'TRADER' SERVICE SHEETS

BURRELL

4-VALVE SUPERHET FOR A.C. MAINS

THE Burrell A.C. super-heterodyne receiver employs a modern circuit using three thermionic valves—all pentodes—and a "Westector," which functions as the second detector and also gives A.V.C. An interesting point in the design is that a pick-up, when employed, modulates the I.F. carrier, the signal being rectified as on radio.

CIRCUIT DESCRIPTION

One aerial connection by way of series condenser **C1** to capacity coupled band-pass input filter. Primary **L1, L2** tuned by **C2**; secondary **L3, L4** tuned by **C4**; coupling condenser **C3.** Sensitivity control by means of aerial shunt resistance **R1** and local-distant switch **S1.** First valve **(V1, Cossor metallised MS/Pen)** functions as combined oscillator and first detector. Oscillator grid coils **L7, L8** tuned by **C6**; coupling coils **L5, L6,** in cathode circuit. Single variable-mu pentode I.F. amplifier **(V2, Mullard metallised VP4)** with band-pass intermediate couplings **L10, L11** and **L12, L13. I.F. 110KC/s.** "Westector" half-wave second detector gives linear rectification and also provides voltage which is fed back through decoupling resistance **R12** and **L11** as G.B. to **V2,** thus giving automatic volume control. Rectified L.F. component from "Westector" is controlled by manual volume control **R13** (part of R.C.C. circuit) and passed to high efficiency IHC output pentode **(V3, Mazda AC2/Pen)** through I.F. filter **R14, C15** and coupling condenser **C16.** Tone compensation by condenser **C19** in anode circuit.

H.T. current supplied by I.H.C. full-wave rectifier **(V4, Mullard IW3).** Smoothing by speaker field **L9** and dry electrolytic condensers **C20, C22.** Hum filter condenser **C24** across speaker field.

Output from gramophone pick-up is fed by way of resistance **R11** and switch **S7** to secondary **L11** of first intermediate frequency coupling transformer, thus modulating the I.F. carrier. The resultant signal is amplified by **V2** and then rectified by the "Westector" as on radio. Switch **S7** cuts out A.V.C. circuit on gramophone, and switch **S6** shunts **L8** with a low resistance **R6** to prevent radio breakthrough.

DISMANTLING THE SET

Removing Chassis.—Remove the three control knobs (set screws). Remove local-distant switch securing nut (a box spanner or flat-nosed pliers will be best for this). Remove four screws and washers holding chassis to base of cabinet. Chassis can then be withdrawn sufficiently for most service work. To remove it entirely, the four leads to the speaker must be unsoldered from the speaker transformer terminal panel, after first removing its metal cover (held by two screws). Of the four leads, the two red ones go to the speaker field (two outer tags), while the two black leads go to the speaker transformer primary (the two tags each side of the central one). The centre tag is free.

If the chassis is entirely removed, it cannot be tested under working conditions unless the speaker and its field are temporarily re-connected.

Removing Speaker.—This is held to the sub-baffle by four screws and nuts.

COMPONENTS AND VALUES

	Resistances	Value (ohms)
R1	Aerial shunt (local-distant)	1,000
R2	V1 grid decoupling	20,000
R3	V1 G.B. resistance	3,500
R4	V1 S.G. decoupling	100,000
R5	Osc. L.W. damping	50,000
R6	Signal suppressor (gram only)	250
R7	Part of V2 S.G. pot.	30,000
R8	V2 anode decoupling	1,000
R9	Part of V2 S.G. pot.	30,000
R10	V2 fixed G.B. resistance	250
R11	Pick-up series resistance	50,000
R12	A.V.C. circuit decoupling	500,000
R13	Manual volume control	250,000
R14*	I.F. stopper	100,000
R15	V3 grid resistance	250,000
R16	V3 G.B. resistance	130

* Two 50,000 Ω resistors in series, in our sample.

	Condensers	Value (μF)
C1	Aerial coupling	0·0001
C2	Band-pass pri. tuning	—
C3	Band-pass coupling	0·03
C4	Band-pass sec. tuning	—
C5	V1 S.G. by-pass	0·1
C6	Oscillator tuning	—
C7	V1 G.B. resistance by-pass	0·01
C8	Osc. L.W. padding	0·0017
C9	V2 S.G. by-pass	0·1
C10	A.V.C. circuit decoupling	0·1
C11	V2 cathode by-pass	0·1
C12	V2 anode decoupling	0·1
C13	Osc. L.W. trimmer (pre-set)	—
C14	Pick-up by-pass	0·01
C15	I.F. filter	0·0002
C16	I.F. coupling	0·01
C17	V3 G.B. resistance by-pass	25·0
C18	Ext. speaker coupling	1·0
C19	Tone compensator	0·01
C20	Smoothing condenser (electrolytic)	8·0
C21	Westector reservoir	0·0001
C22	Smoothing condenser (electrolytic)	4·0
C23	Mains aerial coupling	0·0001
C24	Speaker field hum filter	0·1
C25	Oscillator coupling (pre-set)	—
C26	1st I.F. sec. tuning (pre-set)	—
C27	2nd I.F. pri. tuning (pre-set)	—
C28	2nd I.F. sec. tuning (pre-set)	—

(Continued overleaf)

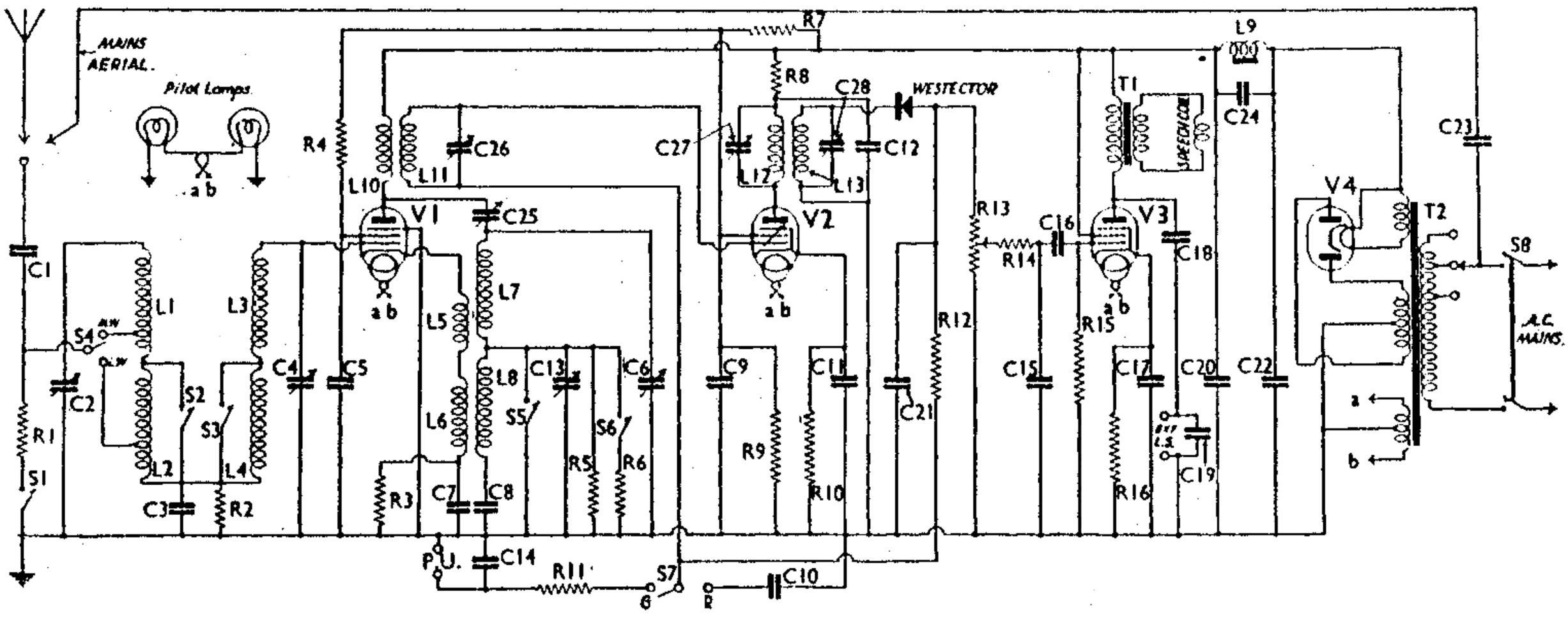


Fig. 1.—The circuit of the Burrell 4-valve A.C. superhet. The tuning condensers, C2, C4 and C6, have the usual trimmers, which are not shown above, but which are indicated in Fig. 3.

BURRELL 4-V. A.C. SUPERHET (contd.)

Components			Value (ohms)
L1	Band-pass primary		3·3
L2			19·0
L3	Band pass secondary		3·3
L4			19·0
L5	Oscillator coupling coils		0·65
L6			
L7	Oscillator tuning coils		2·8
L8			13·0
L9	Speaker field		1500·0
L10	1st I.F. transformer	Pri.	117·0
L11		Sec.	125·0
L12	2nd I.F. transformer	Pri.	117·0
L13		Sec.	125·0
T1	Speaker input transformer	Pri.	450·0
		Sec.	0·2
T2	Mains transformer	Pri. (total)	52·0
		Heater sec.	0·0
		Rect. fil. sec.	0·1
		H.T. sec.	220·0
S1	Local-distant switch		—
S2-S5	Waveband switches (ganged)		—
S6	Radio-gram. switches		—
S7			—
S8	D.P. mains switch		

VALVE ANALYSIS

The D.C. voltage readings given below were taken with a meter having a resistance of 1,000 Ω per V, from the points named to chassis in each case, with no signal input. The mains voltage was 240 V 50 c.p.s., and the 240/250 V tapping was employed.

Valve		Anode Volts	Screen Volts	Grid Volts
V1.	MS/Pen	260	53	−4·3
V2.	VP4	257	95	−1·6
V3.	AC2/Pen	240	260	−5
V4.	I.W.3	*325 A.C.	—	—

*Each anode.

GENERAL NOTES

Switch Panel.—This is held to the chassis in front by the bush through which the switch spindle passes, and at the rear by two nuts and bolts. If the switches ever need attention, the panel and its associated wiring will have to be removed before much can be done.

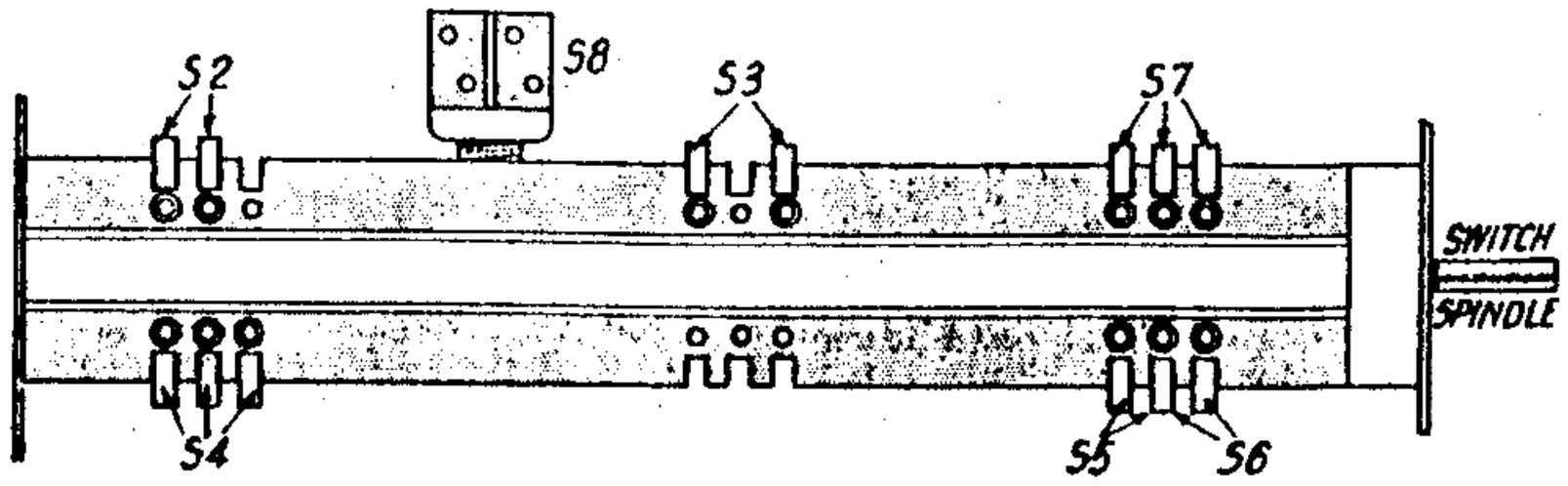
Switches.—**S1** is the local-distant switch located at the front of the chassis. It is of the Q.M.B. type, and is open for distant and closed for local reception. **S8** is the double-pole Q.M.B. mains switch, ganged with the wavechange and pick-up control.

The remaining switches, **S2–S7,** are for the wavechange and pick-up switching, and are mounted on an insulating panel running across the chassis, as indicated in the underside view. For clarity, this panel has been sketched, and is reproduced separately, to show the switch contact connections as they appear from the underside of the chassis. The switch control spindle is shown, to indicate the orientation of the sketch.

NOTE.—**S5** and **S6** each have one common contact, the centre one of the three. They are shown separate in the diagram, since **S5** is a waveband switch and **S6** only operates on gram. Actually, the two really form a single pole changeover switch.

The switch positions are shown in the table below.

Position	Closed	Open
M.W.	S2, S3, S5 S4 to MW. S7 to R	S6
L.W.	S4 to L.W. S7 to R.	S2, S3 S5, S6
Gram.	S6 S7 to G S4 to L.W.	S2 S3 S5



Sketch showing the switch panel, with the switches and their contacts identified. S5 and S6 combined form a S.P. changeover switch.

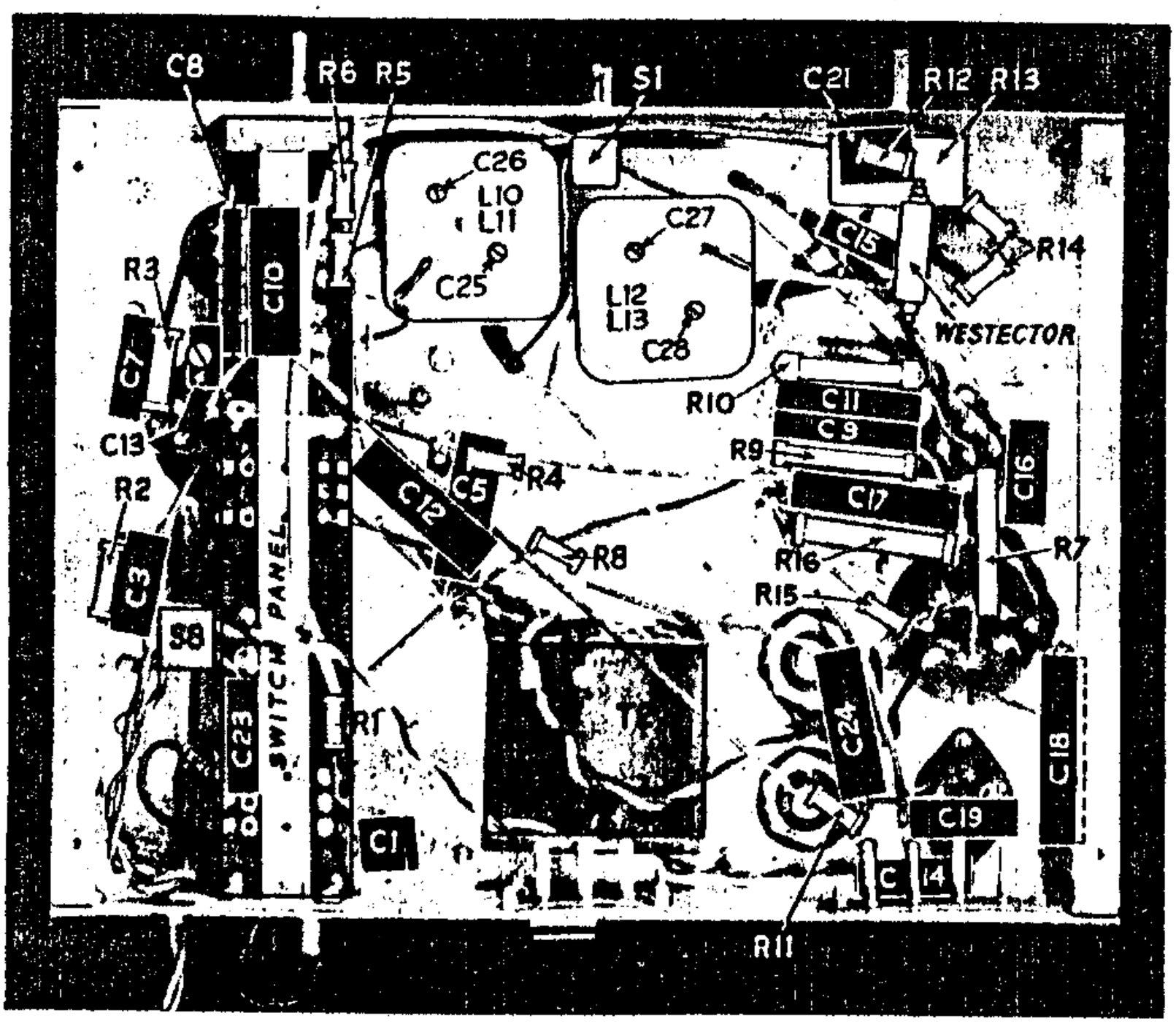
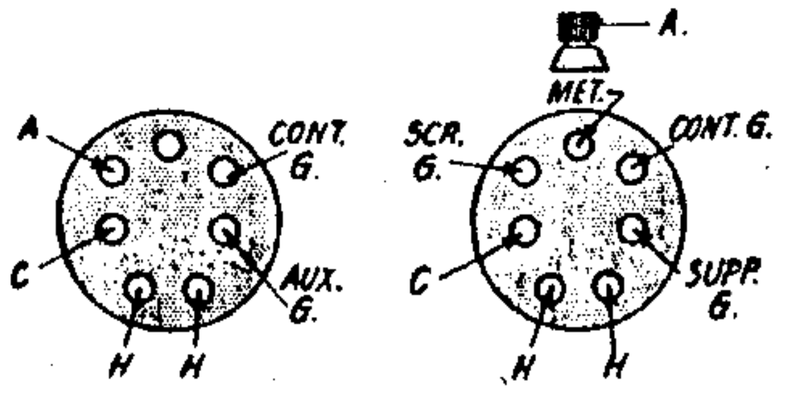


Fig. 2.—The under-chassis view. The switch panel is outlined, but not shown in detail. Reference should be made to the sketch above for the identification of the contacts. C8 is beneath the switch panel.

GENERAL NOTES (contd.)

Coil Screens.—The screening cans of the coils on top of the chassis are held in position by indentations round their bases. They can be removed by inserting a screwdriver blade between the can and the chassis, and twisting gently, repeating the process at various points round the can. Each coil is held firmly by a circular indentation in the top of its can. When replacing the cans, see that these indentations fit inside the cylindrical coil formers.

The screens of the I.F. coils underneath the chassis are held in each case by two screwed rods and nuts passing through the chassis, and a hexagonal nut at the top of the screen. These nuts must be removed



Under chassis views of the two 7-pin valve-holders, showing the connections. On the left is that of the AC2/Pen output pentode, V3, while on the right is that of the MS/Pen H.F. pentode, V1.

before the screens can be taken off, and it will also be necessary to disconnect some of the wires, such as those passing through the tops of the screens. The screws operating the I.F. tuning condensers need not be touched when removing the screens.

Note that some of the wires from the I.F. coils pass out of the screens through nicks cut at the base of the screens. When replacing, take care that these wires are not pinched, otherwise short circuits may result.

External Speaker.—The sockets at the rear of the chassis are fed from a 1 μF coupling condenser, **C18.** The extension speaker, or matching transformer, should be arranged for an optimum load of 9,000 O.

Westector.—When testing the set, do not apply high voltages to the Westector for insulation or continuity tests, otherwise its rectifying properties may be destroyed.

Coil Contacts.—The contacts of the tuning and oscillator coils are in the form of long tags projecting through holes cut in the chassis. Make certain that these tags are not shorting to the edges of the holes, due to the wires soldered to them having been strained.

Pilot Lamps.—These are connected in series across the 4 V heater winding of the mains transformer, with their common point earthed to chassis. Each lamp therefore runs on 2 V A.C. The bulbs fitted are of the Osram 3·5 V 0·3 A type.

Electrolytic Condensers.—**C20** and **C22** are similar in size and appearance, but have different capacities, 8 μF and 4 μF respectively. **C17** is a tubular electrolytic type, with a capacity of 25 μF and a working voltage of 25 V D.C.

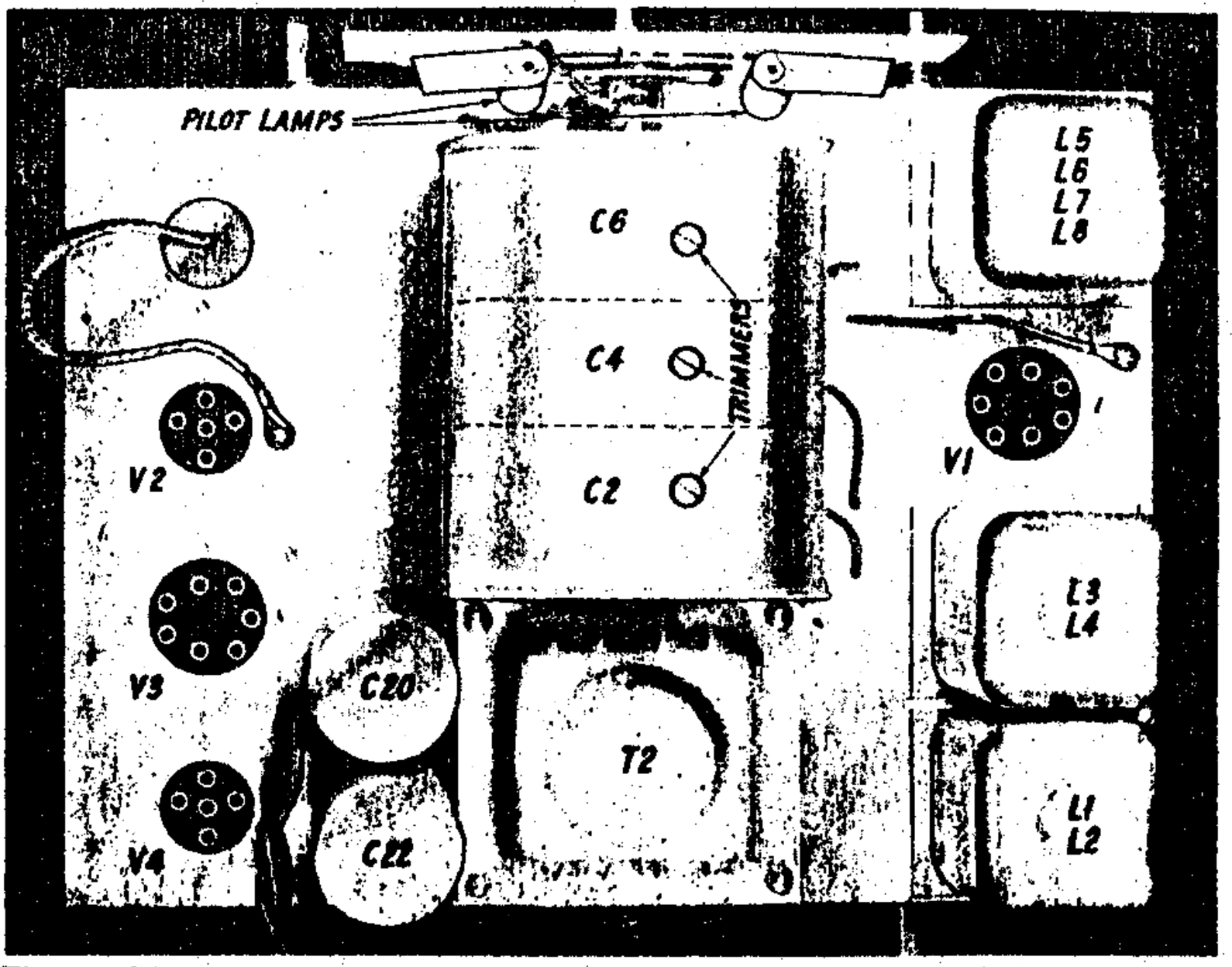


Fig. 3.—Plan view of the chassis. The valves have been removed. Note the tuning condenser trimmers, which are easily accessible.