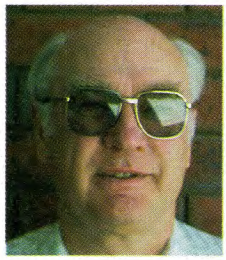
VINTAGE RADIO

By RODNEY CHAMPNESS, VK3UG



Building a vintage radio "replica"

Have you always wanted a 1920s or 1930s "cathedral" style radio. They're as scarce as hens' teeth these days – or are they? If you can't get an original, what about one of the many replicas now coming onto the market?

From time to time, "replicas" of early radio sets appear in catalog advertisements from various electronics and electrical retailers. Consoles and cathedral sets seem to be the favourites but of course, they're not true replicas. First, the cabinets are nothing like the those from the 20s, 30s and 40s, usually being made from cheap ply or particle board with a lacquer finish of some sort. Second, a glance at the front panel reveals that these sets can receive FM transmissions as well as AM. In reality, FM didn't get under way in Australia until well after the era that the "replica" is supposed to represent.

However, it's not until you expect the "insides" of such radios that you realise just how far away they are from being a true replica of the era. Hidden inside the cabinet will be a small transistor radio and that's hardly something that was around in the 1920s or 1930s!

So these sets are in no way an accurate copy or replica of any early radio.

The fact is, there are very few genuine 1920s (and not many more 1930s) sets now available on the market. Many collectors will never own radios of this vintage. But there is nothing to stop you from building a replica using the components (either originals or reproductions), wiring layouts and construction techniques of the era. The resulting set will look like a brand new 1920s or 1930s radio (not a restored set), although it still won't be authentic.

Building a replica requires a lot of work when it comes to sourcing the parts, selecting a representative circuit and planning the layout. You then have to assemble it and get it to work properly. It may also be necessary to vary the original circuitry or layout somewhat, as some parts may just not be available any more.

This view shows the completed Rice Neutrodyne with its loudspeaker.

The Rice Neutrodyne

I haven't personally built a replica of an early set but a few members of the Vintage Radio Club of North East Victoria have. In particular, I was most impressed with Jim Birtchnell's replica of a 3-valve Rice Neutrodyne (you've heard of Jim and his vintage

radios before in this column).

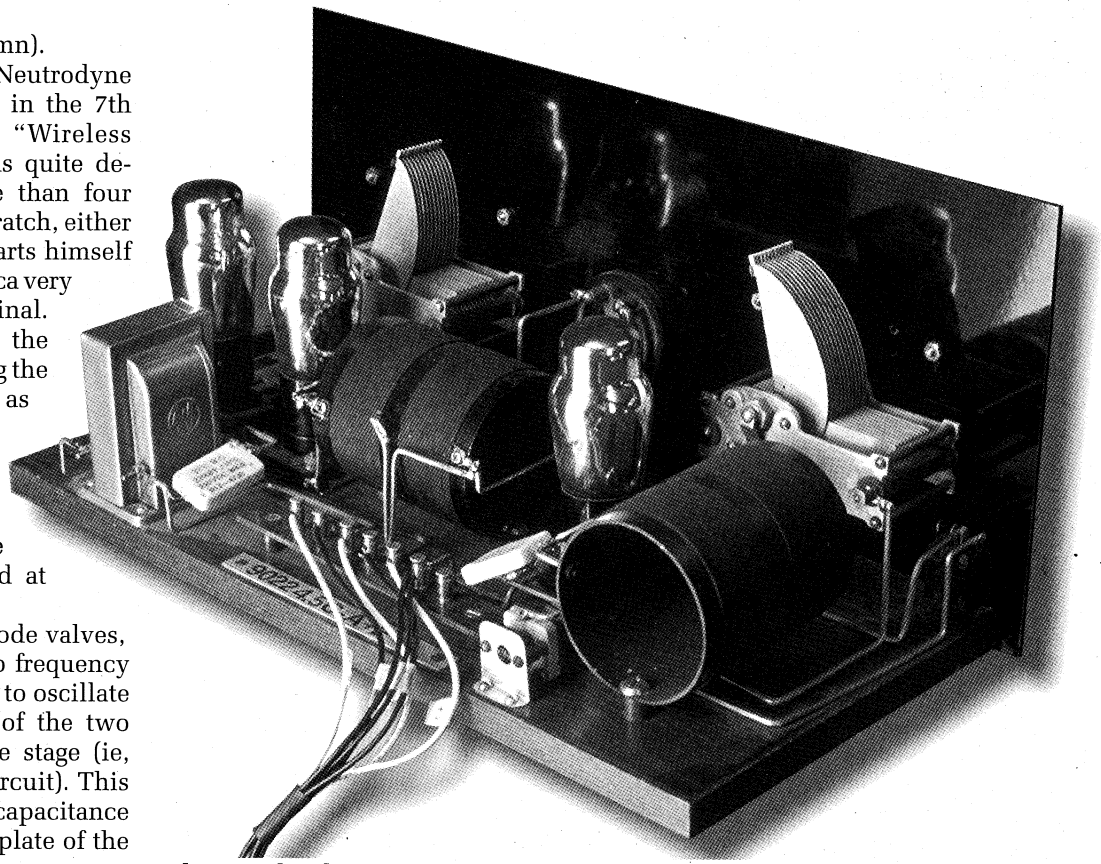
The design for the Rice Neutrodyne was originally published in the 7th October, 1927 issue of "Wireless Weekly". That article was quite detailed and covered more than four pages. Jim started from scratch, either sourcing or making the parts himself so that his completed replica very closely resembles the original.

In the original article, the author began by discussing the Rice neutralising system as seen in an old publication of 1918, some nine years before! This publication discussed the various neutralised triode amplifiers that were used at that time.

The problem is that triode valves, when used in tuned radio frequency amplifiers, are very prone to oscillate at the frequency of one of the two tuned circuits around the stage (ie, the grid circuit or plate circuit). This oscillation is due to the capacitance between the grid and the plate of the valve.

This capacitance is actually quite small – only 4pF in the case of a 6SN7-GT. However, this value is more than enough for this triode to oscillate fiercely if used in a tuned plate and tuned grid amplifying circuit. In fact, this circuit is actually used as an oscillator in some transmitters!

By contrast, a 6BA6 has a grid-to-plate capacity of only .0035pF, which is over 1000 times less than for a 6SN7-GT. However, this low capacity is only realised when the screen grid is earthed to RF signals. Even so, the 6BA6 can still oscillate in some circuits and so the IF stages in quite a few HMV Little Nipper sets are neutralised (we'll explain what neutralising is shortly). This was not done because the stage was inherently unstable but to make sure the stage was unconditionally stable.



The completed Rice Neutrodyne replica closely resembles the original receiver described in "Wireless Weekly" in 1927.

Of course, it is also important to isolate the input and output circuitry of an RF stage, to minimise any coupling between them.

Neutralisation

Radio experimenters of the early 1900s and into the 1920s did not have tetrode and pentode valves to amplify radio frequency signals, so other ways

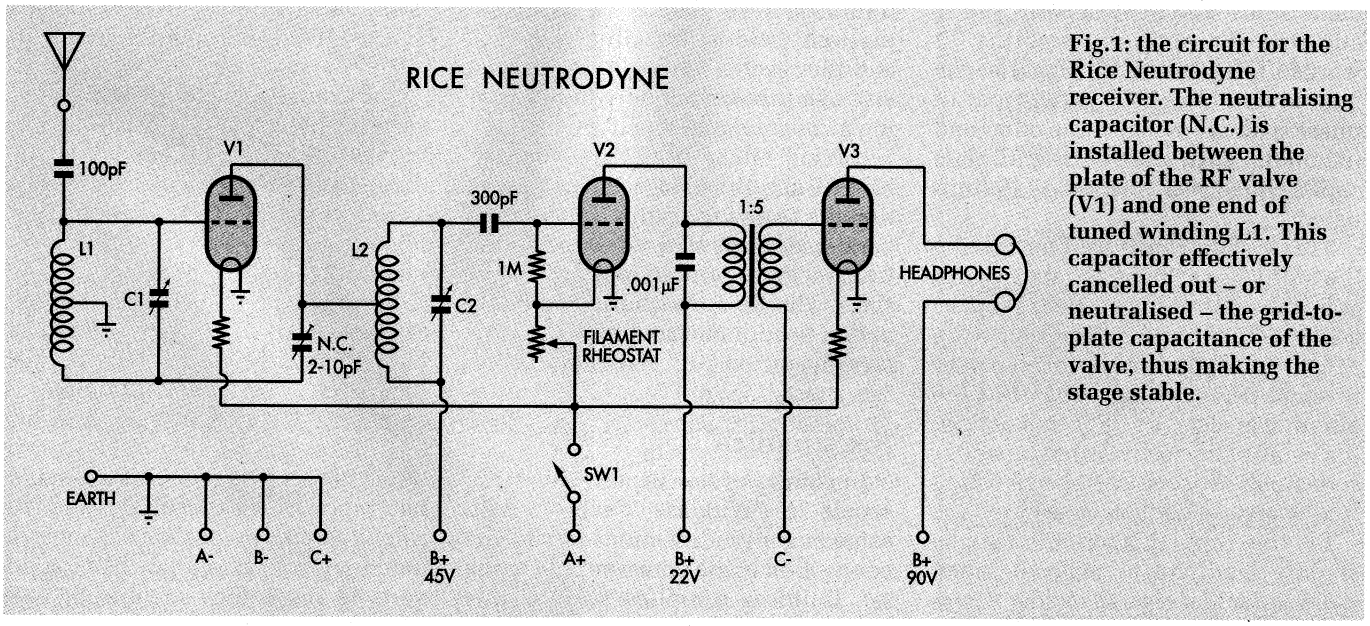
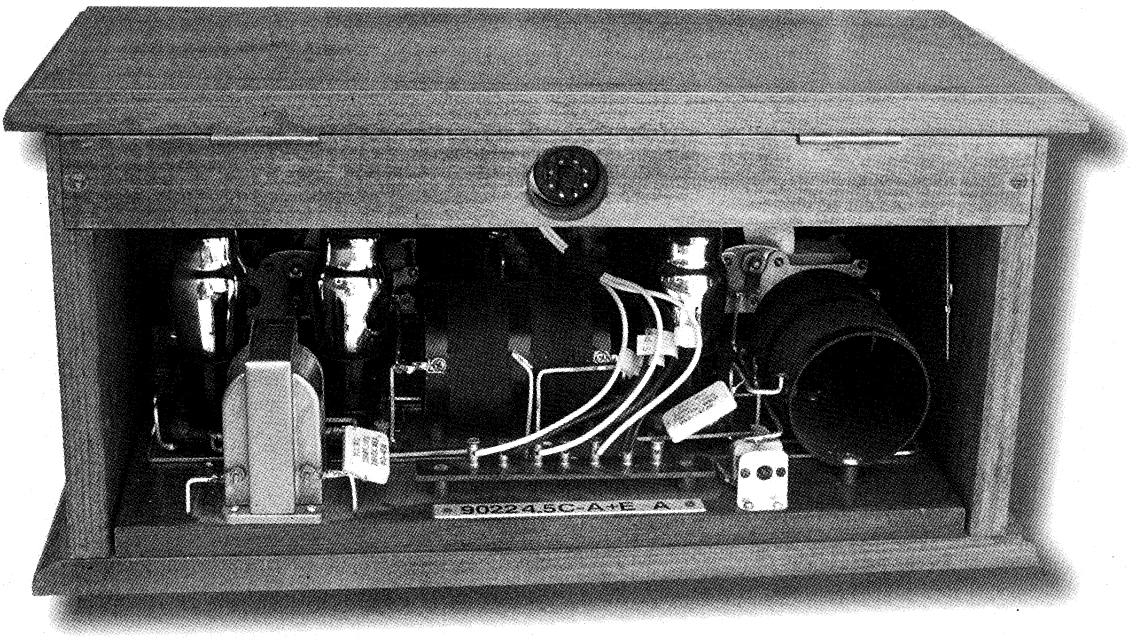


Fig.1: the circuit for the Rice Neutrodyne receiver. The neutralising capacitor (N.C.) is installed between the plate of the RF valve (V1) and one end of tuned winding L1. This capacitor effectively cancelled out – or neutralised – the grid-to-plate capacitance of the valve, thus making the stage stable.



This view shows how the completed receiver fits into the home-made cabinet (it slides in from the front). The large socket in the top panel is for the external power supply connections.

had to be found to stabilise triode RF amplifiers. Neutralising, in the various forms that it took, was not always particularly easy to accomplish although the results were quite reasonable.

Rice Neutrodyne

The Rice Neutrodyne was one such circuit that employed neutralising (Fig.1). Essentially, this involved installing an additional capacitor between the plate of the RF valve and one end of tuned winding L1. This capacitor effectively cancelled out – or "neutralised" – the grid-to-plate capacitance of the valve, thus making the stage stable.

The neutralising capacitor was made adjustable in most cases and is adjusted for optimum stability. It worked because the RF signal at the bottom end of coil L1 is 180° out of phase with the signal at the other end (ie, on the grid) and so the grid-plate capacitance was effectively "eliminated".

This system works well but having the tuning gang "floating" above earth can cause problems. Because the aerial, which is connected to the top of L1 via a 100pF capacitor, can vary in length, the capacitances around the circuit can also vary. For this reason, the value of the neutralising capacitor sometimes required adjustment which is why a variable type is used.

By the way, this circuit can be slightly modified to make it much easier to achieve good results. However, that is a story for another article in the future.

Another common method of ensuring stability was to install a variable resistor between the grid of the valve and the tuned circuit. The value of this resistor was then adjusted until the set was stable (a value of around 850Ω was commonly used by Atwater Kent, for example).

The big problem with this was that the gain of the stage was dramatically reduced. This meant that extra amplifying stages were required to make up for the low gain of an "un-neutralised" RF amplifier. It may seem surprising that not all manufacturers used neutralised RF amplifiers, as valves at that time were very expensive. They didn't because patents on neutralising were held by Hazeltine and Rice and they weren't going to let anyone else use this technique without paying a considerable royalty.

Having talked about the neutralised RF amplifier stage, it can be seen that the rest of the radio is quite conventional, with a grid detector and a transformer-coupled audio output stage. The Rice Neutrodyne is really only a headphone set but it can do a credible job on strong stations, as Jim can attest.

Jim's replica

Jim built the set virtually as per the article in "Wireless Weekly", with some slight modifications to suit the connection of the power supply to the set. Building a replica such as this doesn't require enormous skill as the circuitry is quite simple and the article included detailed layout instructions. However, this is not meant to detract from the obvious skill Jim used in making this set and getting it to operate.

Obtaining the parts to build such a set is quite another story. Where does the builder get 201A valves, or square section copper wire, UX valve sockets, 5:1 audio interstage transformers or the old style vernier dials? However, as can be seen in the photographs, Jim has succeeded in obtaining suitable parts.

Jim told me that he imported most of the bits from America because of price and availability. However, if one is prepared to hunt around, most if not all of the bits can be found (or made) in Australia.

For example, there are several advertisers in SILICON CHIP that cater for the vintage radio buff and contacting them should bring results. They have extensive stocks of all sorts of bits and pieces that are used to restore or build receivers.

Members of the Historical Radio Society of Australia or the New Zealand Vintage Radio Society are also often able to assist when it comes to obtaining that special part. And bits and pieces can turn up in all sorts of other places – garage sales, second-hand shops, deceased estates and "for sale" columns in local newspapers, to name but a few sources. Placing adverts in magazines such as SILICON

CHIP, in local newspapers and on supermarket notice boards can also help track down the bits required to make an authentic replica of a bygone age.

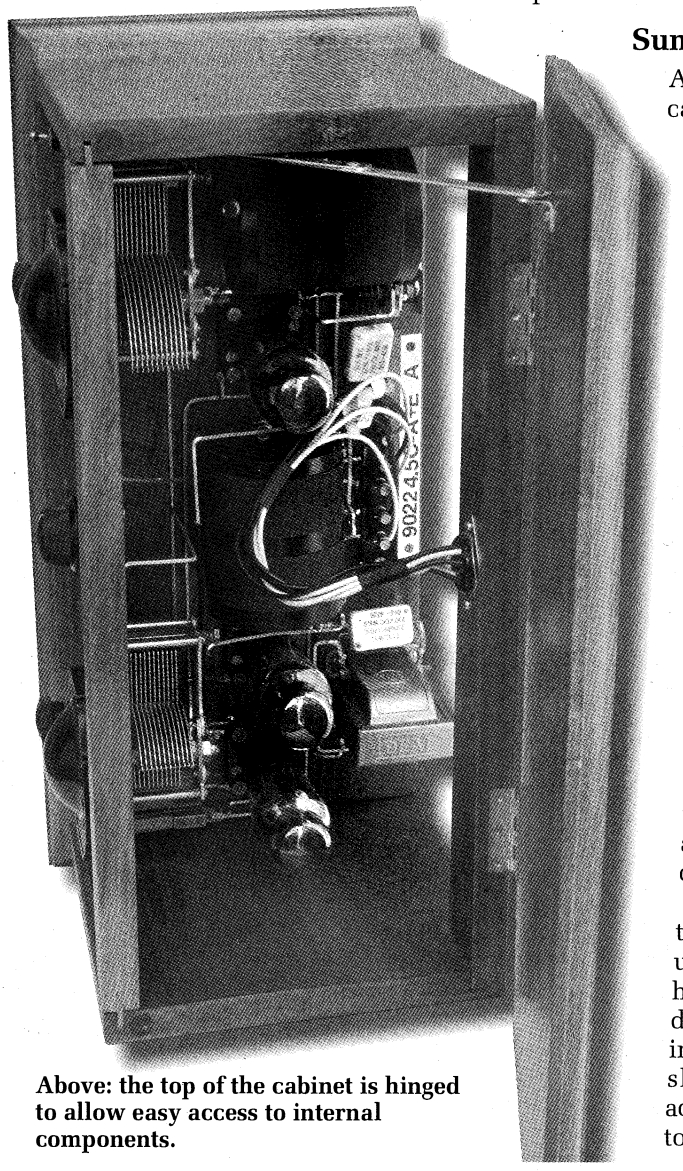
Each vintage radio buff has his or her particular area of expertise, so it is quite reasonable to enlist the aid of others to help in areas where you are no expert. As can be seen from the photographs, the cabinet and the works of Jim's set reflect the era that the Rice Neutrodyne came from. Jim is very good with cabinet work and with circuit layout, although he admits to getting a friend to help with any difficult electronic work on more complex sets.

Other replicas

Replicas can be made of sets from any era, from the very first sets made (with coherers and the like) up to transistorised radios of the 1960s. However, an enthusiast is more likely to build an early wireless set from the 1920s rather than a 1960s set. There are still many of these later radios around and if you can scrounge more than one unit of a particular model, it's usually possible to make at least one good working unit using parts scrounged from the others.

For this reason, I always endeavour to collect several sets of the model I want to restore so that I can make one "perfect" radio.

There is of course another type of replica. This replica is not a slavish copy of any particular set but rather a copy of the style of set that was used during a particular era. For example I know of some enthusiasts who have built typical 4-valve mantle sets using octal valves and a wooden cabinet. They look the part, are similar to many commercially made sets of the era depicted and work much the same.



Above: the top of the cabinet is hinged to allow easy access to internal components.

Summary

As we've seen, replicas can be direct copies of receivers from bygone times or can simply be representative of sets of a particular era while not copying any particular make or model. And although they are not true vintage radios, they can be interesting and valuable sets in their own right. Other projects that have been held in recent times by various groups include building a "Little General", a "Little Jim", a "Hikers One" or some other radio, as described in popular radio magazines of the time. All of these are examples of replicas.

Finally, my thanks to Jim for sharing with us the information on his replica Rice Neutrodyne. The photographs in this article clearly show what can be achieved with attention to detail. **SC**