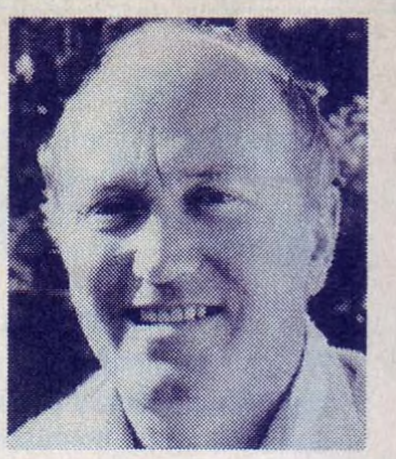
VINTAGE RADIO



By JOHN HILL

Fault finding – there's always something different

Vintage radio receivers can develop some very unusual faults. Here's what it took to bring two old receivers back to life again.

Having done numerous vintage radio repairs during the past 10 years, I have encountered a wide range of faults and problems. After a while, repairs become fairly routine and it usually doesn't take long to diagnose a fault and repair it.

However, this is not always the case and whenever I come across anything unusual, I like to pass the details on so that others can benefit from my experiences.

Not all the repairs I do are for myself and I frequently become involved in the problems of other collectors. This often means having to solve some nasty problem or doing a full restoration for someone who has no idea of what is involved. They wrongly believe that I can fix anything, have all the necessary spare parts and that the whole job takes about 20 minutes.

In the following stories, one receiver had some hard to find faults, while the other is interesting because of the extent of damage the set had sustained.

The HMV table model

The first headache was an early post-war dual-wave 5-valve HMV table model with a timber cabinet. On removing the chassis, it was evident that someone had already replaced most of the capacitors, including the electrolytics, but a couple of the old original paper capacitors still remained. These were replaced before any serious attempt was made to see why the set was not working.

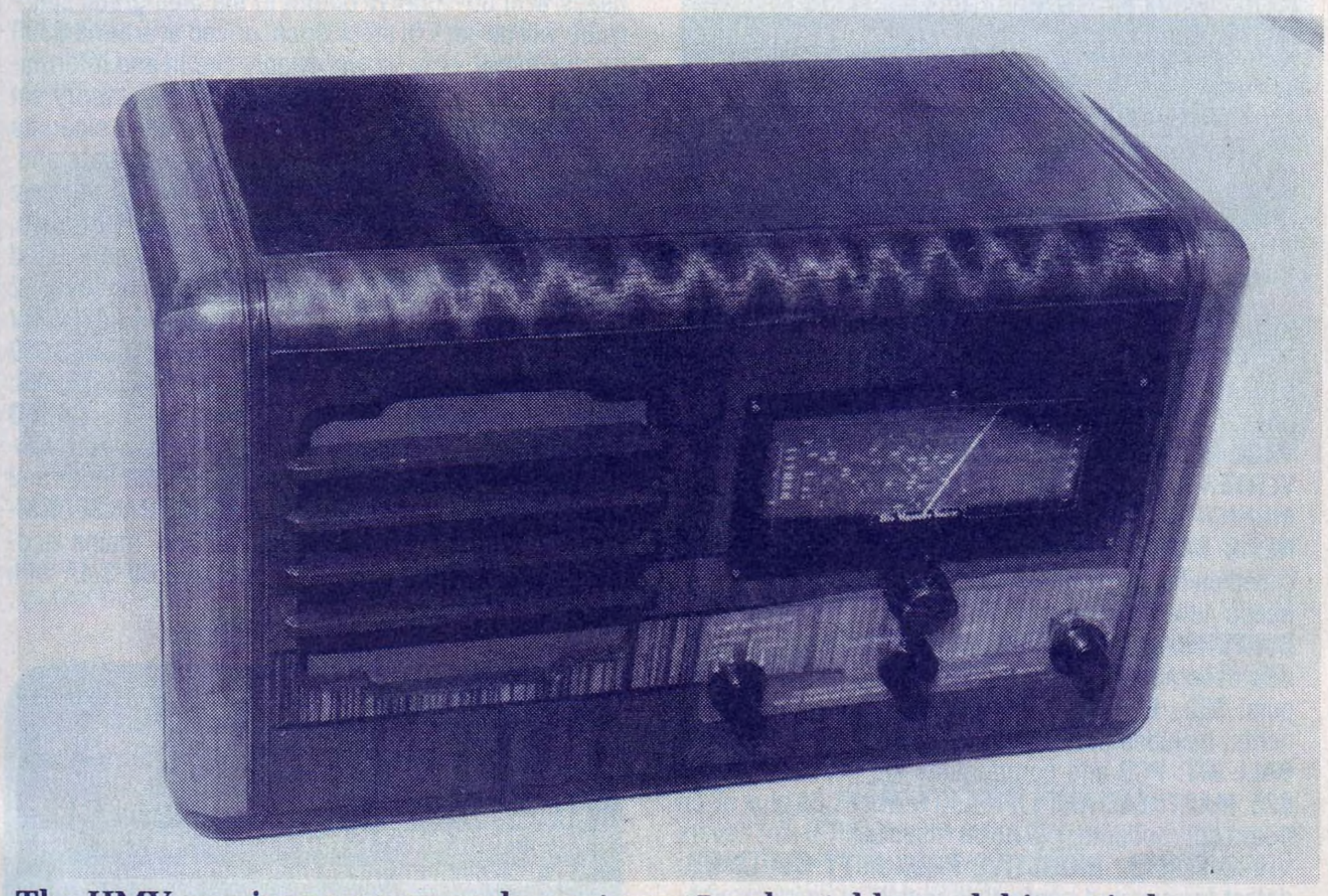
The usual routine continuity checks were also made on the aerial and oscillator coils, intermediate frequency (IF) transformers, the resistors, output transformer and the field coil. All passed OK. In addition, a valve tester revealed that all the valves were in excellent condition. But despite all these favourable indications, the receiver was quite mute.

Now I have a handy little gadget called an "astable multivibrator". This is a simple 2-transistor signal generator that outputs a 2kHz tone. The signal generator can be used to inject an audible signal into either the radio or audio frequency circuits of a receiver so as to test whether or not a particular stage is working (see SILICON CHIP, August 1992).

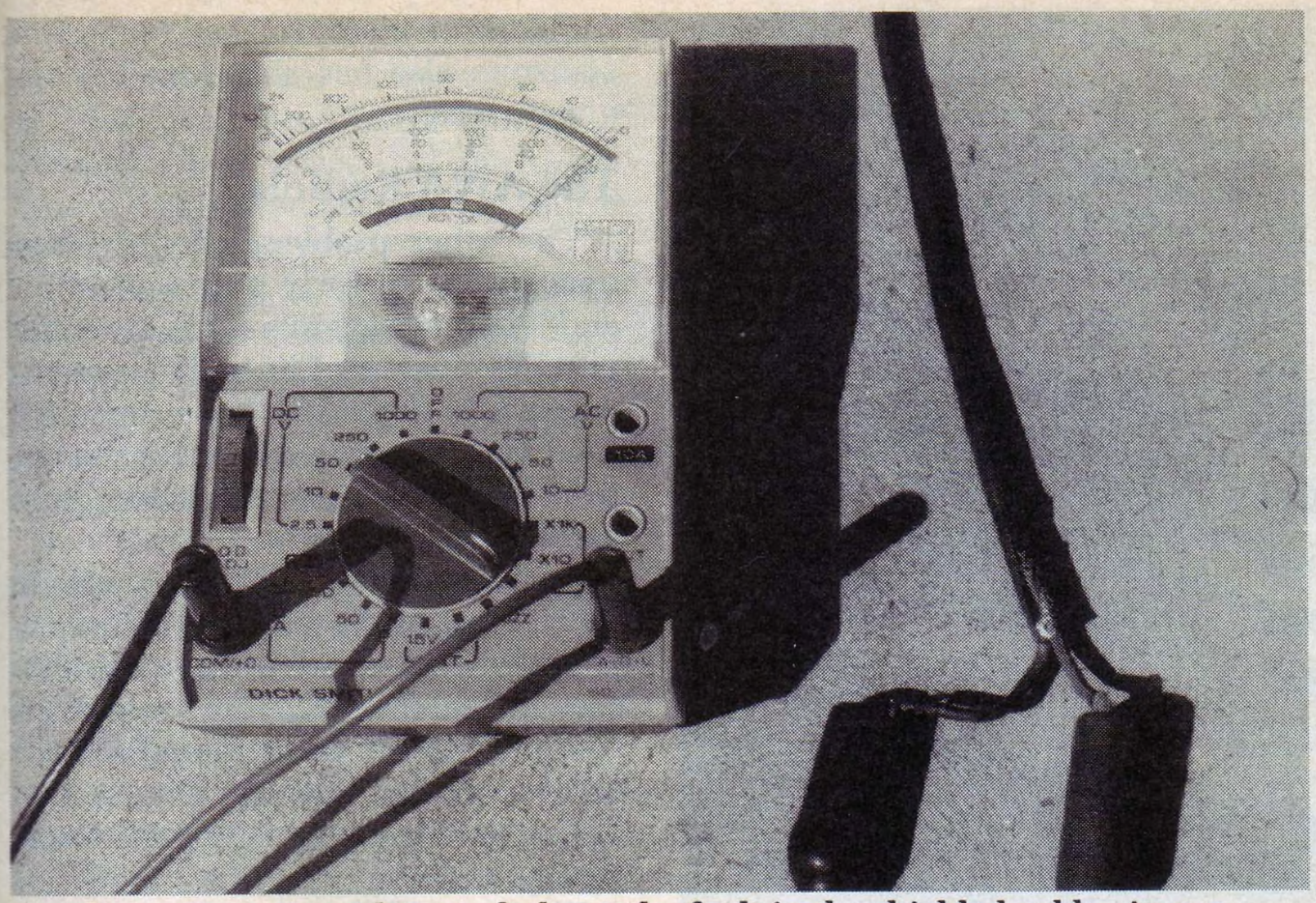
Placing the signal generator's probe onto the control grid of the output valve produced a beep from the loudspeaker. That immediately cleared the output stage. Similarly, connecting the probe to the grid of the output driver (or first audio valve) produced a much louder beep, indicating that this stage was also alive and well.

By contrast, moving the probe back to the control grid of the IF amplifier valve resulted in no sound whatsoever through the speaker. So the fault lay somewhere between this stage and the next.

But although a signal generator can



The HMV receiver was an early post-war 5-valve table model in a timber cabinet. Some misplaced wiring, a short circuit in some shielded wire & a missing capacitor caused quite a few headaches.



An ohmmeter was used to track down the fault in the shielded cable. As can be seen, it indicates a short between the inner lead & the shielded cable. It's no wonder that the receiver was mute.

This photo shows the troublesome shielded wire in the old HMV radio. The short circuit was at the solder joint where the heat of the soldering iron had damaged the rubber insulation of the inner lead. This problem has been encountered before in other old receivers, so it was not an isolated incident.

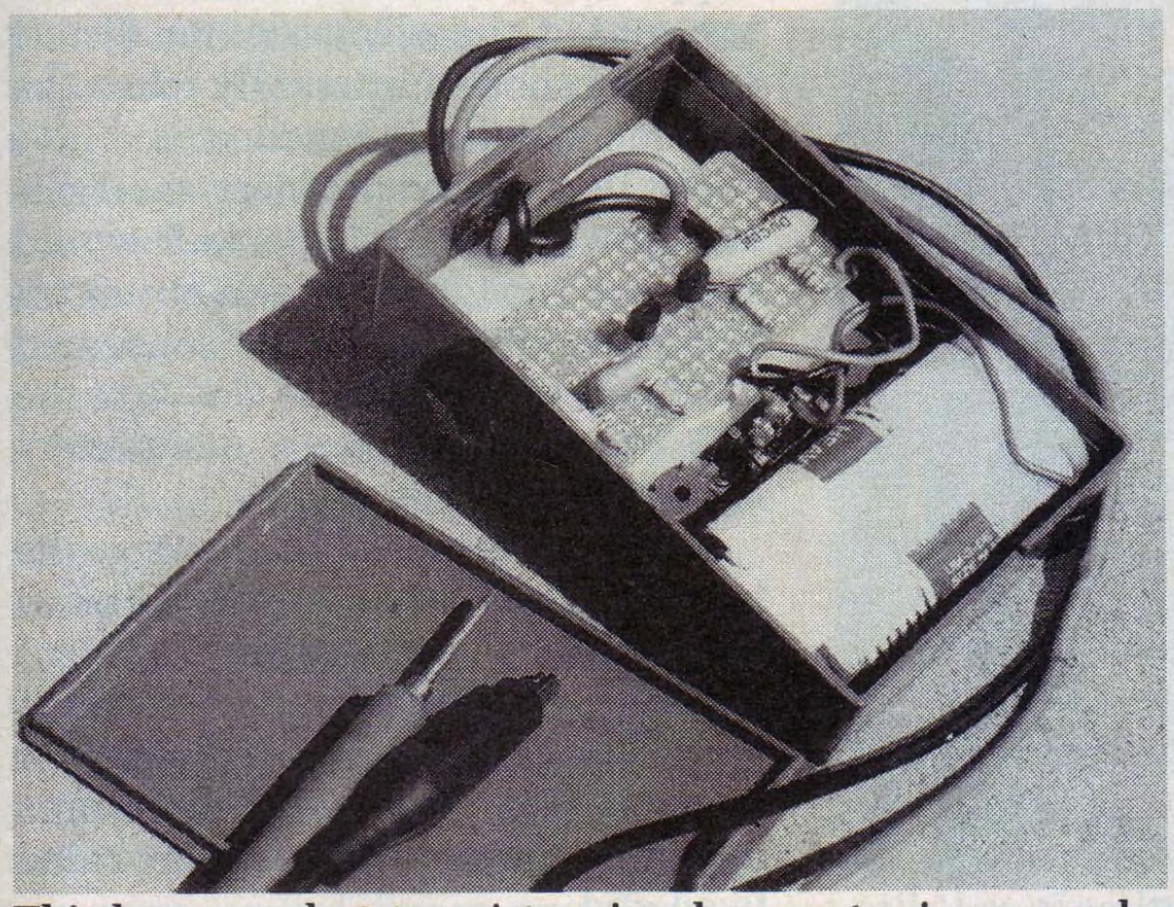
help locate which section is at fault, it only narrows the field down a little. There were a lot of components to check out between the grid of the IF valve and the grid of the first audio valve in order to find out which one is faulty, disconnected, shorted, or whatever.

By using a pair of high-impedance headphones in conjunction with a small mica capacitor (to block high DC voltages) and a signal diode (for detection), it was noted that a local radio station could be heard when this simple test equipment was connected to the plate of the IF amplifier valve. (Warning: a valve plate operates at high voltage. Do not try this unless you know exactly what you are doing). So where the signal injector implied that this valve may not have been working, in actual fact it was and the trouble spot was further on down the line.

The problem was obviously between the IF valve output and the control grid of the first audio valve. As the second IF transformer had checked out OK, then perhaps there was something wrong with the detector circuit or the volume control. The volume control was removed, checked and found to be perfectly OK. It was therefore reinstalled in the chassis.

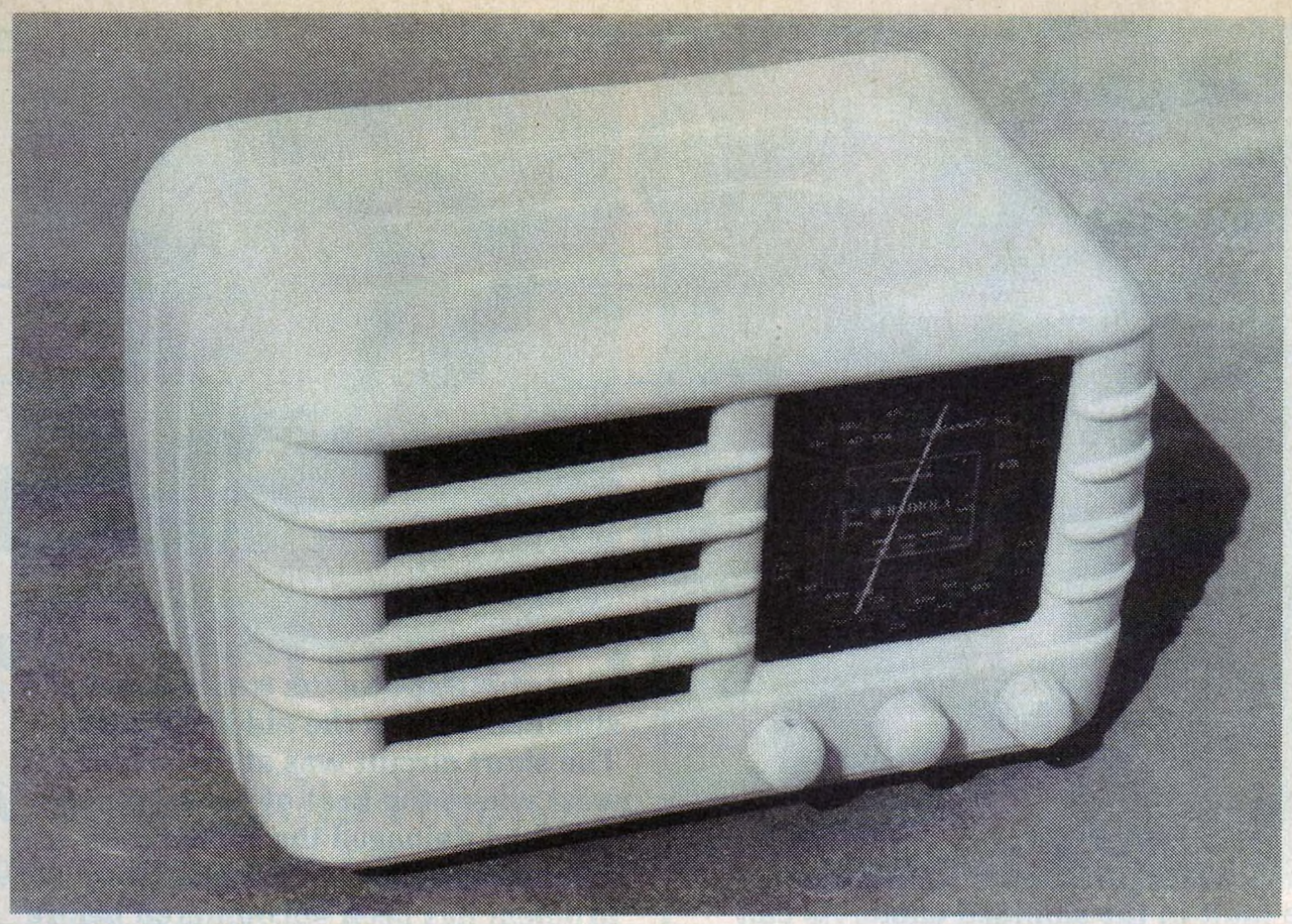
This HMV receiver has two shielded leads that bring audio signals from the detector and the pick-up socket to the volume control, after which they are fed to the control grid of the first audio valve. It occurred to me that I had a similar problem once before, which turned out to be a short circuit in a shielded cable.

A quick investigation revealed a similar fault in this unit – the inner wire from the pick-up socket was found to be shorting where a wire had been soldered to the shielding to make an earth connection. Apparently, the heat of the soldering iron had damaged the rubber insulation between



This home-made 2-transistor signal generator is powered by two AA cells. It produces a 2kHz signal that can be injected into the RF & audio stages in a receiver.

The signal generator circuit was housed in an old Tandy burglar alarm case. It is a very handy device when it comes to troubleshooting old radio receivers.



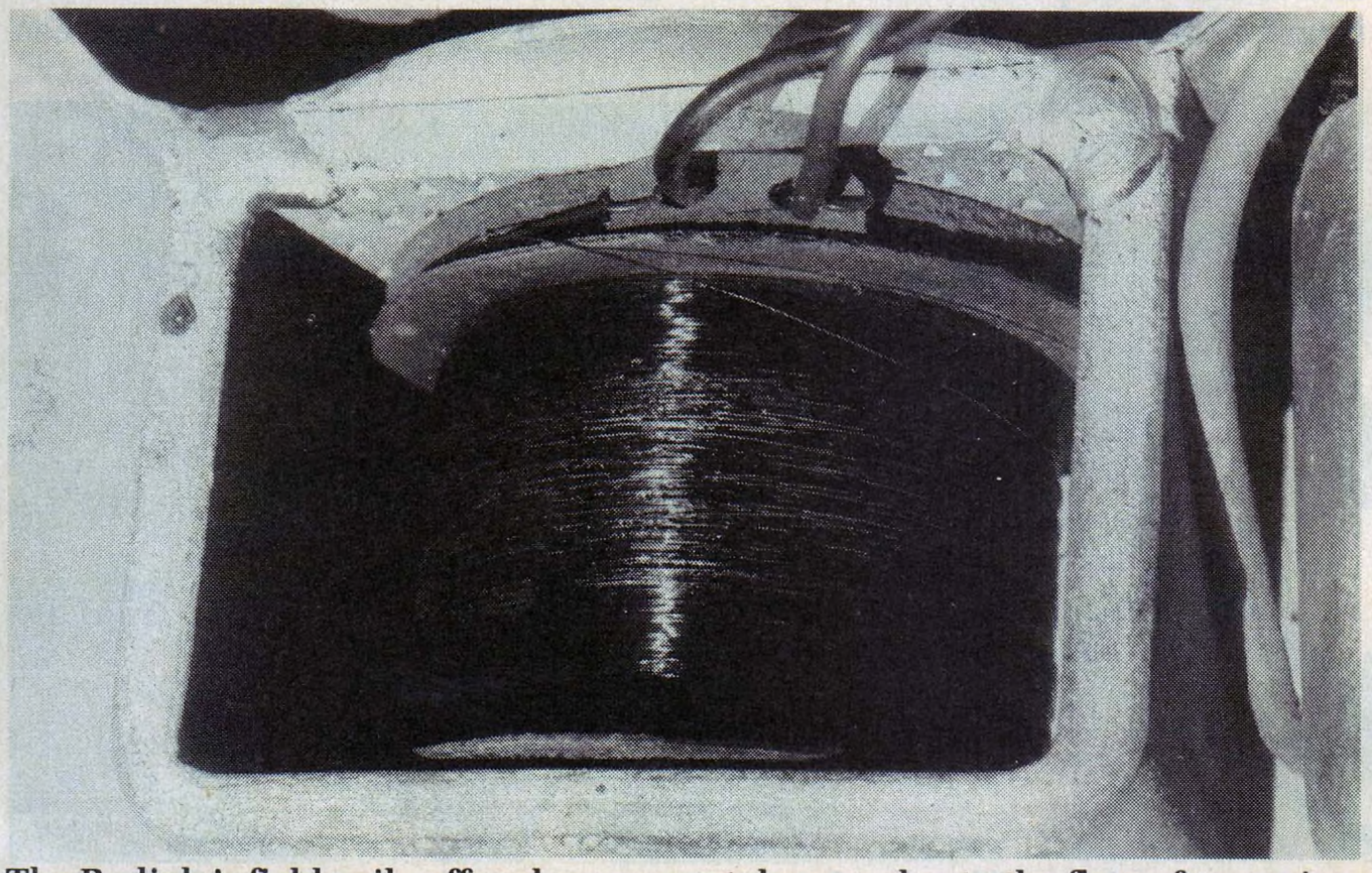
This little AWA Radiola receiver required a major restoration job, due to the failure of the set's high tension supply. In fact, the costs exceeded the value of the old receiver but the owner insisted that the job be done.

the inner wire and the shield, which eventually shorted and muted the receiver.

The shielded lead probably gave no trouble until it was disturbed and that most likely happened when the capacitors were replaced. After replacing the shielded cable, one would expect everything to work OK but there were still problems!

Who ever had previously replaced the capacitors had not reconnected two of them correctly to the volume control. Although the receiver was partly working, there were audio problems and the shortwave section was only just functioning.

Not having a circuit diagram, I did the next best thing. I borrowed a similar model HMV from a friend and used it to trace the muddled connections. A bit of a swap around at the volume control and all was well in that department. The shortwave reception was restored by adding a capacitor that had been previously removed and not replaced. After realignment, the receiver then worked normally.



The Radiola's field coil suffered permanent damage due to the flow of excessive high tension current. Note that the enamel insulation has been burnt off the wire. The paper wrapping on the outside was charred to a crisp.

Taking on an unfinished repair that someone else has abandoned is not always easy!

The AWA Radiola

The other problem receiver was, once again, an early post war model and it had more faults than you could possibly imagine. The main problems were: a broken dial glass, an open field coil, a burnt out rectifier valve, defective capacitors and a couple of well-cooked resistors.

As it was an old AWA receiver with its original black moulded paper capacitors, it was not unreasonable to assume that they were the cause of the trouble. This set had suffered a major breakdown and it would require a lot of time and spare parts to get it working again.

The most likely scenario regarding the set's demise is as follows. A shorted high tension component (possibly a paper capacitor or an electrolytic) caused a considerable increase in high tension current. As the receiver used an electrodynamic loudspeaker, the increased high tension current had no option but to flow through the field coil, which caused considerable overheating.

In fact, the field coil became so hot it burnt the enamel insulation off the wire and charred the paper wrapping around the coil to a crisp. Only a few fragments of blackened paper remained.

A short circuit of this nature also usually results in the rectifier plates glowing red hot because of the high current demands and that no doubt happened in this case. This overheating caused the electrodes to distort and they shorted internally when the cathode and plates touched.

But this was no ordinary short circuit between valve elements. It would appear as though an arc was struck (as in arc welding) and this arc continued until part of the cathode sleeve of the 6X5 rectifier had been completely zapped away – see photo.

While all this was happening, the two 100Ω half watt resistors between the rectifier plates and the high tension winding on the power transformer were severely overloaded. It was only when these resistors became open that the fireworks display came to an end.

Naturally such abnormal demands on the power transformer caused it to

overheat too. There were several dobs of black pitch stuck to the bottom of the cabinet to verify that the transformer had indeed become very hot at some time in the past.

Readers may be able to think up other possible reasons for the high tension failure. While the scenario I have presented is possible and makes interesting speculation, it may have happened some other way!

No doubt the receiver was unattended at the time of failure. One assumes that such a performance would not have gone unnoticed and if someone had been nearby, they would have switched the set off.

Generally speaking, a little plastic-cased late 1940s receiver is not a valuable item but the owner was insistent that it be fixed. He liked the set and wanted it going again. A quick check in my spare parts locker revealed that there was a spare dial glass; so work began.

The electrodynamic loudspeaker was replaced with a permag type from a later model Radiola. Fortunately, that meant being able to use the same mounting screws and all the holes in the speaker baffle were in the right places.

When restoring one of these AWA receivers, it is a good idea to glue the replacement speaker cloth to the cabinet rather than in its original position on the front of the loudspeaker baffle. By doing this, it makes the speaker much easier to work on next time and it can be readily removed without having to first remove the speaker cloth.

The overcooked field coil was replaced with a 20W resistor of similar resistance. This substitution produced a little hum in the speaker but it was not objectionable by any means. While a resistor and choke would have given better results, there is little room to mount such things underneath the chassis.

Naturally, all the defective paper capacitors were replaced, as were the electrolytics and a couple of valves, including the burnt-out rectifier.

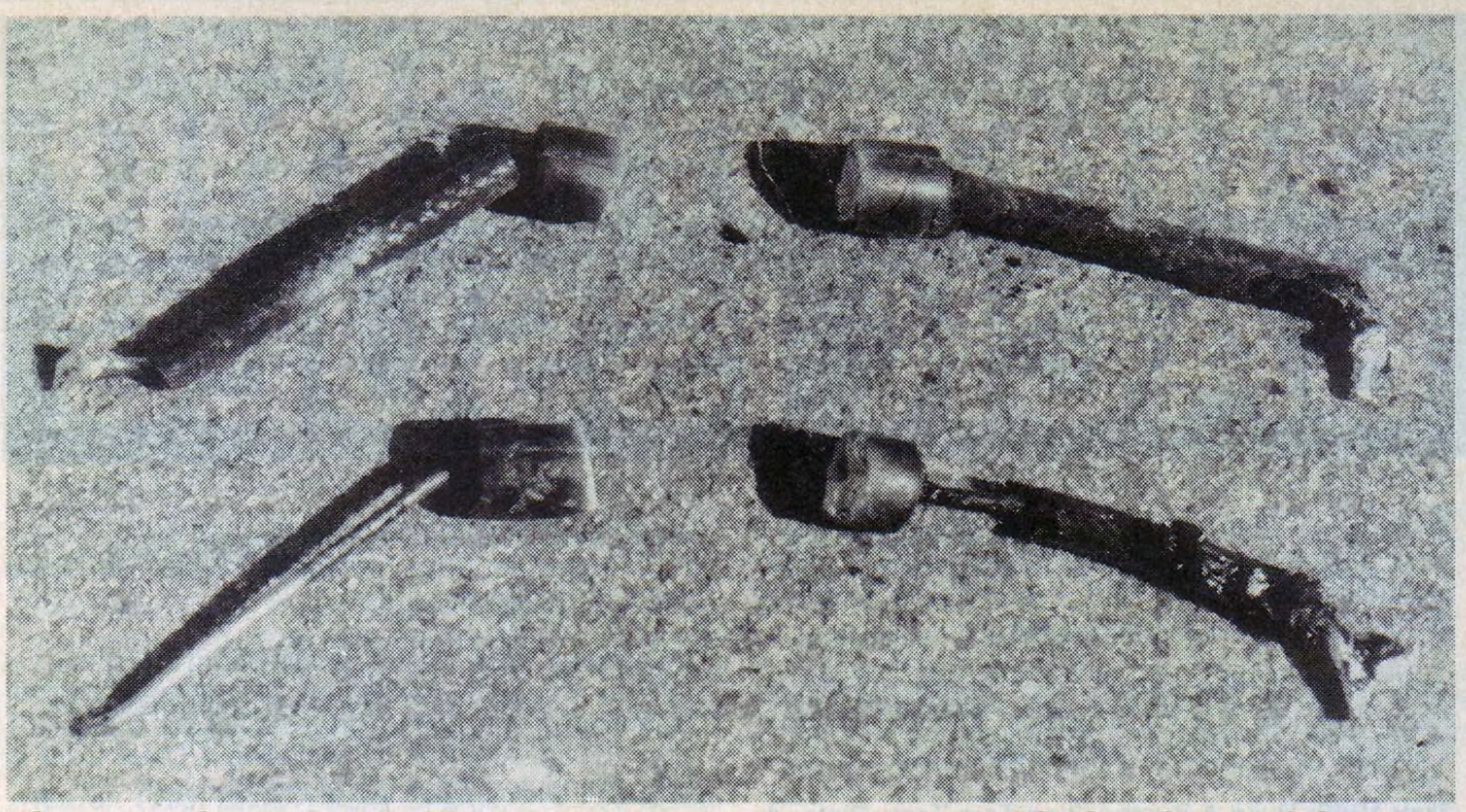
As luck would have it, the power transformer appeared to have been unaffected by the mishap. It had lost a little pitch but the windings were intact and voltages normal. Prolonged use over several hours revealed no signs of overheating and it seemed that no real damage had been done.

The fact that the power transformer had survived so well can probably be attributed to the 100Ω half-watt resistors in the plate leads of the rectifier valve. While not fitted for this reason – their job is to limit the peak current through the rectifier on each conduction cycle – they did act like slow blow fuses (very slow blow fuses!) and eventually cut the circuit. Had they blown earlier, they may have prevented other damage.

However, resistors are not fuses and, even when severely overloaded, they will still pass current for quite a while until they finally breakdown. Unfortunately, other components were being damaged or destroyed in the meantime. In fact, some restorers fit fuses into the high tension circuits for this very reason.

In the end, the amount of time involved to fix the little Radiola was considerable and the repair costs exceeded the value of the radio. But that wasn't my concern; the owner wanted it fixed and that's all there was to it.

To summarise, repairing old valve radios can be both interesting and frustrating – depending on the nature of the problem. No matter how many repairs you may have done, there is always the possibility of finding something new and different. Sometimes fault finding can be a baffling experience but with a little perseverance, most problems can be solved. **SC**



These two burnt-out half-watt resistors were in series with the plates of the 6X5 rectifier & the high-tension winding on the power transformer. They have been totally destroyed, leaving only the ends and a powdery white centre piece. Their eventual failure probably saved the power transformer from destruction.

This close-up view shows the effects of the overload within the rectifier valve. Arcing within the valve has completely removed the cathode sleeve, leaving the heater element clearly visible between the two plates.