FORUM

Conducted by Neville Williams

This didn't happen in Australia — or did it?

For some strange reason, there seems to be a mood abroad to relive the past. There have been signs of it in our own columns and, of late, a contributor has been reminiscing in the columns of the Australian IREE "Monitor". Now the "RCA Engineer" has come to the party with a story which is new to me, anyway.

Having been a witness, at first hand, to the introduction of wireless sets and wireless entertainment to the community, I thought I had seen or heard about most of the goings on in the period. What I missed personally, I tended to pick up from our former Assistant Editor, Phil Watson, who shared the same era.

More than that, we both experienced it in country situations, where the arrival of the very first wireless in the town was an historic occasion; where reception was a constant battle against thunderstorm static; where you listened expectantly but grudgingly, knowing that you were running down the heavy and expensive batteries.

I remember my late father growing weary of the traditional box with a lift-up lid and bakelite panel; of accumulators, batteries and even depression-style home-made wet batteries spread around the floor. How, with infinite patience, he transferred the works into a home-made console cabinet and replaced the bakelite panel with one hand-cut, drilled and fashioned from heavy plate glass.

It didn't work any better but it was certainly an unfailing conversation piece.

A book could be written — maybe should be written — about those days!

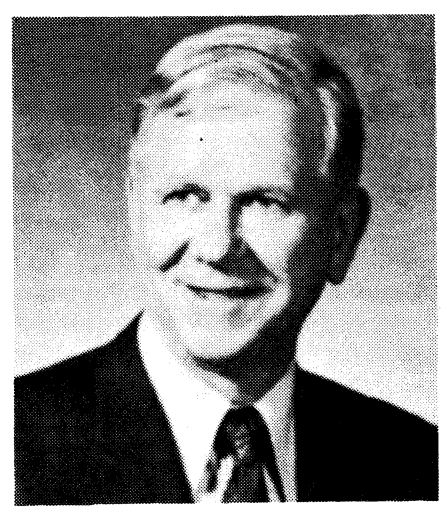
But, as I said above, the story in "RCA Engineer" has no parallel in my experience. It was penned by a now-retired RCA employee G. F. (Gordon) Rogers who lived, at the time, in north-western Carolina, USA.

Gordon tells how, in the winter of 1930/1, he became dissatisfied with the old uneconomical battery powered radio that served the family up to that time. So he was in a receptive mood when the opportunity came to acquire an unserviceable mains powered receiver using four type 26 valves, a 27 and a 71-A. This was painstakingly reconditioned and put back into service.

I met with a few such receivers a little later than this, when I started work in the "big smoke". But they certainly had no place in the country areas with which I was most familiar. There were no power mains and very few other services. You ran your own messages, chopped your own wood, grew your own vegetables, caught your own rainwater and buried your own night-soil!

But I should explain about those valves, for those who would not know what the numbers signify.

On the Australian/American scene, the 26 (or 226) was the first well known valve intended for mains operation. It did not boast the luxury of one of the new-fangled indirectly heated cathodes. It still had a directly heated filament rated at 1.5 volts at 1.05 amp, and relied on the heavy filament wire to store heat between half-cycles of mains current.



Gordon Rogers, formerly attached to the Consumer Electronics Division of RCA, now retired. A friendly gesture in 1931 led to an audio system serving 600 homes via 400 miles of line.

The filament was earthed via the tapping on a potentiometer wired across the filament supply Part of the setting-up procedure, if valves were replaced, or as they aged, was to adjust the pot. for minimum hum. As I recall, it was never better than a tolerable minimum, rendered so because the horn and primitive cone loudspeakers of the era boasted very little low frequency response.

But no amount of pot. juggling could make a 26 acceptable in the role of detector/first audio stage. That was where the 27 scored. It was a triode, very like the 26 in other respects, but it did have a new-fangled indirectly heated cathode.

As for the 71-A, it was a reworked version of the old 01-A triode battery valve, still with the same directly heated filament. It could be used in the audio output socket with a centre-tapped AC filament supply only because the amplification factor of this final stage was so low (three times) that filament hum didn't have much of a chance to make itself heard.

Under maximum rated conditions (plate 180V at 20mA) the 71-A boasted an "undistorted" power output of 0.79W.

Well, finding himself with this kind of receiver and this order of power output, Gordon Rogers felt he had to share it with neighbours — particularly those whose homes were not connected to the electric power mains.

Accordingly, using a single overhead wire and an earth return, he connected his neighbour's loudspeaker to the receiver and obtained gratifying results. Within a month, six other neighbours were knocking on his door, requesting a similar connection. The additional wiring was duly installed.

If there was no publicity about such enterprise in Australia, it may well have been because it would have been thoroughly illegal. Here, as in Britain, transmission and communication by wired circuits across property boundaries has traditionally been regarded as a Government monopoly, not to be sur-

rendered lightly. In the USA, the ground rules are different.

The rules for listening to radio were also very different in those days. You didn't try to talk above it, or clatter dishes while the radio was on. You sat in deathly silence, listening to every word the man said – or to what you thought he said, through a Reiss carbon microphone, indifferent circuitry, an overloaded output stage and a distortion-ridden loudspeaker!

Even so, Gordon Rogers found that eight homes sharing the output of one poor little 71-A was a bit tough so, within a year, he set about building a new receiver – a superphet using the new 50 series valves (57, 58 etc) and ending up in a 47 type output pentode. It was choke fed and coupled to the lines through blocking capacitors.

The 47 offered a supposed 2.7 watts of "undistorted" power – but only into an ideal 7000-ohm load. It soon became evident that, with all the loudspeakers in circuit, the effective load was a lot lower than 7000-ohms and the power available nothing like the rated figure.

So, skipping over the new 59 output pentode (a notoriously unreliable bottle) he subsituted the even newer glamour output triode, the 2A3. It offered somewhat higher power output (3.5 watts) at lower distortion but, more importantly, into a lower nominal load (2500 ohms).

At about this time, with the gradual raising of power output and the gradual expansion of the system, Gordon Rogers realised that he had inadvertently been radiating IF energy. Whatever other effects it might have had, the energy got back into his own receiving antenna and produced whistles and instability on some stations. So better filtering had to be devised.

MORE AUDIO POWER

Next step was to substitute an output stage using push-pull 2A3 output valves matched to the lines through a hand-wound output transformer. This was so successful that it became necessary to provide a 10,000-ohm wire-wound potentiometer at each location to serve as a volume control.

The trouble was that the pots themselves absorbed too much of the power. The most remote subscribers didn't have enough left, while the pots close to the receiver tended to burn out. So they all had to be replaced with 25,000-ohm types.

At this stage, the system had 15 subscribers served by about five miles of line but, just then, a supply of "bargain" magnetic cone loudspeakers became available at $2.85 each. In no time at all, Gordon Rogers found himself trying to cope with a couple of hundred new customers.

He tried to keep pace with the demand by using four, and then eight, 2A3s in push-pull parallel – adding up to a 21-valve receiver with 60 watts of power output. But even that wasn't enough to cope with 200-plus loudspeakers located as much as 15 miles from the source.

There was no choice but to get into the realm of professional type valves with a pair of 830-B (60W) triodes operating at plate voltage of between 1000 and 1250. The 2200V CT power transformer, the main filter choke and the filament transformer all had to be wound by hand, then placed in vacuum and impregnated with a combination of hot beeswax and resin.

(How did I get into this . . . .etc?)

Unfortunately, the 830-Bs did not stand up too well to the rigours of continuous service and they were replaced by a second-hand pair of 204-As, audio valves with a dissipation rating of 500 watts. But these, in turn, had to be discarded in favour of a pair of 250W 212-Ds.

By way of power supply for these last-named tubes, Gordon Rogers purchased a couple of obsolete pole transformers from a supply authority and used them in conjunction with 866 mercury vapour rectifiers. A further pole transformer, partially rewound, served as an output transformer to handle the 350-400 watts of audio power.

With this equipment and a further updated tuner, the system reached its peak at the end of four years, with 600 homes, and 400 miles of single-wire transmission lines extending over three counties. The most distant customer was 24 miles from the receiver!

(In fact, it had also stirred similar initiatives elsewhere in the USA. By 1936, when Gordon Rogers delivered a paper on his sytem to a student AIEE Conference at Clemson College, he stated that at least a dozen other systems were in operation).

In its early stages, the network had a distinctly personal character and switching was devised, supplemented by a valve type tone generator, which allowed the network to be used in an intercom mode. However, as the network spread, the increasing load on the line, plus the intrusion of power mains earth currents rendered the intercom role less and less practicable. In addition, it became clearly undesirable to interrupt the regular program for personal reasons.

Even so, when atmospheric static rendered ordinary radio programs inaccessable, as often happened in those days during summer, a local program was often substituted -- local talent live, phonograph records, and community announcements.

Not surprisingly, for the scale of the system, Gordon Rogers learned lessons about reticulation the hard way.

Initially he used any wire that he could get his hands on — mainly discarded fencing wire. Apart from resistitive losses, poor connections and voltage surges across the connections caused corresponding current in the earth circuit, producing a form of radio interference.

Ultimately, and by common agreement, a levy had to be struck on all users to buy copper wire, and more attention given to the earth returns.

Subsequently, as the system grew in size and power, an earth problem of another kind was encountered. The audio signal would get into telephone circuits, even though they might be separated by as much as a quarter-mile. To overcome this problem, it became necessary to rearrange the customers in groups and manipulate the phase of the outgoing signal so that earth currents would cancel, rather than add.

And, of course, there were all the expected problems with open, shorted and leaky lines, and the need to develop equipment which would allow operators to spot faults and correct them as quickly as possible.

It was on-the-spot, hands-on training for a man who went on to join RCA in 1946 and to hold a series of responsible positions in that company until his retirement.

But it is fascinating to reflect upon the way radio came to 3000 country folk in Carolina, USA; people who, in many cases didn't bother with newspapers, and whose initial musical preference was invariably for "Hill-Billy" and "Fiddlin' " programs.

After a few years, their requirements had broadened to a point where they needed to make their own choices on their own radio.

Wired audio, a venture that grew out of a sudden impulse, had played out its role!