VINTAGE RADIO

By JOHN HILL

The combined A-B battery eliminator

The year 1927 was notable in radio history because it marked a real change in the type of receiver being offered for sale. For the first time, radios that plugged into household power became practical and a number of makes and models were made available.

While there were mains-operated receivers around before 1927, they were few and far between and not many could be described as being really successful. But valves such as the 26, 27, 71A and 80 changed all that and made workable mains-powered radios possible. From that time onward, radio receivers became better and better.

Prior to 1927, almost every radio was battery-powered and the cost of replacing those batteries was a major problem. To help counter this problem, special devices such as "B" battery eliminators and "A" battery trickle chargers were developed. Of course, these money saving accessories were only of use in electrified areas but that included most of the cities and big towns, even back then.

For the benefit of younger readers, it may useful to clarify the terms "A", "B" & "C", as applied to batteries or associated circuits. The term "A" battery was used for the filament battery and, by usage, the filament circuit as a whole. The term "B" battery was used for the high tension battery and its associated circuitry, while the "C" battery was for grid bias circuits.

Of course, battery-powered valve receivers continued in use for a long time after 1927, in some cases until the late 1950s and early 1960s. It took that long for the electricity grid to reach some of the more remote regions of the country.

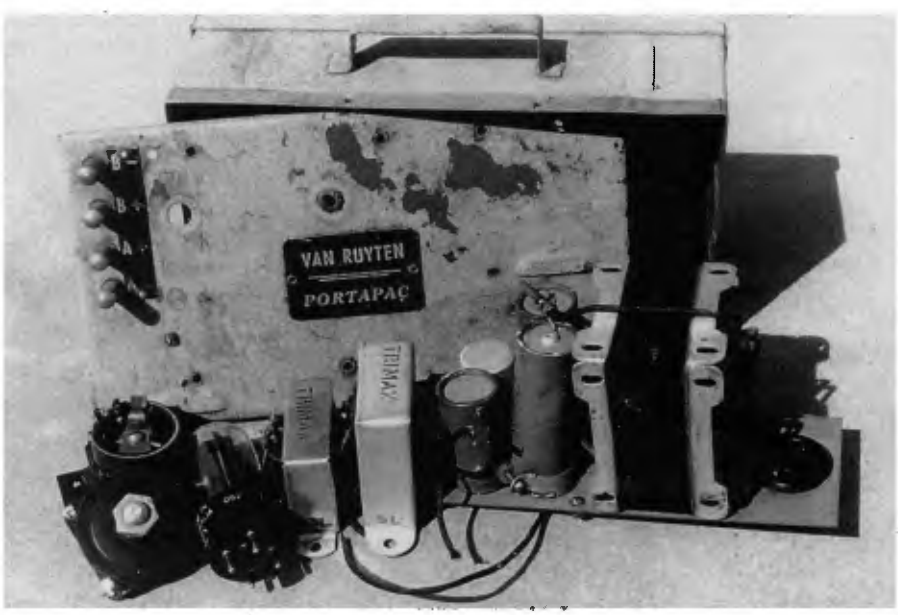
The battery eliminator

Electrification was a mixed blessing for some country folk in that, although their homes had electric power, its arrival meant the obsolescence of some existing household appliances, including the battery radio. In many instances, however, these radios were kept in use by the same device that powered many early battery receivers – the battery eliminator.

The more modern versions were actually combined "A" and "B" eliminators. This type was never on offer in the 1920s because a satisfactory A battery eliminator was beyond the technology of the day. Such a device required large capacitors and a rectifier capable of passing an amp or more of current. Although such things were available at the time, their large size and high price excluded them from being used in domestic radio applications.

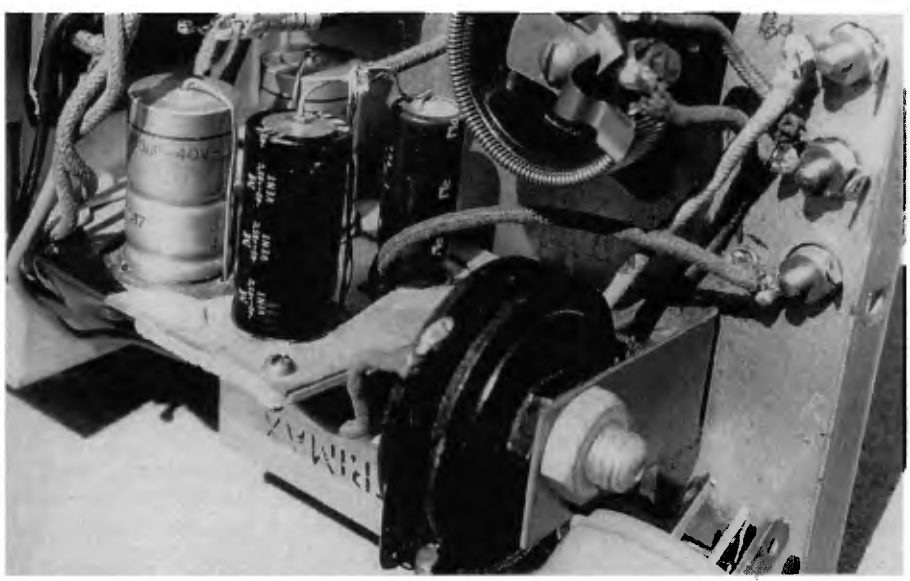
As a result, the rechargeable "A" battery continued in use in combination with a trickle charger. This was the best that could be done at the time. The combined "A-B" battery eliminator of the post-war years solved this problem by using a copper oxide rectifier and large value electrolytic capacitors.

Battery receivers made during this period used low consumption 1.4V



The old Van Ruyten battery eliminator is shown here stripped, ready for repairs. Like most vintage radio equipment it was in a fairly sorry state.

These old electrolytic capacitors were next to useless. Three had virtually no capacitance while the fourth had an internal short.



This view shows the copper oxide low tension rectifier in the foreground, with the replacement electrolytics to the left. The new electros were mounted on a piece of thick cardboard as they were too small to be held by the original clamps.

valves and had considerably reduced low tension requirements compared to receivers from the 1920s and 1930s. A 4-valve set using 1.4V valves consumes only 250mA of filament current. By comparison, a single old 201A valve pulled 250mA at 5V.

An "A" battery eliminator circuit using a transformer (which it shares with the "B" eliminator), a copper oxide rectifier, a choke and a pair of 500µF electrolytics could supply the filament requirements of a late-model battery radio quite easily. Combined "A-B" eliminators kept many battery receivers working without the need to trade-in or modify the receiver for AC operation.

Restoring an eliminator

Battery eliminators are not that common these days but that doesn't mean that they are not worth finding. Any working "A-B" eliminator is a very convenient way to operate a vintage battery radio receiver.

Recently, I was lucky enough to find such a unit, a Van Ruyten, and this month's Vintage Radio will delve into its construction, operation and restoration.

This particular eliminator uses a 5Y3GT valve rectifier for the high tension or "B" voltage supply and a copper oxide rectifier for the filament or "A" voltage supply. Both voltages are well filtered using chokes and electrolytic capacitors. There is also a rheostat to adjust the output voltage of the "A" circuit.

The copper oxide rectifier was an early solid state device and the one in the Van Ruyten is quite small. It provides full wave rectification in conjunction with a centre tapped transformer winding. It was an interesting exercise to check it and compare its performance with a pair of 1A silicon diodes.

In this particular setup, both rectifiers performed similarly, producing exactly the same voltage under load. And although the silicon diodes, which are quite small, ran warm under test, the copper oxide rectifier remained quite cool.

Because it worked so well, the old rectifier was put back into service so as to keep the unit working with as many of the original components as possible. At least the comparison proved that a couple of silicon power diodes could be used to replace the copper oxide rectifier in this circuit if the need ever arose, without altering the output voltage of the unit.

Output adjustment

Now this old battery eliminator, like most other power supplies of that era, is unregulated in both the "A" and "B" circuits. To counter this problem a 6-ohm rheostat is incorporated into the "A" circuit to help compensate for various loads that may be applied. This allows the correct voltage to be delivered to suit a particular current demand and there is enough adjustment to allow use at 1.4V and 2.0V, although the latter situation is very marginal.

The adjustment procedure for setting the "A" supply is as follows: (1) with the eliminator hooked up to the receiver, connect a voltmeter to the "A" battery terminals of the set; (2) back off the rheostat as far as it will go before switching on; and (3) slowly advance the rheostat until the desired voltage is shown on the voltmeter. And that's it!

This view shows the power transformer, the 5Y3GT HT rectifier and the two Trimax brand filter chokes (beneath the chassis).

The original "B" supply had no adjustment for altering the output voltage but this facility was added during the restoration procedure.

There were a number of other items that needed attention and the old Van Ruyten was completely stripped so as to make the necessary repairs. These repairs included: replacement of the filter capacitors and the 5Y3GT rectifier valve, a new power cord, repainting of the steel cabinet and, as mentioned above, alterations to the high tension circuit to permit the "B" voltage to be varied.

The modification to the "B" circuit involved adding a multi-pole 3-position switch so that two pairs of resistors could be switched into the plate circuits of the high tension rectifier. The resistors used here were 10kΩ and 27kΩ and they reduced the "B" voltage to approximately 60V at 4mA and 45V at 2mA. The unloaded voltage without the resistors is 150V.

This simple modification was necessary so that the eliminator could be used on 1- and 2-valve regenerative receivers, which have much lower "B" voltage and current requirements.

Another reason for incorporating the variable "B" voltage switch was to fill a hole in the control panel. Originally the power cord exited through this hole but a previous repairer has cut a new power cord hole (and a fairly ragged one at that) in a far better position on the side of the cabinet.

As a result, the leftover hole in the control panel was the logical place to fit the new switch to vary the "B" voltage.

A close-up view of the two filter chokes prior to installation. The larger one at the rear is for the low tension supply.

Because the low tension supply is unregulated, the supply voltage varies with the load. This wirewound rheostat is used to adjust the "A" voltage to suit the receiver.

Performance

With the restoration completed, a couple of wirewound potentiometers were set up in conjunction with volt and amp meters to monitor the Van Ruyten's output capabilities. The results only proved just how good modern regulated power supplies really are compared to something from the Van Ruyten's era. The "B" voltages can vary by as much as 50V, depending on the load, while "A" voltages varied by up to 2.5V.

No wonder there is a rheostat in the "A" circuit so that the voltage could be adjusted to suit the load – see Table 1 for details.

Table 1 shows that the "A" supply is capable of delivering no more than 340mA at 2.0V. Any additional current is obtained at the cost of reduced voltage. These figures seemed to indicate that an average 1930s battery receiver with 2V valves would not work satisfactorily since it would draw more filament current than the eliminator could supply. It was time to find out whether or not this was to be the case.

The only 2V battery receiver available for test was a 1937 4-valve Radiola with a valve complement of 1C6, 1D5, 1K6 and 1D4. All up, these valves draw about 540mA so it was fairly unlikely that the Van Ruyten would be able to fully power this particular receiver.

And so it proved to be. Even with the rheostat fully advanced, the "A" voltage was a meagre 1.6V and while the set worked, it certainly lacked performance. In fact, it sounded a bit sick! Fairly obviously, the old Van Ruyten power pack was designed for receivers with 1.4V valves.

Replacing the "A" battery eliminator with a modern 1A regulated power supply showed that the 2V valves would work down to 1.75V. Below that, the performance starts drops off, with the receiver virtually ceasing to function at 1.5V.

Not being the type that gives up easily, I checked all my spare battery valves to see if any were more suitable to the task. Valve filaments are made to tolerances so some must consume less current than others.

Eventually, I selected another set of valves that consumed slightly less current than the originals. This squeez-

The finished battery eliminator, or "Portapac" as it was called, includes a rotary switch on the front panel. This switch serves to fill the hole originally used for the power cord and allows the "B" voltage to be varied in three steps. The rubber grommet near the output terminals allows screwdriver adjustment of the "A" voltage rheostat.

éd the operating voltage up to just over 1.7V and the old receiver fired up much better than before. This was mainly due to a particular 1D4 output valve which had a much more economical filament consumption than the others. That extra tenth of a volt made a considerable difference to the set's performance and another tenth would bring the set up to its full potential.

(Editorial note: it has been suggested in the past that running valve filaments at less than their rated voltage, but with normal anode voltage applied, may shorten the life of the valves.)

Incidently, the "B" voltage drops to around 125V when the old Radiola is working properly. The maximum "B" battery voltage rating for the receiver is 135V.

Eliminator hazards

Unfortunately, using an unregulated "A" supply can have serious repercussions if one of the valve filaments fails. That's because the voltage to the other valves immediately increases because of the reduced load.

In the case of the 1D4 (with its 0.25A filament) failing, approximately 3V would be applied to the other valve filaments. While a minute or so of that sort of treatment probably wouldn't do much harm, it mightn't do 60-year old battery valves much good either. So if you are contemplating rebuilding an old battery eliminator, a regulated supply is the way to go.

Who knows or cares what's inside when the lid is screwed on? However, such an approach is a marked departure from the original circuit and is an unacceptable restoration as far as some collectors are concerned.

Trying out the old Van Ruyten eliminator on a 2-valve battery receiver also proved a disappointment, although the results were expected. What may be an acceptable level of hum in a loudspeaker is not acceptable through headphones. It mattered not whether the "A" or the "B" supply, or both, were used – the hum levels were distracting. Small regenerative receivers using headphones perform best on batteries. **SC**

Table 1

"A" Voltage	Max. Current
1.5V	400mA
2.0V	340mA
4.0V	60mA
"B Voltage"	**Current**
150V	unloaded
120V	10mA
110V	15mA
100V	20mA