Vintage Radio

By Leith Tebbit

A rare 1929 AWA C54 Radiola set rescued from oblivion

Some vintage radios are in such a dilapidated state when discovered that you wonder why anyone would even attempt to restore them. Such was the case with this rare AWA C54 – its cabinet was badly water-damaged and the chassis was dirty, dusty and rusting.

RADIOS FROM THE 1920s, such as the AWA C54, are now hard to find, with occasional exciting exceptions making collecting worthwhile. This particular discovery was made back in May 2012 during a trip from Queensland to Nowra in NSW. We were passing through a little village called Wingen on the New England Highway (near Scone) and decided to visit an excellent secondhand and antique business.

When I visit such places, I always ask "do you have any old radios that aren't in good condition or are not operating, in particular vintage valve radios?" In this case, the proprietor declared "yes, out in the back shed".

It's hard to describe the condition of the decrepit old AWA C54 console we found there. It was extremely dusty and dirty and on first sight, it was a "no-go zone". The console originally came from the Tamworth district before spending the last six years in its present location.

On closer inspection, it was obvious it wouldn't be just a clean, dust and repair project, as there was considerable damage to the cabinet itself. The chassis components were all there though, which was encouraging, although the corroded metalwork, and especially the tuning capacitors, would be a challenge. The asking price was $200 which I thought was very reasonable considering that I've seen several TRF chassis alone (ie, without a cabinet) sell for well over that figure.

Despite the dilapidated condition of the cabinet, it was well within my capabilities, as I'm a woodworking enthusiast. Restoring it to its former glory would be a monumental task but once finished, it would make a very nice addition to my collection.

On the plus side, the front speaker grille, dial-scale and controls were all in reasonable condition due to the fact that the console's bat-wing doors had been closed during storage. But that's where the good news ended. Pieces were missing from the turned cabinet legs due to the animal-based glue crystallising, while the lower battery compartment had been severely damaged following leakage from the lead-acid "A" filament supply battery. In addition, some parts were missing from the battery compartment.

The accompanying photos of the radio chassis and upper battery storage compartment show the condition they were in – and that's after the removal of a hornets' nest that occupied much of the inside of the cabinet. Surprisingly, there was no sign of spiders or other

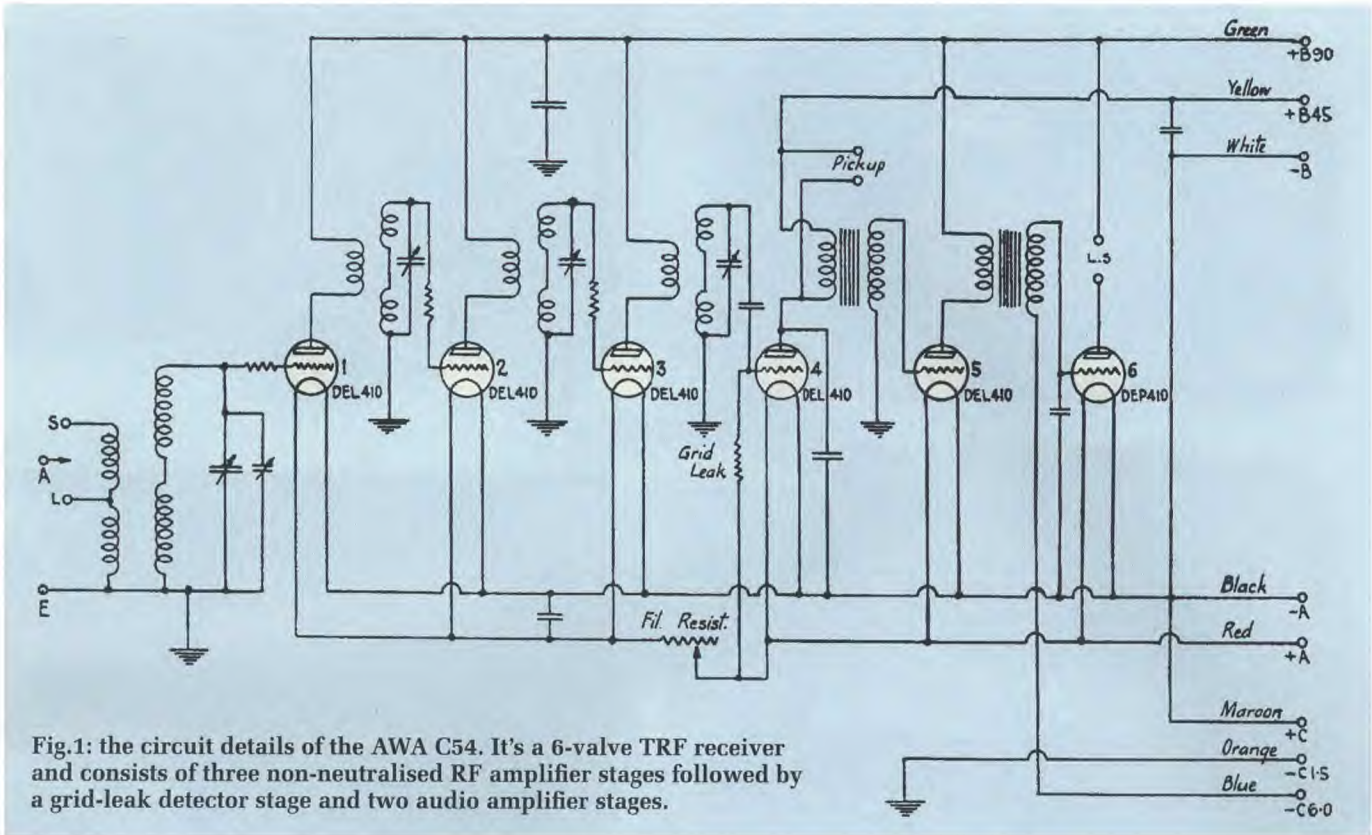


Fig.1: the circuit details of the AWA C54. It's a 6-valve TRF receiver and consists of three non-neutralised RF amplifier stages followed by a grid-leak detector stage and two audio amplifier stages.

pests that are normally found inside a cabinet of this age. Perhaps the hornets had kept them at bay!

Circuit details

Fig.1 shows the circuit details of the C54. It's a 6-valve TRF receiver and is similar to the 1928 C50 model, except that "losser" (or stopper) resistors are used whereas in the C50, the RF stages were neutralised using capacitors. A likely reason for this is that AWA was unwilling to pay the necessary licence fee to Hazeltine to use their neutralisation patent.

In addition, the C54 receiver was a very different mechanical design to the C50. It bore a striking resemblance to the Atwater Kent model 33, with its L-shaped metal chassis, binocular coils and losser resistors in the RF grid circuits, among other things. The Atwater Kent 33 came out in 1927 and must have inspired AWA's designers during 1928.

In summary, stages 1-3 are non-neutralised RF amplifier stages with series resistors between the tuned circuit and the grid of each valve to ensure stability. This, combined with a fairly small number of turns on the primary of each coupling transformer, resulted in adequate gain without instability.

The 84-year-old AWA C54 was obtained by the author in very poor condition, with a badly water-damaged cabinet and a dirty, rusting chassis. Restoring it to full working condition was a monumental task.

The "binocular" coils limited their external field and allowed them to be used without any screening between the RF stages. This differed from the C50 which was also known as the "screened six" because each RF stage was mounted in its own screened compartment.

Stage 4 is a grid-leak detector with no regeneration, while stage 5 is the first audio stage. This is then followed by the audio output stage (stage 6).

These four photos illustrate the damage to the loudspeaker (top, left), the chassis and the cabinet of the old C54 radio. Many of the cabinet sections had to be remade.

It's interesting to note that the chassis is connected to the -1.5V tap of the bias (C) battery, resulting in the negative side of the filament (A) battery being 1.5V above the chassis. This was done so that the three RF stages could be biased with the bottom ends of their coils and tuning capacitors grounded directly to the chassis.

The rheostat in the filament supply to the RF stages serves as the volume control, a popular method in the 1920s. This simple scheme generally worked well with valves with thoriated filaments such as the 01A and 99 but was not very satisfactory with oxide-coated valves as used in this set.

Basically, it worked OK but it shortened the life of the valves by poisoning the emitting material. Oxide-coated cathodes did not like operating in saturated mode, particularly with the relatively high plate voltage used in this set.

The pick-up connection to the primary of the first audio transformer was fairly standard and the small amount of current running through the pick-up coil (which had 45V on it) didn't seem to affect the operation.

The author's home-made copy wood lathe came in handy when it came to making new sections for the turned legs that are fitted to the cabinet.

Restoration

I started the restoration by lightly dusting the chassis and cabinet using a soft brush and a low-pressure compressed-air nozzle. A brush gives much better control and has less chance of damaging components than heavy-handed cleaning using a cloth.

That done, I removed the set's TRF (tuned radio frequency) chassis and a quick inspection revealed severely corroded metalwork, plus oxidised brass and copper components. By now, it was obvious that a considerable

These two views show the fully-restored chassis of the AWA C54 Radiola. The metalwork, including the four tuning capacitors, had to be dismantled and bead-blasted to get everything looking like new again.

amount of work would be required to restore the chassis. The good news was that all the components appeared to be in their original condition and in position.

As previously indicated, the cabinet was in poor condition and there was no choice but to completely disassemble it in order to restore the severely water-damaged veneer panels and to replace missing parts. But that was easier said than done, as pulling it apart without inflicting further damage took considerable effort and patience.

Each section had to be slowly wriggled apart until there was a sufficient gap to use a fine metal saw to cut the original nails and wooden dowels. Basically, it was better to sacrifice the dowels rather than damage other parts during the cabinet disassembly. Fortunately, some sections came apart easily due to the original glue breaking down.

As well as using a small hacksaw blade, I also used a very fine metal-cutting oscillating blade fitted to an electric multi-tool to cut the dowels and nails, while a rubber mallet also came in handy to gently "persuade" the sections to separate. Naturally, any missing or damaged pieces would have to be re-manufactured.

Surprisingly, the solid timber parts were in reasonable condition, with no severe chips or bruising, leaving only minor dents to be filled. However, the weathered and aged ply veneered panels were nowhere near as simple to repair.

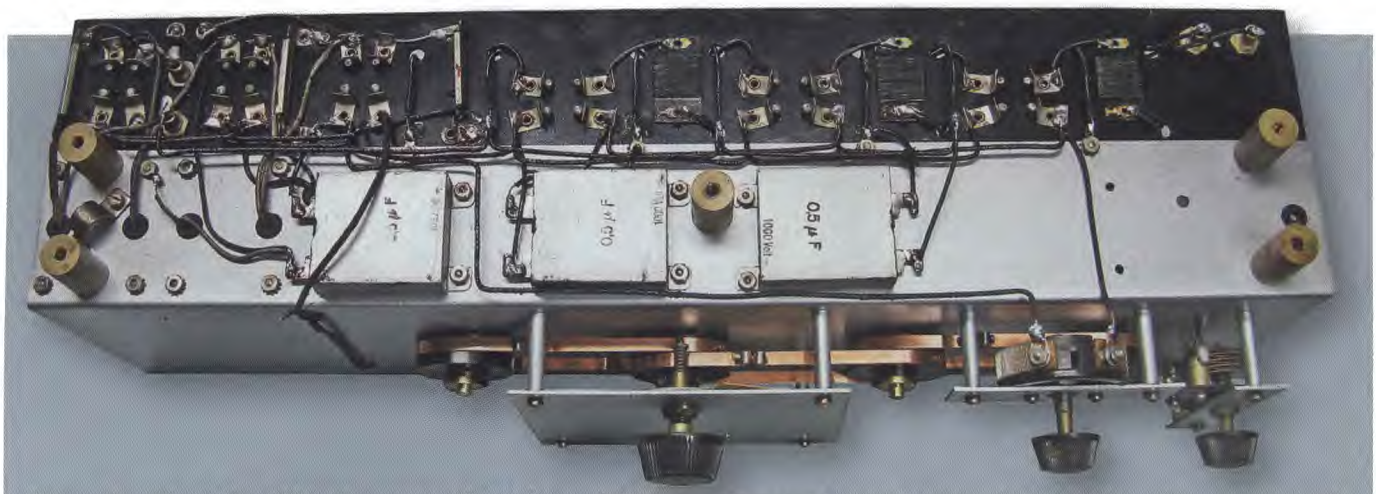
Water damage to the front of the bat-wing doors and the radio compartment lid meant that major restoration work was required on these parts. The lid had missing veneer and had separated from the ply panel in quite a few places as well. Fortunately, the two side panels of the cabinet were in reasonable condition and only required routine sanding and filling of small imperfections.

Once the cabinet had been completely dismantled and these repairs completed, there was no turning back. The legs had been damaged, so new sections were manufactured, using a copy wood lathe I made several years ago. This lathe not only made it much easier to make the parts but also enabled them to be virtually exact.

The upper sections of the turned legs were fabricated from four separate pieces, each glued to a central leg component. This made it possible to turn such a large section without using a single piece of solid timber, thereby conserving material.

Melunak timber was used to remanufacture the missing or damaged components. It's the first time I'd used it and it's very much like teak, with a very similar grain (it's hard to detect the difference, in fact). It machines cleanly without any tearing of the grain, after which it's possible to give the timber a light sanding and apply sanding sealer directly. Most of the new parts were given two or three coats of sanding sealer and I sanded back with 320 grain dry paper between coats.

The lid of the cabinet had to be com-



The underside of the C54's chassis is relatively uncluttered, with point-to-point wiring between the valve sockets, coils and other parts. Note the copper bands used to couple the dial-drive pulleys.

pletely re-manufactured. First, a timber frame was fabricated using a router, then reassembled using the more modern biscuit-jointing method. This then became the base onto which the veneer panels were glued, with the frame edge around the panel enabling better machining, rather than trying to machine across the ply panel's grain when finishing off the edge.

Using biscuit-jointing, rather than the nails and staples used in the original assembly, makes it easier to align the parts while re-gluing. Also, you can test-assemble the various parts prior to the final gluing process, to ensure no imperfections have been missed during restoration.

That done, the lower battery compartment was also completely re-manufactured, since there appeared to be no other alternative. The restored cabinet parts were then finished with Nitrocellulose HY-Tech 70% Matt Sheen Pre-Catalysed Lacquer. This involved applying three coats with sanding between coats using 400 grit dry paper.

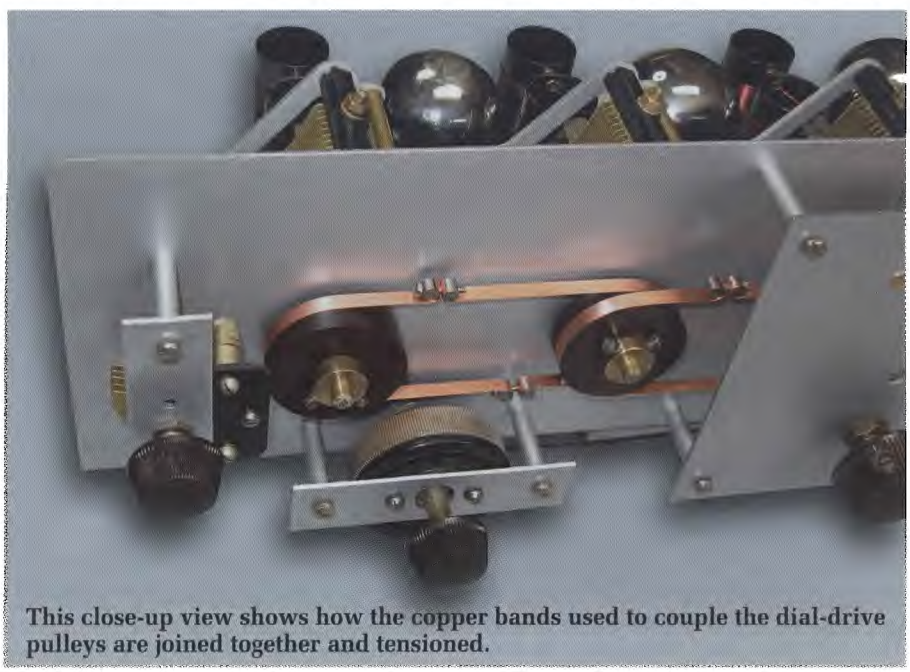
In 1929, AWA assembled the cabinet prior to applying the finishing coats. In my case, the finishing coats were completed prior to the final assembly. As a bonus, biscuit joints don't have nail-holes or staples that need filling. However, it was necessary to thoroughly remove any excess glue immediately after clamping the components tightly together, to ensure a near-perfect joint.

Restoring the chassis

Because of its poor state, I began the chassis restoration by first taking a series of photos before removing all the parts. I then glass-bead blasted all the metalwork, including the tuning capacitors and the speaker components. Surprisingly, the speaker had no obvious damage whatsoever to the cone! There was not one hole to be seen, which is quite incredible considering the age of radio, although the back protection cloth was almost non-existent.

The balanced magnetic speaker arm was also disassembled in order to glass-bead blast the iron surfaces and coils. It's worth noting that the text stamped into the coil former was still intact after this process, indicating just how "gentle" glass-bead blasting can be at low pressures. Basically, it removes the rust and dirt while leaving delicate text and markings. It's a slow process but well worth doing in cases like this.

Following this bead-blasting process, a fine film of Penetrol oil was applied to the metal chassis, tuning condensers and the surfaces of all Bakelite components.



This close-up view shows how the copper bands used to couple the dial-drive pulleys are joined together and tensioned.

Open-circuit inductor

Having cleaned the chassis, I began making a few continuity checks on the major parts and discovered that the inductor in the LC network on the side of the speaker housing was open circuit. As a result, I carefully melted the black pitch from the container using a hot-air gun to reveal the components. This revealed that the internal solder connections to the terminals were open circuit, so it turned out to be an easy repair.

Fortunately, the audio-coupling and

output transformers were all intact and in good working order. They only needed repainting to restore their appearance.

Other repairs included replacing the valves in the first TRF and audio output stages. The 800Ω series grid resistor in the second TRF stage also required attention, since it had gone open circuit. This resistor is wound on a Bakelite former, so it was possible to unwind part of the resistance wire and re-solder the faulty joint.

No capacitors had to be replaced, as they all tested and performed perfectly. The set is battery-operated, so there were no electrolytic capacitors to cause problems. Even so, the fact that the other capacitors were all OK is amazing considering that the set was manufactured in 1929!

Despite the pure simplicity of the chassis, this was one of the most involved chassis restoration projects I've ever attempted. That's basically because all the parts had to be removed prior to cleaning the chassis. Every wire and connection had to be de-soldered and each connection then cleaned and/or glass-bead blasted.

Each wire was then cleaned and re-soldered back in place using the photos taken earlier as a reference. Fortunately, no rubber-covered wires were used, except for the DC battery harness, so the original wiring was largely retained.

Aligning the tuning capacitors

The four variable tuning capacitors were aligned by first setting the dial indicator to "0" and all the gangs to their fully open position with their set-screws tightened. I then tuned through their range to find a weak local station, before individually loosening the set-screw for each tuning gang in turn and rotating its shaft back and forth to peak the received signal.

This alignment procedure was carried out by working backwards from the output end of the receiver towards the front-end stages.

Once completed, this process was repeated, again by first tuning into a weak station. There appears to be no difference between tuning from the antenna RF stages to the final stages or in the opposite direction as described above. However, starting from the final stage and working towards the front is usually the way most radios are tuned. TRF receivers with coil-coupling adjustments are generally much more complicated to tune but in this AWA C54 set, the coils cannot be adjusted.

A major part of the restoration involved rebuilding the cabinet. This view shows the various pieces, many of them completely re-made, before the final assembly.

Copper bands are used as belts to couple the drive pulleys. Each pulley has a hole in its centre for a location pin, thereby eliminating any slippage once the belt is tightened by small cylindrical clamps.

When I first reassembled the tuning capacitors, I didn't realise that the unit in the first TRF stage used a different stator to compensate for the antenna circuit. As a result, it wound up in the wrong place which meant that I was initially unable to get the TRF stages to track properly across the entire RF band.

When I eventually corrected this error, the receiver performed extremely well right across the band using just a short antenna. In fact, the old TRF set picks up 12 stations without any drift or fading – an outstanding result considering we are dominated by a very high-power ABC transmitter only 2km from our location in Dalby, Queensland.

Once the chassis restoration had been completed, the receiver was fitted into the top compartment of the cabinet. The finished cabinet really looks the part and the veneer on the inside of the lift-up lid is joined in the middle for a mirror pattern-match, producing a diamond shape pattern on both the top and bottom. The hinges, handles and latches were also all fully restored.

The battery compartment now has an illustration only of the dry battery pack that was originally used. Batteries are no longer used to power this set. Instead, power is now supplied from a custom-built mains power supply.

The result

The accompanying photos show the finished result. This is the first TRF receiver I've restored and I can only imagine the pride its original owner must have had for the set – the more so given its performance and ease of operation due to the coupled tuning capacitors which were all controlled by a single knob. The quality of the audio from the efficient moving-iron speaker is also very good and it's all built into a very elegant cabinet.

I never expected this restoration project would end up in Melbourne at the 30th Anniversary of the Historical Radio Society of Australia (HRSA) in September 2012. When three members of the HRSA encouraged me to enter it for the Ray Kelly award, I only had two weeks left to complete the project, build a multi-voltage power supply and travel to Melbourne. The set won the Ray Kelly "best in show" award, so the effort was well worthwhile.

Acknowledgement: photographs and text edited by Kevin Poulter; circuit description by Mike Osborne. **SC**