'TRADER' SERVICE SHEET 224

McMICHAEL 363

5-VALVE BATTERY TRANSPORTABLE

OF the self-contained type, the McMichael 363 is a 5 valve battery-operated superhet with its own frame aerial, and having a double pentode output valve in a Q.P.P. stage. The receiver has a sensitivity switch and provision for both a gramophone pick-up and an extension speaker, a jack switch allowing the internal speaker to be cut out of circuit, if desired.

CIRCUIT DESCRIPTION

Tuned frame aerial input **L1, L2, C22** to variable-mu pentode signal frequency amplifier (**V1, Mazda metallised VP210**). Provision for connection of external aerial (via **C1**) and earth. Tuned secondary transformer coupling to **L3, L4, L5, L6, C24** to triode-pentode valve (**V2, Mazda metallised TP22**) operating as frequency changer with suppressor grid coupling. Oscillator grid reaction coils **L7, L8**; anode coils **L9, L10** tuned by **C27**; parallel trimming by **C28** (M.W.) and **C26** (L.W.); series tracking by fixed condenser **C7** (L.W.).

Third valve, a variable-mu R.F. pentode (**V3, Mazda metallised VP210**) operates as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C29, L11, L12, C30** and **C31, L13, L14, C32.**

Intermediate frequency 128·5 KC/S.

Diode second detector is part of double diode triode valve (**V4, Mazda metallised HL21/DD**). Audio frequency component in rectified output is developed across load resistance **R10** and passed via switch **S5,** coupling condenser **C14,** manual volume control **R12** and I.F. stopper **R13** to C.G. of triode section, which operates as A.F. amplifier. I.F. filtering by **C10, C11** and **R9.** Provision for connection of gramophone pick-up by special plug which automatically opens **S5,** thus muting radio.

Second diode of **V4,** fed from **V3** anode via **C15,** provides D.C. potential which is developed across load resistance **R15** and fed back through decoupling circuits as G.B. to R.F., F.C. and I.F. valves, giving automatic volume control.

Delay voltage is normally obtained from drop along **R21** via sensitivity switch **S8**; when the sensitivity switch knob is in the upper position for the reception of powerful transmissions **S8** opens and delay voltage is then obtained via **S7** from drop along **R19, R20** and **R21** in automatic G.B. circuit.

Parallel-fed transformer coupling by **R14, C17** and **T1** to quiescent push-pull output stage, which comprises a double pentode valve (**V5, Mazda QP230**). Fixed tone correction in anode circuit by condensers **C18, C19**; variable tone control by R.C. filter **R17, C20.** Provision for connection of external low impedance speaker across secondary of internal speaker transformer **T2.** Switch **S6** breaks internal speaker speech coil circuit automatically upon full insertion of special external speaker plug.

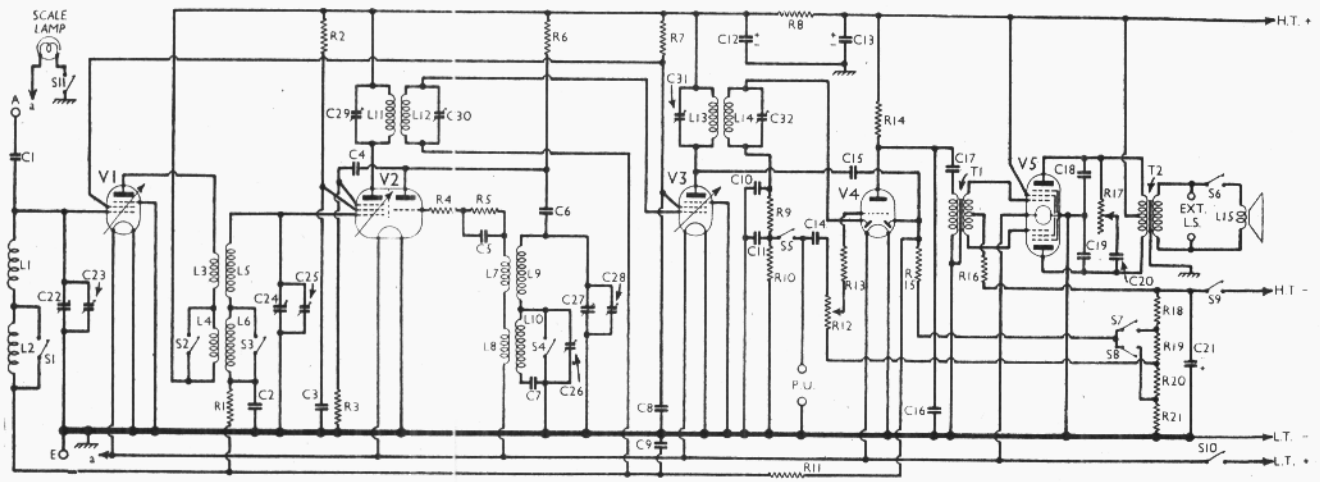
COMPONENTS AND VALUES

	RESISTANCE	Values (ohms)
R1	V2 pent. C.G. decoupling	500,000
R2	V2 pent. S.G. H.T. feed	100,000
R3	V2 pent. supp. grid resistance	2,000,000
R4	V2 osc. harmonic suppressor	1,000
R5	V2 osc. C.G. resistance	100,000
R6	V2 osc. anode resistance	70,000
R7	V1, V3 S.G. H.T. feed	100,000
R8	V1, V2, V3 H.T. feed resistance	5,000
R9	I.F. stopper	100,000
R10	V4 signal diode load	500,000
R11	A.V.C. line decoupling	1,000,000
R12	Manual volume control	1,000,000
R13	V4 triode C.G. I.F. stopper	100,000
R14	V4 triode anode load	50,000
R15	V4 A.V.C. diode load	1,000,000
R16	V5 C.G. circuit stabiliser	100,000
R17	Variable tone control	100,000
R18	Automatic G.B., A.V.C., delay voltage and sensitivity control resistances	400
R19		450
R20		20
R21		100

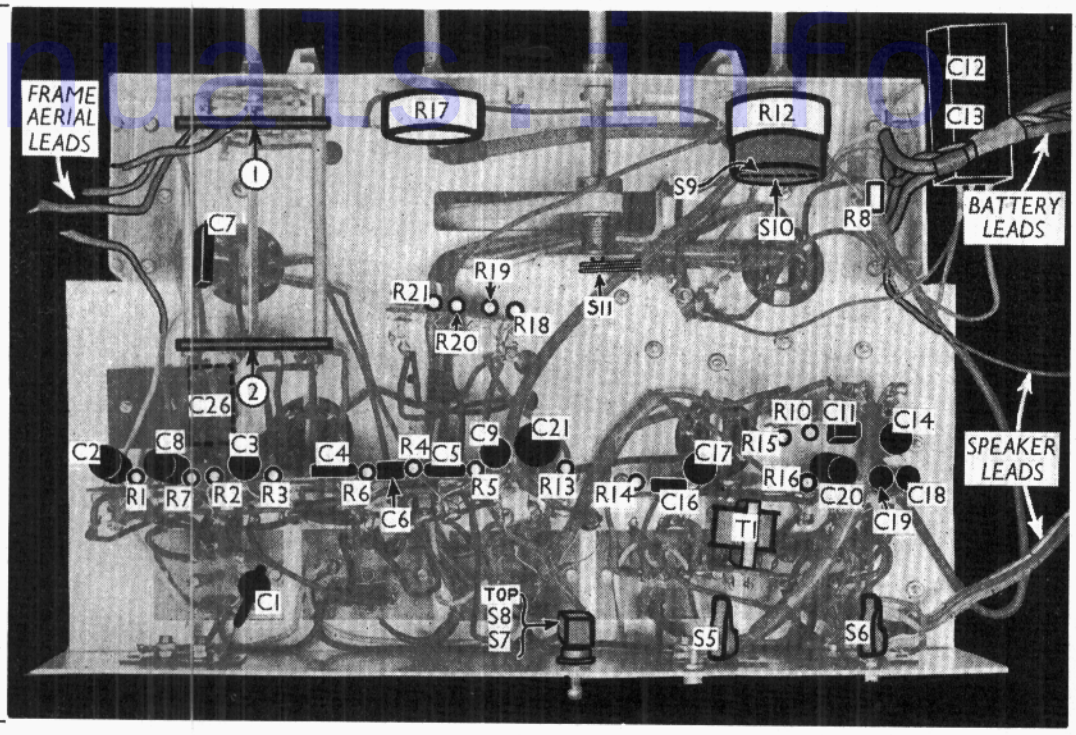
	CONDENSERS	Values (μF)
C1	Ext. aerial series condenser	0·00001
C2	V2 pentode C.G. decoupling	0·1
C3	V2 pentode S.G. decoupling	0·1
C4	V2 osc. anode to supp. grid coupling	0·0005
C5	V2 osc. C.G. condenser	0·0005
C6	V2 osc. anode condenser	0·0001
C7	V2 osc. L.W. tracker	0·001081
C8	V1, V3 S.G. decoupling	0·1
C9	A.V.C. line decoupling	0·1
C10	I.F. by-passes	0·0001
C11		0·0001
C12*	H.T. supply reservoir	8·0
C13*		8·0
C14	A.F. coupling to V4 triode	0·005
C15	Coupling to V4 A.V.C. diode	0·0001
C16	V4 triode anode I.F. by-pass	0·0003
C17	A.F. coupling to T1	0·1
C18	Fixed tone correctors	0·001
C19		0·001
C20	Part of T.C. filter	0·01
C21*	Auto. G.B. circuit by-pass	50·0
C22†	Frame aerial tuning	—
C23‡	Frame aerial trimmer	—
C24†	R.F. trans. sec. tuning	—
C25‡	R.F. trans. sec. trimmer	—
C26‡	Oscillator L.W. trimmer	—
C27†	Oscillator tuning	—
C28‡	Oscillator 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.

	OTHER COMPONENTS		Approx. Values (ohms)
L1	Frame aerial windings		2·5
L2			17·5
L3	R.F. trans. pri. coils		3·5
L4			2·5
L5	R.F. trans. sec. coils		4·5
L6			12·0
L7	Oscillator grid coils, total		2·0
L8			
L9	Oscillator anode tuning coils		4·0
L10			7·5
L11	1st I.F. trans.	Pri.	43·0
L12		Sec.	43·0
L13	2nd I.F. trans.	Pri.	43·0
L14		Sec.	43·0
L15	Speaker speech coil		2·0



Circuit diagram of the McMichael 363 battery transportable receiver. **S7** and **S8** form a single pole double throw sensitivity switch.



Under - chassis view, showing also the **C12, C13** unit, which is mounted inside the framework of the aerial. The wavechange switch units are indicated by numbers in circles and arrows. **S11** is the scale lamp switch. **C26** is adjusted through a hole in the chassis deck.

OTHER COMPONENTS (*Continued*)			Approx. Values (ohms)
T1	Intervalve trans.	Pri. ..	650·0
		Sec. total	6,000·0
T2	Speaker input trans.	Pri. total	700·0
		Sec. ..	0·25
S1-S4	Waveband switches	.. ..	—
S5	Radio muting switch (gram.)		—
S6	Internal speaker switch	..	—
S7,S8	Sensitivity switches	.. ..	—
S9	H.T. circuit switch	.. ..	—
S10	L.T. circuit switch	.. ..	—
S11	Scale lamp switch	.. ..	—

DISMANTLING THE SET

Removing Chassis.—It is possible to remove the chassis, speaker and frame aerial together. To do this the knobs should be removed (pull off), taking care not to lose the springs. Now remove the partition protecting the speaker (four countersunk-head wood screws) and remove the partition. Next remove the two bolts (with nuts and lock washers) holding the frame to the bottom of the cabinet and the four round-head wood screws holding the back of the chassis to the fillets on the side of the cabinet.

The chassis, speaker and frame aerial can now be withdrawn together, but care should be taken not to damage the frame aerial windings on the fillets on the sides of the cabinet. To gain access to the components near **V4** and **V5** it will first be necessary to remove the screen under the chassis (six screws with nuts and lock washers.)

When replacing, note that the cut away washers for the bolts holding the frame to the bottom of the cabinet go inside the cabinet. As the knobs are marked with their purpose, they must be placed on the correct spindles.

If it should be necessary to remove the chassis from the frame aerial, unsolder the leads to the frame and speaker, free the battery leads from the cleat on the side of the frame, and remove the electrolytic condenser from the side of the frame (round-head screw and metal strap). Now free the two straps holding the top of the tuning scale to the frame (two round-head wood screws) and swivel the straps to clear the frame, then remove the four countersunk head screws (with nuts) holding the sides of the chassis to the frame. The chassis is now free.

When replacing, connect the leads to the frame as follows, numbering the tags from front to back :—1, dark green lead to switch and component panel; 2, dark green lead to switch; 3, two light green leads. Connect the leads to the speaker as follows, numbering the tags from bottom to top :—1, yellow; 2, two red leads; 3, green; 4, blue; 5, white; 6, yellow. The black lead goes to the tag on one of the screws holding the transformer to the speaker.

Removing Speaker.—To remove the speaker from the cabinet, remove the partition protecting it (four countersunk-head wood screws), unsolder the leads and remove the two top clamps holding the speaker to the frame (two round-head wood screws) and slacken the other two. *When replacing*, see that the transformer is on the left and connect the leads as above.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating with a new H.T. battery reading 125 V on load. The receiver was tuned to the lowest wavelength on the medium band and both the volume and sensitivity controls were at maximum (the latter down). There was no signal input, as the frame aerial connections were shorted.

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 VP210	93	0·8	40	0·2
V2 TP22*	93	0·6	43	0·4
V3 VP210	93	1·1	40	0·3
V4 HL21/DD	80	0·5	—	—
V5 QP230	112†	2·1†	114	1·0

* Oscillator anode 42 V, 0·6 mA.
† Each anode.

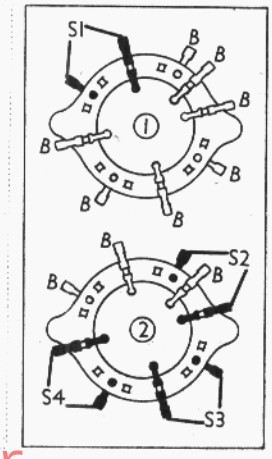
GENERAL NOTES

Switches.—**S1-S4** are the waveband switches, ganged in two rotary units beneath the chassis. They are indicated in our under-chassis view, and shown in detail in the diagrams below. All these switches are *closed* on the M.W. band (anti-clockwise) and *open* on the L.W. band (clockwise).

S5 is the radio muting jack switch

Continued overleaf

Switch diagrams, as seen from the rear of the underside of the chassis.



McMICHAEL 363—*Continued*

at the rear of the chassis, which opens when the pick-up plug is fully inserted. **S6** is a similar jack switch, also at the rear of the chassis, which opens when the external speaker plug is fully inserted, thus disconnecting the internal speaker.

S7, S8 are the Q.M.B. sensitivity switches in a single unit at the rear of the chassis. In the "L" position (up), **S8** is open and **S7** closed; in the "H" position (down), **S7** is open and **S8** closed.

S9 and **S10** are the H.T. and L.T. circuit switches, of the Q.M.B. type, ganged with the volume control, **R12.** The blue leads go to **S9** and the white ones to **S10.**

S11 is the scale lamp switch, which closes when the tuning knob is pushed in.

Coils.—**L1** and **L2** form the frame aerial windings. **L3-L6** and **L7-L10** are in two screened units on the chassis deck. The I.F. transformers, **L11, L12** and **L13, L14** are in two further screened units on the chassis deck, with their associated trimmers. The second unit also contains **R9, R11, C10** and **C15.**

Scale Lamp.—This is a Bulgin M.E.S. type, rated at 2·0 V, 0·6 A. It is only illuminated as long as the tuning knob is pushed in, closing **S11.**

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (2 O) external speaker. By fully inserting the special plug supplied, **S6** opens, and cuts out the internal speaker.

Condensers C12, C13.—These are two 8 μF (120 V) dry electrolytics in a single carton, fixed by a clip to the inside of the aerial framework, on the left of the speaker. The black lead is the common negative; the red lead to **R8** and a red lead to the speaker is the positive of **C13**; the other red lead to **R8** and an I.F. transformer is the positive of **C12.**

Trimmer C23.—No adjusting nut is fitted to this, as it must always be left at the minimum position.

Batteries.—Those supplied are: L.T., Exide 2 V celluloid cased cell, type PLF5, 2V 26 AH. H.T., Drydex type H 1132 Yellow Triangle 120 V dry battery.

Battery Leads and Voltages.—Black rubber lead, spade tag, L.T. negative; Red rubber lead, spade tag, L.T. positive 2 V. Black lead and plug, H.T. negative; Red lead and plug, H.T. positive 120 V. Grid bias is automatic.

CIRCUIT ALIGNMENT

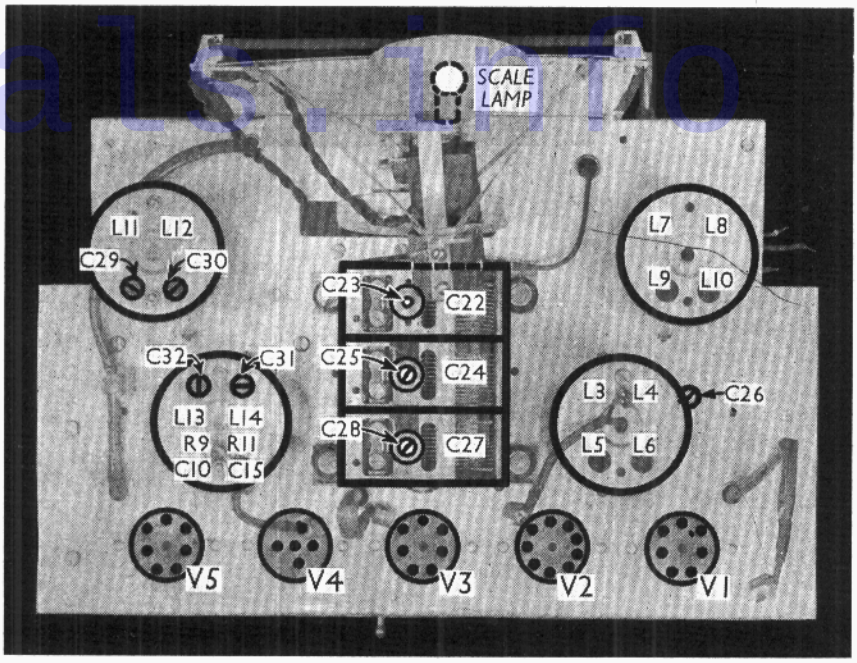
I.F. Stages.—Switch set to M.W., set sensitivity switch to maximum (knob down) and connect across **C27** a 0·1 μF swamp condenser. Remove top cap from **V2** and connect the signal generator output lead in its place, the other lead going to chassis.

Feed in a 128·5 KC/S signal, and adjust **C32, C31, C30** and **C29** for maximum output, in that order. Keep the input low to avoid A.V.C. action. Remove swamp condenser, and replace top cap of **V2.**

R.F. and Oscillator Stages.—With gang at maximum, pointer should rest over the black mark on the double line of the outer scale, about $\frac{3}{8}$ in. to the left of the pointer bearing support. If it does not, rotate it round the spindle to the correct position.

Tune to 214 m. on the scale (pointer resting so that "Radio Lyons" can be read along its upper edge). Inject a 214 m. (1,400 KC/S) signal into external A and E sockets, and adjust **C28** for maximum output. If there are two peaks, that produced with the least capacity of **C28** is correct. Now adjust **C25** for maximum output. Return to **C28**, which may need slight re-adjustment. Always leave **C23** at minimum (no adjusting nut is fitted here).

Switch set to L.W., tune to 1,000 m. on scale, and inject a 1,000 m. (300 KC/S) signal. Adjust **C26** (through hole in chassis deck) for maximum output, rocking the gang slightly for optimum results.



Plan view of the chassis. **C23** has no adjusting nut, as it must always be left at minimum. Note the adjusting screw of **C26.**

MAINTENANCE PROBLEMS

Faulty Padding Condenser

A MURPHY A28C console would work perfectly, sometimes for days, and then would suddenly become distorted and finally fade out altogether. It would then be possible to receive the programme faintly at a higher setting of the tuning dial. This fault had never been noticed on the long waves.

All connections to the tuning coils, wave-change switch and frequency changer valve-holder were re-soldered and during this process a dry joint was discovered on one of the switch blades.

As this was a very probable source of the trouble the receiver was returned to its owner, but after a week it was reported to be just as bad and was brought back to the test bench.

The fault soon occurred but cleared itself when the set was switched to the long waves, after which it worked O.K. for a week. It was then determined to remove all the components in the oscillator circuit for individual test and if found necessary, to replace the lot.

As the most suspect, the medium wave fixed padding condenser was the first to be tested. It was given a high voltage megger test and was subjected to mechanical strain while connected across a capacity bridge, but without result, and finally it was taken to pieces as a matter of curiosity.

It was then seen that while the leaves to one of the connecting lugs were welded into position, the leaves to the other were loose and when the pressure of the bakelite case was removed by carefully chiping it away, were not even in contact.

Accordingly this condenser alone was replaced and up to the present we have had no further complaint.—W. G. R.

Mysterious Trouble With Coils

A VERY similar trouble, the cause of a considerable amount of worry, occurred in a K-B A.C./D.C. superhet. Only very indifferent reception could be obtained on the long waves, although results were normal on the medium waves.

All the coil connections were checked, the long wave trimming and padding condensers were dismantled and cleaned, all with no effect. It was not until both the band-pass coils had been replaced that normal operation was restored, although no fault could be discovered in the coils that were originally fitted.

However, the coils are pile wound and it is thought probable that shorted turns may be disclosed if they were carefully unwound.—W. G. RAISTRICK, HEMEL HEMPSTEAD.

Printed in Great Britain as a supplement to *The Wireless Trader* for the proprietors and publishers, *The Trader Publishing Co., Ltd.*, Dorset House, Stamford Street, London, S.E.1, by Sanders Phillips & Co., Ltd., The Baynard Press, Chryssell Road, London, S.W.9. Every Saturday.