McMICHAEL A.C. MAINS SUPERHET

Circuit.—The oscillator and first detector valve, AC/TP met. (V1) is an H.F. pentode triode, and in front of it is a special aerial coil coupled to a single-tuned aerial coil.

The oscillator coupling in this valve is not electronic as in a heptode, but is obtained by means of the coil in the cathode circuit. A resistance, R2, is connected directly in the oscillator grid circuit to prevent the development of harmonics. Bias is obtained by a cathode resistance and from the A.V.C. diode.

Coupling of the H.F. pentode section to the I.F. valve is by band-pass I.F. transformer (iron-cored), frequency 406 kc. The I.F. valve, AC/SGVM met. (V2) is biased by a cathode resistance and by the A.V.C. diode.

Coupling to the second detector is by another band-pass I.F. transformer, but the I.F. feed to the A.V.C. diode anode is taken from the high potential (AC) end of the primary and is fed through a condenser, C10.

The second detector and L.F. valve, an AC/HL/DD double-diode-triode, is used in the conventional manner. The L.F. is taken from the low H.F. potential end of the IFT2 secondary to a load resistance R15 and by-pass condenser C11 and to the first L.F. coupling condenser C12. The volume control R12 forms the grid leak of the triode section. In addition, a condenser and a variable resistance C13 and R14 are connected between the L.F. output and chassis to form a variable tone control.

The triode section is coupled to the output valve by straight resistance capacity coupling.

VALVE READINGS

No signal.

Valve.	Type.	Electrode.	Volts.	M.A.
1	AC/TP ...	anode ...	215	1.1
		aux.grid	115	—
		osc. anode	130	1.6
2	AC/SGVM ...	anode ...	242	7.7
		screen ...	115	—
3	AC/HL/DD	anode ...	100*	1.5
4	AC/Pen ...	anode ...	232	25
		aux. grid.	243	5

* A high value of anode resistance may give rise to misleading readings. In this case current is the important measurement.

The output pentode, AC/Pen, (V4), uses cathode bias and is tone compensated by a condenser and a resistance and condenser in series across the primary of the output transformer.

Mains equipment consists of transformer, Westinghouse rectifier used on the voltage doubler principle with the field coil in the positive H.T. lead for smoothing with two 8 mfd. electrolytic condensers.

Special Notes.—The suppressor grid of the H.F. pentode triode valve (V1) is connected to the high potential H.T. end of the bias resistance, not to cathode.

The full A.V.C. potential is developed across R11 and is fed back to the H.F. pentode section of V1 and to V2 through decoupling circuits.

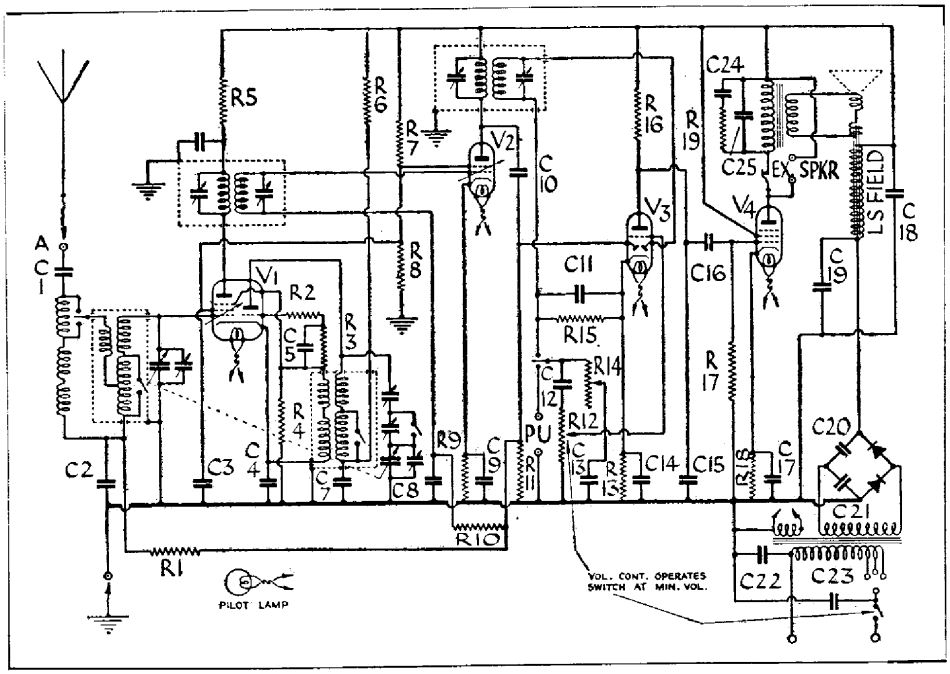
Quick Tests.—Between terminals on speaker transformer and chassis, counting from top :—

(1) Black, H.T. unsmoothed, 365 volts.
(2) Blue, V4 anode, 232 ,,
(3) Green, H.T. smoothed, 243 ,,
(4) Red (joined to 3), 243 ,,
(1) and (4) are L.S. field.
(2) and (3) output transformer primary.

Between case of front electrolytic condenser (C20) and chassis 182 volts (half rectified voltage).

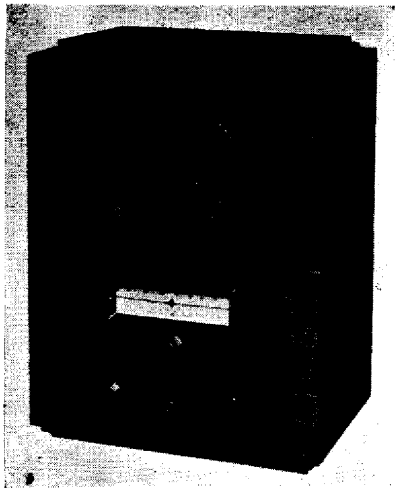
Removing Chassis.—Remove fuse from mains adjustment panel underneath and also the three holding screws. Take off control knobs (grub screw) and undo centre holding screw of switch lever. Do not lose the spring washer underneath the lever. Loosen L.S.

Continued on opposite page.



A triode-pentode frequency changer is one of the novelties in the McMichael A.C. mains superhet. Another is the use of iron-dust cored coils for the band-pass I.F. tuned circuits.

McMICHAEL A.C. MAINS SUPERHET (Cont.)



The duties of six valves are performed by the four actually used in the A.C. mains superhet by McMichael Radio, Ltd.

leads from two cleats and lift the chassis out.

General Notes.—Before testing remember to replace the mains fuse.

With an intermediate frequency of 406 kc. the second channel whistles on English stations cannot be heard as they occur between the medium and long waves.

Despite the numerous resistances and condensers on the central panel, the leads are easily traced.

Connections to AC/TP valve-holder (9-pin), looking from underneath chassis and counting heater sockets first (*i.e.*, the two close together at the end) :—Heater, heater; cathode; osc. anode; osc. grid; metal coating; aux. grid; anode; suppressor grid.

Mains transformer connections :—Four terminals on mains adjustment side (counting from outside) : (1) Mains O. to switch; (2) 200-215 volt tapping; (3) 215-230 volt; (4) 236-250 volt.

Four terminals on lower side in same order : (1) and (2) valve filaments; (3) and (4) high voltage winding to voltage double circuit.

Replacing the Chassis.—Remove mains fuse, lay chassis inside cabinet, replace fuse and three holding screws (long one in front). Clip the speaker cable.

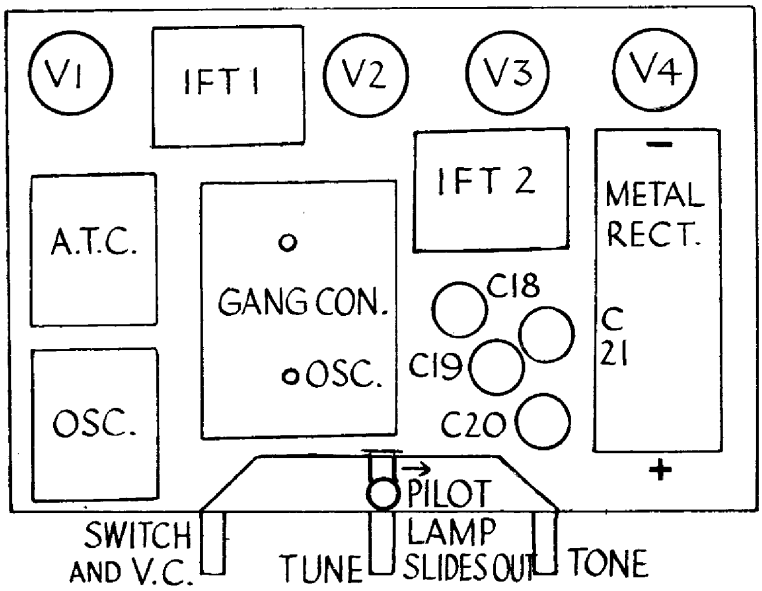
Replace knobs and switch lever with spring washer.

RESISTANCES

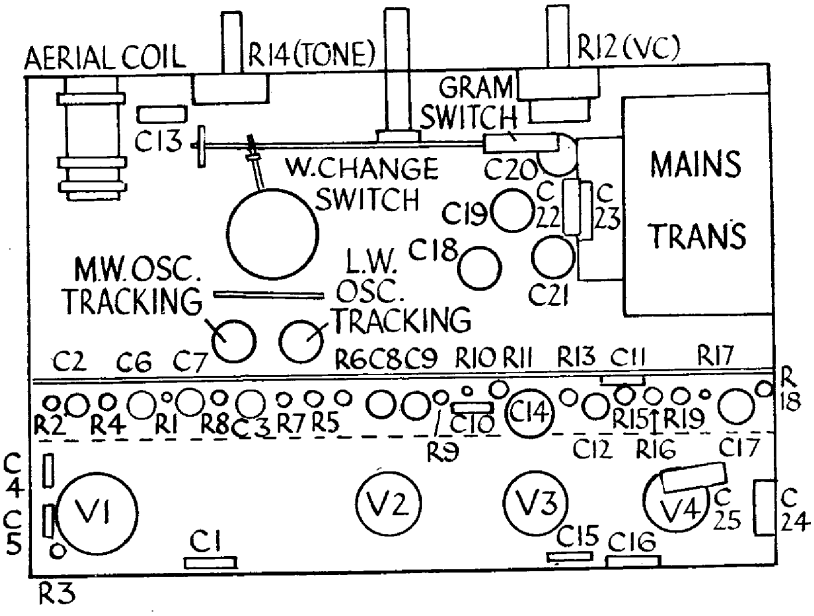
R.	Purpose.	Ohms.
1	Decoupling A.V.C. to V1 ...	.5 meg.
2	Reducing osc. harmonics ...	2,000
3	Osc. grid leak	50,000
4	V1 cathode bias...	2,000
5	V1 anode decoupling	10,000
6	V1 osc. anode decoupling ...	50,000
7	Top part of aux. grid ptr. ...	20,000
8	Lower part of aux. grid ptr. ...	20,000
9	V2 cathode bias...	500
10	Decoupling A.V.C. to V2 ...	.5 meg.
11	A.V.C. diode load	2 meg.
12	V3 grid leak (V.C. ptr.)... ...	.5 meg.
13	V3 cathode bias...	500
14	Tone control	.5 meg.
15	Rect. diode load	1 meg.
16	V3 anode L.F. coupling ...	100,000
17	V4 grid leak	.5 meg.
18	V4 cathode bias...	500
19	Tone compensating circuit anode V4	10,000
—	Field coil	2,500
—	P. of output transformer ...	400

CONDENSERS

C.	Purpose.	Mfd.
1	Series aerial	.0002
2	Decoupling A.V.C. to V1 ...	.1
3	Decoupling aux. grid V1 ...	.1
4	V1 cathode	.0002
5	Osc. grid condenser	.0002
6	Decoupling V1 anode	.1
7	Decoupling V1 osc. anode ...	.1
8	Decoupling A.V.C. to V2 ...	.1
9	V2 cathode	.1
10	I.F. coupling to A.V.C. diode anode	.0001
11	H.F. by-pass from rect. diode...	.0001
12	L.F. coupling diode to grid V3	.1
13	Tone control circuit	.01
14	V3 cathode	.5
15	V3 anode by-pass	.001
16	L.F. coupling V3 to V4 ...	.01
17	V4 cathode	8 el.
18	H.T. smoothing	8 el.
19	H.T. smoothing	4 el.
20	Voltage doubler circuit ...	4 el.
21	Voltage doubler circuit ...	4 el.
22	H.F. by-pass from mains ...	.002
23	H.F. by-pass from mains ...	.002
24	Tone compensating anode V4...	.01
25	Tone compensating anode V4...	.002



No space is wasted in the chassis of the McMichael A.C. mains superhet, as this diagram shows. At the same time everything—including the pilot lamp—is accessible.



A resistance and condenser strip extending the whole width of the chassis is an unusual and distinctly helpful feature of the McMichael superhet.

Speaker Matching Formula

A simple formula for finding the correct ratio output transformer required to match a speaker to a valve is as follows :—

$$2\sqrt{\frac{\text{Optimum Load.}}{\text{Speaker Impedance.}}}$$

If the optimum load of the valve cannot be ascertained, it can be taken at twice the impedance. Similarly, if the actual speaker impedance is not known, it can be taken to be twice the D.C. resistance.

With parallel valves the load is halved; with push-pull the effective load is doubled.