Vintage Radio

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'Battery-Electric' portables

The battery-electric valve portable is about the least desirable of all vintage radios. However they combine battery valves with an inbuilt power supply, and often they actually work very well. As for the rather dubious 'battery reactivation' feature most of them offered, this can only be described as the electronic equivalent of 'snake oil'.

WE HAVE ALL seen them. They come up at vintage radio auctions, whether an organised society function or a weekly mart. These 'things' come up, no-one wants them and the auctioneer just about gives them away. "Well — who will give me a dollar... one dollar? No...? Ok, put it with the next lot..." It's a scenario all too familiar.

But what exactly are we talking about? The very last of the battery valve portables, which were superseded by the transistor portable. They were generally large, came in plastic cabinets, and from about 1953, many manufacturers combined an inbuilt power supply — so that batteries, which were becoming quite expensive again, need not be used wherever 240V AC was available.

Fig.1: Two examples of the last models of battery-electric valve portables, one by Astor and the other by Kriesler.

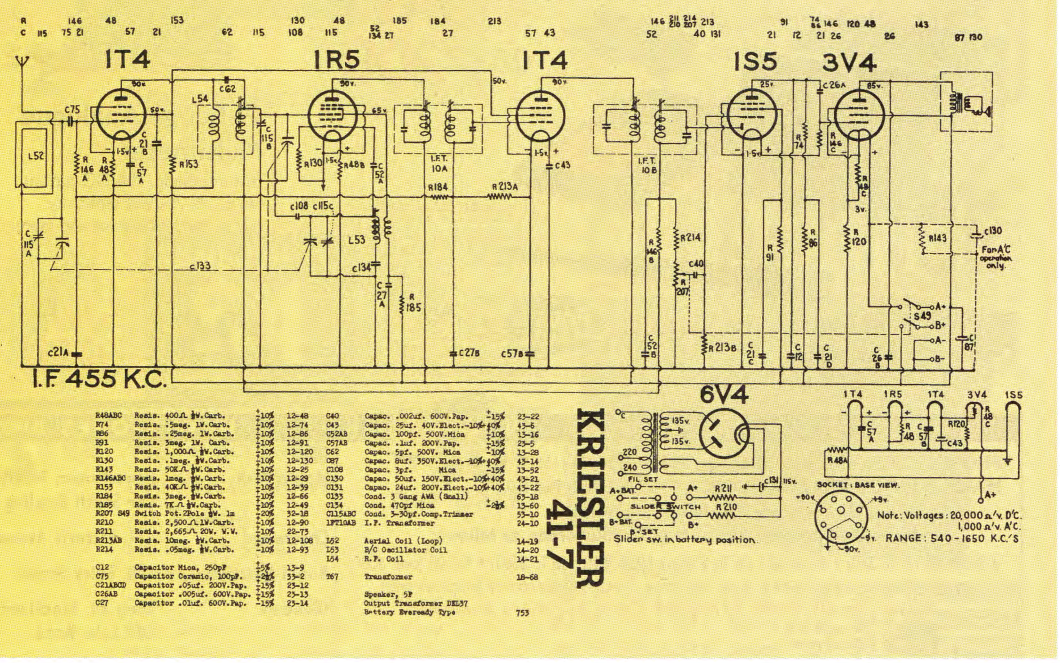

Fig.2: The circuit of the Kriesler 41-7 battery-electric portable of 1952. When running from the AC mains, the 6V4 rectifier provided current for the valve filaments as well as the B supply.

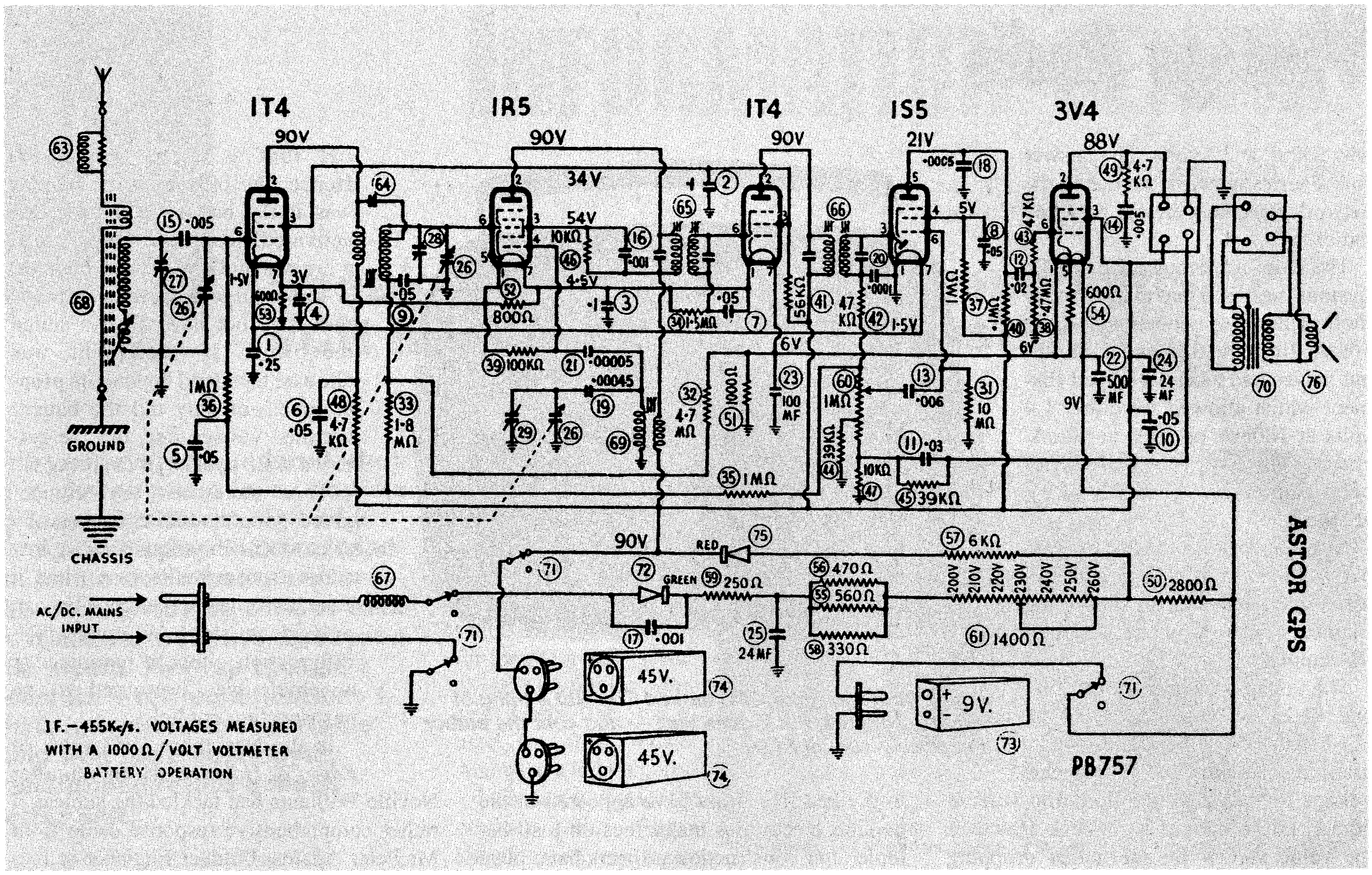

Fig.3: The circuit of the Astor GPS of 1955, with a similar valve lineup — but a rather weird form of battery 'reactivation'.

Batteries were going up in price mainly because the volume produced was decreasing. New battery radios were either vibrator powered, or were as described above, and from about 1957, more and more transistorised radios appeared on the market. It is hard to know just when the last of the battery valve models were made, but it is very doubtful that they were produced after 1960.

Just in case there are those whose memory needs a jog, models by Astor and Kreisler are shown in Fig.1. AWA made theirs in a maroon case with pale cream knobs which fitted into the corner of the dial escutcheon such that only a quarter of the circumference was seen. Philips models were generally grey front and back, with maroon ends. Healing and STC were most often all cream, some with maroon (again) inserts for the speaker grille.

Design considerations

In reality, there were only five principal 1.4 volt 'peanut' valves that were used by manufacturers in these models, from their Australian introduction in about 1947 until the end of manufacture. There are no prizes for guessing: they were the 1T4 RF/IF amplifier, the 1R5 mixer, the 1S5 single diode detector/audio, and either the 3S4 or 3V4 output valve.

Toward the very last days of battery valve manufacture, two new types were introduced: the 1U4 RF/IF amplifier, and the 1U5 diode/pentode. However, radios with those types are not common. The 1U5 is nothing more than a 1S5 with different base connections!

Because of the restriction in available valve types, there was little room for experiment, and the vast majority of these radios fell into two categories: a four-valve version using a lineup of 1R5, 1T4, 1S5 and 3S4, and a five-valve version in which the fifth valve was another 1T4 used as an RF amplifier — which meant a three gang tuning capacitor. As there is only a single diode in the type 1S5, simple AGC only could be used, and whichever circuit configuration was adopted, the earlier versions had a 'loop' aerial coil, while the later versions had one of the new ferrite rod 'loopstick' coils.

There were practically no other variants such as two IF stages, or paraphase push-pull output or anything like that. Only the larger cabinet models seemed to have provision for short waves. In fact I have yet to discover this facility on one of the battery/electric portables, at the time of writing.

One or two manufacturers made a daring foray into audio feedback from the voice coil of the speaker via an elaborate tone compensation network which was fed into a tapping on the volume control at about the 100k position. However with limited gain and only 270 milliwatts of output capability, any sort of audio feedback will ultimately reduce the power delivered to the speaker to a greater or lesser degree. Hence, it was most often dispensed with.

Kriesler's 41-7

The circuit for a Kriesler model 41-7 of 1952 vintage is shown in Fig.2 and nicely illustrates the point. Here we have a five valver, with an RF stage incorporating a loop aerial, AGC to all stages via R146B and R146A (both 1MΩ) R184 (3MΩ) and R213A (10MΩ) and bypassed via C21A and C27B. Notice, though, that the grid leak for the output valve is not returned to earth, but instead to the positive pin of the 1S5. This does seem strange, for returning it to earth would mean an effective grid bias of 6V, about the right figure.

So how were the valve filaments powered? Although copper/copper oxide rectifiers had existed since the late 1920s, and the new selenium bridge rectifiers were making their way onto the market, particularly for domestic battery chargers, they had not been fully developed for 1.4 volt valves. There are arguably two reasons; firstly there was no need, and secondly, adequate filtering would have been a problem. Remember that the highest value of electrolytic capacitor available at the time

Fig.4: What the Astor GPS looked like. Not a thing of beauty, perhaps, but it goes well — and cost the author the pricely sum of $1.00.

was 500uF at 12 volts. The answer was a series network similar to the network used in vibrator powered radios.

The chief advantage of the 1.4V 'peanut' valves is that in most cases their filaments consumed only 50mA. Both the 3S4 and 3V4 output valves had a centre-tapped filament which allowed for either 1.4 volts at 100mA or 2.8V at 50mA. Hence, the five valves in series only required an 'A' supply of 9V at 50mA.

Now the trick was to use the output voltage from a standard full wave valve rectifier, to supply the filaments as well as the plates or 'B' supply.

The voltage at the rectifier cathode under full load is stated in Fig.2 as 115V. A large voltage dropping resistor to reduce the voltage to 9 volts would drop 106 volts at 50mA, i.e., it should be 2120Ω. However the value shown for the actual dropping resistor (R211) is 2665Ω, which computes to a voltage drop of 133 volts — which seems a more likely figure given the transformer secondary voltage.

This large resistor serves as a filter resistor. Together with C43 (25uF), it obviously provided adequate filtering.

More often than not, the voltage dropping resistor for the filaments of this type of set was adjustable, and once the valves were in position, the resistor was adjusted for the correct voltage and the adjustable tap then screwed down tightly.

The 90V 'B' supply for the valves was obtained from the rectifier in a similar manner, by virtue of resistor R210 and filter capacitor C87 (8uF). The B supply probably consumed around 15mA, so that the total load on the power supply was still only 65mA or thereabouts — well within the capability of a 6V4 rectifier.

Battery 'reactivation'

Now for the thorny aspect of these sets: their so-called 'battery reactivation' feature. This has long been a hotly debated topic; for example it occupied quite a bit of space in the late Neville Williams' column 'Let's Buy an Argument' (fore-runner to the current Forum) back in 1953. So what is battery reactivation?

Basically it was a system that was supposed to prolong the life of dry (i.e. carbon/zinc) cells. Now, is this possible? In modern times, it seems so, for articles within the last five years have appeared in the popular electronics magazines on just that topic, and construction projects have been described for dry cell chargers for both alkaline and carbon zinc cells. Ready-made units did appear up until a couple of years ago in the catalogs of the electronic retailers, and these units contained microchips and 'intelligent' circuitry.

However in the present case we are talking 1952, and the technology was somewhat cruder. Unless the consumer was particularly vigilant, battery life was actually decreased and not increased, as was supposed to be the case.

Some extravagant claims were made by the 'National Physics Laboratory' (whoever they were), claiming that it was possible to extend the life of a dry cell by up to six times. But as Mr Williams pointed out in his Let's Buy an Argument column in *Radio & Hobbies* for October 1953: "What a lot of Hooey! There is a vast difference between technicians in white coats with stop watches and elaborate measuring equipment and a largely technically uneducated public..."

He went on. The problems were also clearly explained. A forward voltage incorrectly applied, in time, voltage or amp-hour capacity, actually *increases* the terminal voltage of the battery. What, asked Mr Williams, is 2V and 120V going to do to a set of valves designed for maximum voltages of 1.4V and 90V?

If it was going to be of any benefit, 'reactivation' had to be done quite critically. It also reduced the remaining shelf life that a battery possessed. Hence, the only possible benefit was if the battery was used, reactivated, used, reactivated, etc in a precise and continuous manner.

The trouble was that this regimen may not have always suited the owner. If reactivation was allowed to extend beyond its proper time, not only did the battery terminal voltage rise, but the batteries were cooked in the process!

Then there was the 'advice' given to potential customers by sales staff, who often didn't know a bee from a bull's foot when it came to technical matters. One can only postulate how much misinformation, either by ignorance or mischief, was presented to an unsuspecting public!

In the November 1953 issue of *Radio & Hobbies*, the month after Neville Williams had tackled the subject, a rather comprehensive response came from Mr Peter Adams, Product Engineer at battery manufacturer Ever-ready Australia Pty Ltd. Mr Adams went on to explain the correct method and realistic expectations from battery reactivation.

Firstly, the batteries had to be reactivated by passing a *reverse* current through them after a period of discharge, which should be between 120% and 180% of the amount of discharge during the preceding period of use. Next, the reactivation period should be not less than 12 hours, and is more effective with recently manufactured batteries, rather than ones with an extended shelf life. There followed much technical description of what happens to the internal chemistry of the battery, and explanations for the greater terminal voltage (1.96 volts per cell).

In summary, Mr Adams advised that if batteries underwent a period of heavy discharge — i.e., prolonged use — and reactivation was applied immediately after use (12 hours), then there was a definite increase in their useful life. He also mentioned that the precise conditions did not suit most practical conditions, and if reactivation was intermittent with long periods of non-use, there was little if any benefit, and a possible accelerated deterioration. So there we have it!

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Another example

Let's have a look at another example, an Astor model GPS of 1955 vintage. This was a transformerless model intended for AC or DC operation, and has battery reactivation facilities. The circuit is shown in Fig.3.

The AC mains is half-wave rectified by one of the new selenium rectifiers. Then follows a heavy duty resistor to adjust for the incoming mains voltage. Now we get to the reactivation, which is applied here with forward polarity, not reverse polarity as it's supposed to be.

Audio feedback is applied from the speaker voice coil to the bottom of the volume control, via the 39kΩ and 0.03uF capacitor combination. AGC also appears to be applied to only the RF stage and the mixer.

As with the Kriesler circuit of Fig.2, you will see an elaborate series of resistors (400 ohms to 1000 ohms) either shunting the valve filaments, or returning to earth, often with a bypass capacitor. It seems that this was deemed necessary for two reasons. One was to compensate for the cathode current, or the amount of current drawn from the cathode by the anode (a whole 2 - 3mA!) The old 2V valves worked well enough without these additional components, of course.

The other reason given was that with the newer types of valve there was the possibility of unwanted interstage coupling via the filament network. This potentially led to instability, hence the inclusion of compensating and filtering in the filament network.

The Astor GPS model just described was purchased, along with two others, one of which is shown in Fig.4, for a hefty fee of $2.00. It was purchased with the intention of wrecking it for the small power transformer that was presumed to be inside. After opening it up and replacing three electrolytics, it was plugged in and now works like a charm. The case was also flawless, so now it graces the collection as one of the less popular radios.

For anyone starting out in vintage radio collecting, purchasing a radio for $1.00 that works is not a bad move. These sets may not be popular collectors' items, but they're a cheap way to get experience and quick results! ❖