McMICHAEL ALL-WAVE MODEL 371

CIRCUIT.—The aerial is coupled to the grid of V1, a triode-hexode frequency changer, through a set of self-variable coupling band-pass coils. The output of V1 passes by an I.F. transformer to the grid of V2, an H.F. pentode, working as I.F. amplifier.

The signal then passes via another I.F. transformer to the demodulating diode of V3, a double diode pentode. The other diode of V3 provides a D.C. potential that is fed to the preceding stages through the A.V.C. network.

The coupling arrangements to the grid of the pentode section of V3 include a manual volume control that varies the input. Between the anode of V3 and the chassis are connected a fixed condenser and a resistance and another condenser in parallel with these two components, to give modification of the tone.

Mains equipment consists of a transformer, full-wave rectifying valve, electrolytic smoothing condensers and smoothing choke consisting of the speaker field coil.

Chassis Removal.—The back of the cabinet is secured by two sliding clips. Remove the three control knobs on the front. These are of the spring-fixing type and are removed with a slight pull.

Turn the cabinet on its side and remove the four fixing bolts and washers on the base. Then place the cabinet upright again and remove the metal screen secured to the cabinet walls by three clips and unscrew the clip that carries the connection to the mains transformer for the purpose of earthing.

The chassis can then be removed, and is free to the extent of the leads to the mains transformer. To completely free the chassis these leads must be unsoldered. From left to right (looking from the back of the cabinet) the colours of the leads are: brown, red, yellow, dark blue, green and black. Alternatively, the speaker, electrolytic smoothing condensers and tone control can be removed, when the set can be operated outside the cabinet.

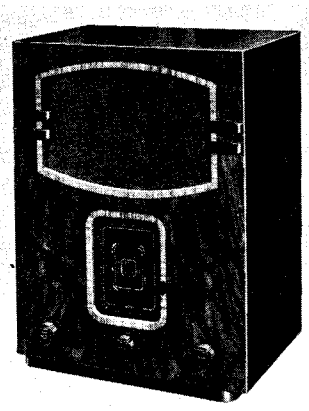
Special Notes.—C20 and R20 are located on the wiring near the speaker, and C16 and C17 are mounted on the speaker baffle board. The tone control is mounted on a metal bracket on the side of the cabinet.

There are two dial lights and three wavelength indication lights. The dial lights are located, one each side of the wavelength dial assembly, and the wavelength indication lights are to be found on the dial drum behind coloured celluloid strips. They are all rated at 6.2 volts, .3 amp.

The mains adjustment is located on the mains transformer, and takes the form of a wander plug adapted to fit into sockets marked with their respective values.

A pair of sockets at the rear of the chassis enable a pick-up to be connected. The makers state that for best results a high output crystal pick-up should be used.

An adjacent pair of sockets enable an external speaker to be operated. This should be of the permanent-magnet moving coil type with the resistance of some two ohms.



"Polychrome Flying Tuning"—a combination of colour indication and flywheel tuning—are distinctive features of the McMichael 371 all-wave A.C. three-valve plus rectifier superhet.

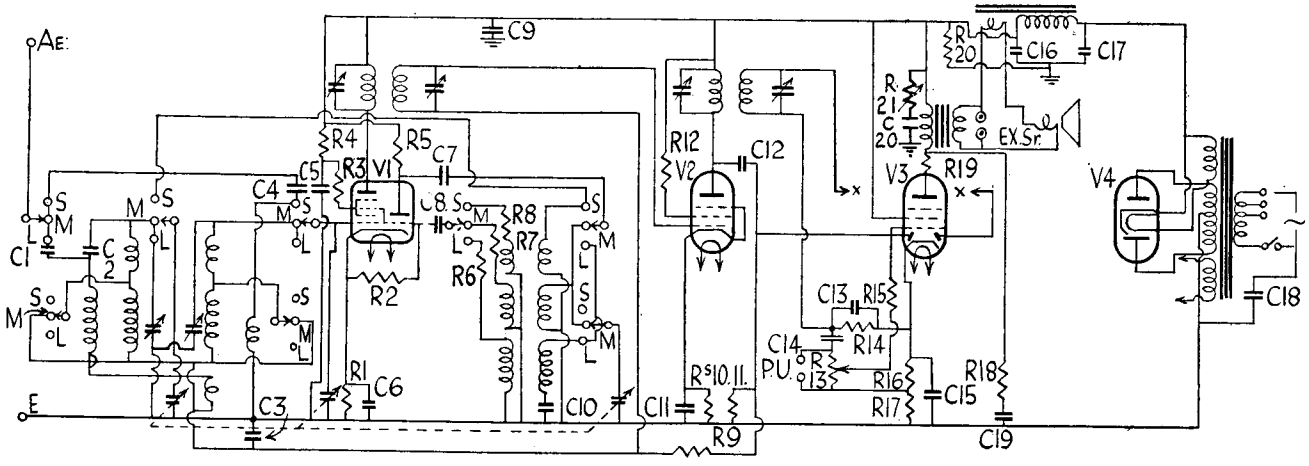
In the chassis diagram the resistance and condenser strips are drawn so as to show the various components.

CONDENSERS

C.	Purpose.	Mfd.
1	L.W. and M.W. aerial coupling	.0002
2	L.W. and M.W. top coupling	.00001
3	V1 A.V.C. decoupling	.5
4	S.W. aerial coupling	.00005
5	V1 screen decoupling	.1
6	V1 cathode shunt	.1
7	Osc. anode coupling	.0001
8	Osc. grid	.0001
9	H.T. line decoupling	.1
10	L.W. osc. fixed padder	.00108
11	V2 cathode shunt	.1
12	A.V.C. diode coupling	.0001
13	H.F. bypass	.0001
14	L.F. coupling	.005
15	V3 cathode shunt	25.
16	H.T. smoothing	8.
17	H.T. smoothing	8.
18	Mains suppressor	.002
19	Tone control (part)	.03
20	Tone control (part)	.03

RESISTANCES

R.	Purpose.	Ohms.
1	V1 cathode bias	250
2	Osc. grid leak.	50,000
3	V1 screen stabiliser	40
4	V1 screen decoupling	20,000
5	Osc. anode load	40,000
6	L.W. regeneration modifier	5,000
7	M.W. regeneration modifier.	2,500
8	S.W. regeneration modifier	50
9	V1, V2, A.V.C. decoupling	500,000
10	V2 cathode bias	100
11	A.V.C. diode load	1 meg.
12	V2 screen stabiliser	40
13	Volume control	500,000
14	Demodulating diode load	500,000
15	H.F. stopper	100,000
16	V3 cathode bias (part)	150
17	V3 cathode bias (part)	500
18	Tone control (fixed)	50,000
19	V3 anode stabiliser	50
20	H.T. bleeder	40,000
21	Tone control (variable)	100,000
	Field coil	1,850



Band-pass coils with a "self variable" coupling circuit feed the first valve, the frequency changer, in the McMichael 371. An I.F. amplifier is followed by a combined double diode and output pentode valve.

Circuit Alignment Notes

I.F. Circuits.—Connect a service oscillator between the top grid cap of V1 and chassis and an output meter across the primary of the speaker transformer. Turn the volume control to the maximum volume position. Switch the set to the medium waves and fully engage the vanes of the gang condenser.

Tune the service oscillator to 128 kcs. and adjust the trimmers of the I.F. transformers, IFT1 and IFT2 respectively, until maximum response is indicated in the output meter. Reduce the input from the service oscillator as the circuits come into line to render the A.V.C. inoperative.

Signal Circuits.—Leave the output meter connected as before, but feed the output from the service oscillator to the aerial and earth sockets of the receiver. Only inject sufficient input from the service oscillator to obtain definite peaks in the output meter so as to render the A.V.C. inoperative.

Turn the gang to maximum capacity and adjust the drive, if necessary, so as to bring the leading edge to the pointer lights on each band.

Medium Waves.—Tune the set and the oscillator to 214 metres (1,400 kcs.) and adjust T1, T2 (on top of the band-pass coil) and T3 respectively for maximum response in the output meter.

(*Continued in next column.*)

VALVE READINGS

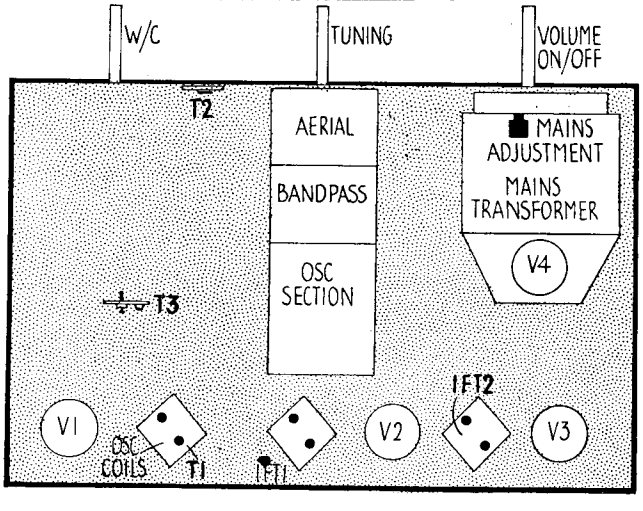
No Signal. Volume Maximum. 200 volts A.C. Mains

V.	Type.	Electrode.	Volts.	Ma.
1	All Mazda. AC/THI met. (7)	Anode ..	220	3.3
		Screen ..	95	6.7
		Osc.anode	70	4.
2	AC/VP2 met. (7)	Anode ..	235	6.5
		Screen ..	242	4.
3	AC2PenDD(7)	Anode ..	200	25.
		Screen ..	220	6.
4	UU4 (4)	Filament	345	—

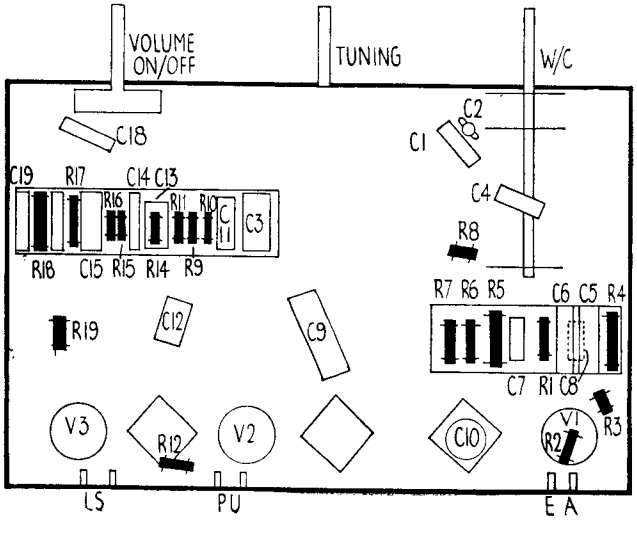
QUICK TESTS

Quick tests are available on this receiver on the speaker leads. Volts measured between these and the chassis should be:—

Brown lead, 345 volts, unsmoothed H.T.
Yellow lead, 205 volts, smoothed H.T.
Red lead, 218 volts, smoothed H.T.



As these layouts show, the construction of the McMichael 371 is particularly clean and straightforward. The "tinted" diagram on the left identifies the top-of-chassis components and the valves.



Right, is the layout diagram for the underside of the 371 chassis. The two resistance - condenser assemblies are drawn tilted to facilitate reference.

McMichael 371 on Test

MODEL 371.—Standard model for A.C. mains operation, 200-250 volts, 40-100 cycles. Price 11 gns.

DESCRIPTION. — Three-waveband, four valves, including rectifier, table model superhet.

FEATURES. — Full-vision "Polychrome" scale marked in waves and station calibration. Multi-colour light pointers, one for each band, and edge-on illuminated station names. Controls for tuning, wave selection and combined volume and on-off. Tuning control incorporates a flywheel drive that provides fine tuning for short waves, but permits the whole scale to be traversed by a spin of the tuning knob. Sockets for pick-up and external speaker.

LOADING.—70 watts.

Sensitivity and Selectivity

SHORT WAVES (16.5-50 metres).—Sensitivity and selectivity up to standard for the valve combination employed. No appreciable drift. Sensitivity well maintained over the range covered.

MEDIUM WAVES (200-550 metres).—Good gain and average selectivity. Local stations spread over some adjacent channels. Gain well maintained.

LONG WAVES (850-2,000 metres).—Sensitivity good, reasonable selectivity. Difficulty experienced in receiving Deutschlandsender.

Acoustic Output

Ample output for an ordinary room, with well balanced tone and crisp, clean attack. Little colouration on speech. Tone control not too vigorous in action.

(*Continued from column 2*)

Long Waves.—Tune both the set and oscillator to 1,000 metres (300 kcs.) and adjust T4 for maximum response in the output meter.

Short Waves.—There are no separate trimmers provided for adjustment on this band.

Replacement Condensers

EXACT replacements are available from A. H. Hunt, Ltd., of Garratt Lane, Wandsworth, London, S.W.18, for two of the condensers in the McMichael 371.

For the block containing Cs 16 and 17 there is unit list number 3,763 at 6s. 6d., and for C15 there is unit 2,918 at 1s. 9d.

BACKGROUND GROWL

A WHISTLE or growl background may be due to the fact that the I.F. stage is oscillating.

Other likely causes are excessive regeneration in the oscillator stage owing to incorrect potentials, faulty by-pass condensers, high resistance in grid circuits or faulty bias resistors.

Sometimes parasitic oscillation in the oscillator circuit modulates the injected signal at an audio frequency.

'TRADER' SERVICE SHEET

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McMICHAEL 371 (A.C.) AND 401 (A.C. CONSOLE)

FITTED in the McMichael 371 (A.C.) receiver is a 3-valve (plus rectifier) 3-band superhet chassis with a short-wave range of 16·5-50 metres. Features of the set are a flywheel tuning drive and provision for a gramophone pick-up and an extension speaker.

The standard model is for mains of 200-260 V, 40-100 C/S, but other models are made for mains of non-standard voltage and periodicity.

An identical chassis is fitted in the 401 console receiver.

CIRCUIT DESCRIPTION

Aerial input on M.W. and L.W. is via coupling components **C2, L1** and **C3** to inductively coupled band-pass filter. Primary coils **L2, L3** are tuned by **C22**; secondaries **L6, L7** by **C24**; image suppression by coil **L4**. On S.W. input is via condenser **C1** to single tuned circuit **L5, C24.**

First valve (**V1, Mazda metallised AC/TH1**) is a triode-hexode operating as frequency changer with internal coupling. Oscillator anode coils **L12** (M.W.) and **L13** (L.W.) are tuned by **C27**; on S.W., anode coil **L11** is tuned by **C22,** to which it is connected by switch **S12**; parallel trimming by **C25** (M.W.) and **C26** (L.W.); series tracking by fixed condenser **C9** (L.W.); M.W. tracking by specially shaped condenser vanes of **C27.** Grid reaction coils **L8** (S.W.), **L9** (M.W.) and **L10** (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-secondary transformer couplings **C28, L14, L15, C29** and **C30, L16, L17, C31.**

Intermediate frequency 128·5 KC/S.

Diode second detector is part of double diode pentode output valve (**V3, Mazda AC/2Pen/DD**). Audio-frequency component in rectified output is developed across load resistance **R12** and passed via A.F. coupling condenser **C12,** manual volume control **R11** and I.F. stopper **R13** to C.G. of pentode section. Provision for connection of gramophone pick-up across **R11.** Fixed tone correction by **C16** in anode circuit. Variable tone control by R.C. filter **R19, C17,** also in anode circuit. Provision for connection of low impedance external speaker across secondary of internal speaker input transformer **T1.**

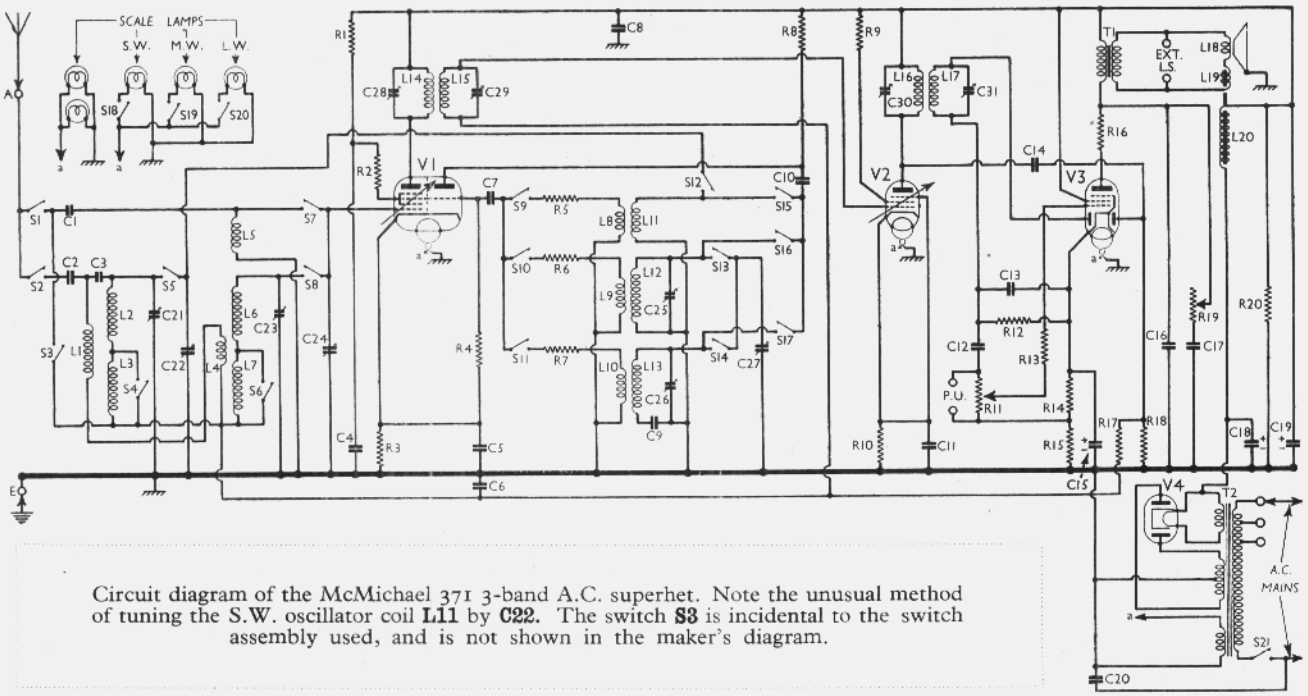
Second diode of **V3,** fed from **V2** anode via **C14,** provides D.C. potential which is developed across load resistance **R18** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage is obtained from drop across resistances **R14, R15** in cathode circuit.

H.T. current is supplied by I.H.C. full-wave rectifying valve (**V4, Mazda UU4**). Smoothing by speaker field **L20** and dry electrolytic condensers **C18** and **C19. R20** protects the latter from voltage surge when receiver is first switched on.

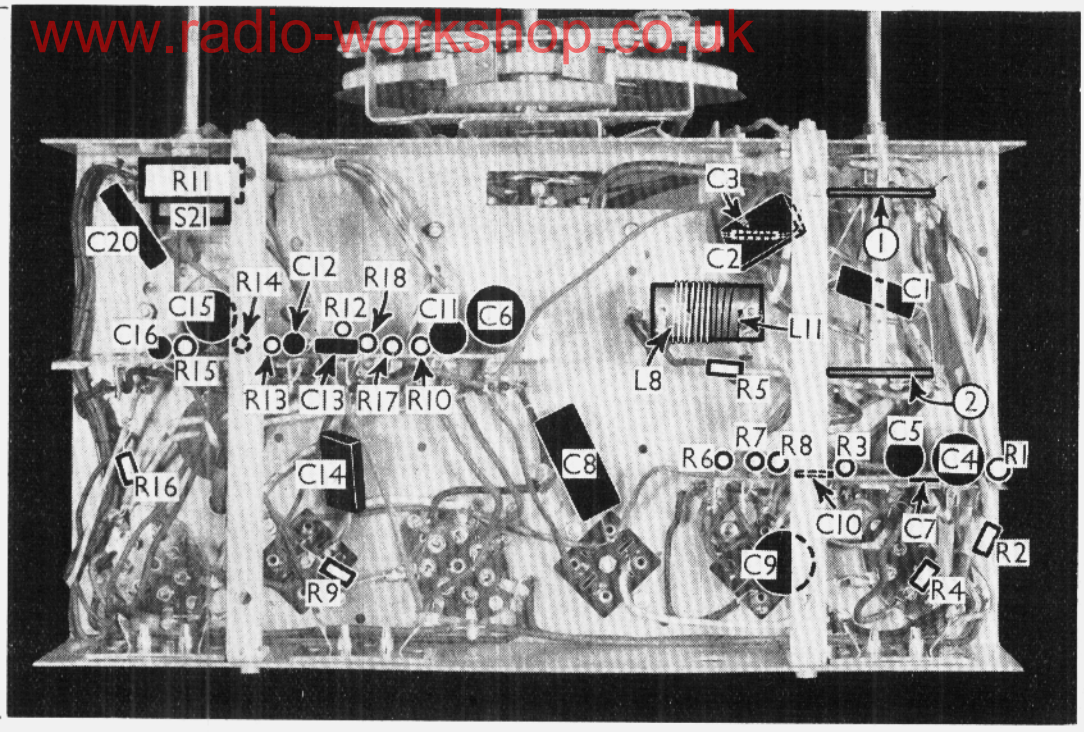
COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 S.G. H.T. feed	20,000
R2	V1 S.G. anti-parasitic resistance	40
R3	V1 fixed G.B. resistance	250
R4	V1 osc. C.G. resistance	50,000
R5	Osc. reaction S.W. damping	50
R6	Osc. reaction M.W. damping	2,500
R7	Osc. reaction L.W. damping	5,000
R8	V1 oscillator anode H.T. feed	40,000
R9	V2 S.G. anti-parasitic resistance	40
R10	V2 fixed G.B. resistance	100
R11	Manual volume control	500,000
R12	V3 signal diode load	500,000
R13	V3 pent. C.G. I.F. stopper	100,000
R14	V3 pentode G.B. and A.V.C. delay potential resistances	150
R15		500
R16	V3 anode circuit stabiliser	50
R17	A.V.C. line decoupling	500,000
R18	V3 A.V.C. diode load	1,000,000
R19	Variable tone control	100,000
R20	Voltage surge reducer	40,000

	CONDENSERS	Values (μF)
C1	Aerial S.W. coupling	0·00005
C2	Aerial M.W. and L.W. couplings	0·0002
C3		0·00001
C4	V1 S.G. decoupling	0·1
C5	V1 cathode by-pass	0·1
C6	A.V.C. line decoupling	0·5
C7	V1 osc. C.G. condenser	0·0001
C8	H.T. positive line R.F. by-pass	0·1
C9	Osc. circuit L.W. tracker	0·001081
C10	V1 osc. anode coupling	0·0001
C11	V2 cathode by-pass	0·1
C12	A.F. coupling to V3 pentode	0·005
C13	I.F. by-pass	0·0001
C14	Coupling to V3 A.V.C. diode	0·0001
C15*	V3 cathode by-pass	25·0
C16	V3 anode fixed tone corrector	0·002
C17	Part of variable T.C. filter	0·03



Circuit diagram of the McMichael 371 3-band A.C. superhet. Note the unusual method of tuning the S.W. oscillator coil **L11** by **C22.** The switch **S3** is incidental to the switch assembly used, and is not shown in the maker's diagram.



Under-chassis view. The two switch units are indicated, and are shown in detail on page VIII. **C9** is a flat disc-type condenser. **C3** is below **C2**. **L8** and **L11** are the S.W. oscillator coils, **L11** being the enamelled wire winding.

	CONDENSERS (*Continued*)	Values (μF)
C18*	H.T. smoothing	8·0
C19*	H.T. smoothing	8·0
C20	Mains R.F. by-pass	0·002
C21‡	Band-pass pri. M.W. trimmer	—
C22†	Band-pass pri. and S.W. osc. tuning	—
C23‡	Band-pass sec. M.W. trimmer	—
C24†	Band-pass sec. and S.W. aerial tuning	—
C25‡	Osc. circuit M.W. trimmer	—
C26‡	Osc. circuit L.W. trimmer	—
C27†	Oscillator circuit tuning (M.W. and L.W.)	—
C28‡	1st I.F. trans. pri. tuning	—
C29‡	1st I.F. trans. sec. tuning	—
C30‡	2nd I.F. trans. pri. tuning	—
C31‡	2nd I.F. trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial M.W. and L.W. coupling		10·75
L2	Band-pass primary coils		3·6
L3	Band-pass primary coils		11·5
L4	Image suppressor		0·45
L5	Aerial S.W. tuning coil		0·1
L6	Band-pass secondary coils		3·3
L7	Band-pass secondary coils		12·75
L8	Oscillator S.W. grid reaction		6·0
L9	Oscillator M.W. grid reaction		2·5
L10	Oscillator L.W. grid reaction		4·75
L11	Osc. circuit S.W. tuning coil		0·1
L12	Osc. circuit M.W. tuning coil		3·2
L13	Osc. circuit L.W. tuning coil		14·3
L14	1st I.F. trans.	Pri.	65·0
L15	1st I.F. trans.	Sec.	65·0
L16	2nd I.F. trans.	Pri.	65·0
L17	2nd I.F. trans.	Sec.	65·0
L18	Speaker speech coil		3·0
L19	Hum neutralising coil		0·15
L20	Speaker field coil		1,800·0
T1	Speaker input trans.	Pri.	600·0
T1	Speaker input trans.	Sec.	0·1
T2	Mains trans.	Pri. total	30·0
T2	Mains trans.	Heater sec.	0·1
T2	Mains trans.	Rect. heat. sec.	0·1
T2	Mains trans.	H.T. sec. total	550·0
S1-S17	Waveband switches		—
S18-20	Scale lamp switches		—
S21	Mains switch, ganged R11		—

DISMANTLING THE SET

Removing Chassis.—To remove the chassis from the cabinet, remove the three control knobs on the front of the cabinet (pull off), taking care not to lose the springs. Free the mains lead from the cleat on the side of the cabinet and remove the four bolts (with washers) holding the chassis to the bottom of the cabinet. Now remove the screen held to the side of the cabinet by two cleats and unsolder the lead to one of the cleats.

The chassis can now be withdrawn to the extent of the speaker leads, which should be sufficient for normal purposes.

To free the chassis entirely, unsolder the speaker leads from the terminal strip on the top of the mains transformer and *when replacing*, connect them as follows, numbering the tags from left to right:—1, brown; 2, red; 3, yellow; 4, blue; 5, green; 6, black.

Removing Speaker.—If it is desired to remove the speaker from the cabinet without disturbing the chassis, unsolder the leads from the speaker transformer terminal strip and earthing tag and slacken the four clamps holding the speaker to the sub-baffle (four round-head wood screws). *When replacing*, see that the transformer is at the top and connect the leads from the chassis as follows, numbering the tags from left to right:—1, brown; 2, yellow; 3 and 5 joined together, blue; 4, green; 6, red and one end of **R20**. Connect one of the red leads from the electrolytic block to tag 1, the other red lead to tag 6 and the black lead to the earthing tag on the speaker frame. Take the free ends of **R20** and **C17** to the earthing tag and the red lead from **R19** to tag 2.

VALVE ANALYSIS

Valve voltages and currents given in the table (Col. 3) are those measured in our receiver when it was operating on mains of 230 V, using the 220 V tapping on the mains transformer. 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 1,200 V scale of an Avometer, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 AC/TH1*	240	2·3	93	6·4
V2 AC/VP2	240	12·0	240	3·4
V3 AC/2Pen/DD	220	27·0	240	5·8
V4 UU4	335†	—	—	—

* Oscillator anode, 70 V, 4·0 mA.
† Each anode, A.C.

GENERAL NOTES

Switches.—**S1-S17** are the waveband switches, and **S18-S20** the scale lamp switches, all ganged in two rotary units beneath the chassis. These are indicated in our under-chassis view, and are shown in detail in the diagrams on page VIII. Note the extra switches formed by the two contacts on the rotor of the first switch unit. **S3** appears to be merely incidental to the switching system used. It is not shown in the makers' diagram, but we include it for the sake of completeness.

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

S21 is the Q.M.B. mains switch, ganged with the volume control **R11.**

Coils.—**L1-L4** and **L6, L7** are on a single unscreened tubular former mounted vertically on the chassis deck. The positions of the individual coils, from top to bottom, are indicated in our plan

Continued overleaf

McMICHAEL 371—*Continued*

chassis view. **L5** is on a separate unscreened former mounted just above the chassis deck. **L9, L10, L12, L13** and the I.F. transformers **L14, L15** and **L16, L17** are in three screened units on the chassis deck. The S.W. oscillator coils **L8, L11** are on an unscreened tubular former beneath the chassis. **L11** is the enamelled wire winding.

Scale Lamps.—There are five of these in all, two being for indirect illumination of the scale, and alight whenever the set is on, the remainder being switched in one at a time by **S18-S20,** according to the waveband in use. The three lamps rotate with the large indicator wheel behind the scale, their connections passing through the hollow spindle and being brought out to flexible leads.

All the lamps are Ever Ready M.E.S. types, rated at 6·2 V, 0·3 A.

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (2 O) external speaker.

Components Inside Cabinet.—Apart from the speaker, speaker transformer and speaker field, the following components are inside the cabinet: **R19,** the variable tone control (attached to the left-hand side of the cabinet); **C17,** the tone control condenser; **R20,** the voltage surge reducer; **C18** and **C19,** the H.T. smoothing condensers.

Looking inside the cabinet, with the speaker *in situ*, **T1** being on top, **R19** is connected with its centre tag joined to the second tag from the left of the **T1** connection panel, one outside tag of **R19** going to one side of **C17,** the other outside tag being blank. The other side of **C17** goes to the earthing tag on the speaker chassis.

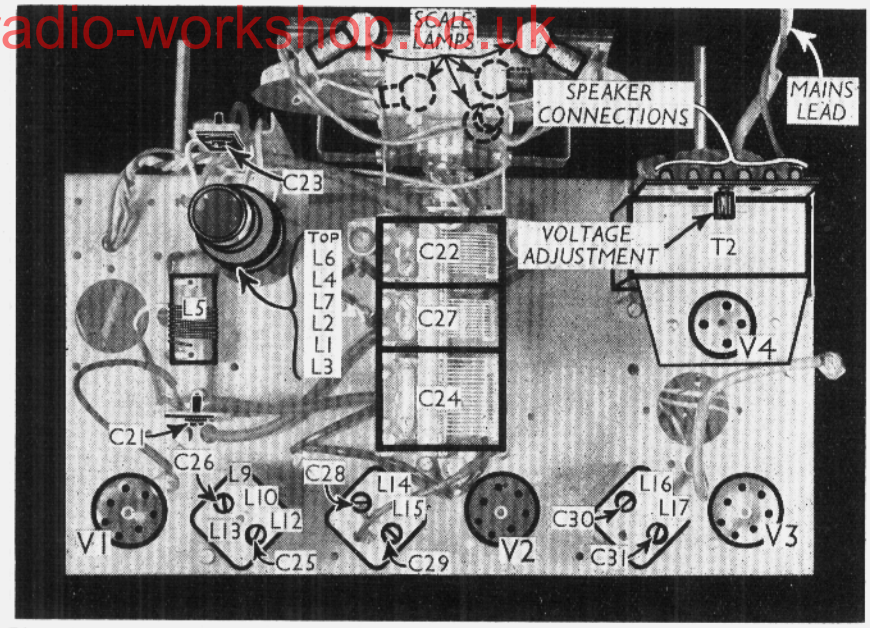
One side of **R20** also goes to this earthing tag, the other side going to the right-hand tag on the **T1** panel.

The common negative (black) lead of the **C18, C19** block goes to the earthing tag on the speaker chassis, the two red leads (positives) going to the extreme left and right-hand tags respectively on the **T1** panel.

Chassis Divergencies.—**S3** is not shown in the makers' diagram (see note under Switches). **R19** is shown as a fixed 50,000 O resistance, not a 100,000 O variable, in the makers' first diagram.

SWITCH TABLE

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	C
S9	C	—	—
S10	—	C	—
S11	—	—	C
S12	C	—	—
S13	—	C	—
S14	—	—	C
S15	C	—	—
S16	—	C	—
S17	—	—	C
S18	C	—	—
S19	—	C	—
S20	—	—	C



Plan view of the chassis. Note the panel carrying the tags for the speaker connections. (See "Removing Chassis").

CIRCUIT ALIGNMENT

With the gang at maximum the tuning drive should be adjusted (using the set-screws of the flexible coupling) so that when switched to the M.W. band the orange indicating slit points to the calibration mark which will be found about ½ in. to the right of the 550 m. calibration.

I.F. Stages.—Connect signal generator to grid (top cap) of **V1** and chassis, switch set to M.W., connect a 0·1 μF or larger swamp condenser across **C27,** and feed in a 128·5 KC/S signal. Adjust **C31, C30, C29** and **C28** in turn for maximum output. Re-check, then remove swamp condenser and replace normal top cap connection.

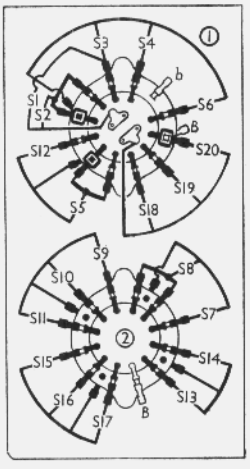
R.F. and Oscillator Stages.—Connect signal generator to **A** and **E** sockets.

M.W.—Switch set to M.W., tune so that pointer light is at the bottom edge of the station name "Rad. Lyons." Inject a 1,400 KC/S (214 m.) signal, and adjust **C25** for maximum output. Then adjust **C23** and **C21** for maximum output.

L.W.—Switch set to L.W., set pointer light to read 1,000 m., and inject a 1,000 m. (300 KC/S) signal. Adjust **C26** for maximum output.

No variable tracking is provided on M.W. or L.W., and no variable trimming or tracking on S.W.

Switch diagrams, looking from the rear of the underside of the chassis. B indicates blank, and b, bearer.



MAINTENANCE PROBLEMS

Instability in Pye T7

AFTER overhauling a Pye model T7 receiver recently a slight "plopping" was noticed when the set was tuned very slightly off the local station. No doubt the job could have been passed out and the customer would not have been any the wiser, but taking no chances it was decided to investigate, and it was found that instability was taking place in the I.F. stage.

Decoupling the anode circuit of this stage effected a complete cure. Most sets these days are designed and work satisfactorily without the I.F. stage decoupled, but I have come across the trouble before.—W.A.D.

Electrolytic Condenser Trouble

ON testing a G.E.C. AVC5 it was found that one section of the main condenser block (electrolytic) had the usual dead short. This condenser has a common positive, so the negative was disconnected, but on checking the total H.T. current load, this was still found to be excessive. The other two sections were also disconnected, and were found to be leaking, leaving only the positive lead connected. The current, however, was still high. There was no short on the lead itself, and it was found that the leakage was actually taking place through the cardboard container to the metal casing in which it is fitted.—W. A. DAVIS, NEWCASTLE-ON-TYNE.

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