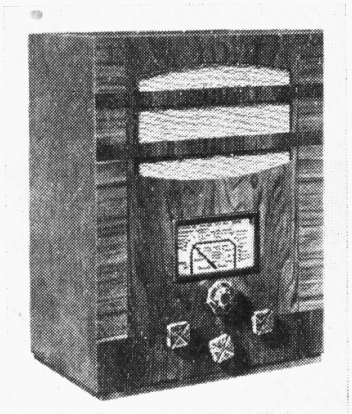
'TRADER' SERVICE SHEET 317

INVICTA 420

3-VALVE BATTERY RECEIVER



A SIMPLE 3-valve battery-operated chassis is fitted in the Invicta 420 receiver, the valve arrangement comprising a variable-mu hexode RF amplifier, a triode detector and a pentode output valve. Two alternative aerial sockets are provided, one bringing into circuit a Droitwich rejector.

CIRCUIT DESCRIPTION

Two alternative aerial input sockets, **A1, A2.** From **A1,** input is via series condenser **C1** and coupling coil **L1,** on both bands, to single-tuned circuits comprising coils **L2** (MW), plus **L3** (LW), tuned by **C9.** The low potential end of **L1** is tapped into the low potential end of **L3.** From **A2** socket, input is fed to same circuit via Droitwich rejector circuit **L4** and **C3.**

First valve (**V1, Mullard metallised VP2B**) is a variable-mu hexode operating as radio frequency amplifier with manual gain control by variable potentiometer **R2** which, with minimum limiting resistance **R1,** is connected across the GB battery to vary GB applied.

Tuned-anode coupling by **L6** (MW), plus **L7** (LW), tuned by **C12,** between **V1** and triode detector valve (**V2, Mullard metallised PM2HL**) which operates on the grid leak system with **C6** and **R4.** Reaction is applied from anode by coil **L5** coupled back to **L6, L7,** and is controlled by variable condenser **C11.** RF filtering in anode circuit is carried out by **C7.**

Directly-fed transformer coupling by **T1,** via RF stopper resistance **R5,** between **V2** and pentode output valve (**V3, Mullard PM22A**). Fixed tone correction in anode circuit by fixed condenser **C8.**

Provision is made for connection of low impedance external loud speaker across secondary winding of output transformer **T2.** No provision is made for breaking the speech coil circuit of the internal speaker, but a switch could easily be inserted in one of the leads from **T2** secondary to internal speaker speech coil.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 fixed GB resistance ..	5,000
R2	V1 gain control	50,000
R3	V1 anode HT feed	3,000
R4	V2 CG resistance	1,000,000
R5	V3 CG RF stopper	250,000

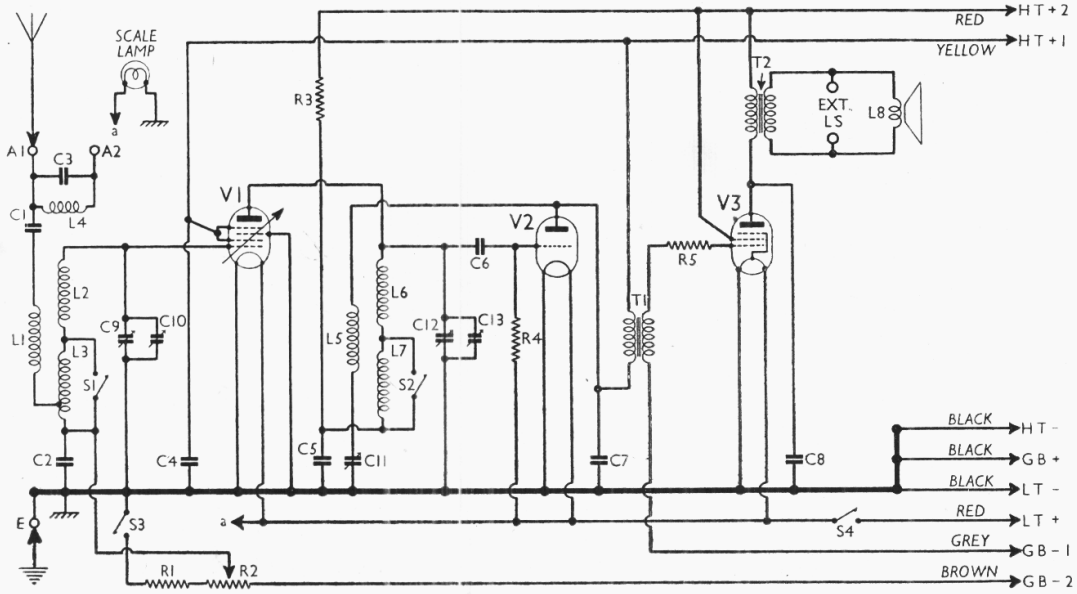
	CONDENSERS	Values (μF)
C1	Aerial series condenser ..	0·0002
C2	V1 CG decoupling	0·1
C3	Droitwich rejector tuning ..	0·00015
C4	V1 SG and V2 anode RF by-pass	0·1
C5	V1 anode decoupling	0·1
C6	V2 CG condenser	0·00015
C7	V2 anode RF by-pass. . ..	0·0002
C8	Fixed tone corrector	0·005
C9†	Aerial circuit tuning	0·00054
C10‡	Aerial circuit MW trimmer ..	—
C11†	Reaction control	0·0005
C12†	V1 anode circuit tuning ..	0·00054
C13‡	V1 anode circuit MW trimmer	—

† Variable. ‡ Pre-set.

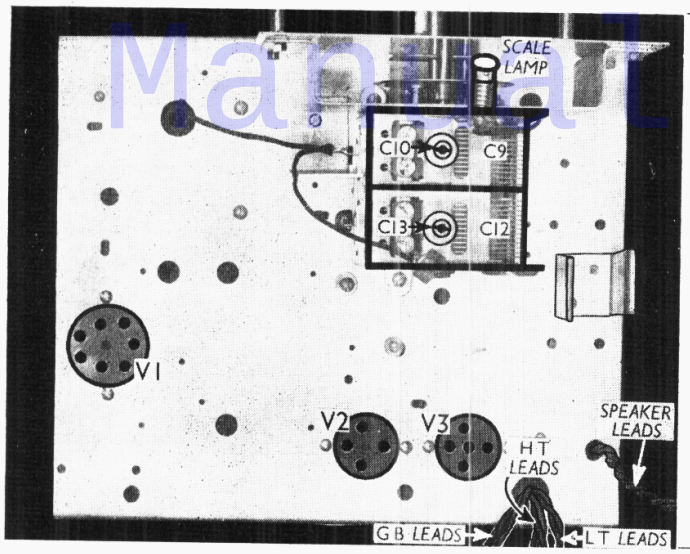
	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial coupling coil	11·0
L2	Aerial circuit MW tuning coil	2·5
L3	Aerial circuit LW tuning coil	10·0
L4	Droitwich rejector circuit coil	18·25
L5	Reaction coil	1·6
L6	V1 anode circuit MW tuning coil	2·5
L7	V1 anode circuit LW tuning coil	10·0
L8	Speaker speech coil	2·5
T1	Intervalve trans. Pri. ..	1,200·0
	Sec. ..	2,700·0
T2	Output trans. Pri. ..	550·0
	Sec. ..	0·15
S1, S2	Waveband switches	—
S3	GB circuit switch	—
S4	LT circuit switch	—

DISMANTLING THE SET

Removing Chassis.—If it is desired to remove the chassis from the cabinet, remove the knobs (recessed grub screws) and felt washers from the four control spindles, and the two bolts (with washers) holding the chassis to the bottom of the cabinet. The chassis can now be with-



Circuit diagram of the Invicta 420. Note the fixed-tuned Droitwich rejector **L4, C3,** which is in circuit when the **A2** socket is used. **V1** is an RF hexode.



Plan view of the chassis. A clip is provided to hold the GB battery.

drawn to the extent of the speaker leads, which is adequate for normal purposes. *When replacing*, do not forget to replace the felt washers on the control spindles before fixing the knobs.

To free the chassis entirely, unsolder the speaker leads.

Removing Speaker.—If it is necessary to remove the speaker from the cabinet, remove the nuts from the four ornamentally-headed screws holding the speaker to the front of the cabinet. *When replacing*, see that the terminal panel is at the bottom.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating with an HT battery reading 120 V, on load. The receiver was tuned to the lowest wavelength on the medium band and the volume control was at maximum, but the reaction control was at minimum. There was no signal input.

Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being negative.

If, as in our case, **V1** should become unstable when its screen current is being measured, it can be stabilised by connecting a non-inductive condenser of about 0·1 μF from grid (top cap) to chassis.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 VP2B	110	3·0	60	1·4
V2 PM2HL	59	0·6	—	—
V3 PM22A	117	3·3	120	0·6

GENERAL NOTES

Switches.—**S1, S2** are the waveband switches, and **S3, S4** the battery circuit switches, ganged in a single unit beneath the chassis, and identified in our under-chassis view. In the "off" position, **S3** and **S4** are *open*, and in the MW and LW positions they are *closed*. On MW, **S1** and **S2** are *closed*, and on LW they are *open*.

Coils.—**L1-L3** and **L5-L7** are in two unscreened units beneath the chassis. **L4** is on a separate former, close to the **L1-L3** unit.

Scale Lamp.—This is an Ever Ready MES type, rated at 2·5 V, 0·2 A.

External Speaker.—Sockets are provided at the rear of the chassis for a low resistance (about 3 Ω) external speaker.

Batteries.—LT, 2 V 20 AH or larger accumulator cell. HT, 120 V or 150 V dry HT battery. GB, 9 V dry GB battery.

Battery Leads and Voltages.—Black lead, spade tag, LT negative; red lead, spade tag, LT positive 2 V; long black lead and plug, HT negative; yellow lead and plug, HT positive 1, +60 V; red lead and plug, HT positive 2, +120 V or +150 V; short black lead and plug, GB positive; grey lead and plug, GB negative 1, −4·5 or −6 V (120 V HT), −6 or −7·5 V (150 V HT); brown lead and plug, GB negative 2, −9 V.

CIRCUIT ALIGNMENT

With gang at maximum, pointer should be horizontal.

Connect signal generator to **A1** and **E** sockets, feed in a 250 m (1,200 KC/S) signal, switch set to MW, and tune to 250 m on scale. With reaction condenser **C11** at minimum, adjust **C10** for maximum output.

Reduce output from signal generator and increase reaction until set is just short of oscillation, then adjust **C13** for maximum output.

Check at 550 m and on LW.

MAINTENANCE HINT

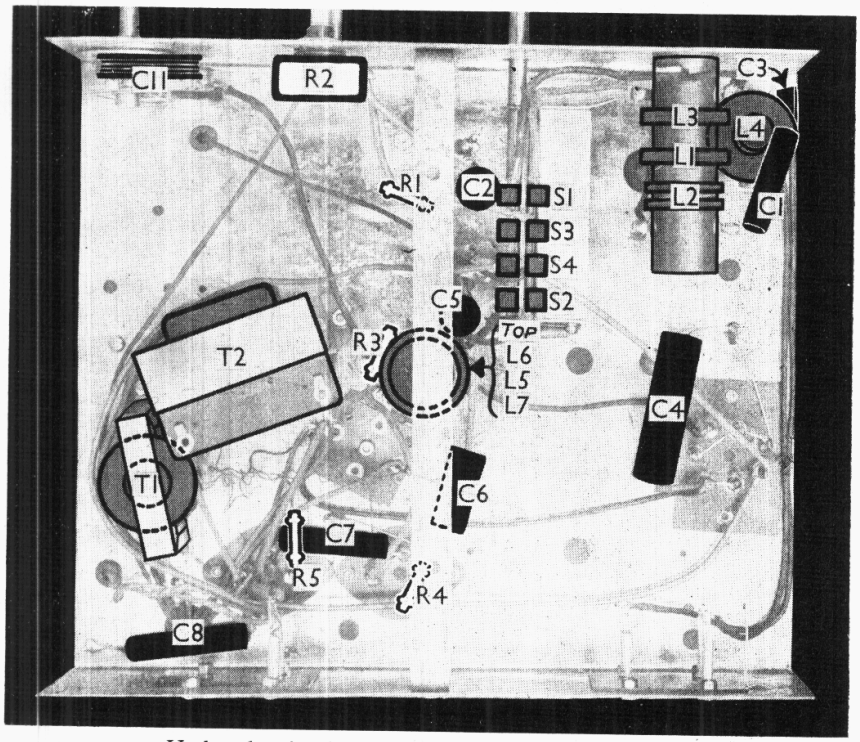
Instability Due to Electrolytics

I SHOULD like to endorse the remarks of L. P. Dismore in *Radio Maintenance* dated April 16, page v. I now make it a rule to test the electrolytic pack first in any superhet which comes in for service, with instability the cause of complaint.

I find in six cases out of ten instability is caused through a section of the condenser being open, or a large capacity drop, with no hum to make the cause apparent. In DC/AC chassis, smoothing condensers have, in a great number of cases, been found to be responsible for loss of *volume*, without the hum one would expect in these cases.

After testing valves, I find the shortest cut to completing the repair, is by making a test of smoothing condensers in all cases of loss of volume and instability.

As a further hint to locate the same faults, should the smoothing condensers be found O.K., I would place bias resistors and condensers next for checking before any complicated testing is carried out.—C. ETCHELLS, MIDDLESBROUGH.



Under-chassis view. All the switches are indicated.