VINTAGE RADIO

By JOHN HILL

Power supplies for battery receivers

Early radio receivers up until approximately 1927 were battery-operated with very few exceptions. They used a variety of different batteries, including dry & wet cells and rechargeable & non-rechargeable types.

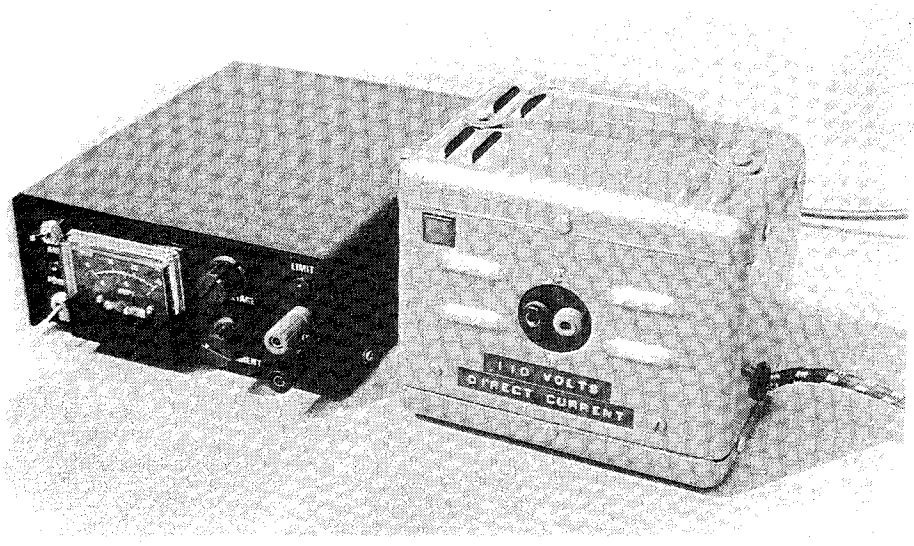
The late 1920s saw a market trend away from battery-operated receivers to "all electric" models that used household power. These electric radios were much cheaper to run and allowed many people to own a receiver in circumstances where they previously may not have been able to afford the high cost of battery operation. However, not all households had electric power and battery radios were manufactured until the end of the valve era, even if they mainly took the form of portables in those latter years.

I live in country Victoria and it is surprising the number of old battery sets that are still around. Perhaps one in every six pre-1950 receivers I find is a battery model. Most of these sets haven't been used for 30 years or more and have often been stored in a shed or a farmer's barn.

Personally, battery receivers don't interest me greatly and their general level of performance is only fair when compared to mains-operated sets. A battery output valve such as a 1D4 is rated at 0.35 watts. When compared to the 4.5 watts of a 6V6, the advantages of mains operation are fairly obvious.

Despite my lack of enthusiasm for battery radios, there are several in my collection and there is a GE vibrator model in the shed awaiting restoration. I'm not so one-eyed that I pretend that battery sets don't exist!

The main problem with battery-powered receivers today is the lack of suitable batteries, for it has been many years since they were made. Even if they were still available, the price would be prohibitive.



The author's home-built 1A regulated power supply and the accompanying small "B" battery eliminator will power most battery receivers.

The battery eliminator

Back in the 1920s, there was a handy radio accessory called a "B" battery eliminator. Even today, an eliminator is a handy thing to have if one is into battery receivers.

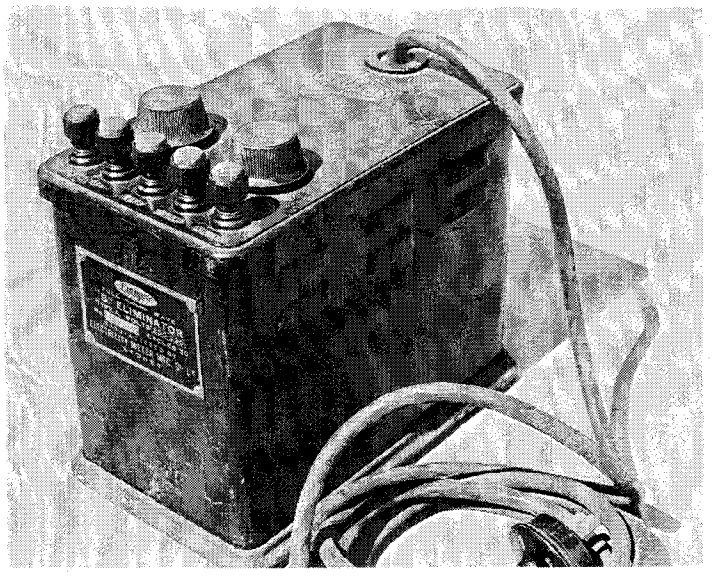
There were several different types of battery eliminators. Some were "B" eliminators only, while others also produced "C" battery voltages. More recent types produced "A" voltages as well.

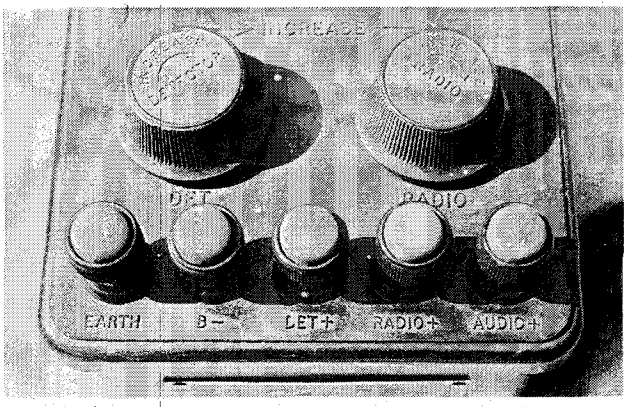
A breakdown of these "A", "B" and "C" batteries may be helpful for readers unfamiliar with battery receivers.

The "A" battery's function is to supply the low tension current to the valve filaments. Typical battery valve filament voltages range from 1.5V to 6V.

The "B" battery supplies the receiver's high tension current and is applied to the plates and screen grids of the valves. "B" batteries were usually made in 45-volt units (sometimes with a 22.5V tapping) and were used singularly or in twos or threes, depending on the specifications of the receiver. Three large "B" batteries producing 135 volts was a fairly common high tension requirement for many battery receivers.

Finally, the "C" battery supplies the negative bias to the control grids of the valves. There is virtually no load on a "C" battery – it only supplies a negative potential to the control grids. "C" batteries were usually either 4.5V





A "B" battery eliminator solves most of the problems of operating old battery radios. Shown at left is an Emmco eliminator of 1927 vintage while immediately above is a close-up view of the controls. This unit has three outlets, two of which are variable. Some eliminators also had a range of "C" battery voltages.

or 9V types with tappings.

An old original

One of my battery sets is a 1938 model which still had its "C" battery installed in a special battery holder when I bought it. The interesting aspect of this battery (possibly the original) is that it is still in use today.

Unfortunately, the old "C" battery was not dated but it is old enough for the cells to be sealed with sealing wax, which suggests that it has been around for quite a while. The design of the Eveready trade mark it carries is similar to those shown in mid-1930s radio books.

When checked with a voltmeter, the old 4.5V battery measures 4.44V but when short-circuited, it is so weak that it cannot even manage a 1mA discharge. However, as the "C" battery's only function is to give the control grids a negative potential, this ancient battery still performs its task quite well.

How one gets side-tracked; let's get back to battery eliminators.

A simple "B" battery eliminator will solve the most serious problem of operating battery radios. Finding 135 volts DC is difficult if one thinks only in battery terms. If a "B" battery eliminator cannot be found, a home-made version can be built using a suitable transformer and a rectifier (either valve or solid state power diodes). Add suitable filtering and the appropriate high-voltage electrolytics and bingo, you have a "B" battery eliminator.

If you are repairing an old "B" eliminator, the capacitors will most likely need replacing to restore it to full working order.

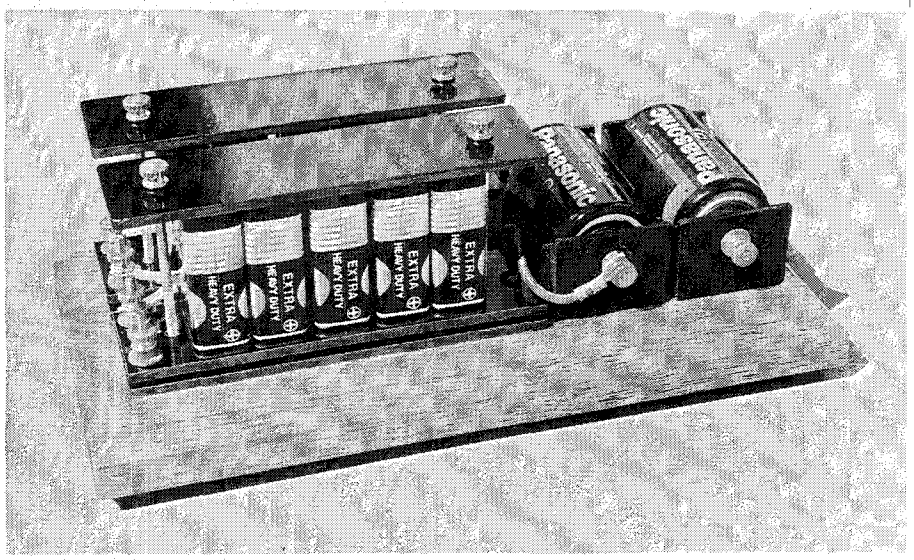
"A" batteries are not much of a problem to substitute. Dry cells or rechargeable nicads are OK for receivers with 1.5V or 2V valves. A wirewound rheostat in the circuit will help to control the voltage.

The old triode valves from the 1920s with their 4V and 6V filaments need a higher supply voltage. A small 6V motorcycle battery will do the job nicely and a suitable rheostat (about 20Ω) will knock back the voltage for use with 4V valves.

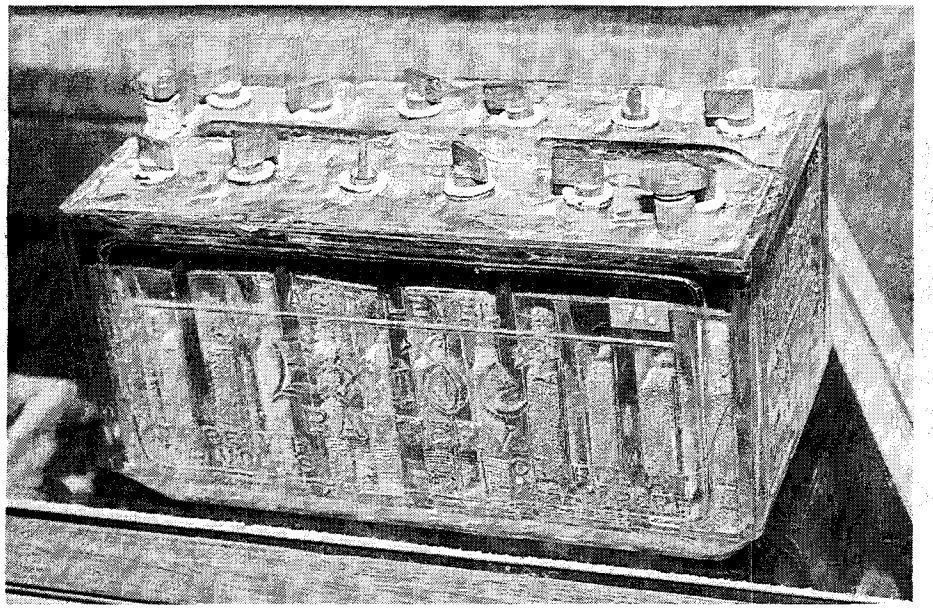
A rechargeable 6V motorcycle battery is also a good power supply for any battery radio with a vibrator unit. Most vibrator radios operated from a single 6V supply rail, although some required a 4V or 32V rail. Typically, a small lead-acid battery will keep a vibrator set operating for three or four hours.

Low-tension receiver voltages can also be supplied by regulated power supplies. A regulated power supply produces a virtually ripple-free current which is most desirable for battery valve filaments. A poorly filtered DC filament supply can cause considerable hum in the loudspeaker.

A regulated power supply can also be used as a "B" battery eliminator if it is capable of producing sufficient voltage. A simple 1-valve regenerative receiver often works quite well



This home-made power supply is used with a small 2-valve headphone receiver. The "A" battery consists of two "D" cells, while the 90V "B" battery consists of ten 9V transistor batteries.



Rechargeable "B" batteries were not all that popular as they were messy, smelly and expensive to buy. The unit shown here has 12 cells and is rated at 24V. (Photo courtesy Orpheus Radio Museum, Ballarat).

on 30V, which is well within the capabilities of many power supplies.

Other options

There are also other power alternatives for battery receivers.

Last month's Vintage Radio dealt with the building of a 2-valve regenerative receiver. This particular receiver is typical of the simple home-built radios that so many of us oldies built in our youth. Like the receivers in this month's story, the 2-valve regenerative receiver is also battery operated.

This particular radio uses two size "D" dry cells connected in series to light the filaments. A rheostat reduces the supply to 2V.

The "B" battery is formed by using five 9V transistor batteries connected in series. These little batteries can be joined using their own snap connectors, soldered together or mounted in a special battery pack as shown in one of the photographs.

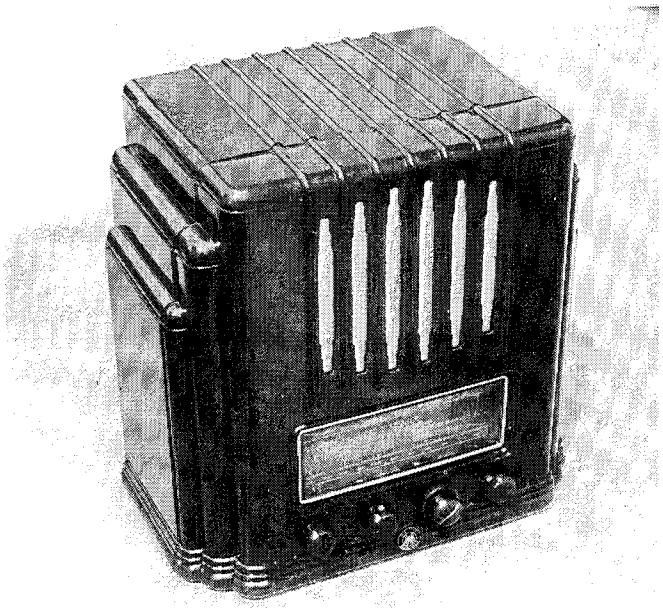
Although this "B" battery is quite small compared to the large 45V batteries of yesteryear, its capacity is more than adequate for the task. The little two-valver draws just one milliamp of high-tension current when the receiver is operating. This rate of consumption is only a fraction of what the battery would be subjected to if it were used in its intended role in a transistor radio.

The 90V "B" battery shown in another of the photographs has had quite a bit of use and most of the batteries in it are six years old. Only two have been replaced in that time. Despite the battery's age, it still delivers in excess of 80 volts under load.

Dry cell shelf-life is very good these days. Modern batteries are sealed very well and the electrolyte does not dry out. What's more, the purity of the zinc used in their manufacture is also better than in the past. This reduces the amount of "local action" which slowly destroys the cell from within. I have an 11-year old "Sharp" AA cell that still tests OK under load.

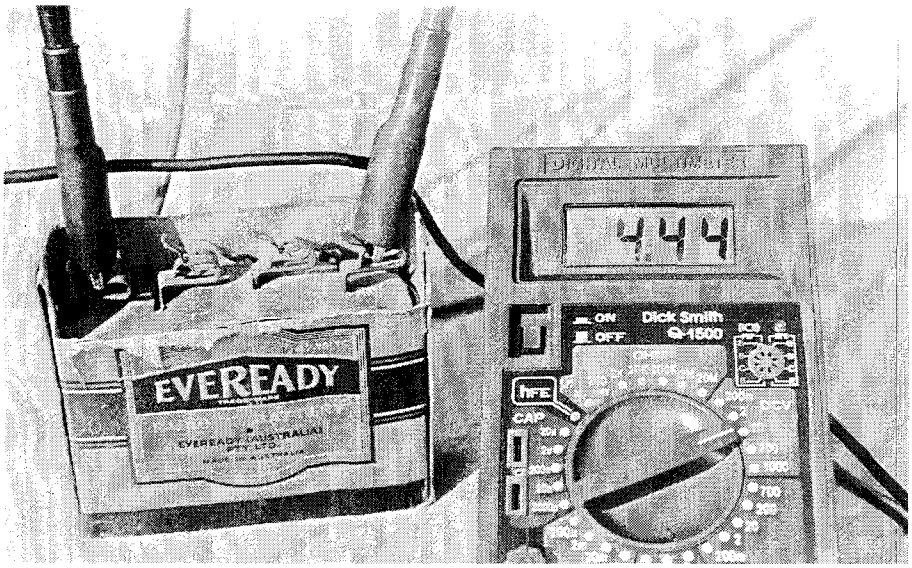
Rechargeable batteries

In bygone days, when battery-operated receivers were the norm, re-



This 1938 AWA receiver is a 4-valve battery set which performs quite well. Many battery sets are worth collecting and they are much more interesting if they are in working order.

This old Diamond 45V "B" battery came with a 22.5V tap. Three of these batteries were used in the AWA receiver shown at left to give a 135V high tension supply. (Photo courtesy Orpheus Radio Museum, Ballarat).



Despite being many decades old, this 4.5V "C" battery still delivers close to its rated voltage. "C" batteries were used for grid bias in early battery sets.

chargeable lead-acid "A" batteries were quite popular. These batteries required charging at regular intervals. If the household didn't have mains power, then the rechargeable battery had to be taken to the local garage or radio service centre for its weekly or fortnightly charge.

Less common was the rechargeable "B" battery and this item, with a charger, would probably have cost as much as the average receiver did in the 1920s.

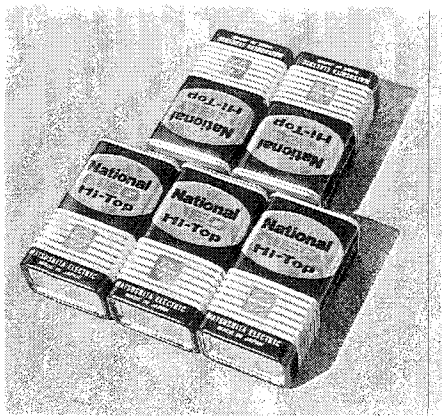
My father built a rechargeable "B" battery back in the 1920s. It was charged direct from the DC mains using a globe in series with it to control the charge rate.

Rechargeable batteries were large, heavy, seepy, smelly things and a good many users must have been very pleased to trade them in on a mains-operated receiver.

The Air Cell

One "A" battery worthy of mention was the "Air Cell", and battery receivers from the 1930s era were often powered with this unique device. This cell used a carbon/zinc element combination, with an electrolyte of caustic soda (sodium hydroxide, NaOH) in water. It developed 1.4V on no load, dropping to between 1.2V and 1.3V under typical loads.

A battery consisted of two cells and, as purchased, the cells were sealed and contained the dry caustic soda. The battery was activated by breaking the seals and adding water. The name



A 45 volt "B" battery can be made simply by connecting five 9V batteries in series as shown here. Such a battery has quite a long service life when used with a 1 or 2-valve receiver.

"Air Cell" was given to this unusual device because it used oxygen from the atmosphere as a depolarising agent for the positive electrode.

When used with a 2V filament string, a small amount of resistance ranging from 0.6-1.1Ω was needed for typical current drains.

A single Air Cell battery could operate a 7-valve receiver (filament consumption 550mA) for 1100 hours. By contrast, 36 No.6 dry cells at twice the cost were required to operate the radio for a similar period.

In spite of this, the Air Cell wasn't around for very long and this was due to a number of factors. One was the high initial outlay which many people simply could not manage, even though it was cheaper to operate in the long run.

It also had to compete with the 2V accumulator which, even if less convenient, was more economical for many people.

Another factor was the timing of its appearance. Battery valve design was evolving rapidly, particularly in the area of operating economy, and eventually lead to the 1.4V-type valves, which were designed specifically for dry cell operation.

At the same time, the vibrator-type receiver, powered by a single large 6V accumulator, was gaining popularity as the supposed answer to the whole battery problem.

But regardless of the type of batteries used, battery receivers were costly to run and the power supply took up a considerable amount of space. Many early radios had quite sizable compartments in them to house batteries, while others were built on double-storey trolleys, with the lower shelf used entirely as a battery storage area. The mains-operated electric models must have had great appeal when they appeared. **SC**