INVICTA 800 ALL-DRY JUNIOR

Four - valve, two - waveband portable superhet receiver for operation from all-dry batteries. Made by Invicta Radio, Ltd., Cambridge.

Circuit.—The frame aerial windings form the grid coils of V1. The long wave winding is shorted out for medium wave reception.

V1 is the frequency-changer, and the oscillator section is tuned grid with anode reaction coils. Tracking is obtained by specially shaped vanes of the oscillator section of the gang condenser.

Permeability adjusted intermediate-frequency transformers link up V2, the I.F. amplifier, and V3, the single-diode triode. R4, the diode load, provides A.V.C. via R5 as well as L.F. via C17.

The triode section is resistance-capacity coupled to the output pentode, V4, which has tone condensers across both grid and anode. Automatic bias of 7.3 volts is obtained by the drop across R10.

Notes.—Values of 250,000 ohms for R1 and 100,000 for R2 enable V1 to operate satisfactorily when the L.T. battery is partly run down. If it is desired to use a 2-volt accumulator, a 2-ohm resistance should be inserted in the L.T. + lead.

Battery.—Invicta type 4.

GANGING

I.F. Circuits.—Tune set to M.W. max. Inject 469 kc. to V1 grid and adjust I.F. cores with non-magnetic screw driver.

M.W. Band.—Loose couple generator to frame aerial. Tune to 200 m., inject 200 m. and adjust T1 and T2. Check at 550 m.

L.W. Band.—Tune to 1,300 m., inject 1,300 m. and adjust T3 and T4. Check at 1,800 m.

VALVE READINGS

V	Type	Electrode	Volts	Ma.
1	DK1	Anode	82	.7
		Screen	40	1.04
		Osc.anode	82	1.4
2	DF1	Anode	82	.9
		Screen	82	.25
3	DAC1	Anode	46*	.07
4	DL2	Anode	80	5.5
		Screen	82	1

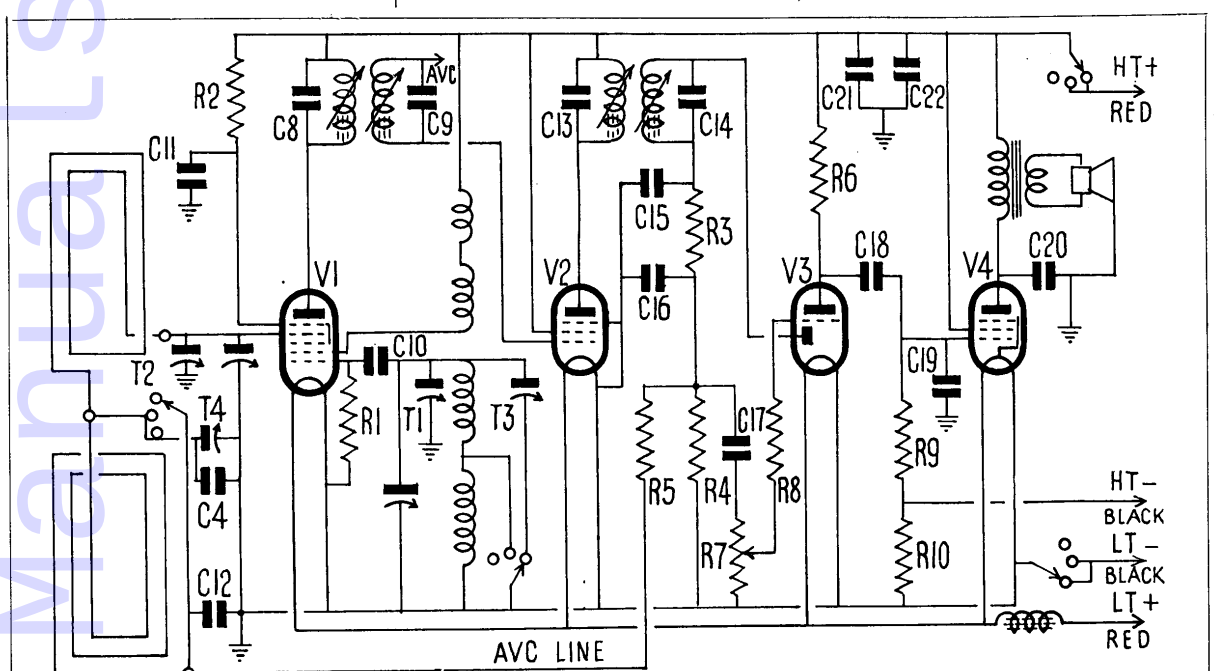
* Calculated.

RESISTANCES

R.	Ohms.	R.	Ohms.
1	110,000 or 250,000	5	3.5 meg.
2	30,000 or 100,000	6	510,000
3	20,000	7	1 meg.
4	510,000	8	50,000
		9	2 meg.
		10	680

CONDENSERS

C	Mfds.	C	Mfds.
4	15 mmfds.	15	100 mmfds.
8	70 mmfds.	16	100 mmfds.
9	70 mmfds.	17	.01
10	100 mmfds.	18	.01
11	.1	19	200 mmfds.
12	.05	20	.001
13	60 mmfds.	21	.25
14	80 mmfds.	22	2



A simple two-band, all-dry superhet, the 800 uses the frame windings as input grid coils.

Substitute for Line Cords

At the present time, line resistance cords are not so easy to obtain. Where a set is being used on A.C. it is possible to replace the line cord by a paper-type condenser. Moreover, less heat will be developed and power will be saved.

The required capacity of the condenser can be worked out quite easily by means of the following formulæ.

The total impedance of the circuit is the sum of the reactance of the condenser and the resistance of the heaters. As voltage and current are 90 degrees out of phase in the condenser, the reactance and resistance are added "geometrically":—

$$Z^2 = Xc^2 + R^2$$

Where Z is total impedance, Xc the reactance of the condenser and R the resistance of the heaters. As we require to find Xc, our formula is:—

$$Xc = Z^2 - R^2.$$

We require, of course, to know both Z and R. These can be found by Ohms Law:—

$$Z = \frac{\text{Mains voltage}}{\text{Valve heater current.}}$$

$$R = \frac{V_1 \text{ volts}}{V_1 \text{ amps}} + \frac{V_2 \text{ volts}}{V_2 \text{ amps}}, \text{ etc.}$$

Having found Xc, the reactance of the condenser, we require to find what capacity condenser has this reactance at the mains frequency concerned.

$$C = \frac{1{,}000{,}000}{2\pi f Xc.}$$

where C is the capacity, π is 3.14, and f is the mains frequency.

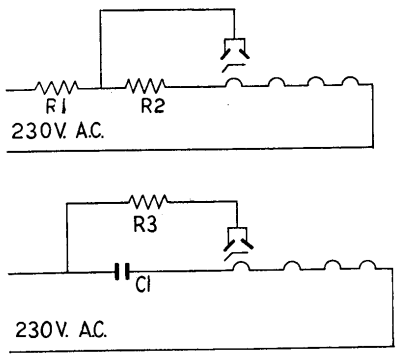
This gives the capacity in microfarads, and the nearest commercially obtainable capacity should be used.

For example, a four-valve set on 230 volts 50 cycles using two 6.3-volt and two 25-volt valves, all taking .3 amp., would need a total capacity of 4.5 mfds. in place of the line cord or ballast lamp.

As the condenser will be operating on A.C., a paper type and not an electrolytic must be used.

In most cases where line cords are used, the arrangement requires 115 volts A.C. on the rectifier anode. The usual way of obtaining this is shown in the top diagram.

If the line cord R_2 is to be replaced, it is correct to replace it with a condenser as calculated by the formula, reckoning 115 volts as the mains voltage.



If, however, both R_1 and R_2 are to be replaced, the arrangement shown in the lower diagram should be used. A 25Z5 will function with a 100-ohm resistor in the position R3. As the wattage of R3 will not be very high, there is no object in using a condenser to replace this resistance.—ALFRED ROSE.

Circuits Explained

THE first step in radio servicing is learning the theoretical principles on which receivers operate. The second step is learning how these principles are applied in practice. In many ways the second step is more difficult than the first because the principles are few, while the practical arrangements are many.

For this reason the "Radio Receiver Circuits Handbook," by E. M. Squire, is particularly valuable to the "second-stage" learner, and at the same time an excellent reference book for the experienced man.

The book takes the stages of a set—high-frequency amplifiers, detectors, frequency-changers, power supply circuits, and so on—outlines the basic theory in a page or so, and then gives practical circuit diagrams, and explains the purpose and value of each component.

The book will enable the engineer to appreciate the duty of every component in the vast majority of sets he handles, and in this way will form a great aid to practical fault location.

It is comprehensive—for example, screen-grid and push-pull types are covered in the detectors chapter, and up to date all the familiar frequency-changers being dealt with. Published by Pitmans at 4s. 6d., the book is available from Odhams Press, Technical Book Dept., 92, Long Acre, London, W.C.2, at 4s. 10d., post free.