Vintage Radio

By Associate Professor Graham Parslow

Restoring a pile of hydrated ferric oxide

This was once HMV's C13C 5-valve mantel radio

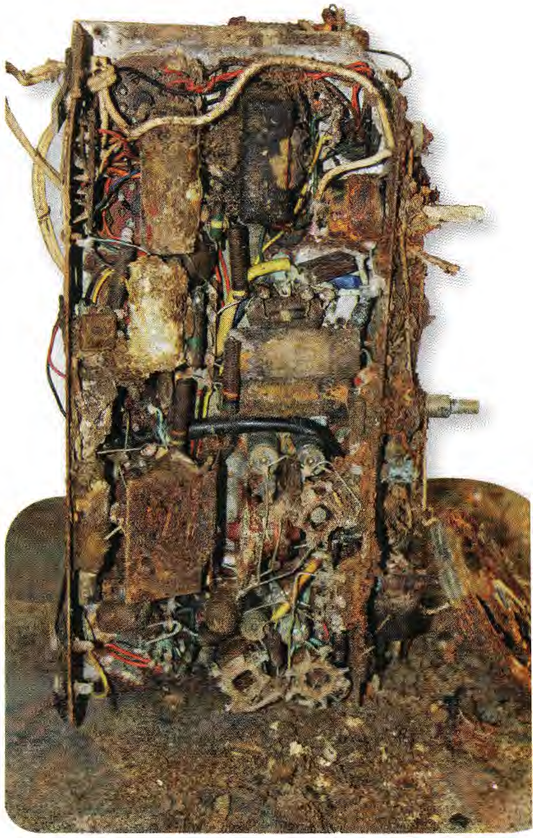
Why would you want to restore an "unrestorable" radio when you already have a number of similar radios by the same manufacturer and with the same valve line-up? It all comes down to the cabinet. There were so many cabinet styles and colours and some are more interesting than others. And of course, there was the challenge...

The most memorable aspect of this radio was how I came to acquire it. It was on a seller's table at an Historical Radio Society of Australia (HRSA) meeting in Melbourne.

It was late in the day as I passed a table manned by HRSA vice president Mike Osborne. With considerable good humour, Mike solicited me to purchase this radio.

He suggested that I should acquire it as a challenge to my reputation as patron saint of lost-cause radios. As an aside, Saint Jude the apostle is held to be the patron saint of other lost causes.

This radio was so far lost and degraded that the old song "get out of here with that boom-de-boom and take it down below" came to mind. As Mike persisted, the asking price came down until in desperation I was offered $2



You can see above that this shattered Bakelite cabinet looks almost beyond repair, but it hides a chassis that has decayed to the point that it can never be restored.

While shown at right is the underside view of the chassis, with various components having been shed over time.

to take it away. I accepted. True to his word, Mike handed over $2 but I declined and paid him $2 for his hard work in selling the radio.

It looked like a pile of rubbish and it was. The cabinet was badly fractured and that was only the start. And while I had paid the princely sum of $2 for ten minutes of banter with Mike Osborne, I was really just saving him the trouble of carting it home and putting it in the bin. I was certainly not motivated to restore it.

I thought it looked liked a generic no-brand type that various chain stores marketed under brands of convenience, at the time. However, the fluted side moulding on the cabinet did give a stylistic clue that it might be a HMV model.

Just as a matter of curiosity, I sent an email to several HRSA members who might be able to recognise it and sure enough, Jim Eason (HRSA treasurer) came back with the correct identity. Fortunately, a good example of the C13C was shown online in Ernst Erb's Radiomuseum in Switzerland (www.radiomuseum.org).

The radio stayed in the box that I had brought it home in for quite some time before I ventured to have another look at it. Once it was out of the chassis, it was clear that I had purchased a badly deteriorated Bakelite cabinet containing a kilogram or so of hydrated ferric oxide and other debris!

And the reason the ferric oxide was hydrated was that the radio had evidently been partly submerged in water for some years. The water had destroyed every component under the chassis except for some coils and resistors; hardly a good starting point for an electrical restoration.

So the chassis was definitely not a prospect for full restoration and that is an understatement. I have numerous working radios of this general type so I knew what it would sound like. I do have other radios which are far more deserving of full restoration. But perhaps this was a case for a display-only restoration...

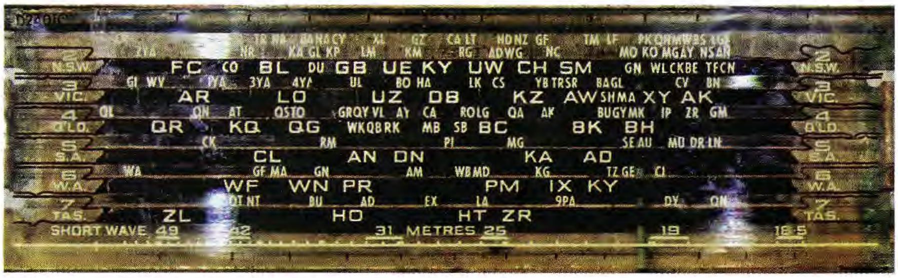
But there is a compelling temptation among most radio collectors (myself included) to take a peek at the back of a radio, to see the valves and general layout.

Because of the information on the Radiomuseum website, perhaps I would be able to reproduce labels and add components, to give a cursory simulation of a working radio.

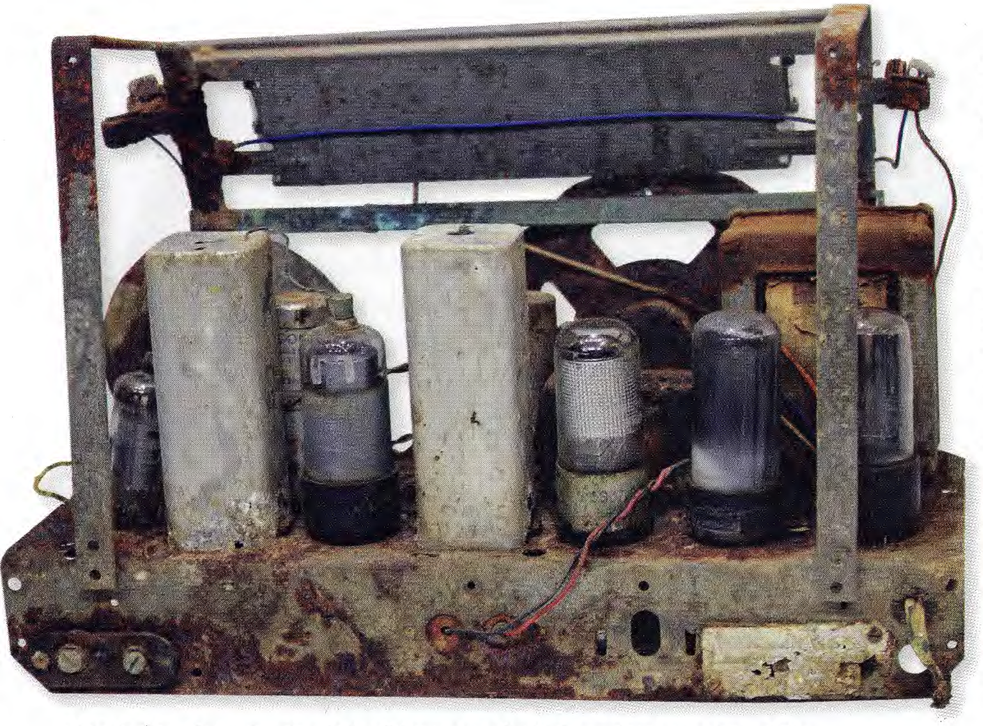
After all, the human eye is easily deceived. We frequently perceive an object as simply another example of something familiar. We fill in details that are not there and we can easily miss anomalies. Film makers and magicians are well aware of this.

In James Cameron's 1997 film Titanic one scene is taken on a deck of the majestic ship but if you freeze the frame and look to the far left, you can see where the mock-up ends and the studio begins.

Few people ever noticed that mis-



The screen-printed glass dial was virtually the only component that survived years of immersion in water. Maybe the mud preserved it.



This is the chassis after it had been washed. Note the remains of the loudspeaker and the exposed windings of the transformer.

take or any of the other numerous visual errors in that film (check them out at https://youtu.be/8-JXpxr0fzg).

And this radio will certainly never pass close scrutiny. I must admit to having serious doubts about whether I could even justify the work required to make it worthwhile as a display-only set when I took it out of the cabinet, as the chassis lay on my bench dropping rust and other miscellaneous detritus. There was virtually nothing that was recognisable on the underside.

The top of the chassis was similarly discouraging. The tuning capacitor had evidently completely dissolved and just a rusty rim was left of the 5-inch Rola speaker.

This shows the chassis after it has been painted, labels added and the loudspeaker replaced. Note the gaffer tape around the base of the first IF transformer, hiding a large hole. It's still a pile of garbage.

But apart from that, most of the components were still there, even though none of them would ever operate again!

As a start, the bare case was thoroughly washed and the lettering "HIS MASTER'S VOICE" emerged from underneath the encrustation of mud. The case had some serious fracturing but fortunately, a large fragment of the missing top section was present as a separate piece. So it was not beyond redemption.

The next step was to cut an aluminium sheet to span the gap, large enough to overlap so that it could be clamped and glued in place with Araldite from below.

This corrected the distortion of the case and provided a base for gluing the large fragment. Then 2-part car body filler was applied to achieve a good surface for sanding back.

This was followed with an undercoat, then a spray with Motortech-brand "Indian Red" paint. The result was similar to the appearance of the original Bakelite case and certainly a miraculous improvement over the initial condition. Some yellow speaker grille cloth and knobs completed the external restoration.

Painting over the defects

The rust-encrusted steel chassis was cleaned up as well as possible but not too vigorously because it was tissue thin in many places. A coating of silver paint (water-based acrylic enamel) restored the appearance of the chassis. A little paint hides a lot defects; well, more or less.

And even though the radio would never be operational, a replacement 5-inch Rola speaker was essential to keeping up appearances.

The original phenolic panel for the aerial and earth connections simply crumbled away due to the adverse effects of water immersion, so I fitted a new set of terminals.

A glance at the photos of the chassis before and after this will reveal the full extent of this superficial restoration to a "static model". Notice the exposed windings of the primary transformer after it had been hosed off.

Perhaps the most remarkable aspect of this story was the screen-printed dial. Once the caked-on mud had been carefully cleaned off, all the station markings were there in their original condition.

Apart from rising to the challenge of restoring this model as a rough-and-ready static model and thereby attempting to maintain my reputation as the patron saint of restorers, er, lost causes, what is the particular interest of this HMV 5-valve superhet radio?

The model C13C is quite similar to mantel radios offered by other manufacturers at the time.

Released in 1951, it has its legacy in the 1940s, both electronically and by way of styling. As an end-of-era example, it merits a place in the history of Australian radio.

Only one IF stage

There are two noteworthy aspects of the circuit shown in Fig.1. First, there is only one IF amplification stage and the tone control is not the usual continuously-variable top-cut type but is a 3-position switch, with "Bass" and "Speech" settings.

On the left-hand side, we see a conventional aerial coil in two sections and a 3-pole switch (S1) provides the

This shows the tarted-up chassis back in the newly painted cabinet. The tuning capacitor for this radio was not replaced as the area where it would sit is still heavily corroded. The 6V6 tetrode output valve (far right) was coloured black using a marker pen to hide the fact that it was gassy.

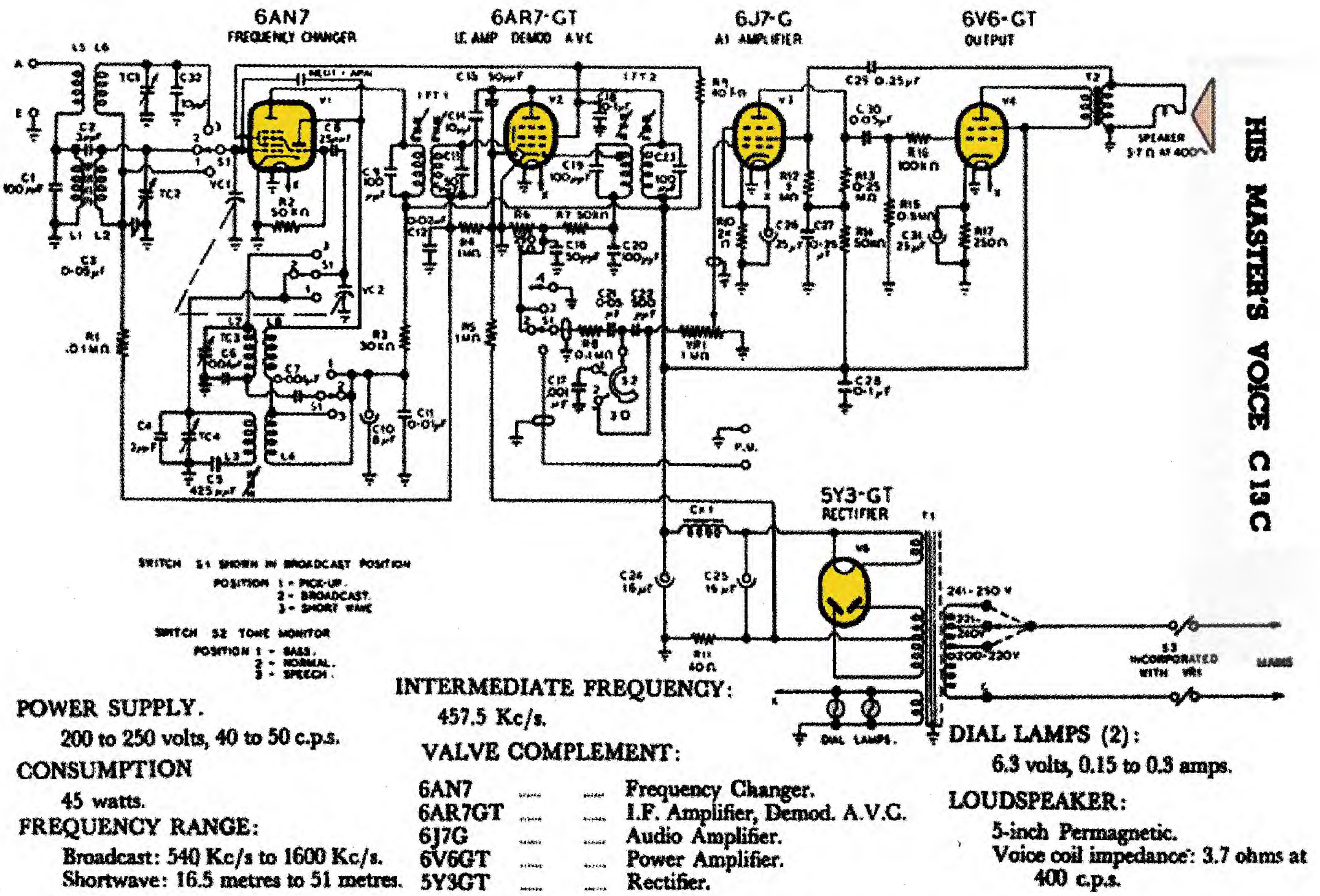


Fig.1: the circuit is quite conventional except that it does not have a variable tone control but a 3-position switch giving "Bass" and "Speech" settings.

Shown above is the freshly painted cabinet and finished restoration for the HMV C13C mantel radio. From left-to-right, the first knob is the band switch, next is tone control and the last is for volume/power.

While not the star of this article, this HMV E43E radiogram used a nearly identical circuit as the HMV C13C mantel radio but was still regarded as hifi. The only difference was that it had a 12-inch Rola loudspeaker.

band switching: medium wave, MW ranging from 540kHz to 1600kHz or shortwave, 16.5 to 51 metres (5.9 to 18.2MHz).

Band switch S1 selects the appropriate secondary winding of the aerial coil to be tuned by the first gang of the tuning capacitor and also selects the coils for the local oscillator.

The only miniature valve in the chassis is the 9-pin 6AN7 as the frequency converter (mixer-oscillator). The other valves are classic octal types (ie, 8-pin with a Bakelite base) with a heritage dating back to the 1930s.

The 6AN7 was released by Philips, Eindhoven as the ECH80 for Europe in March 1949. This 9-pin miniature valve then became a common inclusion for Australian radios of the 1950s. It required 6.3V for the filament at 230mA.

The intermediate frequency (IF) of this set is 457.5kHz. This was fairly common for HMV sets around this time, but most sets of this era would have had a 455kHz IF.

The dial calibration is almost entirely devoted to the MW band which suggests that casual domestic listening was the primary market.

The band change switch also selects the gramophone pickup. When the pickup input is selected (switch 1 position 1), the local oscillator coils are disconnected.

This disables the tuner section to avoid the potential for annoying breakthrough of radio while playing records. The gramophone pickup feeds in through the two central sockets at the rear of the chassis.

It seems the HMV C13C was rarely used with a pickup. In reality, the gramophone pickup connection was a standard feature of the chassis which HMV did use in a wooden cabinet radiogram, model E43E of 1951.

After the 6AN7 frequency changer, the secondary of the first IF transformer drives the grid of the 6AR7 amplifier-demodulator valve. This valve was designed and manufactured by the Amalgamated Wireless Valve Company (AWV). Rather than a typical twin-diode tetrode IF amplifier such as the 6N8, the 6AR7 is a pentode partnered with twin diodes.

The pentode's higher gain compensates to some extent for the lack of a second IF valve. The pentode's plate drives the second IF transformer and there is adequate signal to pass to a

HIS MASTER'S VOICE

— VOLTAGE TABLE. —

(MODELS, D33A, D33B, C13C, E43D, E43E)

- VOLTAGES AND CURRENTS ARE WITH THE RECEIVER OPERATING ON AVERAGE MAINS VOLTAGE, AND TUNED TO A POINT OF NO RECEPTION ON THE BROADCAST BAND.
- VOLTAGE READINGS TAKEN WITH METER RESISTANCE OF 1,000 OHMS PER VOLT.
- VOLTAGE AND CURRENT READINGS WITHIN ±15 %
- RESISTANCE READINGS ARE APPROXIMATE

VOLTS TO CHASSIS	CURRENT M.A.	RESISTANCE TO CHASSIS	VALVE ELECTRODE	BOTTOM VIEW OF VALVE SOCKET	VALVE ELECTRODE	VOLTS TO CHASSIS	CURRENT M.A.	RESISTANCE TO CHASSIS
			V1	6AN7	FREQUENCY CHANGER			
					HEATER	6·3 A.C.	230	—
—	—	NIL	HEATER		INT. CONN.	—	—	—
NIL	9·6	NIL	CATHODE		HEX PLATE	240	2·4	INFIN
—	—	2·1 MEG	CONTROL GRID		OSC PLATE	95	4·6	INFIN
80	2·3	INFIN	SCREEN GRID		OSC. GRID	—	—	50,000 Ω
			V2	6AR7-GT OR EBF35	I.F. AMPLIFIER — DEMODULATOR — A.V.C			
					GRID	—	—	2 MEG Ω
80	1·1	INFIN	SCREEN GRID		DIODE No 2	—	—	300,000 Ω
240	4	INFIN	PLATE		DIODE No 1	—	—	1 MEG Ω
NIL	—	NIL	METAL SHELL		CATHODE	NIL	5·1	NIL
NIL	—	NIL	HEATER		HEATER	6·3 A.C.	300	—
			V3	6SJ7-GT	AUDIO AMPLIFIER			
—	—	1 MEGΩ (MAX)	GRID		CATHODE	1·1	0·75	2,000 Ω
1·1	—	2,000 Ω	SUPPRESSOR		SCREEN GRID	30	0·2	INFIN.
NIL	—	NIL	HEATER		HEATER	6·3 A.C.	300	—
NIL	—	NIL	BASE SLEEVE		PLATE	40	0·55	INFIN.
			V4	6V6-GT	OUTPUT			
240	3·5	INFIN	SCREEN GRID		GRID	—	—	0·6 MEG Ω
222	42	INFIN.	PLATE					
NIL	—	NIL	HEATER		HEATER	6·3 A.C.	450	—
			NO CONN.		CATHODE	10·5	45·5	250 Ω
			V5	5Y3-GT	RECTIFIER			
246 A.C.	—	240 Ω	PLATE No 1					
					PLATE No 2	246 A.C.	—	240 Ω
260	2 AMP. A.C.	INFIN	HEATER					
			NO CONN		HEATER	260	—	INFIN.

REMARKS :- UNFILTERED H.T. VOLTAGE = 260 VOLTS.
FILTERED H.T. VOLTAGE = 240 VOLTS.
TOTAL H.T. CURRENT = 60 MA.
VOLTAGE ACROSS R11 = 2·4 VOLTS.
RECTIFIER HEATER VOLTAGE = 5 VOLTS.

Table 1: voltage table for the valves used in the HMV C13C and various other HMV radio sets.

diode in the 6AR7 for demodulation.

The recovered audio then passes to the volume control potentiometer which is ganged with the mains on/off switch, a common feature of sets of this era. The second 6AR7 diode generates the AGC voltage which is fed to the grids of both the 6AN7 and 6AR7 to reduce gain for high strength signals.

The following 6J7 audio preamplifier pentode and 6V6 beam-tetrode output valve provide an audio section that is capable of producing around 3W from either a crystal gramophone pickup or local radio signals.

Tone control is by the aforementioned 3-position switch (S2). Its "Bass" setting is simply a top-cut provided by a 1nF capacitor and the "Speech" position is bass-cut by adding a series 0.5nF capacitor to the signal path.

The circuit was basic to several HMV models as can be seen from the voltage table (Table 1) reproduced here that lists multiple models. The table clarifies the function of each valve pin, as well as giving operating voltages and current.

Using the same circuit and chassis as in the C13C, the HMV E43E radiogram was "hifi" in 1951. The only difference was the provision of a well-baffled 12-inch Rola speaker to provide good volume and frequency response.

The HMV radiogram pictured here from the author's collection shows that it was also an elegant item of furniture. **SC**