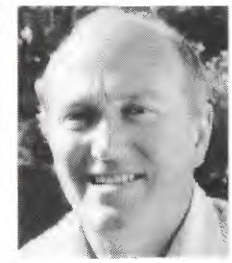
# VINTAGE RADIO

By JOHN HILL



# Valves & miniaturisation: a look at some remarkable receivers

**Prior to the introduction of transistors, many attempts were made to miniaturise equipment by making the valves smaller & by packing the components more efficiently into the available space. A number of remarkable receivers were produced, most capable of good performance.**

There's no doubt about it – the transistor paved the way for miniaturisation in the field of electronics. Prior to the transistor, most electronic circuits used valves and while they did the job, they were large, fragile, limited in their application, and highly inefficient to say the least.

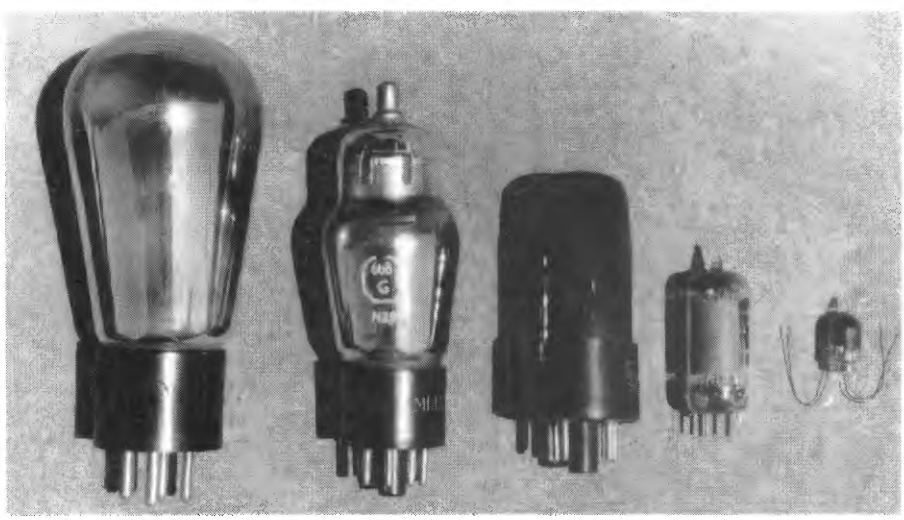
The cathode in a thermionic valve must be red hot in order to maintain an electron stream. As a result, valves used a considerable amount of power compared to the amount of work they did. On the other hand, the transistor was what early radio technicians dreamed of – a valve without a heater.

As much as I hate to admit it, valve equipment is, by modern standards, big, heavy and expensive to run. The latter is particularly true of any battery-operated apparatus. But development over a long period eventually produced smaller and more efficient valves than the early types, resulting in some extremely compact receivers being made towards to end of the valve era.

Some valve types were so small that they no longer used a socket; leads out of their bases were wired directly into the circuit. These ultra-small valves found a use in remote control applications, such as radio control receivers for model aircraft and boats. They were also used in early hearing aids and no doubt many other devices where space was limited.

When I first became interested in flying radio-controlled models in the mid 1960s, some model boat enthusiasts were still using valve equipment. It would appear that the survival rate was considerably better in boats than in aircraft.

A comparison of the two is interesting in that the new transistorised transmitters were fully self-contained in a handheld unit, whereas a valve transmitter was housed in a sizable cabinet that stood on the ground, with a separate hand control for the operator. What's more, where the transistorised equipment used six AA cells in the transmitter and a standard 9V battery in the receiver, the valve set required A and B batteries (for filament and plate) in both the transmitter and receiver. The battery complement alone was heavy, bulky and expensive. No wonder their owners couldn't sell them!

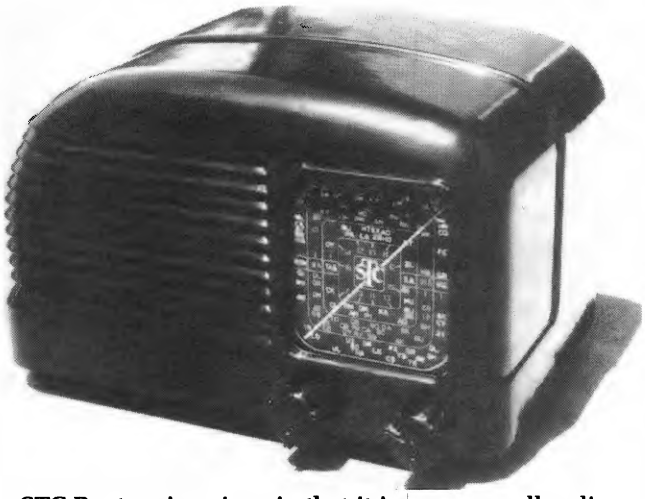


**Over the years, valves diminished in size to quite a remarkable degree. This view shows, from left, a 45, 6G8, 6V6, 6BE6 & a Z7OU. The latter is a truly miniature triode.**

## Early hearing aids

I often remember Mr Kennedy, a nice old chap I knew in my youth. One interesting aspect about Mr Kennedy was his hearing aid which would have been built using early 1950s technology. Naturally, it was an old valve type and heavy on batteries. The hearing aid most likely ran on a 1.5V filament battery and a 67.5V B

**The model 100 Philips "Philipsette" is a particularly good performer for a 4-valve radio. It is a full superhet design with a 5-inch loudspeaker.**



**The STC Bantam is unique in that it is a very small radio that was been built using full sized components. Like the Philips set it is a full superhet design & is a good performer.**

battery, the latter being made especially for hearing aid applications. Whether all this equipment was self-contained or distributed throughout a number of pockets I never found out but it was probably a single unit.

Because of the hearing aid's heavy battery consumption, it was usually switched off until someone approached; then there were a few moments of fumbling in a vest pocket to find the switch to turn it on. Once on the air, however, he could carry on a normal conversation without much trouble.

That hearing aid – or the manner in which Mr Kennedy used it – had its shortfalls, though. It seemed he could never judge the engine revs when driving his nice new Austin A70. He would back out of his driveway and over a steep gutter with the accelerator nearly to the floor. In fact, he managed to scrub out a clutch plate in only 12,000km – but you can't blame the valves in his hearing aid for that. Those old valve hearing aids worked quite well but they were bulky and battery hungry.

Miniaturisation, as such, wasn't all that important in the valve era. Who really needed a radio any smaller than a 4-valve mantel or, later on, a TV set smaller than a monochrome valve set with a 17-inch screen? Even the car radio manufacturers of those days had learned how to pack comparatively large components into a relatively confined space.

But power consumption was another matter. While not all that important for mains-powered equipment, it was a serious matter for battery-operated equipment. As already implied, hearing aids were very costly to run, so much so that they were only turned on when needed. A modern hearing aid, by contrast, will run continuously for, typically, 15 hours a day over about 16 days on a tiny 1.5V battery costing less than a dollar.

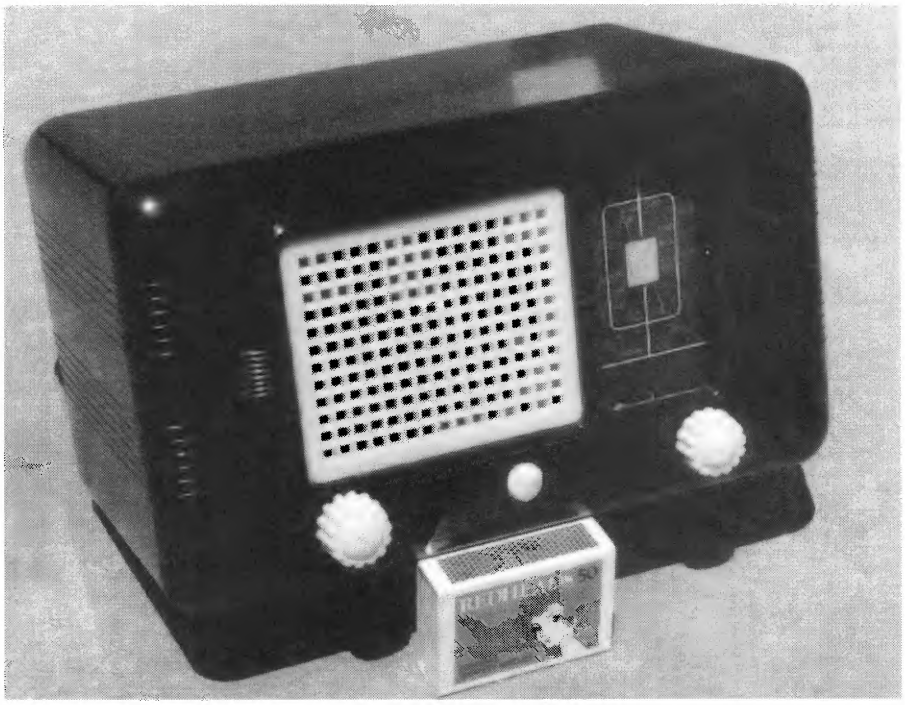
The same limitations applied to portable receivers but the hardest hit were country people, who depended on battery operated sets for their only contact with the outside world for weeks at a time. And they cost a fortune to run.

The military were among the first to explore the benefits of miniaturisation. And one of the first applications, towards the end of World War ll, was the development of an electronic proximity fuse robust enough for use in anti-aircraft shells. Its main feature was the use of printed wiring and components, in place of hard wiring and discrete components.

But the real boost to miniaturisation came during the space race days of putting a man on the Moon. Now transistorised equipment shrank to integrated circuit sized equipment, thus allowing lightweight computers and other essential goodies to be packed into those cramped Moon vehicles. That was where miniaturisation really mattered – not in the domestic market!

However, these developments eventually spun off to other areas and the integrated circuit has revolutionised the electronics industry. Everything has benefited while many new things have been made possible, including


**This is the view inside the back of the Philipsette. Everything is neat & tidy.**



**This neat little set is unbranded but was obviously made in Australia. It is a TRF design & has severe overload problems when tuned to local stations. However, it is a worthwhile collector's item due to its very small size.**

VCRs, CD players, personal computers and engine management systems for cars.

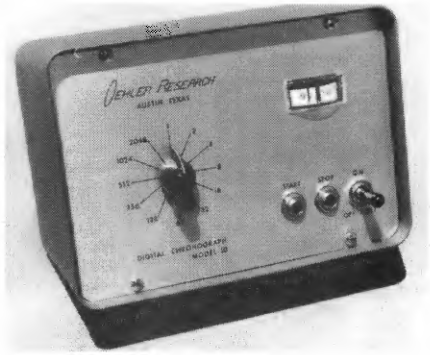
## Portable chronograph

As a matter of interest, I have a fairly high-tech electronic instrument called a portable chronograph. It is approximately 23 years old, is not much larger than a brick, has fourteen ICs in it and operates on three D cells. But what the heck does it do, you may ask.

The chronograph is a specially made instrument designed solely to help calculate the velocity of rifle bullets. It accurately times a bullet's passage between two electrical screens spaced exactly five feet apart. If the time and distance are known, the velocity is easily calculated or, in this instance, found from a list of tables. More modern chronographs have photoelectric screens and digital readouts in either feet or metres per second. But what's all this to do with valves or miniaturisation?

Well, in the days before my chronograph, there were valve chronographs that did exactly the same thing. With the valve unit, however, it was the size of a large suitcase and that did not include the battery pack which was housed in a smaller suitcase. As I said earlier, valves could do a lot of things in the field of electronics but they were nowhere near as power or space efficient as modern equipment. I might add that my chronograph has never been serviced and is still in working order.

For those who may be interested, a crystal oscillator in the chronograph operates at 400kHz, which translates to 2.5µs per cycle. The count for a humble little .22 long rifle bullet to pass through the timing screens is around 1550, which gives some indication of how fast the count rate is. It will accurately time velocities to Mach lV, which is well beyond the capabilities of any rifle bullet.




**This photo shows the author's vintage chronograph. This instrument has been specially designed to measure the time it takes a bullet to travel a given distance.**

The main reason for compiling all this information has been for the benefit of younger readers, who may have little or no idea of the various fields in which the old valve has been used. In addition to their use in radio and TV, including colour TV, valves found use in early computers, sonar, metal detectors, photoelectric devices, radar, long distance telephone communications, electronic organs and radio astronomy – the list is long indeed. Much of today's electronic wizardry saw its humble beginnings in cumbersome valve operated equipment. The transistor and the integrated circuit have only streamlined some of those old ideas.

Humans have short memories and some seem to think that all these modern electronic miracles have happened only in the past 20 years or so

## Miniature valve receivers

In my collection of valve radios, there are four receivers that deserve a mention in this story on miniaturisation because they are significantly smaller than the average set of their day. What is interesting is that some of these receivers used no specially made miniature parts but used standard size components instead. What's more, some also maintained the traditional 5-inch (125mm) loudspeaker that was almost an industry standard for 4-valve receivers and although these sets were relatively small, they still had a reasonable sound.

Sound quality is one of the characteristics that separate larger valve radios from their smaller transistorised brethren. Valve receivers typically have larger loudspeakers which gives them a decidedly better sound reproduction than transistor sets with much smaller loudspeakers. Play a small transistor radio through a large extension loudspeaker and it will sound a good deal better.

The two most common contenders for the title of smallest mantel valve radio would be the STC "Bantam" and the Philips "Philipsette", as I have heard it called. There is not much to choose from here and both receivers are well packed into their cabinets, with the STC being the most compact.

The little Philips receiver (shown in some of the accompanying photographs) was originally bought in 1947 and apart from still being in near perfect condition, came complete with

its original sales docket and guarantee card.

The Philips valve complement is: ECH35, EBF35, 6V6 and 6X5 rectifier. It is not hard to guess from that line-up that the little set is a superhet and, in this particular case, a very good one at that. I suspect that a reflex circuit gives it its performance. One odd aspect of this receiver is that the circuit does not incorporate AGC (automatic gain control) and special mention is made in the operating instructions about backing off the volume control to avoid "blaring" on the stronger local stations.

It might appear as though the little Philips set was made to a price which did not include AGC. It is more likely, however, that the use of a reflex circuit made the provision of AGC too difficult.

The tiny unbranded mantel receiver (see photograph) is considerably smaller than the Philips or STC models. It is a 3-valve radio with a bakelite cabinet and a 4-inch (100mm) speaker.

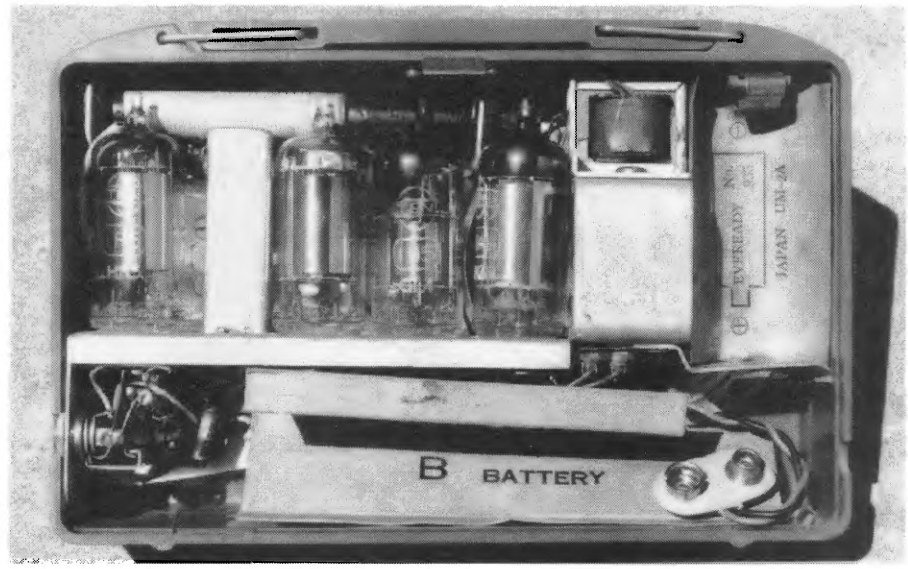
This Australian-made midget receiver sounds more like a small transistor radio than a valve radio because of the small speaker. It is a 3-valve TRF (tuned radio frequency) setup, using a 6CU8 (triode/pentode), a 6V6 output and a 6V4 rectifier. It has no AGC, no worthwhile performance, and is more a novelty than a practical radio receiver.

Powerful stations produce distorted sound which is not corrected when the volume is reduced. The only way this little receiver will handle strong stations is to use a very short aerial, which is no good for receiving distant stations. It seems fairly obvious that the volume control should be in the RF section as it was with TRFs of old and not immediately ahead of the output valve, as in this case.

The valve radio that really takes the miniaturisation honours is the little Japanese "Starlite". It really is no larger than a small transistor receiver even though it is a 4-valve unit. It is interesting to note that it is made under license to RCA of America. Externally, it looks just like a little transistor radio because it has the same direct drive dial, earphone jack, and general proportions that we have become accustomed to in small pocket radios.

A single C cell is used for an A supply and one of the previously mentioned 67.5V hearing aid batteries for the B supply. The C cell would need replacing at fairly regular intervals and may only last a few hours.

**The Japanese-made Starlight pocket portable was similar in appearance to later-model transistor radios. It featured a combined volume on/off control, a direct drive dial, a carry handle & an earphone socket.**




**The Starlight 4-valve superhet is neatly constructed so as to fit everything into a confined space. While a remarkable feat in its day, it is now quite obsolescent.**

As the back view of the Starlite shows, the receiver uses four miniature valves (1R5, 1T4, 1U4 and 3S4) in a superhet circuit. The little valve receiver works every bit as well as a transistor radio of comparable size, except that the latter is much more economical on batteries.

So, while many ultra-small valve radios have been made in the past, they were more of a novelty than anything else. Of the four receivers mentioned in this article, the only useful ones are the Philips Philipsette and the STC Bantam. These 4-valve superhets with their 5-inch speakers give excellent performance for their size. Perhaps the STC is the more noteworthy of the two, as it uses all large-scale components and it does have AGC. There is no waste space in this set.

When one compares the STC and Philips with the little TRF receiver, it seems incredible that a TRF circuit was considered as an alternative to a superhet. Price must have been the only consideration.

As for the Starlite, its compactness places it in a special category of its own. But how outdated it is today in the light of modern technology. **SC**