Supplement to The Wireless & Electrical Trader, May 31, 1947

"TRADER" SERVICE SHEET 813

R.I. "AIRFLO"

MODELS 451, 451A, 451B

A VARIABLE-MU A.F. Amplifier gives post-detector gain control from the A.V.C. line in the R.I. 451 "Airflo" range. The receiver is a 4-valve (plus rectifier) 2-band superhet, designed to operate from A.C. mains of 200-250 V, 40-100 c/s.

There is provision for mains aerial operation, switched pick-up sockets are fitted and an external speaker connecting panel is mounted on the cabinet. Small differences between the 451 and the "A" and "B" versions are explained in "General Notes."

Release date and original price: July, 1946; £19 10s, plus £4 3s 11d purchase tax.

CIRCUIT DESCRIPTION

External aerial input, via series capacitor **C1** and coupling coils **L1** (M.W.) and **L2** (L.W.), to capacitatively coupled band-pass filter. Primary coils **L3** (M.W.) and **L4** (L.W.) are tuned by **C27**; secondary coils **L5** (M.W.) and **L6** (L.W.) are tuned by **C30.**

First valve **(V1, Mazda metallized TH41)** is a triode-heptode operating as frequency changer with internal coupling. Triode oscillator anode coils **L9** (M.W.) and **L10** (L.W.) are tuned by **C35.** Parallel trimming by **C34** (M.W.) and **C31** (L.W.); series tracking by **C6, C32** (M.W.) and **C7, C33** (L.W.). Reaction coupling by grid coils **L7** (M.W.) and **L8** (L.W.).

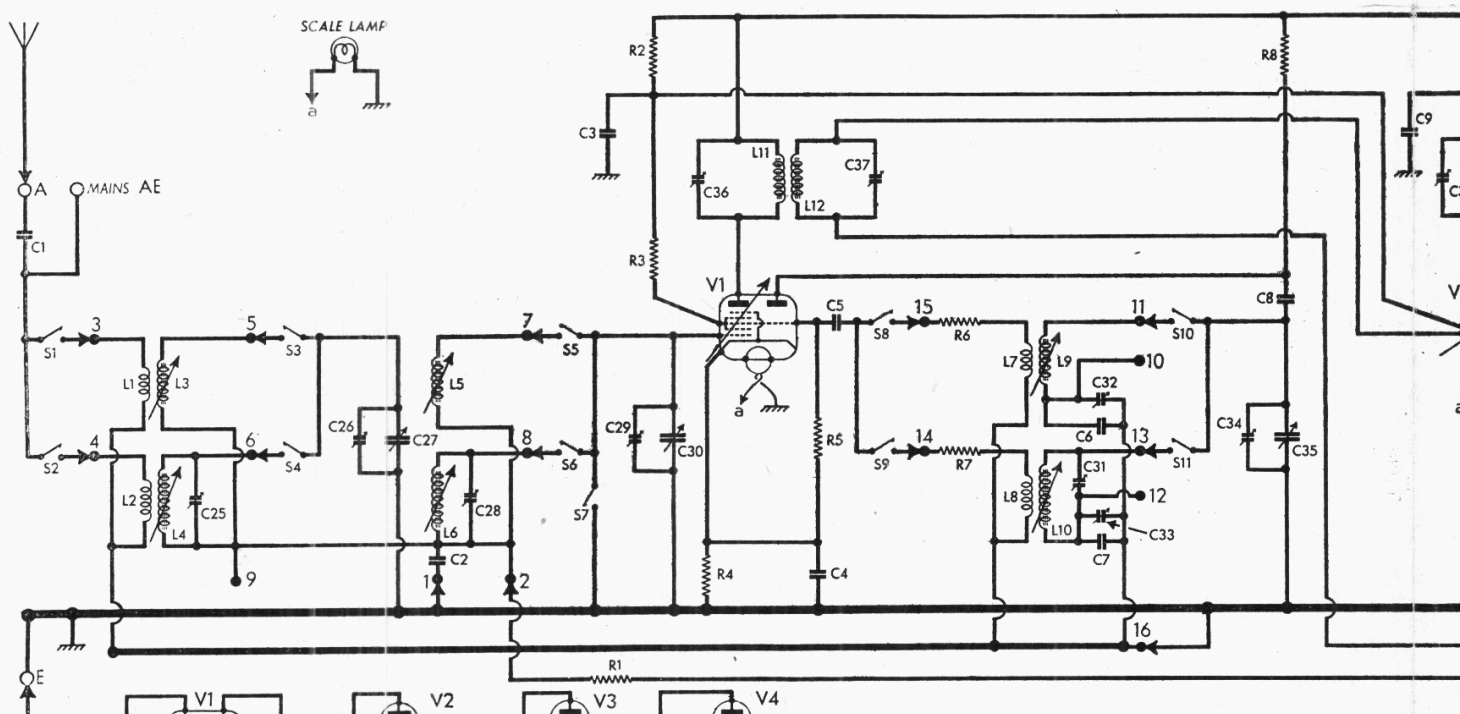
Second valve **(V2, Mazda metallized VP41)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C36, L11, L12, C37** and **C38, L13, L14, C39.**

Intermediate frequency 450 kc/s.

Diode second detector is part of double diode triode valve **(V3, Mazda metallized HL42DD).** Audio frequency component in rectified output is developed across manual volume control **R11,** which also acts as diode load resistor, and passed via A.F. coupling capacitor **C14,** C.G. resistor **R12** and grid stopper **R13** to C.G. of triode section, which operates as A.F. amplifier. I.F. filtering by **C10, R10, C11** in diode circuit, and provision for the connection of a gramophone pick-up across **R11,** via **S12** which, with **S7** and **S13,** closes only in the "gram" position of the waveband switch.

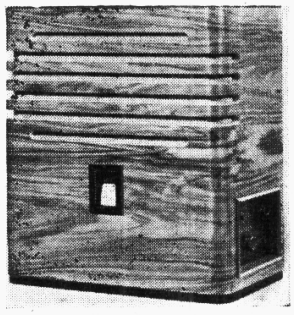
Second diode of **V3,** fed from **V2** anode via **C13,** provides D.C. potentials which are developed across load resistors **R18, R19** and fed back through decoupling circuits as G.B. to **V1** heptode, **V2** and **V3** triode (except on "gram") giving automatic volume control, the line feeding **V2** and **V3** being taken from the junction of **R18, R19. V3** triode has variable-mu characteristics. Delay voltage, together with fixed G.B. for triode section, is obtained from the drop along **R14** in **V3** cathode lead to chassis.

Resistance-capacitance coupling by **R16, C18** and **R21,** via grid stopper **R22,** between **V3** triode and beam tetrode output valve **(V4, Mazda metallized PEN45).** Variable tone control by **R21, C19** in control grid circuit, and fixed tone correction in anode circuit by **C20, R23.** Provision



Circuit diagram of the R.I. 451B "Airflo" differences in the 451 and 451A are explained A.V.C. is applied via **S14** to the triode of **V3,** trol. The connections between the tuning assemb numbered in the diagram to agree with the s second chassis line, below the main one, repres

A diagram of the speaker plug is inse



for the connection of a low-impedance external speaker across the secondary winding of **T1,** when **S15** may be used to mute the internal speaker.

H.T. current is supplied by I.H.C. full-wave rectifying valve **(V5, Mazda metallized UU6).** Smoothing by speaker field **L17** and electrolytic capacitors **C22** and **C23.** Mains aerial connection by plug and flying lead, via isolating capacitor **C24.**

VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted by the manufacturers.

Readings were taken with the receiver operating on A.C. mains of 230 V and tuned to the highest wavelength on the M.W. band. The volume control was at

(*Continued column 1 overleaf*)

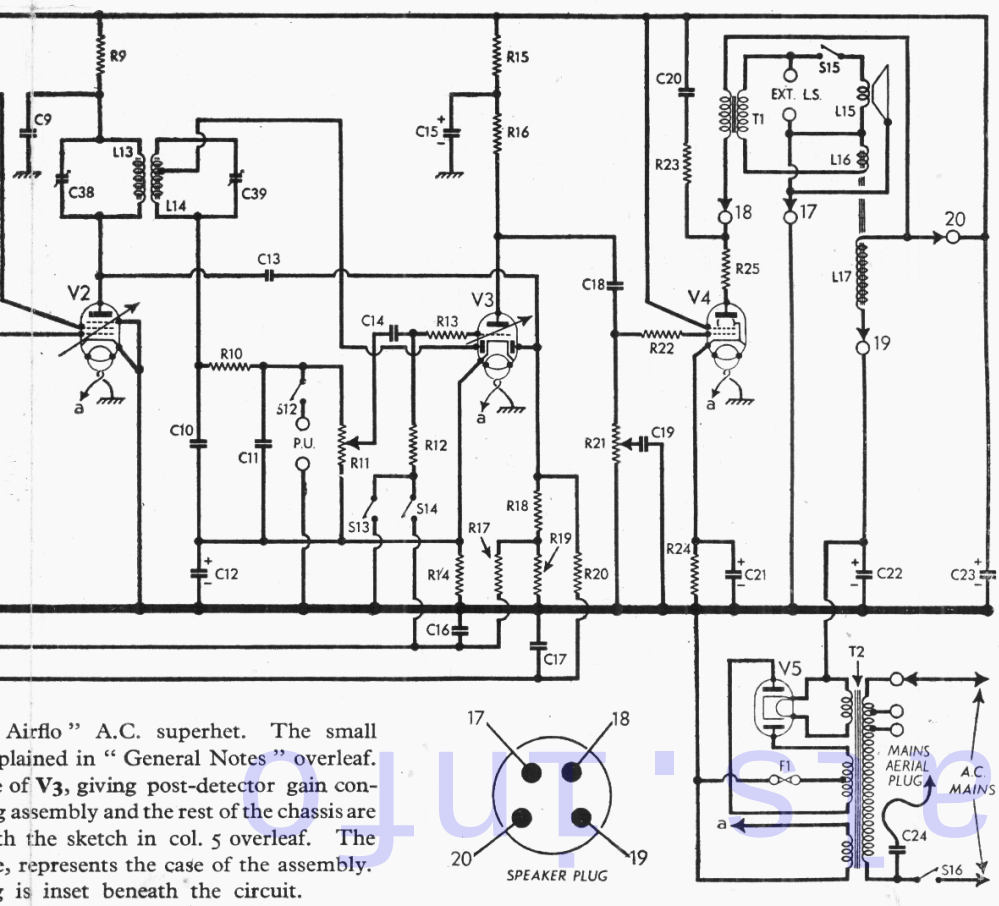
COMPONENTS AND VALUES

	RESISTORS	Values (ohms)
R1	V1 hept. C.G. decoupling	100,000
R2	V1, V2 S.G.'s H.T. feed ...	22,000
R3	V1 S.G. stopper	5·0
R4	V1 fixed G.B. resistor ...	220
R5	V1 osc. C.G. resistor ...	47,000
R6	Osc. M.W. reaction stabiliser	1,000
R7	Osc. L.W. reaction stabiliser	3,300
R8	V1 osc. anode H.T. feed...	47,000
R9	V2 anode decoupling ...	4,700
R10	I.F. stopper	47,000
R11	Manual volume control ...	500,000
R12	V3 triode C.G. resistor ...	1,000,000
R13	V3 triode grid stopper ...	100,000
R14	V3 G.B. resistor	470
R15	V3 triode H.T. decoupling	22,000
R16	V3 triode anode load ...	47,000
R17	V2 C.G. decoupling ...	1,000,000
R18	V3 A.V.C. diode load resistors	470,000
R19		470,000
R20	A.V.C. line decoupling ...	2,200,000
R21	Manual tone control ...	250,000
R22	V4 grid stopper	4,700
R23	Part fixed tone corrector	6,800
R24	V4 G.B. resistor	180
R25	V4 anode stopper ...	47

	CAPACITORS.	Values (μF)
C1	Aerial series	0·0002
C2	Aerial band-pass coupling	0·035
C3	V1, V2, S.G's decoupling	0·1
C4	V1 cathode by-pass ...	0·1
C5	V1 osc. C.G. capacitor ...	0·0001
C6	Osc. M.W. fixed tracker	0·00048
C7	Osc. L.W. fixed tracker ...	0·00015
C8	V1 osc. anode coupling ...	0·0001
C9	V2 H.T. decoupling ...	0·1
C10	I.F. by-pass capacitors ...	0·0001
C11		0·0001
C12*	V3 cathode by-pass ...	50·0
C13	V3 A.V.C. diode coupling	0·00005
C14	A.F. coupling to V3 C.G....	0·025
C15*	V3 triode H.T. decoupling	8·0
C16	V2 C.G. decoupling ...	0·05
C17	A.V.C. line decoupling ...	0·05
C18	A.F. coupling to V4 C.G....	0·1
C19	Part variable tone control	0·02
C20	Part fixed tone corrector...	0·02
C21*	V4 cathode by-pass ...	50·0
C22*	H.T. smoothing capacitors	16·0
C23*		16·0
C24	Mains aerial coupling ...	0·0002
C25‡	B.–P. pri. L.W. trimmer...	0·00004
C26‡	B.–P. pri. M.W. trimmer...	0·00005
C27†	Band-pass pri. tuning ...	0·000487
C28‡	B.–P. sec. L.W. trimmer	0·00004
C29‡	B.–P. sec. M.W. trimmer	0·00005
C30†	Band-pass sec. tuning ...	0·000487
C31‡	Osc. circ. L.W. trimmer ...	0·00006
C32‡	Osc. circ. M.W. tracker ...	0·00006
C33‡	Osc. circ. L.W. tracker ...	0·00006
C34‡	Osc. circ. M.W. trimmer...	0·00005
C35†	Oscillator circuit tuning ...	0·000487
C36‡	1st I.F. trans. pri. tuning	0·00025
C37‡	1st I.F. trans. sec. tuning	0·00025
C38‡	2nd I.F. trans. pri. tuning	0·00025
C39‡	2nd I.F. trans. sec. tuning	0·00025

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial M.W. coupling coil	0·65
L2	Aerial L.W. coupling coil ...	2·35
L3	Band-pass primary coils ...	1·6
L4		17·5
L5	Band-pass secondary coils	1·6
L6		18·0
L7	Osc. M.W. reaction coil ...	0·84
L8	Osc. L.W. reaction coil ...	1·5
L9	Osc. M.W. tuning coil ...	2·8
L10	Osc. L.W. tuning coil ...	6·8
L11	1st I.F. trans. Pri. ...	3·3
L12	Sec. ...	3·3
L13	2nd I.F. trans. Pri. ...	3·3
L14	Sec., total	3·3
L15	Speaker speech coil ...	2·5
L16	Hum neutralising coil ...	0·2
L17	Speaker field coil	970·0
T1	Speaker input trans. Pri. ...	700·0
	Sec. ...	0·7
T2	Mains trans. Pri., total ...	33·0
	Heater sec. ...	Very low
	Rect. heat. sec.	Very low
	H.T. sec., total	275·0
S1-S14	Waveband switches ...	—
S15	Internal speaker switch ...	—
S16	Mains switch, ganged S1-S14	—
F1	Mains fuse—250 mA. ...	—



Airflo" A.C. superhet. The small
plained in "General Notes" overleaf.
e of **V3,** giving post-detector gain con-
g assembly and the rest of the chassis are
th the sketch in col. 5 overleaf. The
e, represents the case of the assembly.
g is inset beneath the circuit.

Valve Analysis—*continued*

maximum, but there was no signal input, and voltages were measured with a 1,000 ohms-per-volt meter, chassis being the negative connection.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 TH41	270	2.5	90	6·8
	Oscillator			
	85	3·3		
V2 VP41	245	5·7	90	1·2
V3 HL42DD	80	3·2	—	—
V4 PEN45	250	42·5	270	9·3
V5 UU6	335†	—	—	—

† Each anode, A.C.

DISMANTLING THE SET

Removing Chassis.—Remove the three control knobs (pull off);
withdraw the speaker plug from its socket on the chassis deck;
if the two chassis fixing screws (with metal and rubber washers) are now removed, the chassis may be withdrawn from the cabinet.
When replacing, ensure that the front flange of the chassis is securely located beneath the wooden batten inside the front of the cabinet.

Removing Speaker.—Withdraw the connecting plug from its socket on the chassis deck;
loosen the screw of the speaker lead retaining cleat and lift out the leads;
remove the two countersunk-head wood screws securing the external speaker socket panel to the right-hand side of the cabinet;
remove the four nuts (with lock washers) securing the speaker to the sub-baffle.
When replacing, the input transformer should be on the right, and if the leads have been unsoldered they should be reconnected as follows, numbering the tags on the transformer from top to bottom: 1, green, plastic covered; 2, blue; 3, red, plastic covered; 4, green, cotton covered; 5, red, cotton covered. The brown and metal braid leads should be soldered to the metal input transformer retaining clamp.

GENERAL NOTES

Switches.—**S1-S11** are the waveband switches, and **S12-S14** are the radio/gram change-over switches, ganged in three rotary units beneath the chassis. These units are indicated in our under-chassis view, where they are identified by arrows and numbers in circles. The arrows indicate the direction in which the units are viewed in the diagrams in col. 2, where they are shown in detail.

The table above gives the switch positions for the four control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C**, closed.

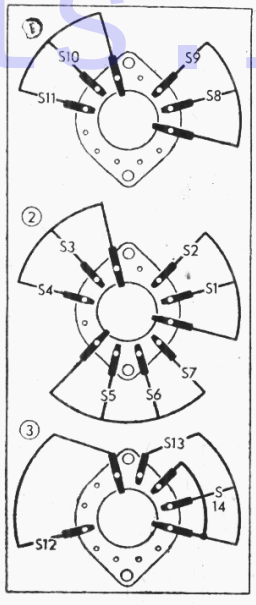
S15 is the jack-type internal speaker muting switch, mounted on the external speaker connecting panel and operated by a special two-pin plug supplied with the receiver. When the plug is pushed right home, **S15** opens. If the plug is inserted only half-way, both speakers operate.

S16 is the Q.M.B. mains switch, operated by the control spindle of the waveband switch unit. It opens in the fully anti-clockwise position of the waveband control knob.

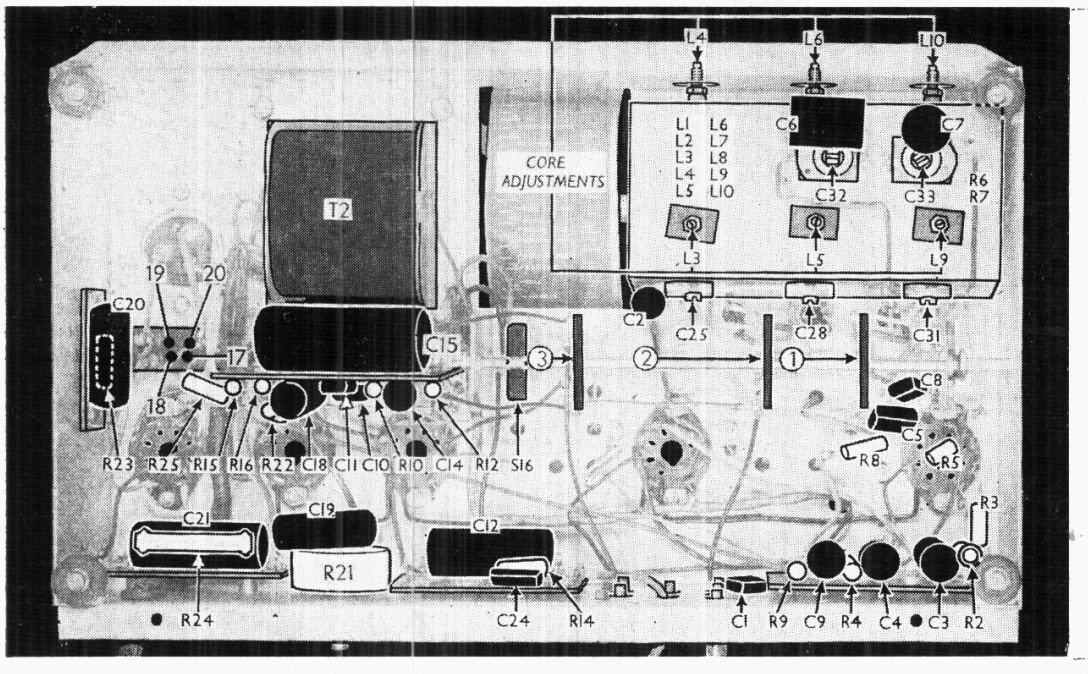
Coils.—All the aerial, band-pass and oscillator circuit coils **L1-L10** are in a screened rectangular container on the underside of the chassis deck beneath the gang. **R6** and **R7** are inside the unit with the coils, but all the associated trimmers

Switch Diagram and Table

Diagrams of the three waveband switches, drawn as seen when viewed from one end of the chassis, looking over the mains switch **S16**, as indicated by the arrows in our under-chassis view below. On the right is the associated switch table.



Switch	Off	M.W.	L.W.	Gram.
S1	—	C	—	—
S2	—	—	C	—
S3	—	C	—	—
S4	—	—	C	—
S5	—	C	—	—
S6	—	—	C	—
S7	—	—	—	C
S8	—	C	—	—
S9	—	—	C	—
S10	—	C	—	—
S11	—	—	C	—
S12	—	—	—	C
S13	—	—	—	C
S14	—	C	C	—



Under-chassis view. In the upper right-hand corner is the tuning assembly, carrying the associated trimmers and trackers on its exterior surfaces. The 16 connecting tags, which are obscured here by the trimmers **C25**, **C28**, **C31**, are identified in the sketch opposite in col. 5. The waveband switch units, which are indicated here by numbers in circles and arrows, are shown in detail in the diagrams above in col. 2.

and trackers, although they form part of the assembly, are actually mounted on the outside of the container, as also is **C2.**

The coil core adjustments are indicated in our under-chassis view. Connections between this assembly and the rest of the chassis are in the form of a row of tags near the chassis deck at the rear of the assembly. These are numbered **1-16,** as shown in the sketch in col. 5, where they are drawn as seen from the rear of an inverted chassis. The points of interconnection between the assembly and the rest of the circuit are similarly numbered in the circuit diagram. Tag **16** connects the case of the assembly, indicated in the circuit diagram by a second chassis line beneath the main one, to chassis proper.

The I.F. transformers **L11, L12** and **L13, L14** are in two screened units on the chassis deck with their associated trimmers.

Scale Lamp.—This is an M.E.S. type lamp, with a large clear spherical bulb, rated at 6.2 V, 0.3 A. Its holder slips on to a bracket bolted to a corner of the mains transformer **T2,** and can be withdrawn from the rear of the set if the gang is first turned to maximum. On the 451A and B versions, a reflector cowl is fitted to the lamp.

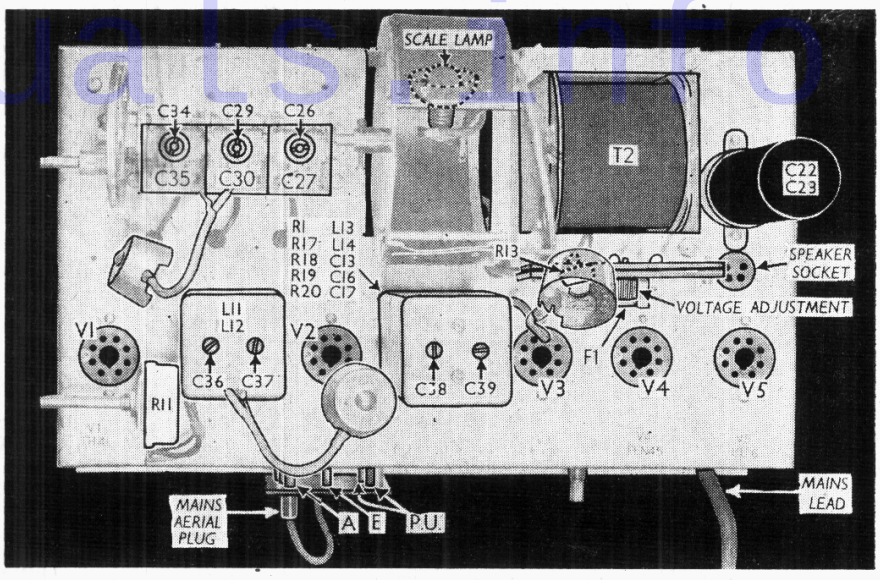
External Speaker.—Two sockets are provided on a panel at the rear of the cabinet for the connection of a low impedance (3 Ω) external speaker. Associated with the sockets is the internal speaker muting switch **S15,** which opens when the special plug provided is pushed fully home. If the plug is inserted only half-way, both speakers operate.

Speaker Connecting Plug.—Connections between chassis and speaker are effected via a 4-pin plug and socket device. A diagram of the plug, viewed from the free ends of the pins, is inserted beneath the circuit diagram overleaf, its pins being numbered **17-20.** These numbers are repeated at the appropriate points in the circuit diagram. The anode lead (pin **18**) is screened with metal braiding which is itself connected to pin **17.**

Gramophone Pick-up.—Two sockets are provided on the aerial panel at the rear of the chassis for the connection of a gramophone pick-up, a special non-reversible plug being provided for it. The screening braid of the pick-up leads should be connected to the upper (thinner) pin, as its socket is connected directly to chassis.

Capacitors C22, C23.—These are two dry electrolytics in a single tubular metal container mounted on the chassis deck. The red tag is the positive connection of **C22,** which is rated at 16 μF, 450 V D.C. working, surge proof; the yellow tag is the positive of **C23,** rated at 16 μF, 450 V D.C. working, 500 V peak; the third tag is the common negative connection. In our sample, the unit was a Hunts type K11. In other versions two separate units may be employed.

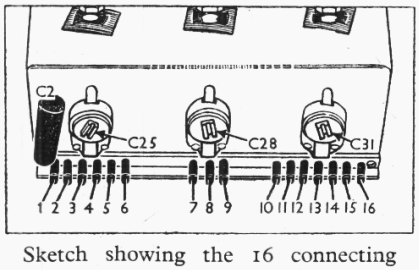
Fuse F1.—This is a standard 1¼in. tubular fuse, rated at 250 mA. It is included in the H.T. negative lead to chassis, and is located on the mains voltage adjustment panel, facing the rear of the chassis.



Plan view of the chassis. The H.T. circuit fuse **F1,** which is mounted on the voltage adjustment panel, is almost completely hidden by the top cap connector of **V3.**

Chassis Divergencies.—The "Airflo" series comprises three models: 451, 451A and 451B. Our sample was a 451B, distinguishable by the fact that its nameplate bears the full number and the electrolytic capacitors **C22, C23** are contained in a single unit. In the 451 and 451A, **C22** and **C23** are in separate units.

In the 451, the voltage adjustment consists of three sockets and a plug on a flexible lead, while the scale lamp reflector is omitted. The drum scale is different also from the other models, and whereas a 451A or B drum scale can be fitted to a 451 model, a 451 scale will not fit the drum of a 451A or B. Although the external speaker panel is fitted in all three versions, only in the 451B is **S15** included.



Sketch showing the 16 connecting tags at the base of the tuning assembly.

CIRCUIT ALIGNMENT

I.F. Stages.—Remove existing control grid (top cap) connector of **V1** and connect signal generator leads, via a 0.01 μF series capacitor and 500,000 ohm parallel resistor, to top cap and chassis. Disconnect **R8,** switch set to M.W. and turn the volume control to maximum. Feed in a 450 kc/s (666 m) signal, and adjust **C39, C38, C37** and **C36,** in that order, for maximum output. Repeat the adjustments until no improvement can be obtained. Remove shunt resistor and series capacitor, replace top cap connector, and reconnect **R8.**

R.F. and Oscillator Stages.—With the gang at maximum the cursor line should coincide with the 560 m mark on the drum scale. Transfer signal generator leads to **A** and **E** sockets via a suitable dummy aerial.

M.W.—Switch set to M.W., tune to 200 m on scale, feed in a 200 m (1,500 kc/s) signal, and adjust **C34, C26** and **C29** for maximum output. Tune to 500 m on scale, feed in a 500 m (600 kc/s) signal, and adjust **C32** and the cores of **L3** and **L5** for maximum output. Repeat the 200 m and 500 m adjustments until no improvement results. Tune to 300 m on scale, feed in a 300 m (1,000 kc/s) signal, and adjust the core of **L9,** while rocking the gang, for maximum output. If any calibration error remains after this operation it may be corrected by further adjustment of the core of **L9** and capacitor **C32.** Finally, return to 200 m on scale and repeat the complete M.W. process.

L.W.—Switch set to L.W., tune to 800 m on scale, feed in an 800 m (375 kc/s) signal, and adjust **C31, C25** and **C28** for maximum output. Tune to 1,850 m on scale, feed in an 1,850 m (162 kc/s) signal, and adjust **C33** and the cores of **L4** and **L6** for maximum output. Repeat the 800 m and 1,850 m adjustments until no improvement results. Tune to 1,150 m on scale, feed in an 1,150 m (261 kc/s) signal, and adjust the core of **L10,** while rocking the gang, for maximum output. If any calibration error remains after this operation it may be corrected by further adjustment of the core of **L10** and capacitor **C33.** Finally, return to 800 m on scale and repeat the complete L.W. process.

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