VINTAGE RADIO

By JOHN HILL

Restoring a 1920s kit radio

Regenerative receivers from the 1920s can provide quite a challenge when it comes to restoration. This month, we look at the restoration of a kit radio from that era.

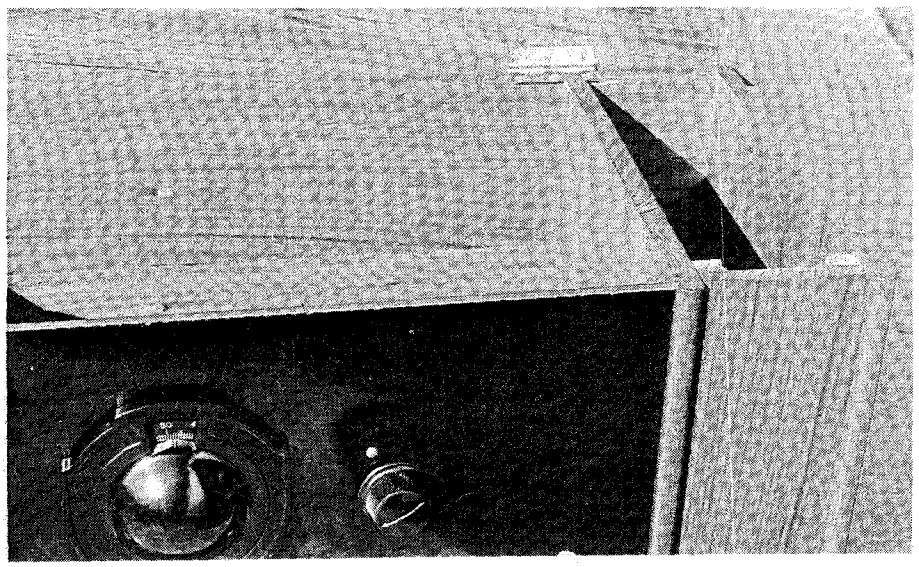
I have made it quite clear in some of my past stories that I am not particularly interested in those old regenerative sets from the 1920s era. Sure, they're valuable and add interest to a collection, but they're not nice to listen to. Five minutes is about enough for me when it comes to those toneless horn speakers. Well, that's what I have said in the past!

I have now changed my mind a little in this regard and recently spent a week or so of my spare time restoring an old mid-1920s 3-valve regenerative receiver. Perhaps one of the main reasons for my new interest in these truly antique radios was the fact that this one was in really excellent condition, even if it was lacking its original loudspeaker. Most radios from the 20s are in an appalling state of disrepair and do not generate much enthusiasm as far as I am concerned.

I paid top dollars for this unit because it was bought from an antique dealer. However, it is worth noting that the price came down by $130 when I showed interest in buying it. This goes to show that dealer prices are sometimes grossly inflated and one should never agree to buy without a little bartering.

Although it looks factory made at first glance, items such as the hand wound coil and the screwed together cabinet suggest that the set was originally packaged as a kit. Many early kit radios were fairly basic and often consisted of an open baseboard with a front control panel. My latest acquisition was a much better kit – one that came complete with quite a reasonable cabinet (presumably in pieces).

The cabinet is unusual in that it has a special compartment at the right-hand end. Built-in compartments were often provided for battery storage but not so in this case. It appears as though the space was provided to store a set of headphones.



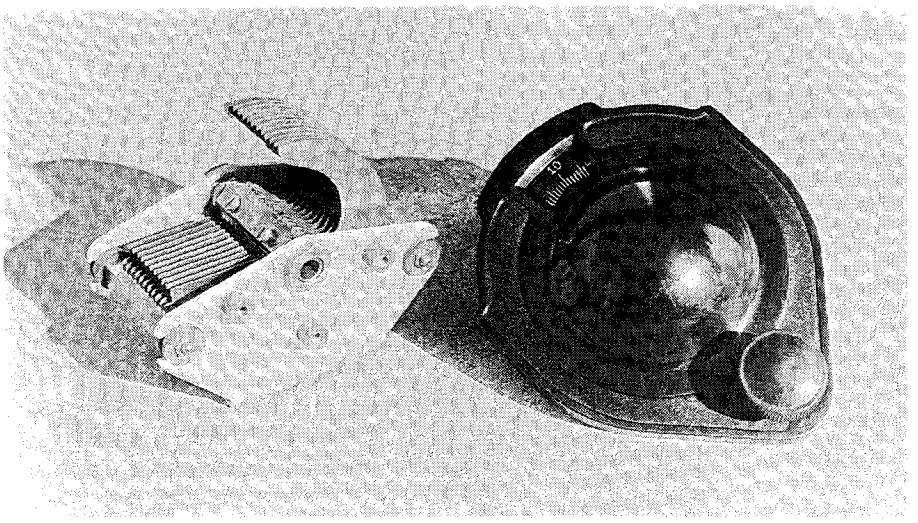
This photo shows the headphone compartment in the receiver cabinet. Although it did not contain a pair of headphones, there was an interesting assortment of other odd bits and pieces.

Phone jack

Although the set is capable of driving a loudspeaker, there is also a phone jack on the front panel which cuts out the output stage and taps the phones into the B+ line of the second valve. In other words: the set can be used as a 3-valver with a loudspeaker or as a 2-valver with headphones.

The cabinet is in incredible condition for its age. It is structurally sound and undamaged except for a few minor scratches. These responded well to a touch up with a cloth soaked with shellac. All things considered, it is remarkable that something can survive so well for so long. According to the "law of averages", it should have been thrown out 50 years ago.

Although there were no headphones in the cabinet compartment, it did contain a few other interesting items. There was a push/pull switch of the type used in the 1920s, a large open-ended spanner, a selection of grid leak resistors and an electoral card dated 1945. The back of the card had battery connection instructions written on it, so it seems as though the old 3-valver had remained in service up until that time at least.



Cleaning & adjusting the mechanical parts is just as important as servicing the electronic circuitry in a restoration of this nature. This photo shows the restored dial & its companion tuning capacitor.

The valves are of the 6V type: A609 regenerative detector, A609 first audio, and C603 output. The audio stages are transformer coupled. For reasons that will be explained later, the C603 was replaced with a B605.

Initially, the set looked fairly original but this was not really the case. After a closer examination, it was obvious that it had undergone quite a few modifications over the years.

The on/off switch was not original and neither were the reaction control capacitor or the filament rheostat. In addition, a replacement audio transformer had been incorrectly wired into the circuit and its mate had an open circuit primary winding.

One notable aspect of the set was the fact that there was no provision for a "C" (bias) battery. Negative grid bias is essential for the correct operation of amplifying valves. Without it, signals are distorted, and the valve will draw excessive plate current. So why no bias battery?

The explanation is that the valves were not totally without bias; there was a source of bias but it was not immediately obvious. This bias comes from the filament supply and varies along the length of the filament – which is also the cathode; ie, there is full battery voltage at one end and 0V at the other. The practical result is a bias equal to half the filament supply voltage. In some cases, particularly where 6V valves were used, this would be adequate, assuming a typical HT or "B+" supply of no more than 90V.

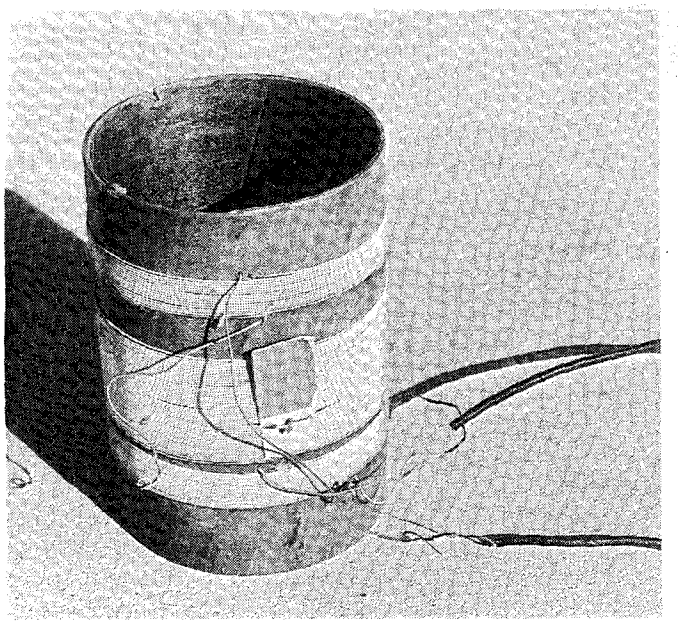
In addition, the relatively high resistance of the transformer and loudspeaker windings would keep the HT current within reasonable limits. As a result, "C" batteries received less attention than might otherwise have been the case. More about this later.

The restoration job

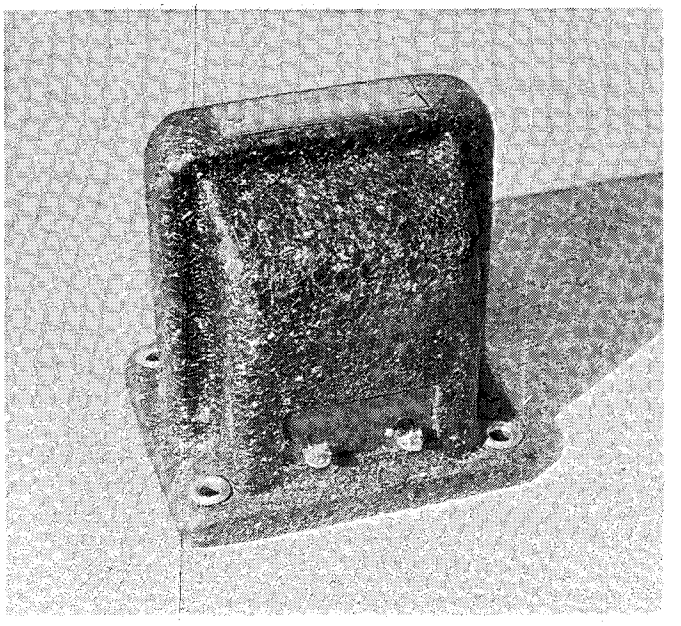
At a practical level, there was quite a lot to do if this old set was to work again. I had no choice other than to go through it systematically, sorting out the problems as they came.

My first step was to test all the valves. As it turned out, they were all in excellent condition so that was a good start!

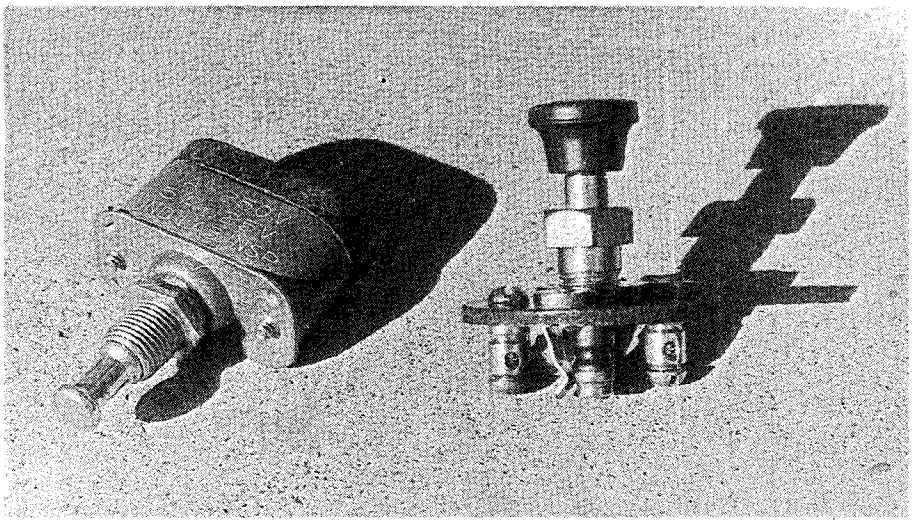
The control panel components were next on the list. The on/off switch was broken internally and was replaced with the one found in the headphone compartment. The filament rheostat was then stripped and



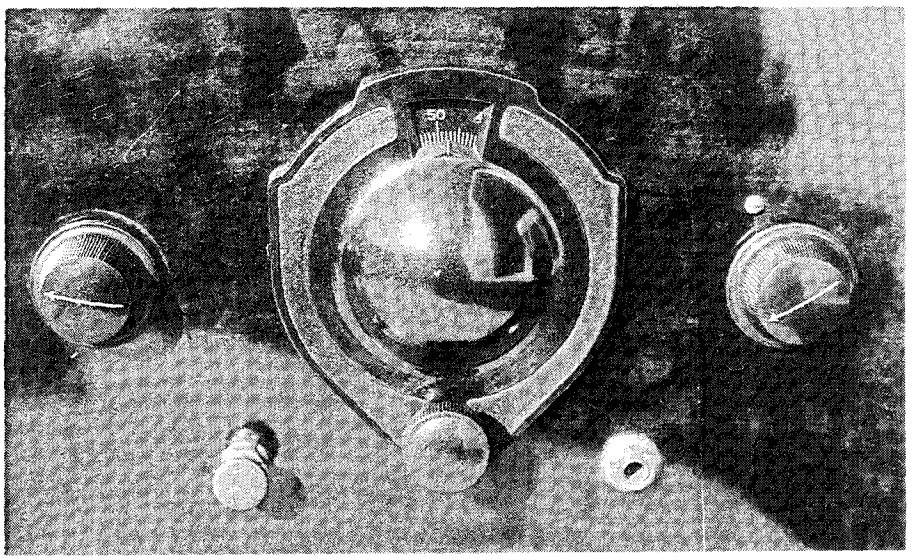
This hand-wound coil, along with the screw-assembled cabinet, the simple 3-valve format, and no maker's nameplate, gave the impression that the regenerative radio was sold in kit form. Build your own was a popular concept in the 1920s.



The defective interstage audio transformer was replaced with a similar unit & the two serviceable transformers then painted to give them a uniform appearance. Open circuit audio transformer primaries are a common problem when restoring a radio of this vintage.



The broken on/off switch (left) was replaced with the switch (right) that was found in the headphone compartment of the cabinet.



This close-up view shows the front panel controls. The filament rheostat, tuning dial & reaction control make up the top row (from left to right), while below them are the on/off switch & the headphone jack.

cleaned, as were the tuning and reaction capacitors.

These variable capacitors are of the plain bearing type and the bearings required lubrication and adjustment. I also took the opportunity to reverse the moveable plates of the reaction capacitor. As they were originally fitted, the reaction increased as the control was turned anticlockwise. However, it seemed more logical to have a clockwise action and reversing the plates achieved this effect.

The next step was to dismantle and clean the dial assembly, after which all the components were re-assembled on the control panel. The ebonite circuit board was then stripped, cleaned and polished with an automotive cut and polish compound.

This done, the valve sockets were dismantled and adjusted so that there was firm contact with the valve pins. Some socket connections were loose and would have given considerable trouble if they had been left as they were. A drill shank can be used to check socket tension.

There were numerous holes in the circuit board where the audio transformers had been mounted, indicating several past replacements. Audio transformers, with their fine windings, were a common source of trouble in the old days. Fortunately, I had about eight good transformers to choose from and one similar in appearance to the set's remaining good unit was selected.

Because the audio transformers were of different colours, they were painted matt brown to give a uniform appearance. They were then mounted on the circuit board in positions that covered up most of the holes.

Rewinding the coil

The original coil looked a bit sad. There were loose windings and the wire insulation was quite grubby in places.

Each of the three windings was removed and the wire strung out and washed with hot soapy water. It was then wound onto spools. The cardboard coil former was also cleaned and given a fresh coat of shellac.

When the wire was rewound onto the coil former, the aerial winding was tapped in three places. Previously it had been a 17-turn winding but all three coils – aerial, tuning and reaction – were now about two turns less than in the original due to trimming the kinked leadout wires. This had no adverse affect on the set's performance and the rewound coil worked perfectly. It was finished off by reinforcing the aerial taps with glue and giving the windings a coat of shellac to hold them in place.

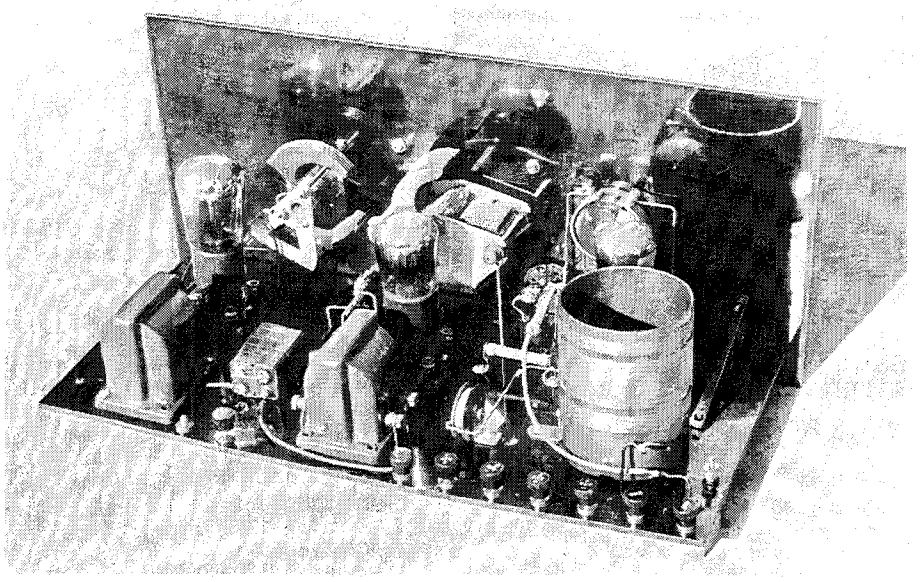
Bias battery

A number of alterations were also made to the circuit. A radio frequency choke was added and provision was made for a "C" battery. This was the reason for discarding the C603 output valve. The C603 is supposed to have -40V grid bias, whereas the B605 that replaced it needs only -18V bias, at maximum plate voltage. One reason for adding the bias circuit was a desire to see just how well the set performed at maximum HT voltage.

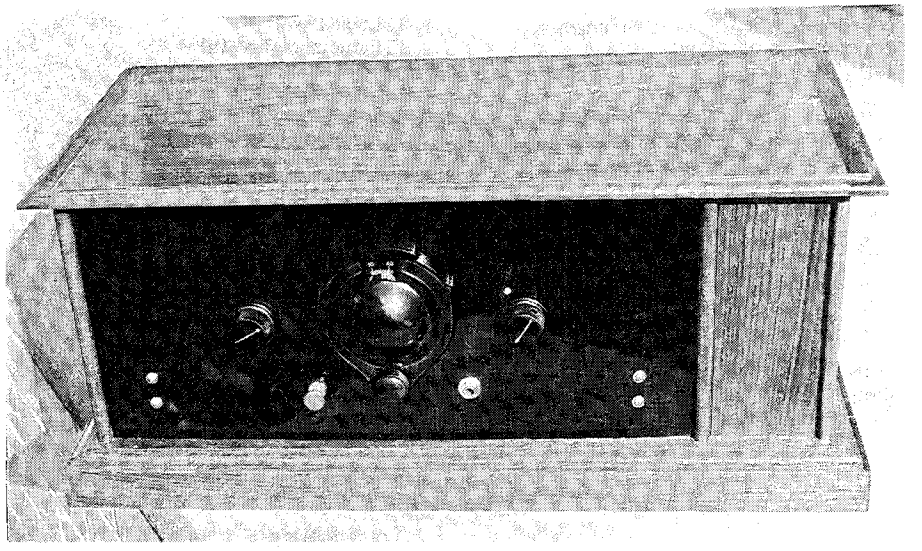
Two 9V transistor batteries were used as a bias battery, with the centre tap connection (-9V) biasing the A609 first audio valve. The bias battery was attached to the circuit board using double sided masking tape and is permanently wired in.

Getting the bias to work correctly was a problem. The set functioned OK on two valves but when the third valve was brought into operation, there was uncontrollable oscillation.

I believe that this may have been caused by mounting the two audio transformers in line with each other. It probably would have been better to have mounted them at right angles to



A rear view of receiver after restoration. The wired in "C" battery (two 9V transistor batteries) can be seen between the two audio transformers.



The finished receiver is hardly a thing of great beauty but is fairly typical for the mid 1920s. The nickname "coffin" was an apt description of early radio cabinets.

each other, to minimise mutual interference between their surround electromagnetic fields. Positioning them the way I did (to cover up unsightly holes) was not the best way to install them, at least not electrically.

However, the feedback problem was easily solved by installing a 1MΩ resistor in the bias line to the first audio valve. That simple remedy isolated whatever it was that was causing the trouble without altering the bias voltage.

According to a colleague, this cure suggests another possible factor contributing to the oscillation – coupling between the two audio stages via the common bias battery. Some of the audio voltage applied to the grid of the output valve could appear across the bias battery and, in turn, at the grid of the audio valve.

The added resistor provided a degree of decoupling but a more elegant approach might have been to add a bypass electrolytic capacitor between the resistor/transformer junction and the negative HT rail. This would probably allow the resistor value to be substantially reduced.

Once all the few minor bugs had been sorted out, the old battery powered regenerative receiver worked really well.

To power the set, a small 6V motorcycle battery was used for the valve filaments and a relatively modern "B" battery eliminator for a high tension supply.

It is interesting to note that many old battery triode valves have the recommended plate voltage marked on them. 20-150V is a common inscription and the Philips valve manual gives specifications at the full 150V. If the valves are correctly biased, these maximum plate voltages can give power outputs of between 0.5W and 0.75W (quite high for their day).

So, casting caution to the wind, I decided to find out just what they could do. The result: these ancient receivers really fire up when the high tension voltage is increased. Previously, I have run similar sets at a conservative 90V but this time I have opted for the valve manual's 150V maximum. The difference is unbelievable!

Perhaps that is why I am now a little more enthusiastic about battery powered sets. Maybe some of these old receivers are better than I previously thought! **SC**