Early two valve sets — 1922 to 1926

The one valve radio was able to be used in many ways, as we've seen in earlier articles. The advent of the two-valver meant that under favourable conditions, loudspeaker reception was possible.

It can be argued that the one-valve radio belonged to the tinkerers and hobbyists, while the two-valver belonged to the serious enthusiast. In those very early days, a two valver would to cost twice as much to purchase the parts, be more complicated by a factor of at least two, take twice as long to build and cost twice as much to operate!

When we think of two valve radios, probably the first thing that may come to one's mind is a radio of two triodes, consisting of a regenerative detector transformer coupled to an audio stage — which, depending upon location, valve types and transmission power, might indeed operate a sensitive loudspeaker. However a two-valve 'radio' equally capable of working a loudspeaker might consist of a well designed crystal set followed by a two stage audio amplifier. The circuit printed in this column for October 1996 showed just such a circuit.

Overseas, particularly in England and the United States, the big boys were already well under way with their selection of two valve designs. Indeed, the Gec-O-phone BC 2001 referred to in October 96 column mentioned above appeared on the English market in 1922. The circuit for this peculiar circuit is shown in Fig.1.

Here we see a choice for the antenna connection; either via the 200pF capacitor, or direct into the first tuning stage. The socket marked 'loading coil' is for an additional inductance which is placed in series with the variometer, so that the set could tune down to the long wave band — typically about 200kHz to about 500kHz. The socket connections were for a long or short antenna, as appropriate.

Following the circuit, we see that the RF amplifier is anode tuned via the 200pF ('0.0002mfd') variable capacitor (not shown as such in the circuit) and the bottom coil of the 'reactance unit'. This curious little device is a moulded bakelite former which looks not unlike one of a pair of castanets. It is hinged at the bottom, and the amount of coupling and hence feedback is adjusted by hand. The de-tuning by hand capacity effect must have been somewhat off-putting!

From there on, the circuit is a normal leaky-grid detector. Note, however, that although the grid leak resistor is shown on the circuit as '2Ω' its value is actually two *megohms* — the capital omega was often used to represent megohms at the time. Ohms were represented by a small omega, as shown on the filament rheostat.

Provision is made for two sets of phones. If one set is used, it is connected horizontally between pins 1, while if two pairs are used they are connected each between pins 1 and 2.

So, how did the second tuning stage tune the long wave bands? The answer is that it didn't. The tuning coil part of the reactance unit acts merely as an RF choke, and the signal is capacitively coupled to the grid of the detector stage. The tuning capacitor and reactance unit would have no effect. Given that there was perhaps one, may be two, long wave stations, one tuned circuit was probably adequate.

Such radios are rare in Australia. Contemporary literature suggests that they were not sold here as such, so they must have accompanied migrants or have been especially imported.

When restoring a set such as this, bright emitter valves should be used if they can be

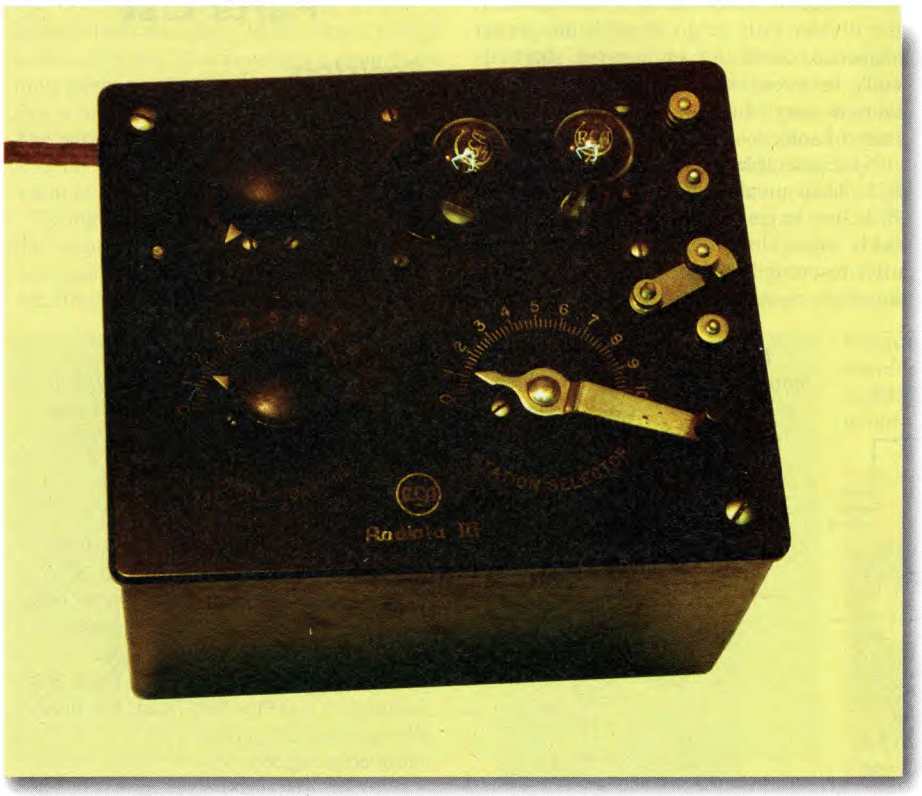

Fig.2: An RCA Radiola III with its WD11 valves in place.

obtained. There are two reasons. The first is to be authentic; and secondly, the filament rheostats are very low in value, typically 2 - 5 ohms and therefore might not give enough variation in filament voltage for stable operation if 'normal' triodes were used.

The Radiola III

We're now going to talk about a Radiola — an American RCA Radiola, not an AWA Radiola! This compact little set is beautifully made, as hopefully you may be able to see from Fig.2. Its circuit is shown in Fig.3.

The terminals numbered 1 to 4 on the left of the circuit diagram refer to the terminal posts on the right had side of the front panel(!). There is provision for a long or short antenna at either terminal 1 or 2, and the earthing link connects either pin 3 or pin 4 to earth, thereby altering the tuning range.

The tuning coil is an interesting affair — a kind of double variometer. It is wound quite as it is drawn; a continuous coil wound in sections as illustrated along a former of about 2" diameter and about 5" in length, with rotors at each end as indicated by the circuit. The first rotor is wound in such a way that it adds to or subtracts from the inductance of the main coil, thereby altering the resonant frequency. The second rotor adds to or subtracts from the amount of energy fed back for regeneration purposes. The rest of the circuit is quite conventional for the times.

The tube types for the Radiola III are the low consumption WD11's. These valves have what is essentially a 'European' triode base, with the same connections, but with 'American' style pins. The anode pin is thicker than the other three.

As WD11's are fairly scarce nowadays, replacements are a problem. One trick is to re-base a type 199 with an European base, and then place a brass sleeve over the anode pin to bring it to the required thickness. If sleeving the tube is not done in this manner, the valve will not fit snugly into the socket.

Other US two-valvers

The Americans weren't keen on two-valvers. It seems that the manufacturers preferred to throw in a couple of extra stages, to be sure that loudspeaker strength was available at all times. Searching the literature to hand at the time of writing revealed only the Crosley model 51, the Grebe '13' regenerative receiver tuning 80 to 300 metres (which is really a 2-stage tuner), the Grebe CR-18 short wave receiver and the Radiola R5. A case could be made for an Attwater Kent two-valver made up of selected AK components in kitset form.

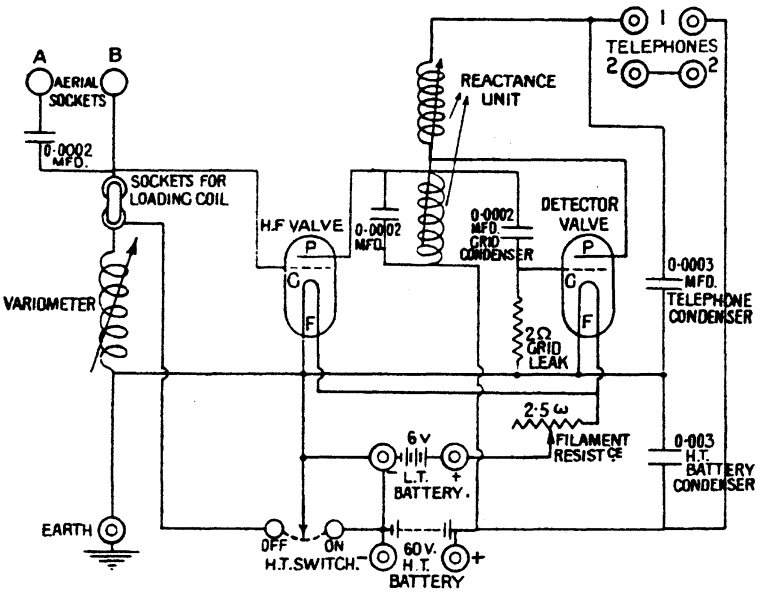

Fig.1: The circuit of the Gec-o-Phone model BC 2001.

British sets

The British manufacturers were a little more forthcoming in offering two-valve sets to their public. Here are some of the better known brands: Ericsson; 'Fellophone' (of the Fellows magneto family); 'Gec-o-phone', made by the General Electric Company; 'Marconiphone' model V2 in their various updates; Stirling; Western Electric; Radiax; Cosmos; the Radio Instruments model V2A (funny about that!); British Thompson Houston or 'BTH'; 'Ethophone' by Burndept; AJS, of the same stable as their famous motor cycles; and last but not least, Edison Bell and their 'Bijou' brand.

Most of these sets, particularly the earlier ones, were housed in anything but conventional coffin box cabinets. There was a variety of sloping panels, 'tobacco cabinets' and exposed bright emitter valves.

Australian sets

As has been discussed in the various snapshot years, many of the early sets sold in this country were assembled by various licensed experimenters who placed their own names upon them. David Jones' store and Farmers Company in Sydney, and Harringtons and Hartleys in Melbourne, all advertised extensively for two-valve sets either of their own brand or in kitset form. Prices for these sets started from as low as £10, with of course, valves, phones and batteries being classed as 'extras'. Other states had their major suppliers as well, and they also had the usual run of dealers-cum-manufacturers.

The valves for these sets were much the same as for single-valvers. That is, early in the piece, the bright emitters such as Ediswan, Philips D1 and D2, type 'E' and type 'R', and finally the 201 and 201-A. In the majority of circumstances the same valve was used in each socket.

RCA introduced a special 'detector' type 200, followed by the 200-A. This valve had a minute amount of gas inserted into the

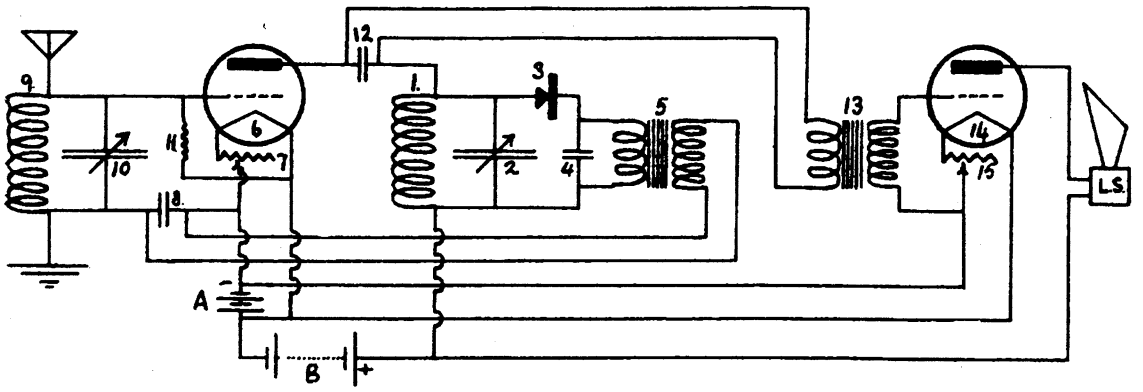

Fig.4: A two-valve reflex circuit given in The Listener In for October 31, 1925. Wired as shown, it wouldn't have worked properly at all...

bulb, and when worked on an anode voltage of 20 to 45 volts, good results were claimed. In the Philips range, the type D1 was regarded as a 'high frequency' valve (i.e., detector) and the type D2 as an 'amplifier' or audio valve. In reality, there was little to choose between them.

By about 1925 the ubiquitous 201-A had permeated just about everything, and remained supreme until the introduction of the low consumption types.

Reflexing

This period of radio history was the heyday of the reflex set, and reflexing was not particularly practical for more than two valves. To recap upon the reflexing principle, one valve was made to act as both an RF amplifier and an audio amplifier, using a 'cats whisker' crystal as the detector.

In a one-valver, the reflexing was exactly as just described, while in a two-valver the second valve was most often an extra stage of audio, sufficient to operate a loudspeaker. The two-valve reflex set described in *The Best of Australia's Wireless Weekly for 1927* shows just a circuit.

Occasionally, there were reflex sets which claimed they could do a little more. The circuit shown in Fig.4 appeared in the rival magazine *The Listener In* for October 31, 1925. The numbered components are referred to in the text, and no component values are given. However the explanation leaves more than a little to be desired.

Yes, the received signal appears at the grid of V1, and yes, it is capacitively coupled to the RF tuning stage, whereupon detection takes place by the cats whisker and the audio is fed to the primary of the audio transformer (5). Let's quote from the text:

Once having reached our old and unchanged friend the 1-2-3-4 detector tuner combination, the current's character is changed and returned by the audio transformer. From here it makes a second tour of the circuit, but this time round, parts that were short cuts on the first trip have now become obstacles, and vice-versa.

High-frequency shunt-condenser 8 does not by-pass rectified current, so it must, on the one hand, traverse coil 9 to the grid, and, on the other, proceed to A-.

Oh really? It is hard to imagine indeed one ounce of signal from the secondary of T5 reaching any grid when the secondary is connected to A- and earth! Perhaps if capacitor 8 was connected between the bottom of the tuned circuit and earth, and the tuned circuit was connected to A- (as if C8 was not there as shown), and the secondary of T5 was connected across C8 in its new position, the circuit may just work! With the wiring alterations as described, the grid leak R11 now has some relevance. It will be required to allow for the earth return of the grid circuit, which would now be locked by C8.

In short, if the circuit worked at all, it must have been wired somewhat differently from Fig.4...

Despite the curious circuits described, it can be said safely that the majority of two-valvers were indeed regenerative detectors, transformer coupled to an audio stage for headphone use. Under favourable conditions, and by cranking up the voltages, loudspeaker reception was possible. More than a few of these sets were home built, and some have endured to this day. Sadly, home-built sets seem to be the ugly ducklings of collectable items.

Soon we'll look at two-valvers from 1927/8 and into the electric era. With pentode valves, the two-valver came to be seen in a different light altogether. ❖

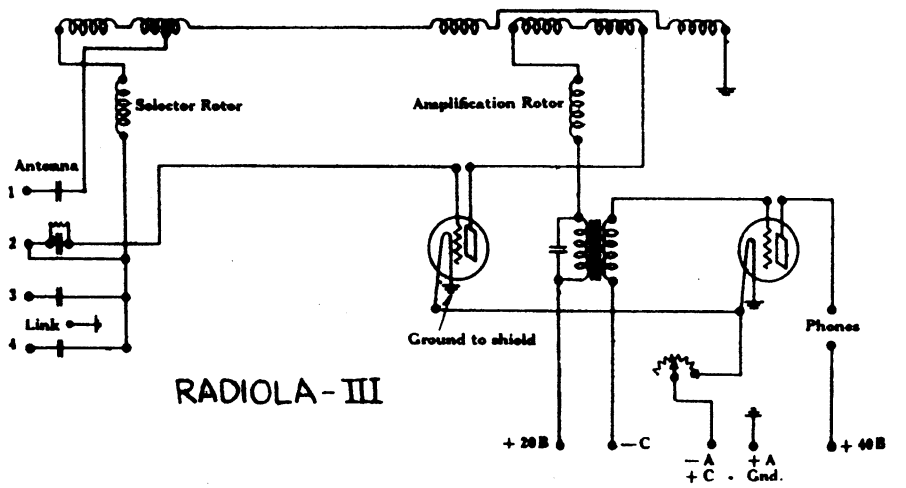

Fig.3: The circuit of the Radiola III two-valver.