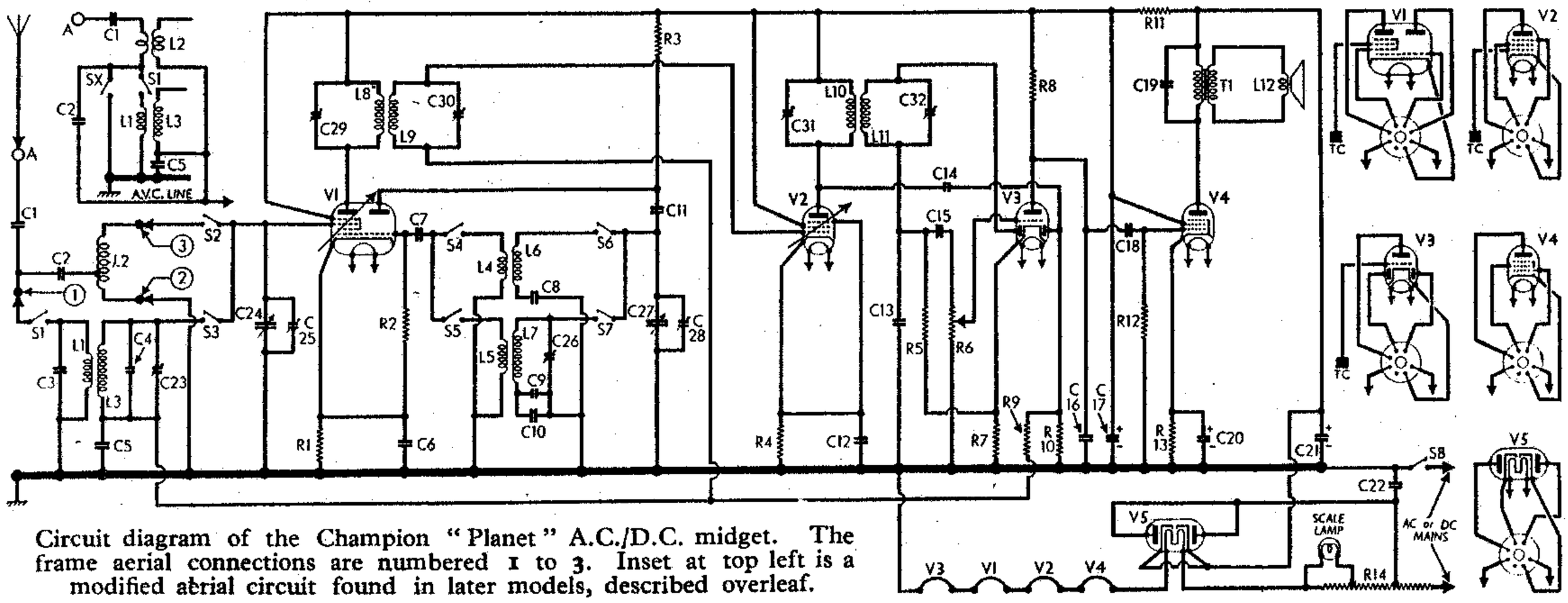
COMPONENTS AND VALUES

	RESISTORS	Values (ohms)
R1	V1 fixed G.B. resistor ...	220
R2	V1 osc. C.G. resistor ...	47,000
R3	V1 osc. anode H.T. feed...	22,000
R4	V2 fixed G.B. resistor ...	220
R5	V3 signal diode load ...	470,000
R6	Manual volume control ...	500,000
R7	V3 fixed G.B. resistor ...	6,800
R8	V3 triode anode load ...	220,000
R9	A.V.C. line decoupling ...	2,200,000
R10	V3 A.V.C. diode load ...	1,000,000
R11	H.T. smoothing resistor...	2,700
R12	V4 C.G. resistor	470,000
R13	V4 fixed G.B. resistor ...	470
R14	Heater circuit ballast, total	510†

† Line cord, tapped at 15 Ω + 340 Ω + 155 Ω from V5 heater.

	CAPACITORS	Values (μF)
C1 } C2 }	Aerial M.W. and L.W. coupling capacitors ...	0·005 / 0·00025
C3	L.W. Aerial shunt ...	0·0001
C4	Aerial L.W. fixed trimmer	0·000015
C5	A.V.C. line decoupling ...	0·1
C6	V1 cathode by-pass ...	0·1
C7	V1 osc. C.G. capacitor ...	0·0001
C8	Osc. circ. M.W. tracker ...	0·000578
C9 } C10 }	Osc. circ. L.W. trackers...	0·000015 / 0·000168
C11	V1 osc. anode coupling ...	0·0001
C12	V2 cathode by-pass ...	0·1
C13	I.F. by-pass capacitor ...	0·0003
C14	V3 A.V.C. diode coupling	0·00005
C15	A.F. coupling to V3 triode	0·01
C16	I.F. by-pass capacitor ...	0·0001
C17*	H.T. smoothing capacitor	32·0
C18	A.F. coupling to V4 ...	0·005
C19	Fixed tone corrector ...	§0·02
C20*	V4 cathode by-pass ...	25·0
C21*	H.T. smoothing capacitor	32·0
C22	Mains R.F. by-pass ...	0·002
C23‡	Aerial circ. L.W. trimmer	—
C24†	Aerial circuit tuning ...	—
C25‡	Aerial circ. M.W. trimmer	—
C26‡	Osc. circ. L.W. trimmer...	—
C27†	Oscillator circuit tuning...	—
C28‡	Osc. circ. M.W. trimmer...	—
C29‡	1st I.F. trans. pri. tuning	—
C30‡	1st I.F. trans. sec. tuning	—
C31‡	2nd I.F. trans. pri. tuning	—
C32‡	2nd I.F. trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.
§ Two 0·01 μF in parallel.



Circuit diagram of the Champion "Planet" A.C./D.C. midget. The frame aerial connections are numbered 1 to 3. Inset at top left is a modified aerial circuit found in later models, described overleaf.

	OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial L.W. coupling coil	...	8·7
L2	Frame aerial winding	...	1·3
L3	Aerial L.W. tuning coil	...	19·0
L4	Osc. M.W. reaction coil	...	2·6
L5	Osc. L.W. reaction coil	...	4·5
L6	Osc. M.W. tuning coil	...	3·1
L7	Osc. L.W. tuning coil	...	7·9
L8	1st I.F. trans. Pri.	...	2·2
L9	1st I.F. trans. Sec.	...	2·2
L10	2nd I.F. trans. Pri.	...	2·2
L11	2nd I.F. trans. Sec.	...	2·5
L12	Speaker speech coil	...	3·0
T1	Speaker input transformer Pri.	...	247·0
	Speaker input transformer Sec.	...	0·4
S1-S7	Waveband switches	...	—
S8	Mains switch, ganged R6	...	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on A.C. mains of 230 V. 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 Universal Avometer, chassis being the negative connection.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 6K8G	108	2·9	108	6·7
	Oscillator			
	56	2·2		
V2 6K7G	108	8·8	108	1·9
V3 6Q7G	36	0·2	—	—
V4 25A6G	182	27·0	108	4·8
V5 25Z6G†	—	—	—	—

† Cathode to chassis, 190 v, D.C.

GENERAL NOTES

Switches.—S1-S7 are the waveband switches, ganged in a single 2-position rotary unit beneath the chassis. All the even-numbered switches close on M.W. (control knob anti-clockwise) and open on L.W., and all the odd-numbered ones close on L.W. and open on M.W. The unit is indicated in our under-chassis view, and shown in detail in the diagram in col. 2, where it is viewed from the rear of an inverted chassis. **S8** is the Q.M.B. mains switch, ganged with the volume control **R6.** **Sx** appears only in some versions (see "Chassis Divergencies").

Coil L2.—This is the frame winding, mounted on the back cover of the receiver, with **C1, C2** and the aerial terminal. The three tags which take the leads from the chassis are indicated in our plan view of the chassis, where they are numbered to agree with the circuit diagram.

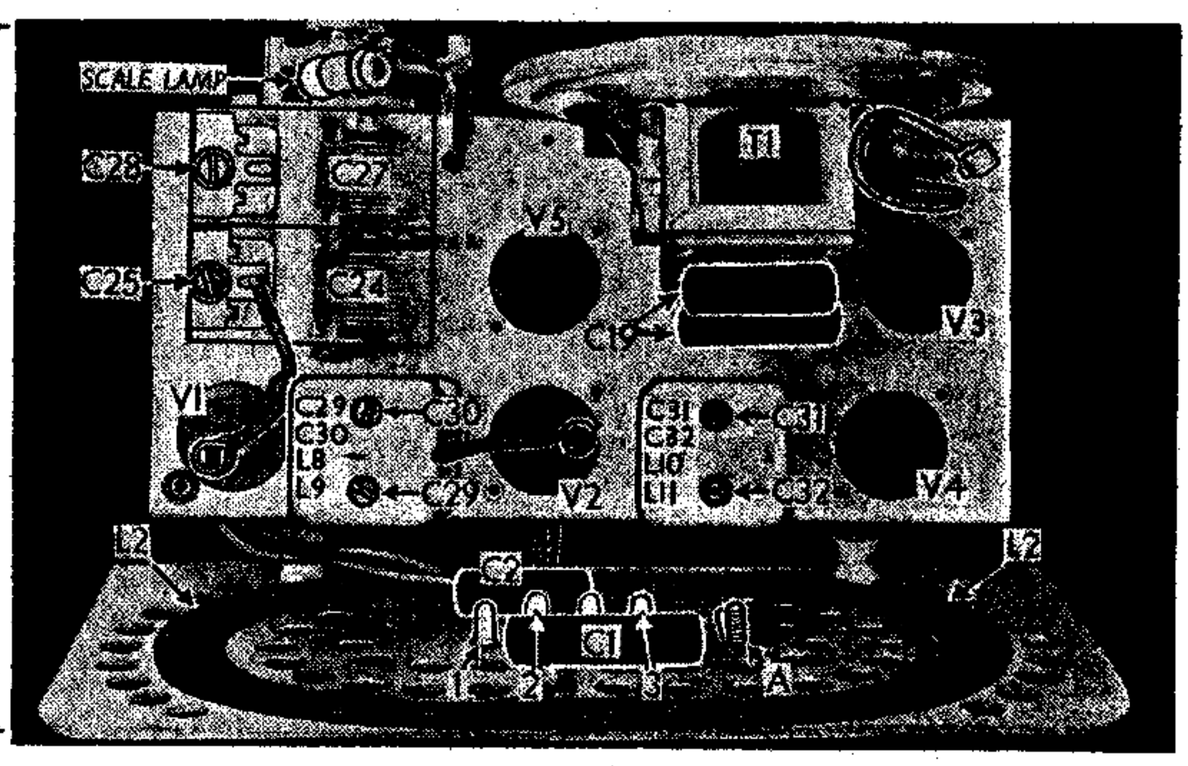
Scale Lamp.—This is an M.E.S. type lamp with a small spherical bulb, rated at 2.5 V, 0.15 A. It is shunted by a small section of the line cord **R14.**

Capacitors C17, C21.—These are two dry electrolytics in a tubular metal container mounted beneath the chassis. Both are rated at 32 μF, 250 V D.C. working. The end tags are the two positive connections, and the case the common negative.

Chassis Divergencies.—Our sample chassis was an early version, and this *Service Sheet* is based upon it entirely. In chassis bearing a serial number higher than 5,000, certain changes occur, mainly in the aerial circuit, resulting in the re-arranged circuit inset in the top left-hand corner of our circuit diagram overleaf.

Here it will be seen that the aerial coupling is considerably modified, a coupling winding being added to the frame aerial, and A.V.C. being applied to **V1** hexode control grid on M.W. as well as L.W. The additional switch **Sx** is indicated by a broken line in our diagram of the waveband switch unit in col. 2. **C1** becomes 0.002 μF, and **C3, C4, C9** and **C20** may be omitted.

In chassis bearing a serial number higher than 14,965 an important physical change occurs in the transposition of **V2** and **V5** valve holders, **V2** then being where we show **V5,** and **V5** being where we show **V2.** In late chassis also **L3, L6** and **L7** may be fitted with adjustable iron-dust cores.



Plan view of the chassis, showing the back cover and frame aerial connections, numbered 1 to 3 as in the circuit diagram. If the chassis serial number is above 14,965, **V2** and **V5** holders will be transposed.

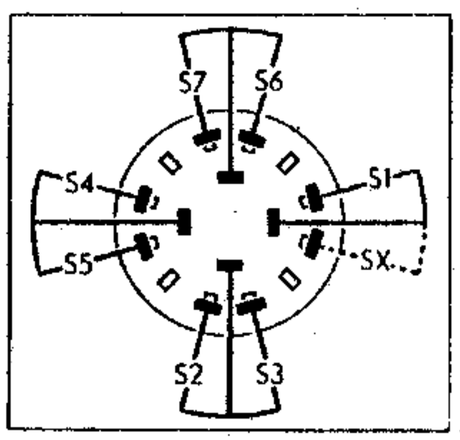


Diagram of the waveband switch unit, as seen from the rear. **SX** is found only in later chassis.

DISMANTLING THE SET

Removing Chassis.—Remove the three small control knobs (recessed grub screws) and pull off the large tuning knob;

remove the three self-tapping screws (with rubber feet and steel washers) holding the chassis to the bottom of the cabinet, when the chassis and speaker may be withdrawn as a single unit.

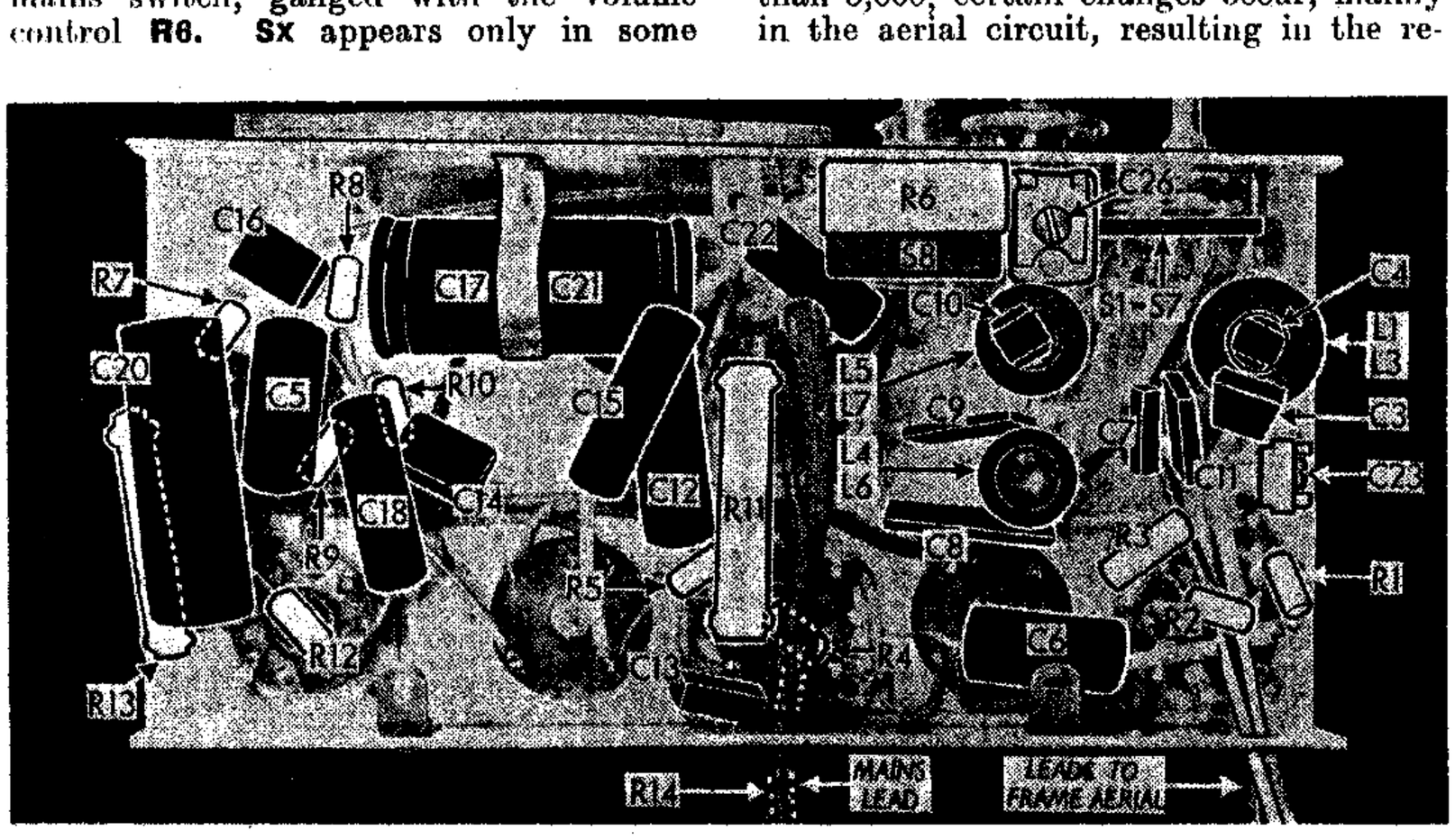
When replacing, do not omit to cover the heads of the chassis and control knob fixing screws with some suitable insulating wax.

CIRCUIT ALIGNMENT

I.F. Stages.—Connect signal generator leads via isolating capacitors of about 0.1 μF to control grid (top cap) of **V1** and chassis, and connect a voltmeter as indicator across **R4.** Feed in a 465 kc/s (645.16 m) signal, and adjust **C29, C30** and **C31** for minimum deflection on the meter. Then adjust **C32** for maximum deflection.

M.W.—Transfer signal generator leads to **A** socket and chassis, switch set to M.W., tune to 214 m on scale, feed in a 214 m (1,400 kc/s) signal, and adjust **C28,** then **C25,** for minimum deflection. If iron-dust cores are fitted, adjust that of **L6** at 514 m (583.6 kc/s) before adjusting the trimmers.

L.W.—Switch set to L.W., tune to 800 m on scale, feed in an 800 m (375 kc/s) signal, and adjust **C26,** then **C23,** for minimum deflection. If iron-dust cores are fitted, adjust that of **L7,** then that of **L3,** at 1,800 m (166.7 kc/s) before adjusting the trimmers.



Under-chassis view. A diagram of the **S1-S7** switch unit appears in col. 2 above.

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