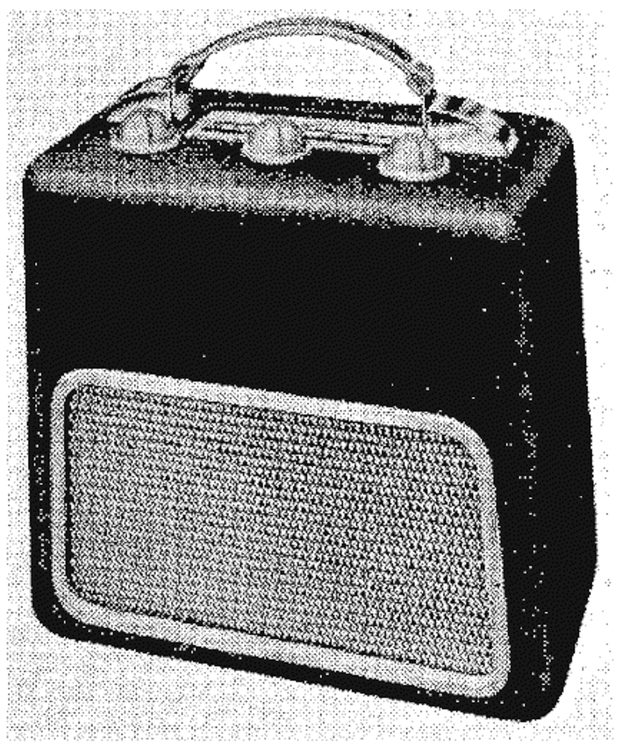
INVICTA 25

All-dry Battery Portable



A SELF-CONTAINED all-dry battery portable, the Invicta 25 is a 4-valve, 2-band superhet employing B7G-based valves and a 6-inch speaker. Negative feed-back is introduced between the last two valves. The waveband ranges are 200-550m and 1,000-2,000m. The makers state that it must not be connected to an external aerial or earth.

Release date and original price: August, 1949; £11 2s. 5d. without batteries. Purchase tax extra.

CIRCUIT DESCRIPTION

Tuned frame aerial input **L1, C21** (M.W.) or **L1, L2, C21** (L.W.) precedes a heptode valve **(V1, Mullard DK91)** operating as frequency changer with electron coupling.

Oscillator grid coils **L3** (M.W.) and **L4** (L.W.) are tuned by **C22.** Parallel trimming by **C23** (M.W.) and **C5, C24** (L.W.); series tracking by **C6** (M.W. and L.W.). Inductive reaction coupling by oscillator anode coil **L5** (M.W. and L.W.).

Second valve **(V2, Mullard DF91)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C2, L6, L7, C3** and **C9, L8, L9, C10.**

Intermediate frequency 470 kc/s.

Diode signal detector is part of single diode pentode valve **(V3, Mullard DAF91).** Audio frequency component in rectified output is developed across manual volume control **R7,** which is also the diode load resistor, and passed via A.F. coupling capacitor **C13** to control grid of pentode section, which operates as A.F. amplifier. I.F. filtering by **C11, R5** and **C12.**

D.C. potential developed across **R7** is fed back via decoupling resistor **R6** as bias to the F.C. and the I.F. valves, giving automatic gain control.

Resistance-capacitance coupling by **R9, C16** and **R11** between **V3** pentode and pentode output valve **(V4, Mullard DL92).** Fixed tone correction in anode circuit by **C17** and **R13. V3** C.G. resistor **R8** is returned to chassis via **T1** secondary, giving negative feed-back. Grid bias potential for **V4** is obtained from the drop across **R15** in the H.T. negative lead to chassis.

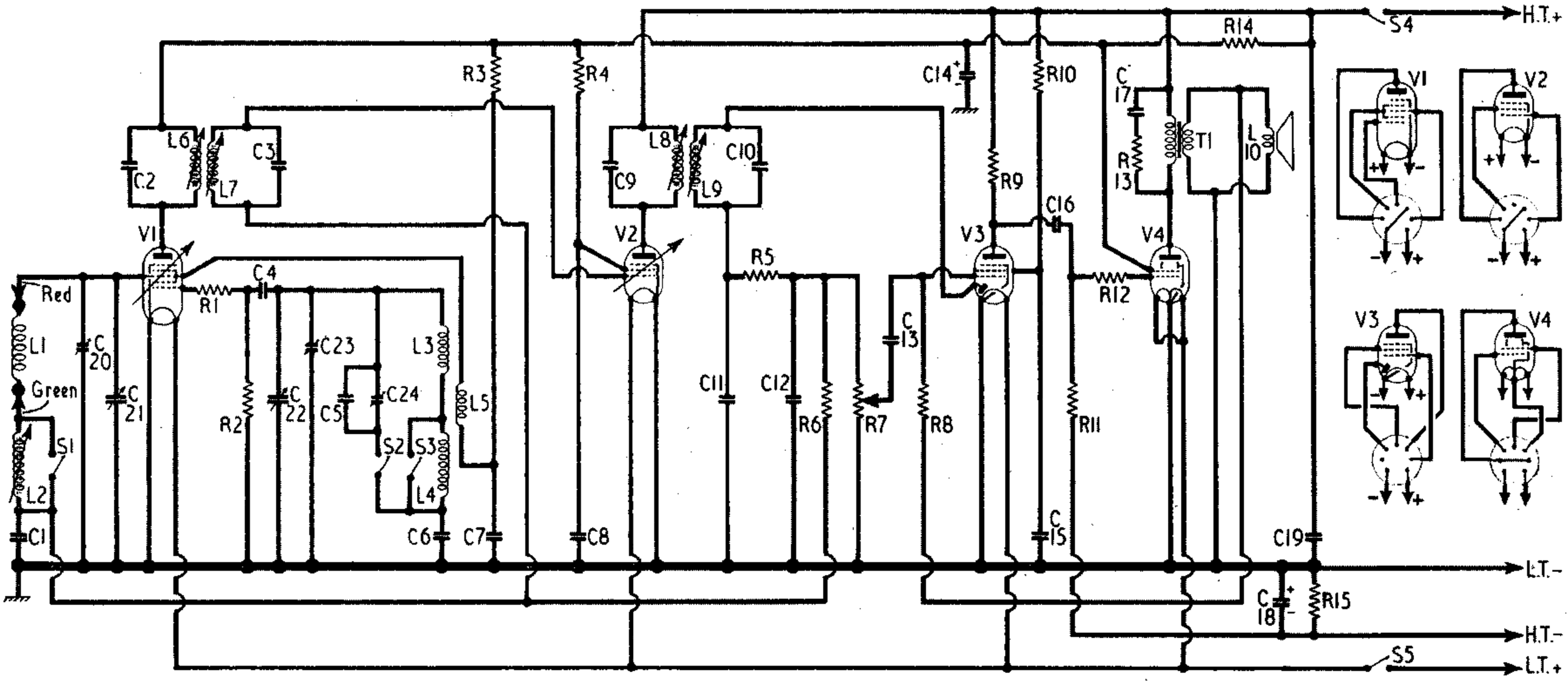
COMPONENTS AND VALUES

RESISTORS		Values	Locations
R1	Osc. C.G. stopper	10kΩ	F3
R2	V1 osc. C.G. ...	100kΩ	F3
R3	Osc. H.T. feed ...	10kΩ	F4
R4	V2 S.G. feed ...	100kΩ	G4
R5	I.F. stopper ...	47kΩ	G4
R6	A.G.C. decoup. ...	2·2MΩ	F3
R7	Volume control ...	1MΩ	E3
R8	V3 C.G.	4·7MΩ	G3
R9	V3 pentode load ...	330kΩ	G4
R10	V3 S.G. feed ...	3·3MΩ	G4
R11	V4 C.G.	1MΩ	H4
R12	V4 grid stopper ...	27kΩ	H4
R13	Tone corrector ...	27kΩ	A2
R14	H.T. decoupling	4·7kΩ	G4
R15*	V4 G.B.	910Ω	H4

* Made up of 1,000Ω and 10,000Ω resistors, in parallel.

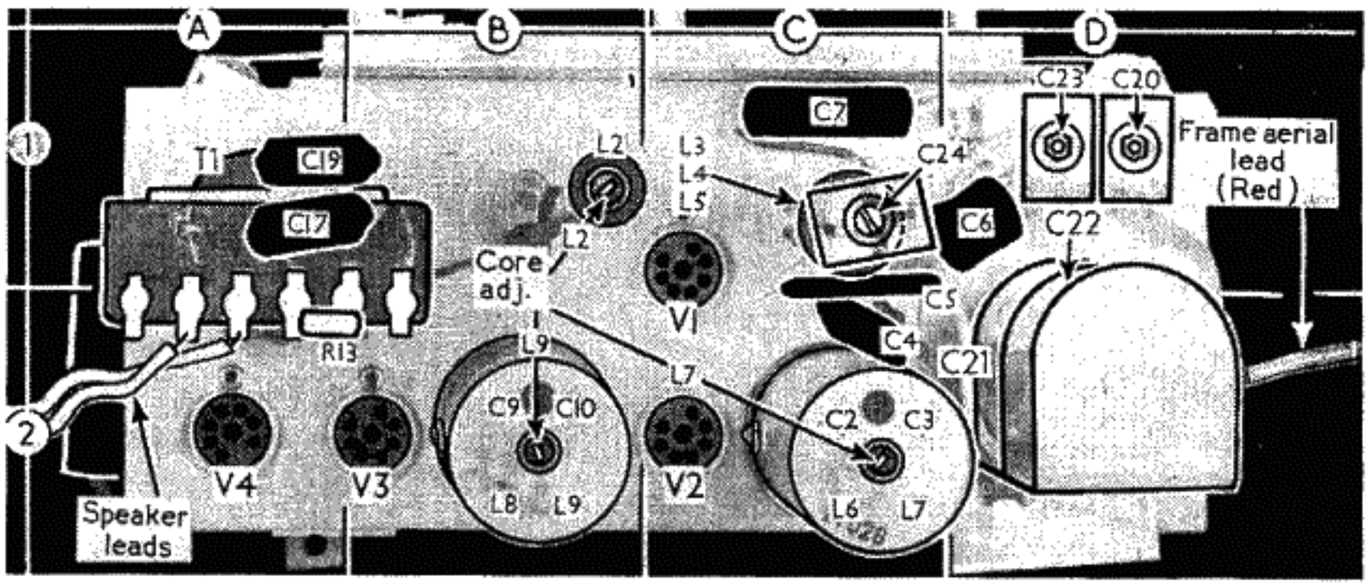
CAPACITORS		Values	Locations
C1	A.G.C. decoupling	0·05μF	F3
C2	1st I.F. trans. tun.	100pF	C2
C3	1st I.F. trans. tun.	100pF	C2
C4	V1 osc. C.G. ...	150pF	C2
C5	Osc. fixed trim. ...	300pF	C1
C6	Oscillator tracker ...	500pF	D1
C7	Osc. H.T. decoup.	0·002μF	C1
C8	V2 S.G. decoupling	0·05μF	F4
C9	2nd I.F. trans. tun.	100pF	B2
C10	2nd I.F. trans. tun.	100pF	B2
C11	I.F. by-passes ...	100pF	G4
C12	I.F. by-passes ...	100pF	G4
C13	A.F. coupling ...	0·01μF	G3
C14*	H.T. decoupling ...	8μF	G3
C15	V3 S.G. decoup. ...	0·01μF	H4
C16	A.F. coupling ...	0·002μF	H4
C17	Part tone correction	0·01μF	A1
C18*	V4 G.B. by-pass ...	25μF	H4
C19	Battery by-pass ...	0·01μF	A1
C20‡	M.W. aerial trim. ...	30pF	D1
C21†	Aerial tuning ...	—	D2
C22†	Oscillator tuning ...	—	D2
C23‡	M.W. osc. trimmer	30pF	D1
C24‡	L.W. osc. trimmer	170pF	C1

* Electrolytic. † Variable. ‡ Pre-set.



Circuit diagram of the Invicta 25 all-dry portable superhet. **L1** is the frame aerial winding. The speech coil circuit is included in the return path of **V3** pentode C.G. resistor, introducing inverse feed-back.

	OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	Frame aerial ...		1·8	—
L2	L.W. loading coil...		27·0	B1
L3	M.W. osc. tuning ...		2·0	C1
L4	L.W. osc. tuning ...		0·5	C1
L5	Osc. reaction coil...		9·5	C1
L6	1st I.F. trans.	Pri.	12·0	C2
L7		Sec.	12·0	C2
L8	2nd I.F. trans.	Pri.	12·0	B2
L9		Sec.	12·0	B2
L10	Speech coil ...		3·0	—
T1	O.P. trans.	Pri.	660·0	A1
		Sec.	Very low	
S1-S5	Waveband and battery switches ...		—	F3



Rear view of the chassis, as seen from the rear of the receiver, where the four RF adjustments are accessible.

CIRCUIT ALIGNMENT

R.F. and oscillator adjustments can be made with the chassis in its carrying case, but for I.F. adjustments the chassis should be withdrawn and placed, resting on its transformer end, on the bench. The frame aerial should be connected with the leads lengthened to give greater freedom to the chassis.

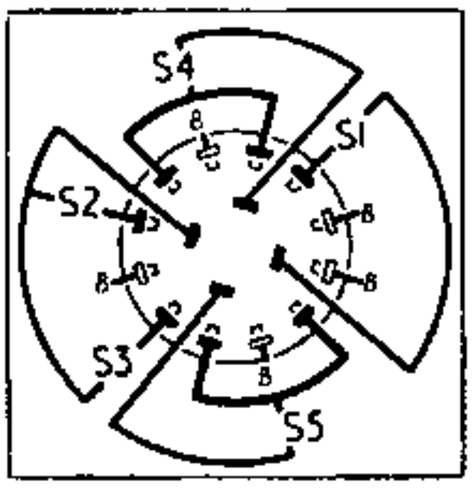
I.F. Stages.—Switch set to M.W., turn gang to minimum capacitance and volume control to maximum and connect signal generator, via a 0.01 μF capacitor in the "live" lead, to control grid (pin 6) of **V1.** Feed in a 470 kc/s signal (638.3 m) signal and adjust the cores of **L9** (location reference B2), **L8** (G4), **L7** (C2) and **L6** (F4) for maximum output, reducing the input as the circuits come into line to avoid A.G.C. action. Repeat these adjustments until no improvement results.

R.F. and Oscillator Stages.—As the tuning scale remains fixed in the carrying case, the chassis should be replaced in the case before making these adjustments. Check that at the maximum and minimum capacitance settings of the gang, the cursor is obscured by the high and low wavelength ends, respectively, of the tuning scale. The cursor may be adjusted by sliding it along the drive cord. Connect signal generator to a loop of wire placed approximately 12in from the frame aerial.

M.W.—Switch set to M.W., tune to 210 m on scale, feed in a 210 m (1,429 kc/s) signal and adjust **C23** (D1) and **C20** (D1) for maximum output. Tune to 500 m on scale, feed in a 500 m (600 kc/s) signal and check calibration.

L.W.—Switch set to L.W., tune to 1,250 m on scale, feed in a 1,250 m (240 kc/s) signal and adjust **C24** (C1) for maximum output. Tune to 1,800 m on scale, feed in a 1,800 m (166.7 kc/s) signal and adjust the core of **L2** (B1) for maximum output. Repeat these adjustments until no improvement results.

The switch unit as seen from below the front side of the chassis.



DISMANTLING THE SET

Removing Chassis.—Remove the three control knobs (pull off), with felt washers, and unplug battery connectors;
unsolder the two frame aerial leads from tags on frame in carrying case on right of chassis;
unsolder leads from speech coil tags on speaker;
remove two 4BA nuts, with spacers, securing scale backing plate to top of carrying case;
remove two 4BA nuts, holding bottom of chassis to sub-baffle, and, pulling lower edge of chassis forward slightly to clear bottom fixing bolts, lower it sufficiently to free scale backing plate from top fixing bolts, and withdraw.

When replacing, connect the green lead to the tag on the frame aerial near the front of the set and the red lead to the rear one.

Removing Speaker.—Remove four 4BA nuts, with washers, holding speaker to sub-baffle.

When replacing, the speech coil tags should be on the left.

GENERAL NOTES

Switches.—**S1-S3** are the waveband switches, and **S4, S5** are the battery switches, ganged in a single 3-position rotary unit beneath the chassis. The unit is indicated in our front view of the chassis, and is shown in detail in the diagram in col. 2, where it is drawn as seen from below the front of the chassis, in the direction of the arrow in our front view.

S1 and **S3** close on M.W. (control knob fully clockwise); **S2** closes on L.W. (control knob fully anti-clockwise). **S4** and **S5** close in both of these positions, while in the central position (off) all switches are open.

Batteries.—Recommended batteries are as follows: L.T., Ever Ready AD4 or Vidor L5041, rated at 1.5 V. These have a 2-pin connector of which the thicker pin is positive. Recommended H.T. batteries are Ever Ready B107 or B126, or Vidor L5508 or L5512, rated at 90 V.

The H.T. plug has three pins of which the centre one is used only as a locator. When the plug is viewed from the free ends of its pins, with the locator at the top, the left-hand pin is positive, and the right-hand pin is negative.

Chassis Divergencies.—In the original circuit diagram, **R3** and **C7** were omitted, and the H.T. end of **L5** was connected to **V2** screen. **R4** was then 10 kΩ, and **C8** was 0.05 μF. **R9** may be 330 kΩ or 390 kΩ. In our chassis, the 910 Ω of **R15** was made up by connecting a 10 kΩ resistor and a 1 kΩ resistor in parallel.

DRIVE CORD REPLACEMENT

About three feet of fine gauge nylon braided glass yarn is required for a new drive cord, whose course is shown in our front view of the chassis, where the drive drum and the cursor are shown with the gang at maximum.

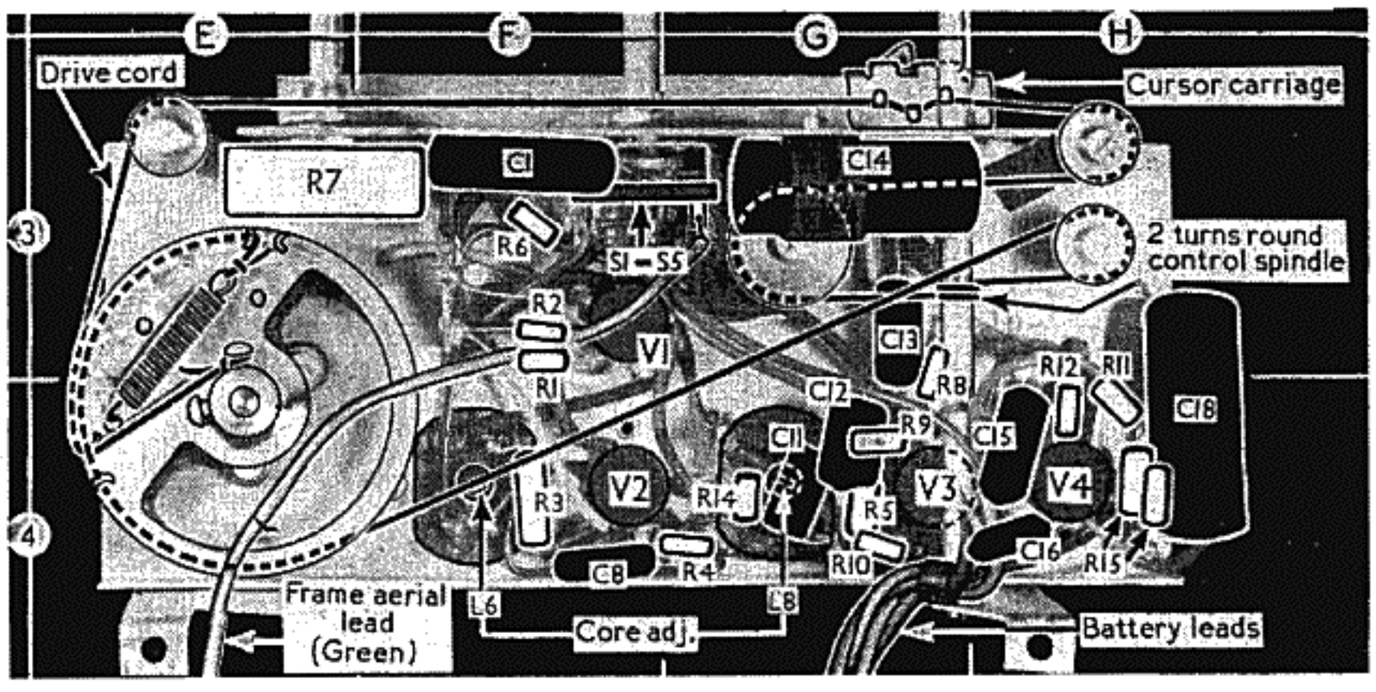
To run the cord, one end is tied to a drum boss screw as shown in our photograph, then the run is made, pulling the gang against its stop to hold the cord in position.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on a new set of batteries. The gang and volume control were at maximum, but there was no signal input. Voltages were measured on the 400 V range of a Model 7 Avometer, chassis being the negative connection.

Valves	Anode		Screen	
	V	mA	V	mA
V1 DK91	60	0·8	44	1·5
V2 DF91	76	0·8	25	0·4
V3 DAF91	16	0·1	*	*
V4 DL92	74	4·5	60	1·0

* Negligible readings.



Front side of the chassis, in which the course of the tuning drive cord is indicated.

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INVICTA Model 25

General Description : Four-valve, two-waveband "all-dry" battery superheterodyne receiver with internal frame aerial. Released November 1949.

Power Supplies : H.T. 90 volt battery; L.T. 1½-volt battery.

Intermediate Frequency : 465 kc/s.

Valves : Mullard (V1) DK91; (V2) DF91; (V3) DAF91; (V4) DL92.

Circuit Modifications : Later models have L.W. frame aerial and 170-pF. condenser in place of L5.

Alignment Procedure :

(1) Inject 465-kc/s. signal to grid of V1. Adjust cores of T1 and T2 for maximum output.

(2) Lay generator lead about 6 in. from frame aerial and adjust each waveband as follows :

	Sig. Gen.	*Osc.*	*Preselector*	*Check at*
L.W.	200 kc/s.	C10	L5	150 kc/s.
MW.	1·5 Mc/s.	C8	C7	600 kc/s.

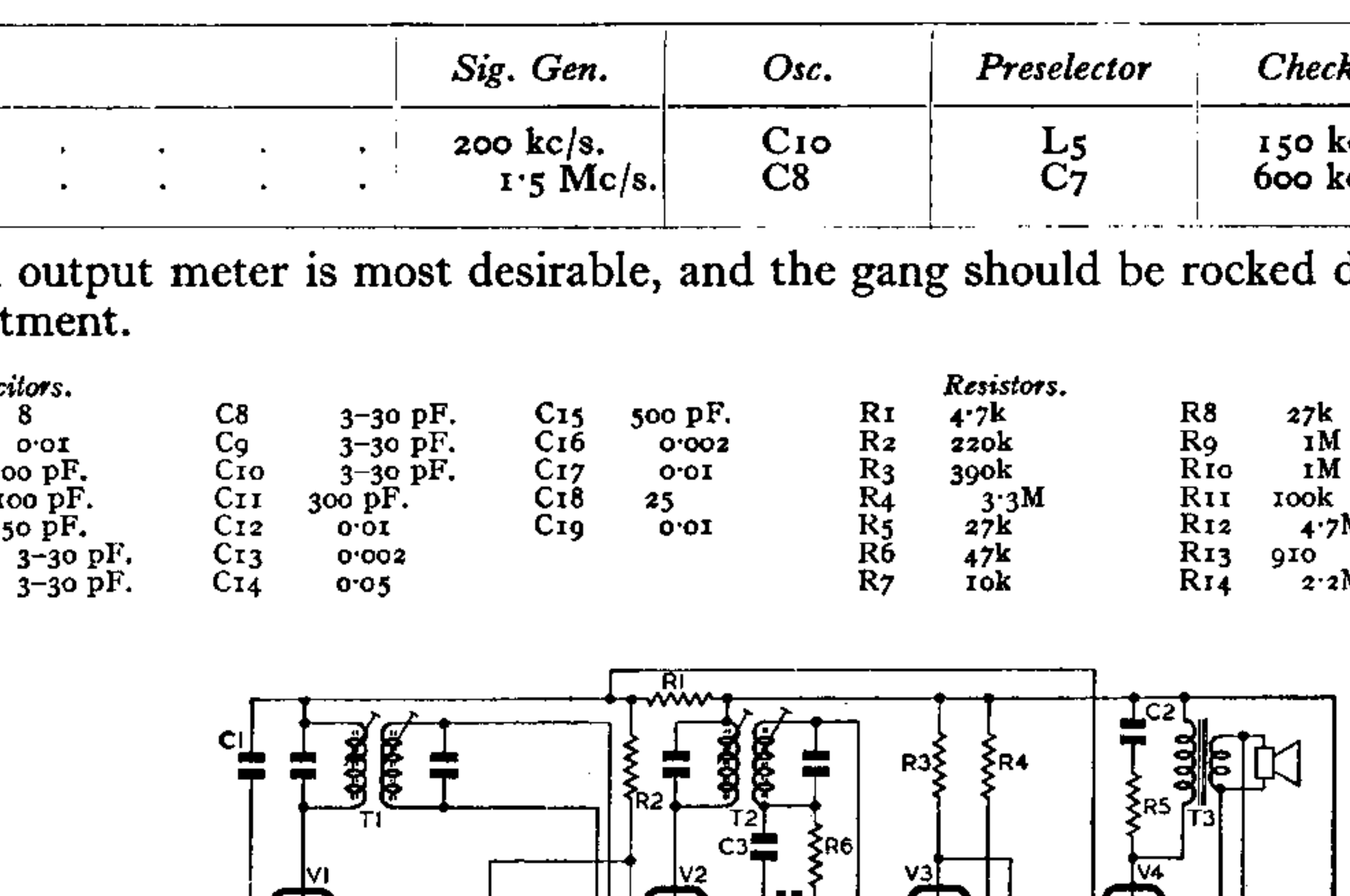
An output meter is most desirable, and the gang should be rocked during adjustment.

Capacitors.

C1	8	C8	3–30 pF.	C15	500 pF.	R1	4·7k
C2	0·01	C9	3–30 pF.	C16	0·002	R2	220k
C3	100 pF.	C10	3–30 pF.	C17	0·01	R3	390k
C4	100 pF.	C11	300 pF.	C18	25	R4	3·3M
C5	150 pF.	C12	0·01	C19	0·01	R5	27k
C6	3–30 pF.	C13	0·002			R6	47k
C7	3–30 pF.	C14	0·05			R7	10k

Resistors.

R1	4·7k	R8	27k
R2	220k	R9	1M
R3	390k	R10	1M
R4	3·3M	R11	100k
R5	27k	R12	4·7M
R6	47k	R13	910
R7	10k	R14	2·2M



CIRCUIT DIAGRAM—INVICTA MODEL 25