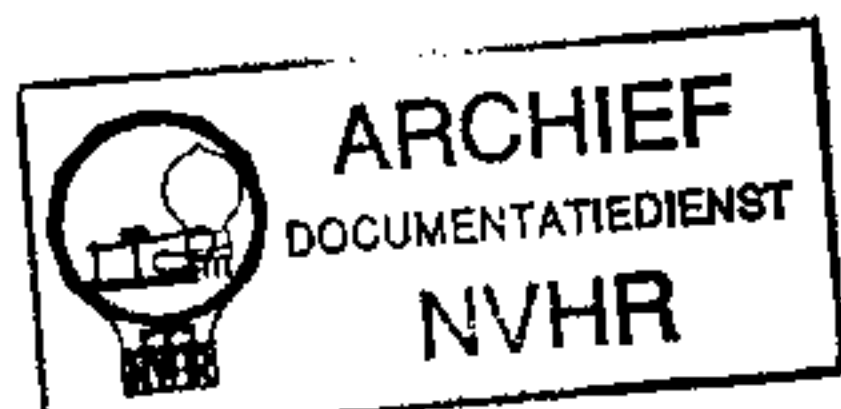


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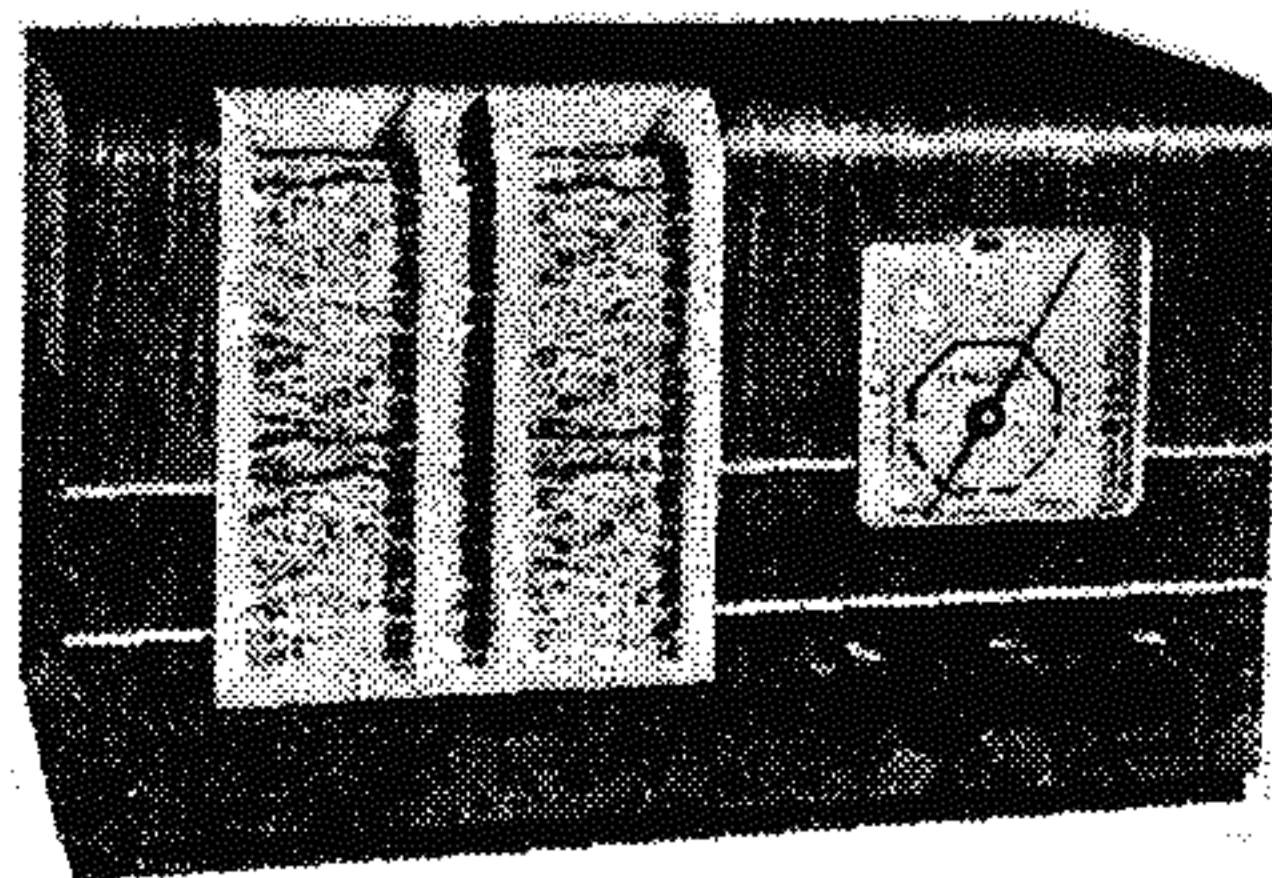
# FERGUSON 910

## AC SHORT-WAVE "MAINS MINOR"

### COMPONENTS AND VALUES

RESISTORS		Values (ohms)
R1	V1 hex. CG decoupling ...	500,000
R2	V1 osc. CG resistor ...	50,000
R3	Osc. reaction damping ...	20
R4	V1 osc. anode HT feed ...	25,000
R5	V2 CG decoupling ...	500,000
R6	V1, V2 SG's HT feed ...	25,000
R7	IF stopper ...	100,000
R8	V3 signal diode load ...	500,000
R9	Manual volume control ...	2,000,000
R10	V1-V3 GB; AVC delay ...	150
R11	V3 triode anode load ...	50,000
R12	V3 AVC diode load ...	500,000
R13		500,000
R14	V4 CG resistor ...	1,000,000
R15	V4 GB resistor ...	470
R16	V4 anode stopper ...	100
R17	HT smoothing resistor ...	1,200

CAPACITORS		Values (μF)
C1	Aerial series coupling ...	0.0005
C2	Aerial MW shunt ...	0.00002
C3	V1 hex. CG decoupling ...	0.1
C4	V1 osc. CG capacitor ...	0.0001
C5	Osc. circ. SW tracker ...	0.005
C6	V1 osc. anode coupling ...	0.0001
C7	V2 CG decoupling ...	0.1
C8	V1, V2 SG's decoupling ...	0.1
C9	V1-3 cathodes by-pass ...	0.1
C10	IF by-pass capacitors ...	0.00025
C11		0.00025
C12	V3 AVC diode coupling ...	0.0001
C13	AF coupling to V3 triode ...	0.02



The appearance of the Ferguson 910 short-wave "Mains Minor."

SHORT waves and medium waves are covered in two wavebands in the Ferguson 910 Mains Minor, a 4-valve (plus rectifier) superhet designed for AC mains of 200-250 V.

Release date: May, 1945. Original price: £12 12s., plus £2 14s. 3d. purchase tax.

### CIRCUIT DESCRIPTION

Aerial input via C1 and coupling coils L1 (SW) and L2 (MW) to single tuned circuit L3 (SW), plus L4 (MW), tuned by C23.

First valve (V1, Mullard ECH35) is a

triode-hexode operating as frequency changer with internal coupling. Triode oscillator anode coils L7 (SW) and L8 (MW) are tuned by C27. Parallel trimming by C25 (SW) and C26 (MW); series tracking by C5 (SW) and C24 (MW). Reaction by L5 (SW) and L6 (MW), and common impedance of trackers in grid and anode circuits.

Second valve (V2, Mullard EF39) operates as IF amplifier with tuned-primary, tuned-secondary transformer couplings.

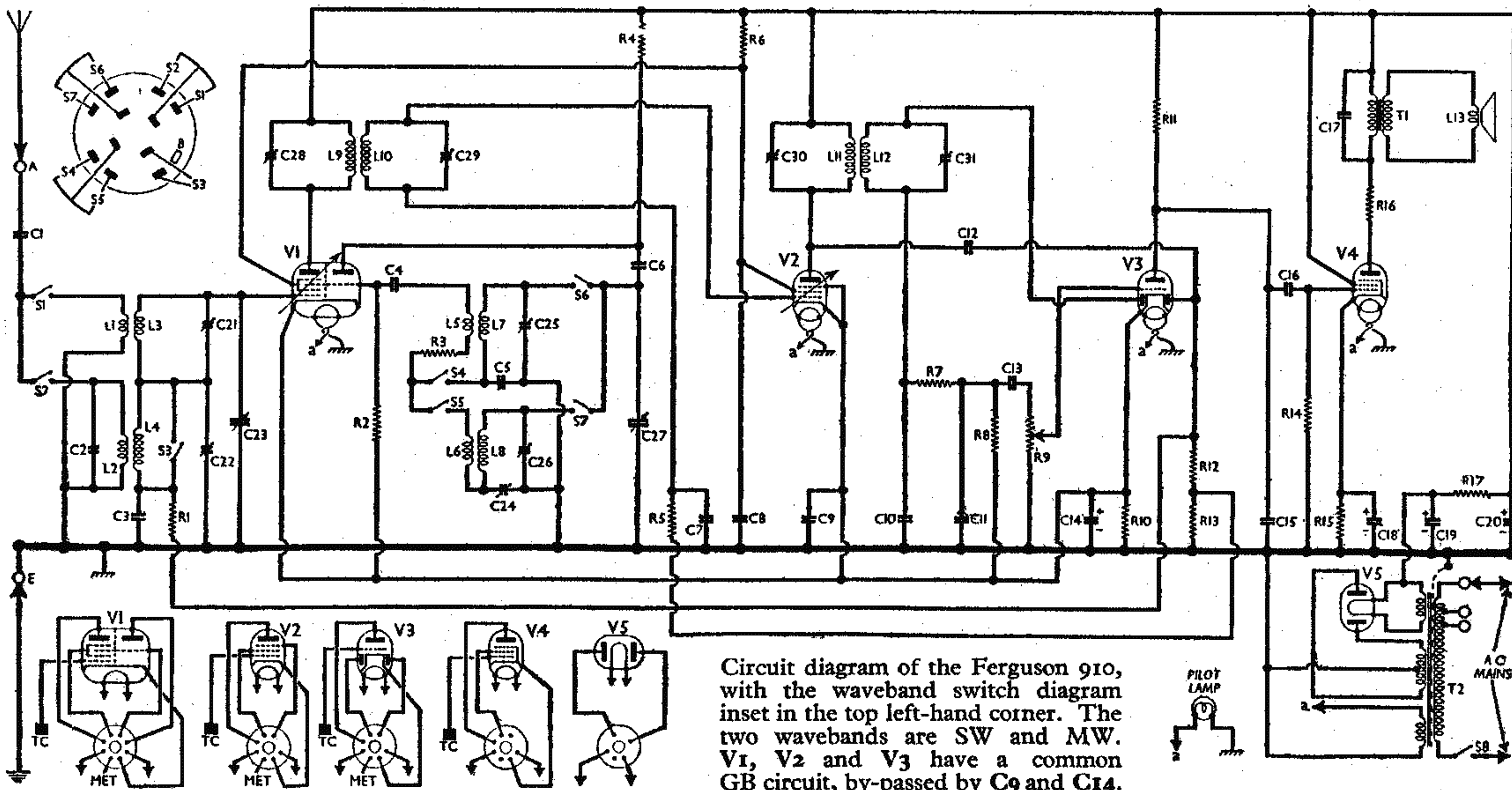
Intermediate frequency 470 kc/s.

Diode second detector is part of double diode triode valve (V3, Mullard EBC33). Audio frequency component in rectified output is developed across load resistor R8 and passed via C13 and manual volume control R9 to CG of triode section. IF filtering by C10, R7, C11.

Second diode of V3, fed from V2 anode via C12, provides DC potentials which are developed across load resistors R12, R13 and fed back through decoupling circuits as GB to FC and IF valves, giving automatic volume control.

Resistance-capacitance coupling by R11, C16, R14 between V3 triode and pentode output valve (V4, Mullard EL32). Fixed tone correction by C17 in anode circuit.

HT current is supplied by full-wave rectifying valve (V5, Mullard AZ31). Smoothing by R17 and electrolytic capacitors C19, C20.



Circuit diagram of the Ferguson 910, with the waveband switch diagram inset in the top left-hand corner. The two wavebands are SW and MW. V1, V2 and V3 have a common GB circuit, by-passed by C9 and C14.



CAPACITORS (continued)		Values ( $\mu$ F)
C14*	V1-3 cathodes by-pass ...	25.0
C15	IF by-pass ...	0.00025
C16	V3 triode to V4 coupling ...	0.02
C17	Fixed tone corrector ...	0.006
C18*	V4 cathode by-pass ...	25.0
C19*	HT smoothing capacitors {	16.0
C20*		16.0
C21†	Aerial circ. SW trimmer ...	0.00003
C22†	Aerial circ. MW trimmer ...	0.00003
C23†	Aerial circuit tuning ...	—
C24†	Osc. circ. MW tracker ...	0.00065
C25†	Osc. circ. SW trimmer ...	0.00003
C26†	Osc. circ. MW trimmer ...	0.00003
C27†	Oscillator circuit tuning ...	—
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.

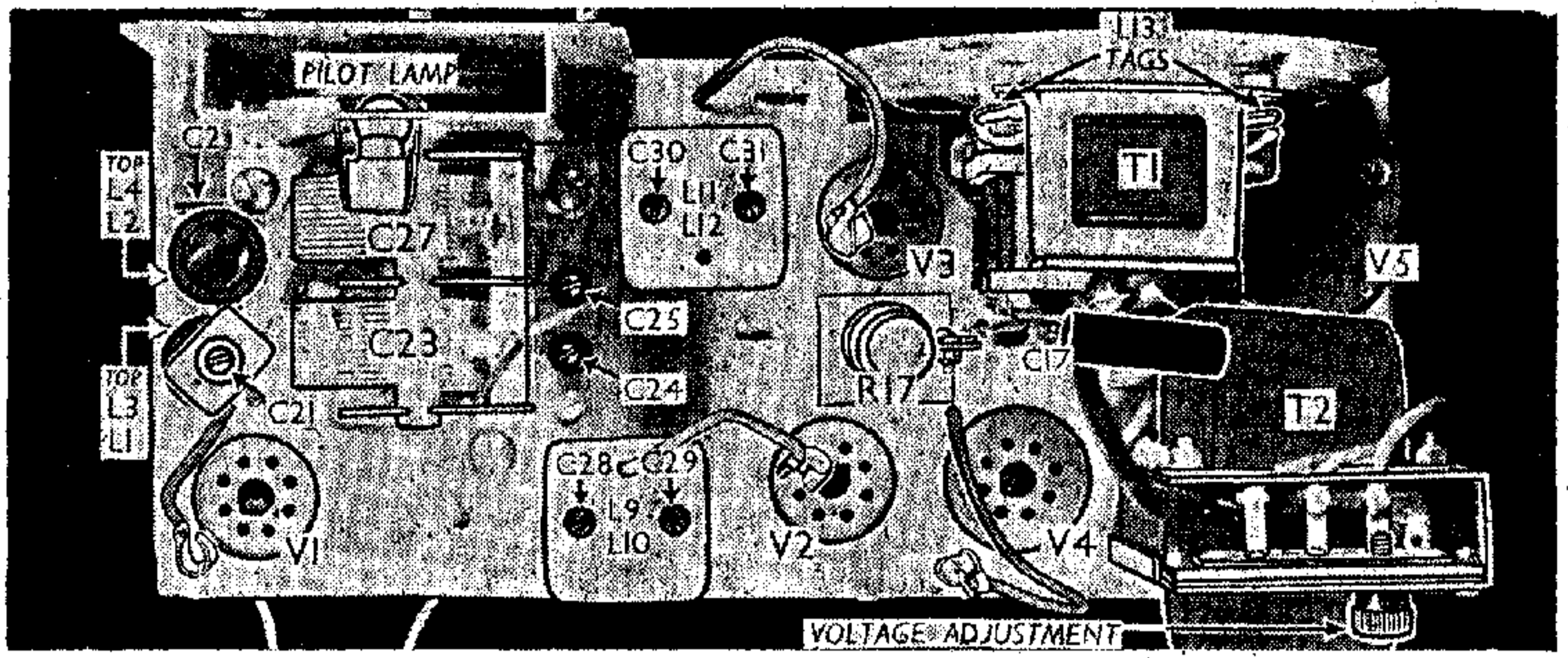
OTHER COMPONENTS		Approx. Values (ohms)	
L1	Aerial coupling coils { SW	1.4	
L2		MW	30.0
L3	Aerial tuning coils { SW	Very low	
L4		MW	3.5
L5	Osc. reaction coils { SW	0.1	
L6		MW	1.0
L7	Osc. tuning coils { SW	Very low	
L8		MW	2.0
L9	1st IF trans. { Pri.	8.5	
L10		Sec.	8.5
L11	2nd IF trans. { Pri.	8.5	
L12		Sec.	8.5
L13	Speaker speech coil ...	4.0	
T1	Speaker input trans. { Pri.	400.0	
		Sec.	0.3
T2	Mains trans. { Pri., total	100.0	
		Heater sec.	0.2
		Rect. heat. sec.	0.2
		HT sec., total	450.0
S1-S7	Waveband switches	—	
S8	Mains switch, ganged R9	—	

**VALVE ANALYSIS**

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 ECH35	210	1.0	100	3.0
	Oscillator			
	105	3.5		
V2 EF39	210	5.3	100	1.7
V3 EBC33	100	2.1	—	—
V4 EL32	200	22.0	210	4.1
V5 AZ31	250†	—	—	—

† Each anode, AC.

Valve voltages and currents given in the table above are those measured in our receiver



Plan view of the chassis. C21 is mounted directly on the SW coil unit L1, L3. A low impedance external speaker may be connected to the tags of L13, indicated on the speaker.

when it was operating with mains of 240 V. The receiver was tuned to the lowest wavelength on the medium 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 negative.

**GENERAL NOTES**

**Switches.**—S1-S7 are the waveband switches, in a single rotary unit beneath the chassis. This is indicated in our under-chassis view, and shown in detail in the diagram inset at the top left hand of the circuit, where it is drawn as seen looking from the rear of the underside of the chassis. On SW (knob anti-clockwise), S1, S3, S4 and S6 are closed, and the other switches are open; on MW (knob clockwise), S2, S5 and S7 are closed, and the other switches are open.

S8 is the QMB mains switch, ganged with the volume control R9.

**Coils.**—The aerial coils L1-L4 are in two unscreened tubular units on the chassis deck, while the oscillator coils are in two similar units beneath the chassis. The IF transformers L9, L10 and L11, L12 are in two screened units on the chassis deck with their trimmers.

**Pilot Lamp.**—This has a clear spherical bulb and an MES base. It is marked N.U. 6.8 V.

**Capacitors C19, C20.**—These are two

dry electrolytics in a single cardboard tubular container marked 16-16  $\mu$ F, 350 V DC working. The red spotted tag is the positive of C19, and the plain tag the positive of C20. The black spotted tag is the common negative connection.

**External Speaker.**—No direct provision is made for this, but one of low impedance (about 6-8  $\Omega$ ) could be connected to the tags of L13, which are easily accessible and are indicated in our plan view. A high impedance (about 8,000  $\Omega$ ) speaker could be connected to the same tags on T1 as C17.

**Chassis Divergencies.**—The makers state that in some chassis the HT smoothing resistor R17 may be replaced by the field coil of an energised speaker which may be used in place of the PM type in our sample.

In various instances several components may be used together to make up the value given in our tables, as owing to restricted supply the correct values are not always available. In our sample, for instance, two small fixed capacitors were connected in parallel with C24 to bring it up to the specified total value. We do not show such modifications as this, as they vary from chassis to chassis.

**DISMANTLING THE SET**

**Removing Chassis.**—Remove the three control knobs (recessed grub screws), and the two screws (with washers) holding the chassis to the bottom of the cabinet.

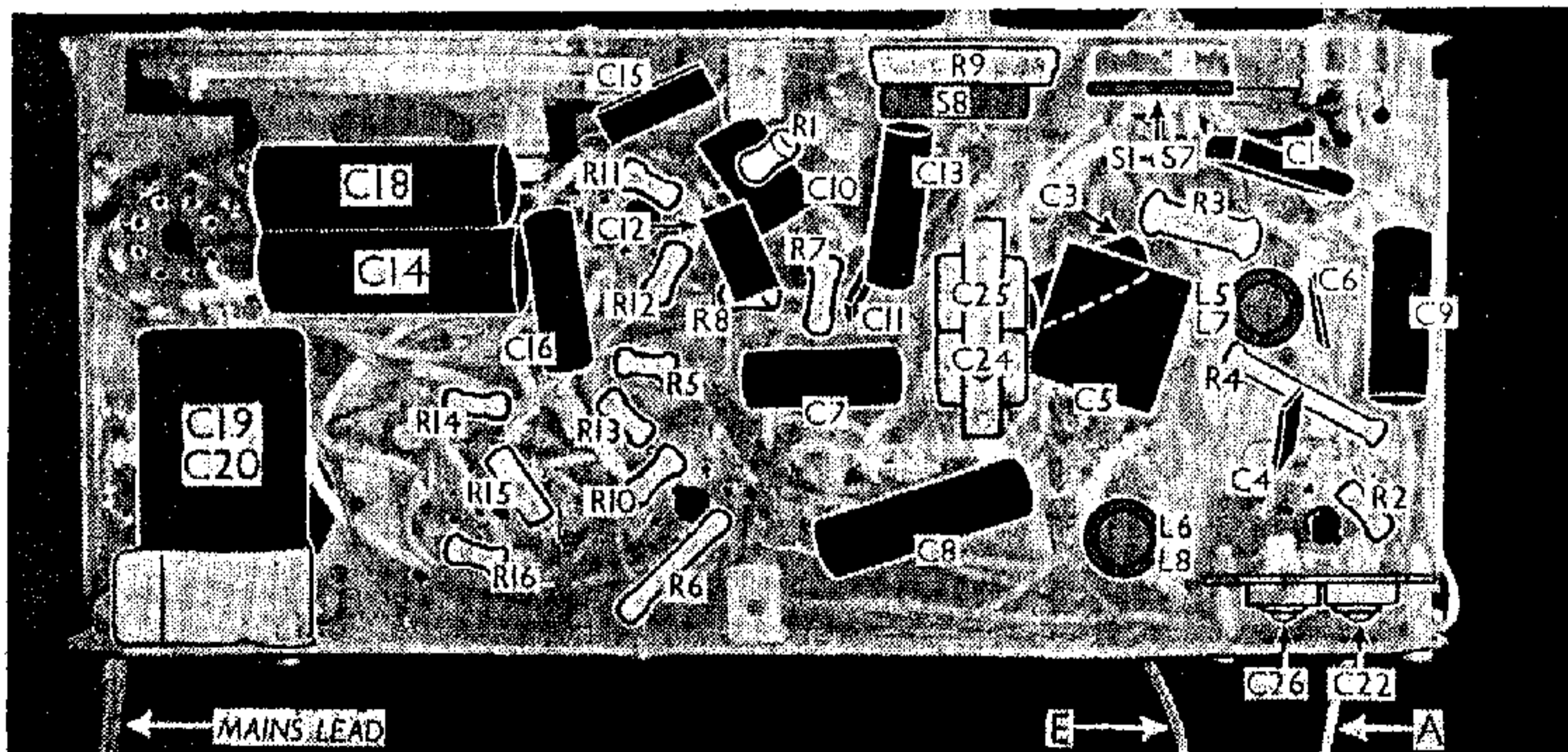
**CIRCUIT ALIGNMENT**

**IF Stages.**—Remove top cap connector of V1, and connect a 0.5 megohm resistor in series between connector and the top cap of the valve. Connect signal generator from top cap of valve to chassis, via isolating capacitors of about 0.1  $\mu$ F. Switch set to MW, turn gang to maximum, and feed in a 470 kc/s (638.3 m) signal. Adjust C31, C30, C29 and C28 in turn for maximum output.

**RF and Oscillator Stages.**—With gang at maximum, pointer should be horizontal. Connect signal generator via a suitable dummy aerial to aerial lead of set, and via a 0.1  $\mu$ F capacitor to chassis.

**MW.**—Switch set to MW, tune to 214 m on scale, feed in a 214 m (1,400 kc/s) signal, and adjust C26, then C22, for maximum output. Feed in a 500 m (600 kc/s) signal, tune it in, and adjust C24 for maximum output, while rocking the gang for optimum results.

**SW.**—Switch set to SW, tune to 16 m on scale, feed in a 16 m (18.75 Mc/s) signal, and adjust C25, then C21, for maximum output. Tracking is fixed, but calibration should be checked at about 49 m (6.125 Mc/s).



Under-chassis view. The position of the waveband switch unit S1-S7 is indicated by an arrow which shows the direction in which it is viewed in the diagram inset with the circuit diagram overleaf.