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McMICHAEL 137 (A.C.)

TWIN SPEAKER SUPERHET

TWO speakers are fitted in the McMichael 137 (A.C.) 3-band A.C. superhet, the valve arrangement comprising a triode-hexode frequency changer, a variable-mu pentode I.F. amplifier, a double diode triode and a pentode output valve, while the short-wave range covered is 16.5-50 m. The tuning scale is of the McMichael Giant type, and tilts when the cabinet lid is raised.

The standard model is for mains of 200-250 V, 40-100 C/S, but a special model is made for 25 C/S supplies. This *Service Sheet* was prepared on a standard model.

CIRCUIT DESCRIPTION

Aerial input on M.W. and L.W. is via series condenser **C1**, to M.W. coupling condenser **C2** or L.W. series choke **L1**, and coupling coil **L2** to mixed coupled band-pass filter. Primary coils **L3**, **L4** are tuned by **C28**; secondaries **L9**, **L10** by **C32**; common coupling by **L6**, **C3** (M.W.) and **L5**, **C3** (L.W.). On S.W. input via **C1** is to coupling coil **L7** and single tuned circuit **L8**, **C32**.

First valve (**V1**, Mazda metallised **AC/TH1**), is a triode-hexode operating as frequency changer with internal coupling. Triode anode coils **L14** (S.W.), **L15** (M.W.) and **L16** (L.W.) are tuned by **C36**; parallel trimming by **C37** (S.W.), **C34** (M.W.), and **C35** (L.W.); series tracking by **C8** (S.W.), **C9** (M.W.), and **C10** (L.W.). Grid reaction by coils **L11** (S.W.), **L12** (M.W.) and **L13** (L.W.).

Second valve (**V2**, Mazda metallised **AC/VP2**), is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-primary tuned-

AC/HL/DD). Audio frequency component in rectified output is developed across load resistance **R13** and passed via radio muting switch **S19**, A.F. coupling condenser **C16**, resistance **R11** and manual volume control **R12** to C.G. of triode section, which operates as A.F. amplifier. Provision for connection of gramophone pick-up by means of jack-switch; upon insertion of plug **S19** opens to mute radio.

Operating potentials for cathode ray tuning indicator (**T.I.**, Mullard **TV4**), are obtained from potential divider **R14**, **R15**, across **R13** and fed to C.G. via decoupling circuit **R16**, **C17**.

Second diode of **V3**, fed via **C15** from **V2** anode, provides D.C. potentials which are developed across load resistances **R23**, **R24** and fed back through decoupling circuits as G.B. to F.C. (except on S.W.) and I.F. valves, giving automatic volume control. Delay voltage is obtained from drop along resistances **R17**, **R18** in **V3**, **V4** cathodes circuit.

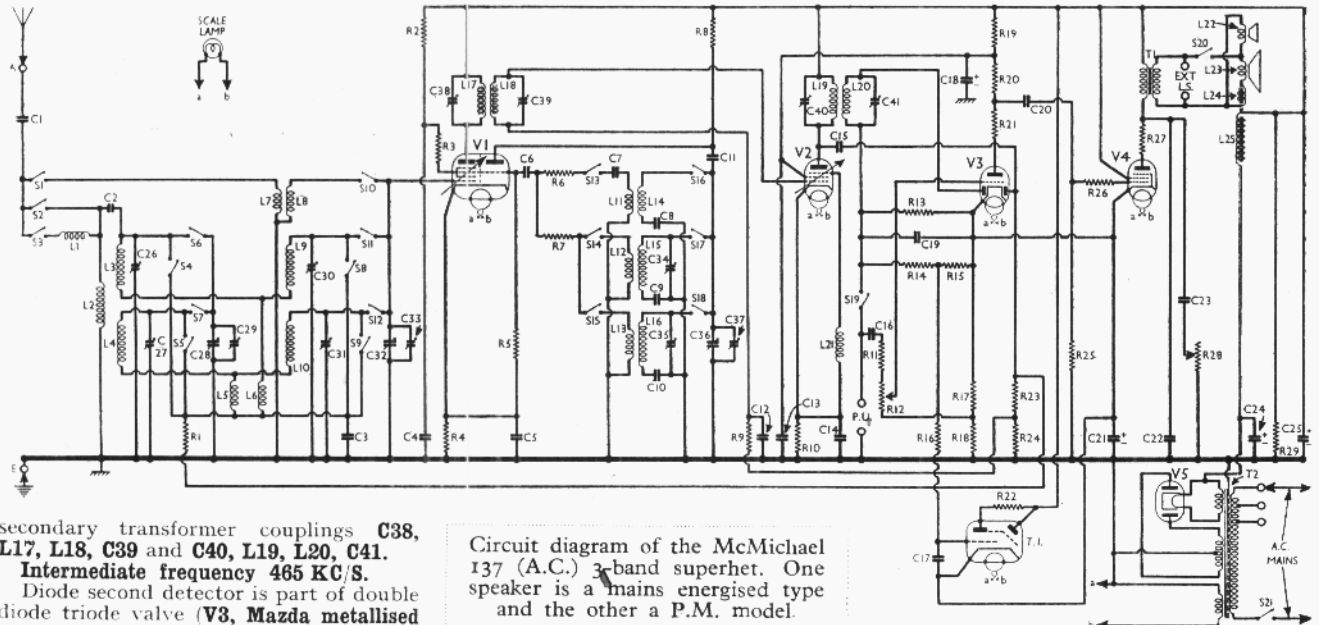
Resistance-capacity coupling by **R20**, **C20** and **R25** via stopper **R26** between **V3** triode and pentode output valve (**V4**, Mazda **AC2/Pen**). Fixed tone correction by **C23**, **R28** in anode circuit. Provision for connection of low impedance external speaker across secondary of internal speakers input transformer **T1** by means of another jack-switch; upon insertion of plug to its full extent **S20** opens, muting the internal twin speakers.

H.T. current is supplied by I.H.C. full-wave rectifying valve (**V5**, Mazda **UU4**). Smoothing by speaker field **L25** and dry electrolytic condensers **C24**, **C25**.

COMPONENTS AND VALUES

CONDENSERS		Values (μF)
C1	Aerial series condenser	0.0002
C2	Aerial M.W. coupling condenser	0.000007
C3	Part band-pass bottom coupling	0.1
C4	V1 S.G. decoupling	0.1
C5	V1 cathode by-pass	0.1
C6	V1 osc. C.G. condenser	0.0001
C7§	V1 osc. C.G. S.W. series condenser	0.0001
C8	Osc. circuit S.W. tracker	0.0035
C9	Osc. circuit M.W. tracker	0.000547
C10	Osc. circuit L.W. tracker	0.000174
C11	V1 osc. anode coupling	0.0001
C12	V2 C.G. decoupling	0.1
C13	V2 S.G. decoupling	0.1
C14	V2 cathode by-pass	0.1
C15	Coupling to V3 A.V.C. diode	0.0001
C16	A.F. coupling to V3 triode	0.005
C17	T.I. feed decoupling	0.1
C18*	V2 S.G. and V3 triode anode decoupling	4.0
C19	I.F. by-pass	0.0001
C20	V3 triode to V4 A.F. coupling	0.01
C21*	V3, V4 cathode by-pass	50.0
C22	Fixed tone corrector	0.002
C23	Part variable T.C. circuit	0.03
C24*		8.0
C25*	H.T. smoothing	8.0
C26†	Band-pass pri. M.W. trimmer	—
C27†	Band-pass pri. L.W. trimmer	—
C28†	Band-pass pri. tuning	—
C29†	Band-pass pri. trimmer	—
C30†	Band-pass sec. M.W. trimmer	—
C31†	Band-pass sec. L.W. trimmer	—
C32†	Band-pass sec. and S.W. aerial tuning	—
C33†	Aerial S.W. trimmer	—
C34†	Osc. circuit M.W. trimmer	—
C35†	Osc. circuit L.W. trimmer	—
C36†	Osc. circuit anode tuning	—
C37†	Osc. circuit S.W. trimmer	—
C38†	1st I.F. trans. pri. tuning	—
C39†	1st I.F. trans. sec. tuning	—
C40†	2nd I.F. trans. pri. tuning	—
C41†	2nd I.F. trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.
§ Sometimes omitted.



secondary transformer couplings **C38**, **L17**, **L18**, **C39** and **C40**, **L19**, **L20**, **C41**.

Intermediate frequency 465 KC/S.

Diode second detector is part of double diode triode valve (**V3**, Mazda metallised

Circuit diagram of the McMichael 137 (A.C.) 3-band superhet. One speaker is a mains energised type and the other a P.M. model.

RESISTANCES		Values (ohms)
R1	V1 hexode C.G. decoupling	1,000,000
R2	V1 S.G. H.T. feed	40,000
R3	V1 S.G. stopper resistance	50
R4	V1 fixed G.B. resistance	250
R5	V1 osc. C.G. resistance	50,000
R6	V1 osc. C.G. S.W. stabiliser	50
R7	V1 osc. C.G. M.W. and L.W. stabiliser	2,000
R8	V1 osc. anode H.T. feed	40,000
R9	V2 C.G. decoupling	500,000
R10	V2 fixed G.B. resistance	200
R11	A.F. feed series resistance	100,000
R12	Manual volume control	500,000
R13	V3 Signal diode load	250,000
R14	T.I. feed potential divider	3,000,000
R15		1,000,000
R16	T.I. feed decoupling resistance	250,000
R17	V3 triode and V4 G.B. and A.V.C. delay voltage resistances	70
R18		40
R19	V2 S.G. and V3 triode anode decoupling	10,000
R20	V3 triode anode load	4,000
R21	V3 triode anode I.F. stopper	30,000
R22	T.I. anode H.T. feed	2,000,000
R23	V3 A.V.C. diode load resistances	500,000
R24		500,000
R25	V4 C.G. resistance	500,000
R26	V4 grid stopper	100,000
R27	V4 anode stopper	50
R28	Variable tone control	100,000
R29	Voltage surge load	40,000

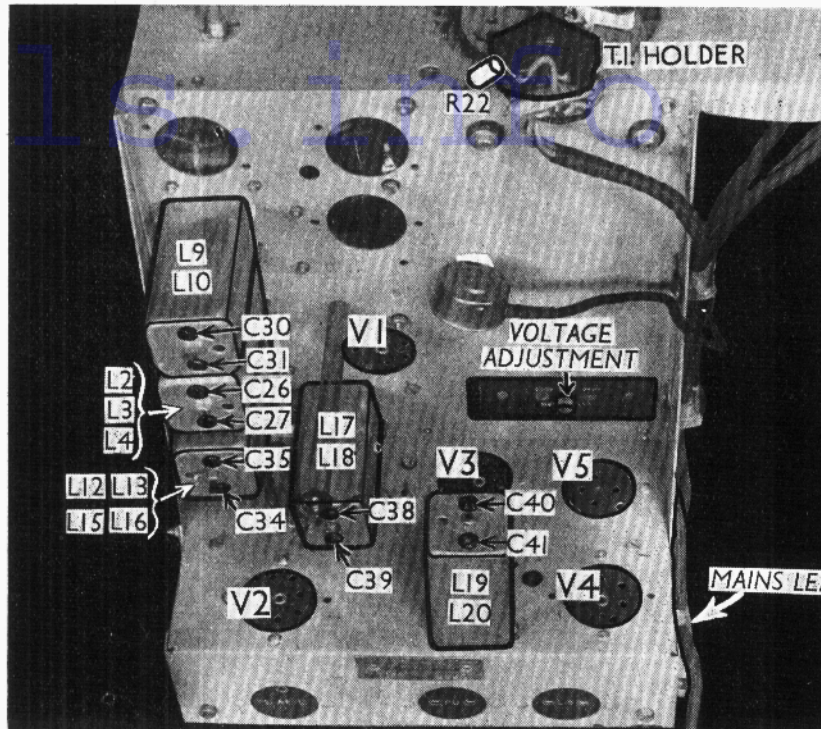
OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial L.W. series coil	41·0
L2	Band-pass pri. coupling coil	15·0
L3	Band-pass primary tuning coils	2·5
L4		21·0
L5	Band-pass L.W. common coupling	3·0
L6	Band-pass M.W. common coupling	0·1
L7	Aerial S.W. coupling coil	0·2
L8	Aerial S.W. tuning coil	Very low
L9	Band-pass secondary tuning coils	2·5
L10		22·0
L11	Osc. circuit S.W. grid reaction	6·0
L12	Osc. circuit M.W. grid reaction	2·5
L13	Osc. circuit L.W. grid reaction	3·25
L14	Osc. circuit S.W. tuning coil	0·1
L15	Osc. circuit M.W. tuning coil	2·5
L16	Osc. circuit L.W. tuning coil	0·5
L17	1st I.F. trans.	Pri. 5·5
L18		Sec. 5·5
L19	2nd I.F. trans.	Pri. 13·0
L20		Sec. 13·0
L21	V2 supp. grid choke	Very low
L22	P.M. speaker speech coil	3·25
L23	Energised speaker speech coil	3·25
L24	Hum neutralising coil	0·15
L25	Speaker field coil	1,750·0
T1	Speakers input trans.	Pri. 460·0
		Sec. 0·5
	Pri., total	24·0
	Heater sec.	0·1
	Rect. heat. sec.	0·1
	H.T. sec., total	410·0
Sr-Sr 8	Waveband switches	—
S19	Radio muting switch (Gram.)	—
S20	Internal speakers switch	—
S21	Mains switch, ganged R12	—

DISMANTLING THE SET

Removing Chassis.—Remove the four bolts (with washers) holding the chassis to the bottom of the cabinet and free the speaker and scale lamp leads from the cleat holding them. Disconnect the leads from the terminal strip on the chassis (screw terminals) and loosen the cleat holding the scale lamp leads to the lid stay.

Next remove the two valves at the back of the chassis and the lid stay from the cabinet (two round-head wood screws), when the chassis can be withdrawn by lifting it up, complete with the top board, through the top of the cabinet.

When replacing, connect the leads to the terminal strip as follows, numbering the terminals from front to back of the chassis:—1, 2 and 3, no external connection; 4 and 5, scale lamp leads;



Three-quarter plan view of the chassis, showing the screened coil units.

6, red; 7, brown; 8, yellow; 9, black; 10, blue; 11, white; 12, green.

Removing Speakers.—To remove either of the two speakers it will first be necessary to remove the chassis, then remove two of the clamps (two round-head wood screws) and slacken the other two.

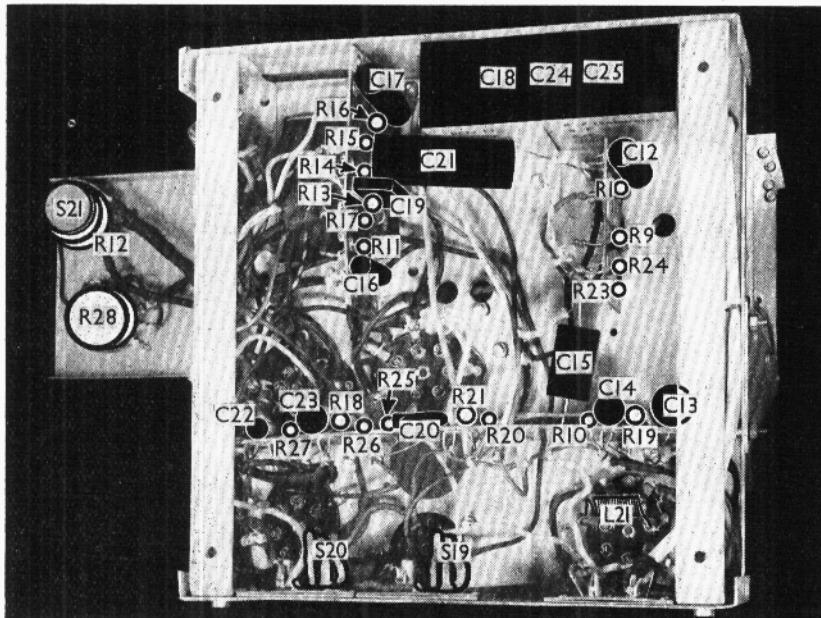
If the smaller speaker has been removed see that the terminal soldering tags are at the bottom when it is replaced and connect the green lead to the left-hand tag and the white lead to the right-hand tag. If the larger speaker has been removed see that the terminal panel is

at the bottom and connect the leads as follows, numbering the tags from left to right:—1, red and one end of R29; 2, 1 white leads; 3, two green leads; 4, bro

VALVE ANALYSIS

Valve voltages and currents given in the table (p. VIII) are those measured on our receiver when it was operating on mains of 228 V, using the 220 V tap on the mains transformer. The receiver was tuned to the lowest wavelength on the medium band and the volu

Continued overleaf



Under-chassis view. Note the jack switches S19 and S20, and the small choke L2

McMICHAEL 137 (A.C.)—Continued

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.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 AC/TH1	220	1.5	70	3.6
V2 AC/VP2	57	3.8	180	2.0
V3 AC/HL1	220	7.6	—	—
V4 AC/2Pn	133	1.2	220	7.2
V5 U14	203	33.0	—	—
T.L. TV4	332†	—	Target anode	—
	18	0.1	220	0.5

† Each anode, A.C.

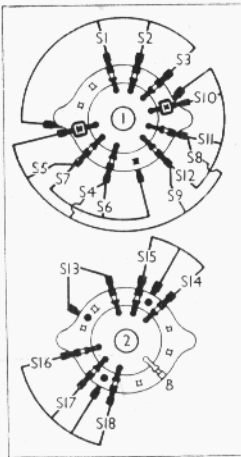
GENERAL NOTES

Switches S1-S18 are the waveband switches, ganged in two rotary units on either side of a sub-assembly above the main chassis deck. The units are marked 1 and 2 in our front chassis view, and diagrams showing them in detail, as seen looking in the directions of the arrows, are given below.

The table below gives the switch positions for the three control settings, starting from fully anti-clockwise. A dash indicates open, and **C**, closed.

Switch	S.W.	M.W.	L.W.
S1	C	—	—
S2	C	C	—
S3	—	—	C
S4	—	—	C
S5	—	C	C
S6	—	C	—
S7	—	—	C
S8	—	—	C
S9	—	C	—
S10	C	—	—
S11	—	C	—
S12	—	—	C
S13	C	—	—
S14	—	C	—
S15	—	—	C
S16	C	—	—
S17	—	C	—
S18	—	—	C

Switch diagrams, looking in the directions of the arrows in the front chassis view.

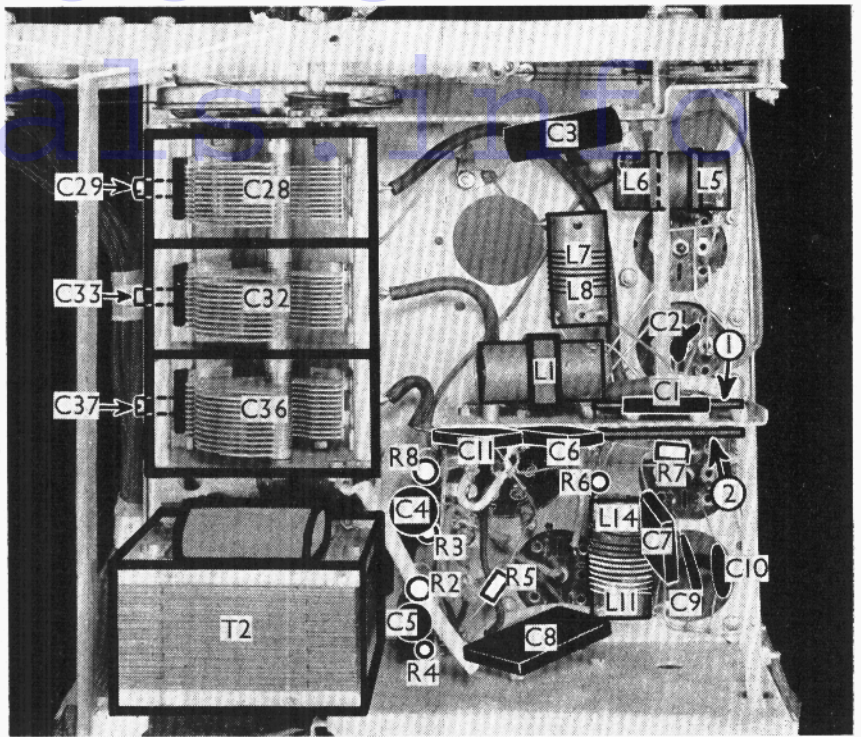


S19 is the radio muting jack switch, at the rear of the chassis, which opens when the pick-up plug is fully inserted, and mutes radio.

S20 is the internal speakers switch, also at the rear of the chassis, which opens when the external speaker plug is fully inserted, and mutes the internal speakers.

S21 is the Q.M.B. mains switch, ganged with the volume control **R12**.

Coils.—**L1**; **L5**, **L6**; **L7**, **L8**; and **L11**, **L14** are on tubular formers, and are



Front chassis view, showing the switch units and the unscreened coil units.

unscreened. They are indicated in our front chassis view. **L2-L4**; **L9**, **L10**; **L12**, **L13**, **L15**, **L16** and the I.F. transformers **L17**, **L18** and **L19**, **L20** are in five screened units, seen in our three-quarter plan chassis view. **L21** is a small choke, situated beneath the chassis, under the **V2** valve-holder. **L22** is the P.M. speaker speech coil and **L23** the energised speaker speech coil.

Scale Lamp.—This is mounted in a tubular metal casing, with removable end-plugs, fitted in clips inside the lid of the cabinet. The lamp is an Ever-Ready M.E.S. type, rated at 6.2 V, 0.3 A.

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (20Ω) external speaker. On inserting the special plug to its full extent, **S20** opens and mutes the internal speakers.

Condensers C18, C24, C25.—These are three dry electrolytics in a single carton beneath the chassis, with a common negative (black lead). The red lead is the positive of **C24** ($8\mu F$), the yellow the positive of **C25** ($8\mu F$) and the green the positive of **C18** ($4\mu F$).

T.I. Connections.—The TV4 C.R. tuning indicator is fitted with an eight side-contact base. The holder has contact numbers moulded on its underside. The connections are as follows: 1, blank; 2, black lead (heater); 3, yellow lead (heater); 4, blue lead (cathode); 5, blank; 6, green lead (control grid); 7, red lead and one side of **R22** (target); 8, other side of **R22** (anode).

Condenser C7.—This may be omitted in some chassis.

Speaker Assembly.—A wooden framework carries the two speakers and their wiring, and also **R29** and **T1**. The connections from this assembly to the

terminal strip on the receiver chassis are given under "Dismantling the Set."

Trimmer C29.—This is not used for alignment, and must be kept fully screwed up.

Chassis Divergency.—In some models the mains transformer and rectifier stand separately to the right of the chassis.

CIRCUIT ALIGNMENT

Circuit alignment can be performed without removing the chassis from the cabinet.

I.F. Stages.—Connect a $0.1\mu F$ or larger condenser across **C36** to swamp the oscillator circuit. Remove top cap connection of **V1** and connect in its place the high potential output lead from the signal generator, the earth lead going to chassis. Feed in a 465 KC/S signal and adjust **C41**, **C40**, **C39** and **C38** for maximum output, in that order. Keep the input low to avoid A.V.C. action. Finally, swing the signal generator control a few KC/S each side of 465 KC/S, and watch the output meter for a symmetrical response. Remove the swamp condenser, and replace **V1** top cap.

R.F. and Oscillator Stages.—If the pointer has been displaced, it may be necessary to undo the three nuts below one edge of the dial, and after sliding out the glass, adjust the pointer. To ascertain if this is necessary, turn the tuning control as far as it will go towards the top of the scales. The pointer should now lie over the point of the angle made by the medium wave line joining the right-hand sector line, on the other side of which are the RANGE slots.

If the pointer does not lie right through the point of the angle, then the centre screw should be loosened with a pair of sharp pointed pliers and the pointer re-set.

S.W.—Switch set to S.W., and turn tuning knob to bring pointer over the printed mark which will be seen just above the shaded portion of the S.W. scale, between 16 and 17 m. Connect signal generator to **A** and **E** sockets, and feed in an 18 MC/S (16.67 m.) signal. Adjust **C37** for maximum output, using the peak obtained with the trimmer screw in the slacker position. Then adjust **C39** for maximum output, **C29** is not used, and should be left at maximum. Repeat the **C37** and **C39** adjustments, and make sure that the maximum output is obtained at the correct tuning point.

L.W.—This band should be adjusted next, as it affects the M.W. adjustment slightly. Switch set to L.W., and tune to 1,000 m. on scale. Feed in a 1,000 m. (300 KC/S) signal, and adjust **C35**, then **C31** and **C27**, for maximum output.

M.W.—Switch set to M.W., and tune to bring pointer over the mark below the M.W. scale adjacent to the name "Rad Lyons." Feed in a 1,400 KC/S (214 m.) signal and adjust **C34**, then **C30** and **C26**, for maximum output.