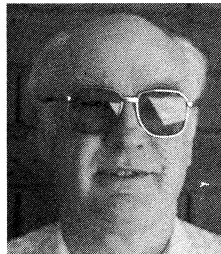


VINTAGE RADIO

By RODNEY CHAMPNESS, VK3UG



The Hellier Award, Pt 3: Simple Superhets

This month, we take a close look at the three winning sets in the Hellier Award and describe the technical details. The sets are all simple superhets using a converter, a regenerative IF on 455kHz and one stage of audio feeding a loudspeaker.

The size of the three winning sets varied considerably, from a small brick-sized set to a very large mantle set. They were built by Gary Newton, Des Nunan and Harvey Utber and all three sets worked very well indeed. Of the three, the mid-sized set built by Des would probably be the easiest for anyone wanting to build a near copy.

The little brick

Gary's brick-sized set is compact and utilitarian in concept, which aided construction, operation and service. Because it is small, it took a great deal

of planning to get everything into the case while ensuring that inputs and outputs were kept apart.

The set has "hand-span" tuning with a knob fitted directly onto the tuning gang shaft. This made tuning a little more exacting compared to the other two sets but it wasn't really a problem.

By the way, the overall IF (intermediate frequency) skirt selectivity of all three sets isn't as good as that from a conventional superhet with four tuned IF coils (ie, two IF transformers). This meant that when tuned to a weak sta-

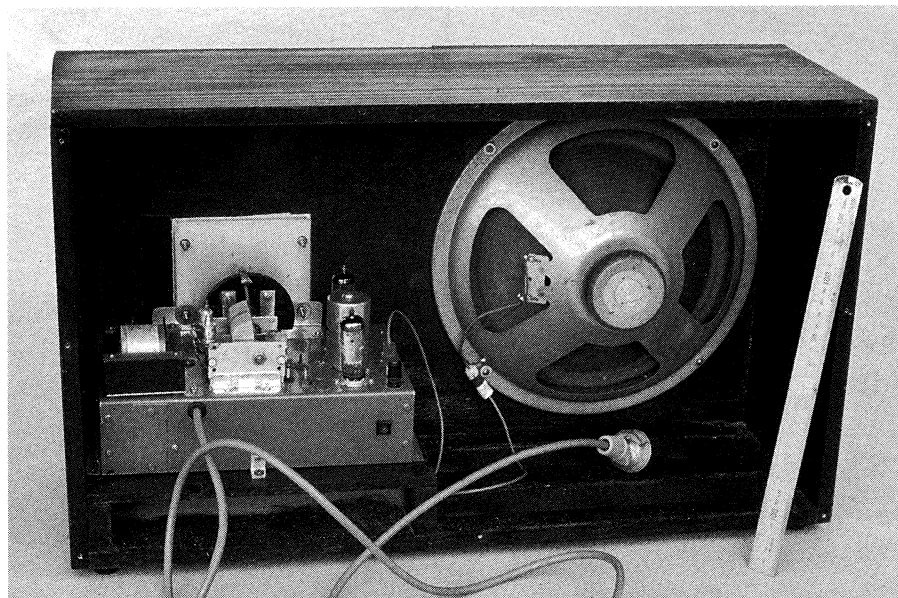
tion, a strong station on a nearby frequency could be heard behind the wanted station. That said, the overall performance of all three sets was very good, considering their simplicity.

The circuits of the three radios were all very similar so only one generic circuit diagram is included with this article – see Fig.1. Gary used a 6AN7 converter which was fed from a loopstick antenna, as well as being connected to an external antenna/aerial. The twin tuning gang was a padderless type which means that the two sections have different capacitances and so no padder capacitor is required.

A 6AB8 triode pentode was used for the regenerative IF and audio stages. The 6AB8 is not commonly used, having a triode with a gain of around 11 and an output pentode similar to half a 6AQ5 (it requires similar voltages but draws less than half the current). The cathode is common to both sections which makes the circuitry a little more complex to obtain correct biasing.

All sets required a modified IF transformer and this involved adding a feedback winding. The reaction was controlled with a series trimmer capacitor, with another parallel capacitor across the trimmer to make adjustment easier in the conventional Reintartz circuit. It's interesting to note that all the simple superhets used this system although there are a number of other methods for achieving regeneration that work well too.

As mentioned previously, almost all the contestants who built the simple superhet receivers had trouble getting the regeneration working to their satisfaction. This problem was solved by jumble-winding the feedback winding close to the grid winding of the IF transformer as shown in Fig.2. In prac-



This is the view inside the giant's mantle set, made by Harvey Utber. This set is large for a 2-valve receiver and its performance matches its size.

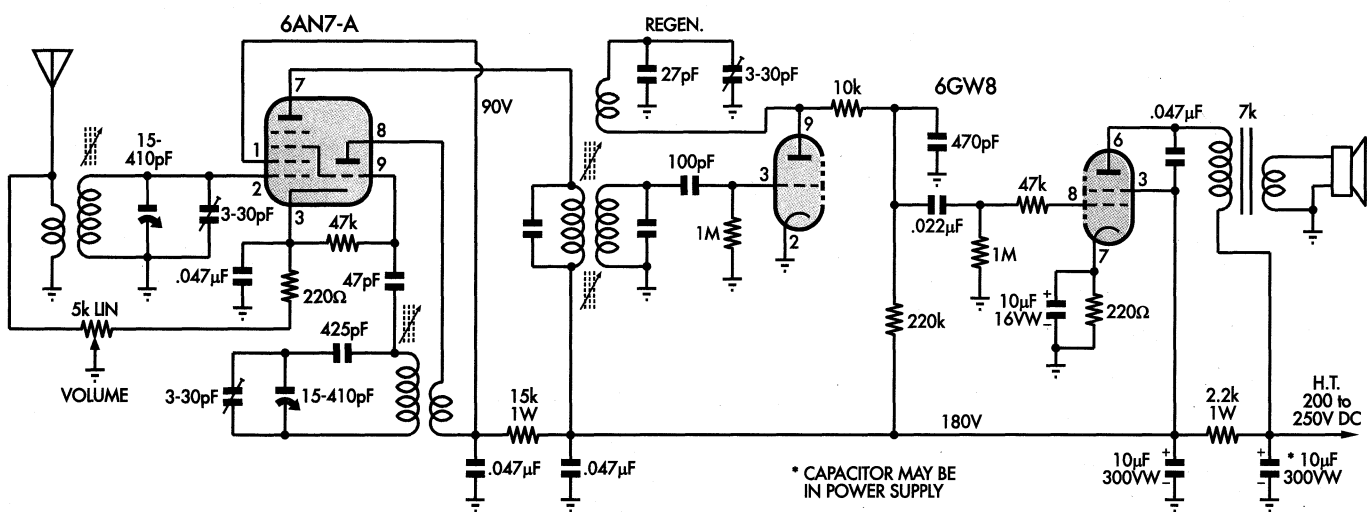


Fig.1: a typical simple superhet radio receiver circuit. All three sets described here used this general scheme.

tice, this feedback winding consisted of 100-150 turns of about 37B&S (0.125mm) enamelled copper wire.

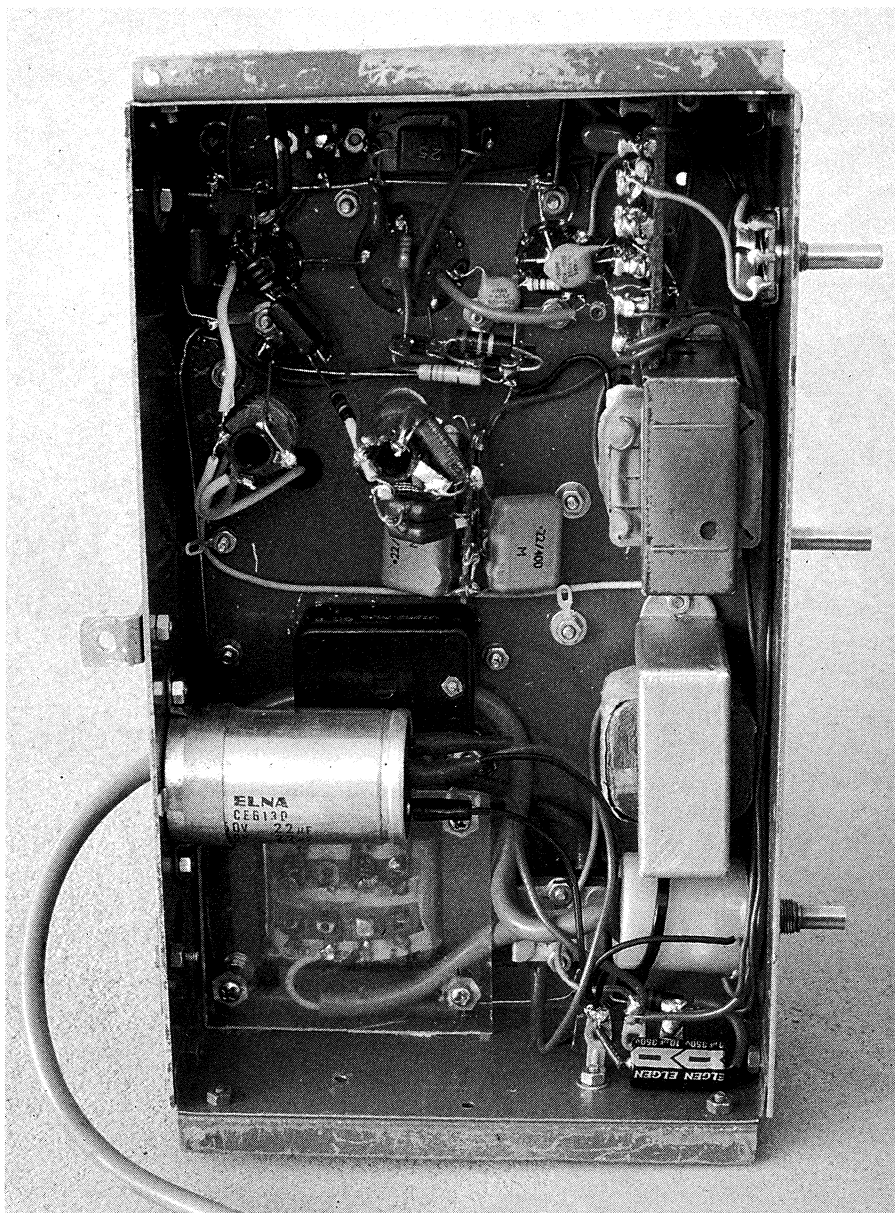
The audio output stage of Gary's set is conventional and uses the pentode section of the 6AB8. Although slightly lacking in performance compared to 6BM8, 6GW8 and 6GV8 output stages, this is hardly noticed and the heater drain is only 0.3A. The plate impedance is quite high, varying between about 10kΩ and 17.5kΩ, depending on the supply voltage. It's not easy to find speaker transformers with a primary impedance in this range but using a 7kΩ:3.5Ω transformer into an 8Ω loudspeaker will give a reflected impedance for the valve plate circuit of (nominally) 16kΩ.

The bass response of the transformer may not be wonderful but a small set like this with a small loudspeaker doesn't have a good bass response anyway.

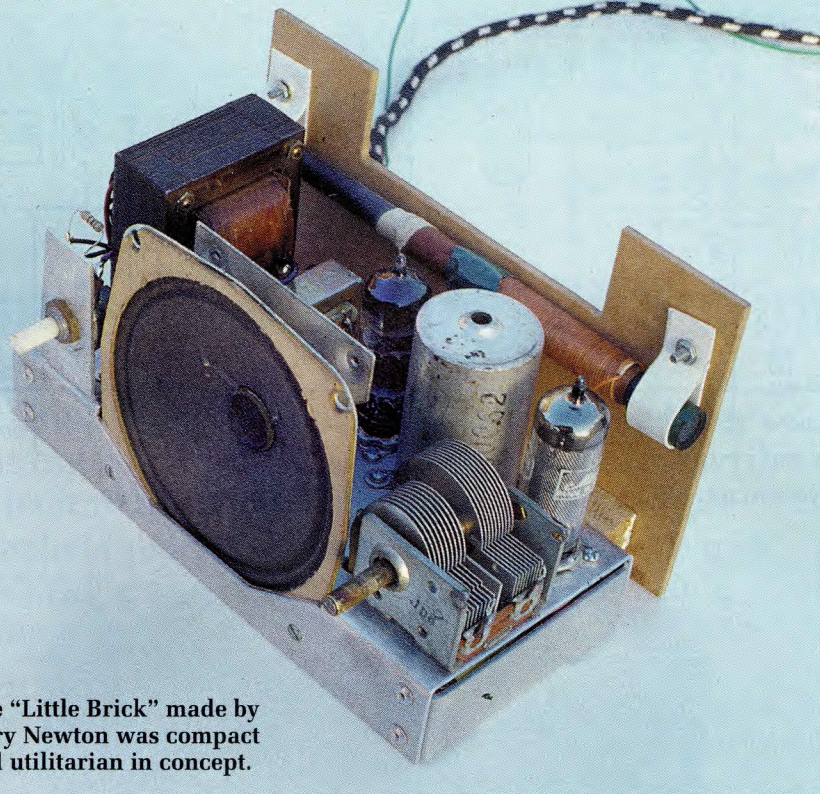
The set is quite a reasonable performer but Gary realised during discussion after the judging that there were a few things that could be altered around the aerial circuitry to improve its performance. These modifications will, I believe, make Gary's set a very good performer.

The 1940s wooden mantle set

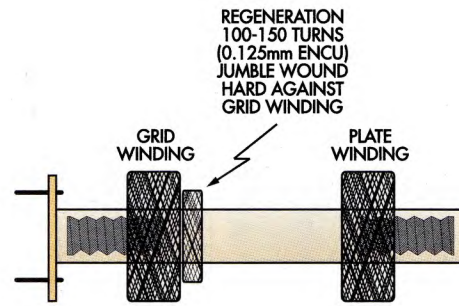
Des stuck to a more conventional layout from the 1940s and achieved a set that is impressive in both looks and performance. To dismantle the set, it is necessary only to remove the knobs and two screws under the bottom of the cabinet and slide the chassis out – simple but effective. The converter is again the ubiquitous



This "under-the-hood" view of the giant's mantle set reveals a well-laid out chassis, with all parts readily accessible.



The "Little Brick" made by Gary Newton was compact and utilitarian in concept.



MODIFIED 455kHz IF TRANSFORMER

Fig.2: this diagram shows how the IF transformer in each set was modified by adding a feedback winding close to the grid winding.

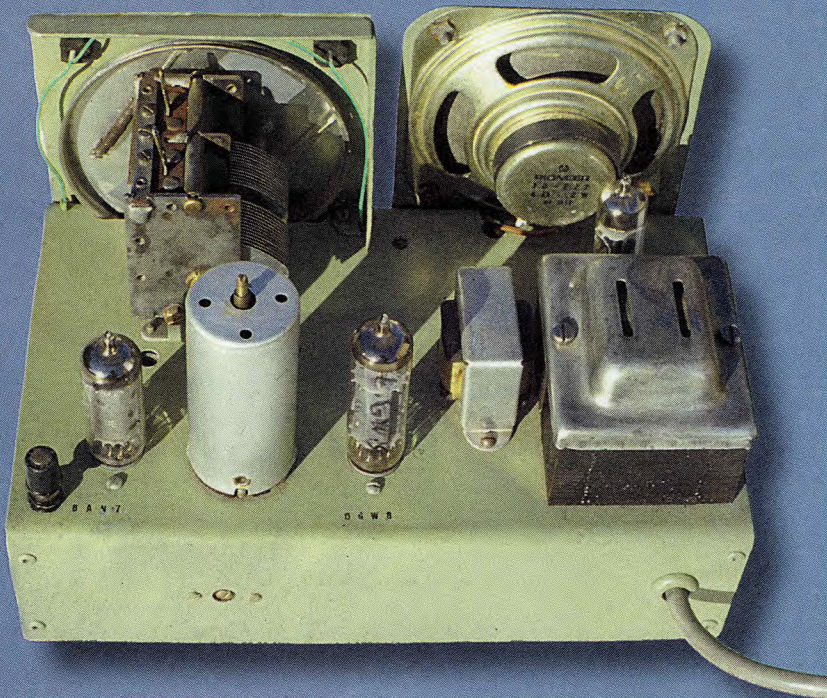
The triode is used as a regenerative IF stage with the pentode once again the audio output. The IF stage is similar to Gary's, the main difference involving the use of an old HMV screw adjustment beehive type trimmer as the regeneration control. This is extremely smooth – in fact, I don't think I've seen such a smooth regeneration control before but this is probably unimportant as it is a "set and forget" control. However, due to variations in mains voltages, it did initially break into oscillation at times and had to be backed off a little to ensure reliable operation under all circumstances.

Unlike Gary, Des used a conventional cord-drive dial system which works well. The layout of the chassis is quite conventional and the wiring is very open and easy to work on (see photo). By the way, this is the only set to use a 6X4 as the rectifier – the other two sets used solid-state diodes in the power supplies.

The giant's mantle set

Harvey had a 12-inch speaker going begging so he decided to build his 2-valve receiver around it. This set is large but its performance matches its physical size and it can easily receive most Melbourne stations in Mooroopna some 150km away during daylight hours. Indeed, the volume and quality of the sound from the 12-inch speaker was quite impressive. Who said that regenerative detectors have too much distortion for normal use?

Harvey's receiver uses a 6AN7(A) and 6GW8 in a similar circuit to the other two sets. In this set, however, there is extensive decoupling of the high tension (HT) supply. In addition,



This 1940s-style mantle set was made by Des Nunan and has a conventional layout. It uses a 6X4 rectifier valve, a 6AN7(A) for the converter and a 6GW8 triode/pentode output stage. A feature of the set is its very smooth regeneration control.

6AN7(A) which is fed from a conventional aerial coil attached to an outside aerial. The second valve is a 6GW8

which is a triode-pentode originally intended for audio use in hifi amplifiers and TV audio stages.

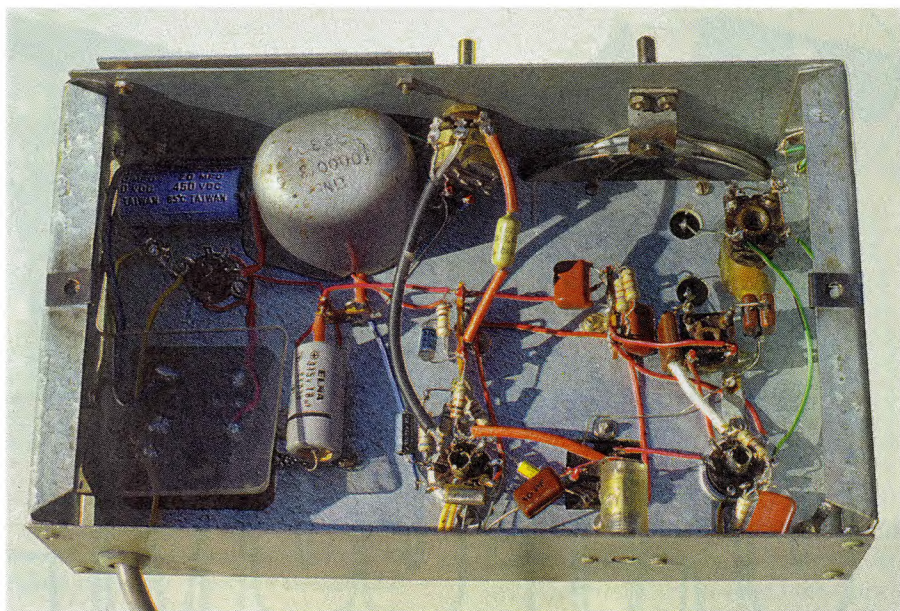
Harvey played around with the operating conditions of the converter to get the best conversion efficiency. The performance of the radio frequency (RF) section of a set depends on the operating conditions of the valves and the quality and matching of the wound RF components (coils and transformers). In my opinion, Harvey got everything just right and the performance certainly is impressive for such a simple set.

By the way, most of the simple superhets used a resistor in series with a potentiometer in the cathode circuit of the converter to control the volume – see Fig.1. This was used as it would be easy to overload the detector near strong stations due to the fact that no automatic gain control (AGC) was generated in these sets.

This meant that the volume control had to be “ridden” when tuning across the band from one station to another. However, this isn’t particularly difficult and in any case, most people usually listen to one favourite station most of the time.

The inductance-tuned set

As mentioned last month, one of



All parts are readily accessible in the 1940s mantle set and the layout is easy to work on. The conventional cord-drive dial system works well.

the other simple superhets (the one in the ice-cream container) used inductance tuning and this worked quite well. The inductance tuning system was originally designed for a Philips set from the early 60s. Apart from this, the circuitry was similar to the

other three sets describe here and used 6AN7(A) and 6GW8 valves.

Hopefully, this series will have whetted your appetite to build your own valve receiver, just for the fun of it. We’ll move onto another topic next month.