

VINTAGE RADIO

By JOHN HILL



Building a classic crystal set

Building a classic crystal set can be a lot of fun. This unit is based on an old navy design & offers excellent performance considering the circuit simplicity.

I recently joined a radio collectors' club – The Vintage Radio Club of North East Victoria Inc. This group meets at various locations around the Shepparton, Benalla and Wangaratta region and has a membership of about 40.

The North East Club is a fairly active group. Not only do they meet on a regular monthly basis but they also put out a monthly newsletter which is a remarkable effort in itself and a credit to those concerned. And every year, the club presents to one of its members a special achievement award called the "Hellier Award".

Les Hellier was a radio pioneer in the Wangaratta district in the early 1920s. His family were happy to have his name used by the club for their annual award and have supplied a shield for use as a perpetual trophy.

Last year, everyone who wished to

participate in the award activity built a Little General receiver. This year's effort centres around the building of a crystal set. Personally, I think the crystal set project is a great idea as it allows members with little practical experience to participate in the event. There are two award categories this year – vintage and open – so the award will have joint winners.

Classic crystal set

Anyway, this preamble is simply a lead up to explain why I have just finished building a crystal set. I am pleased to say that my home-made receiver has turned out to be an outstanding performer and it has been well worth the effort. What's more, I found building this simple little radio to be an interesting and rewarding project.

To be perfectly honest, I cannot take much credit for my crystal set because it has been built to a well-proven design. It is a home-made version of the Technicraft-cum-Orpheus "Super Crystal Set", without the spiderweb coils, plus a few minor modifications of my own. I also decided on a name change to distinguish my version and it is now the "Classic Crystal Set".

The receiver is of elaborate design (for a crystal set), having three coils, a 10-position stud switch, two variable capacitors and four controls on the front panel. As the set is to be entered in the vintage category, it has been built to look like a 1920s production, complete with a catswhisker type crystal detector, black bakelite panels and vintage style control knobs.

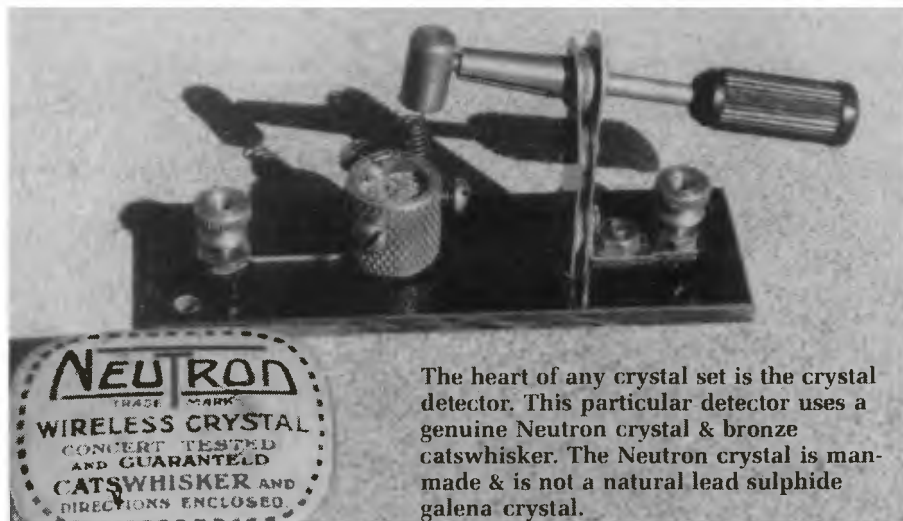
The cabinet also follows this pattern; it has a lift up lid and is made of solid blackwood timber.

Design origins

The previously mentioned Super Crystal Set was originally designed by David Whitby and is based on early navy circuits. The Super Crystal Set, as well as several other vintage radio kits, were quite popular about 10 years ago. In fact, it was these Technicraft kits that started me in vintage radio. If they had not come along at the right time, I would most likely be doing something else for a hobby today.

David eventually sold his vintage radio department to Richard Wilson who then sold the kits through the Orpheus Radio Museum in Ballarat. When Richard eventually decided to get out of the vintage radio business, the production of Technicraft kits suddenly came to an end. No doubt this range of receivers will become quite collectable.

Retailing at \$89, the Super Crystal Set kit was not cheap and many would-





These ancient aerial and earth terminals are just the thing when building a 1920s style crystal set. The parts used in vintage construction should be from the right era, or at least look as though they are.



This photo shows the two old style variable capacitors used in the crystal set. The one on the left has a range of about 0-100pF & the larger one a range of about 0-500pF. Both are plain, single bearing types & both required cleaning & adjustment before they could be used.

be builders were discouraged by the price. If you now want to build this remarkable crystal receiver, simply do as I have done; build it using conventional coils and utilise what odd bits and pieces you may have available. Whether or not the receiver is made to look like a vintage set or not is entirely up to each individual constructor and the components available. Be-

cause my receiver has been built as a vintage replica, the rename to Classic Crystal Set seemed appropriate.

Design points

I like to think of this particular receiver as being a TRF (tuned radio frequency) crystal set. While some would argue that the RF section is nothing other than a loading coil, there

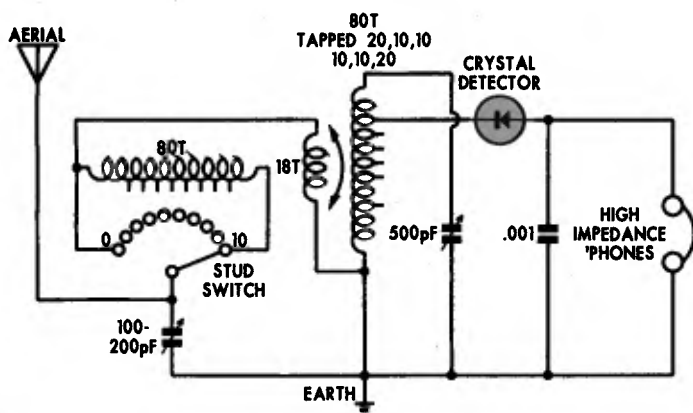
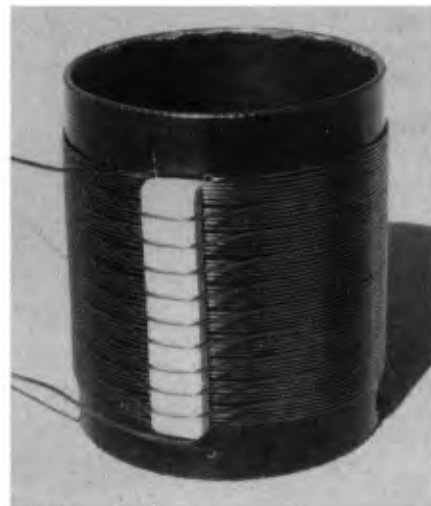


Fig.1: the circuit for the Classic Crystal set uses a tapped loading coil which is accurately tuned with a trimmer capacitor.



The Classic Crystal Set's coils were wound on old (& very rare) 2-inch diameter black bakelite tubing. A thin piece of wood has been used to isolate the coil taps.

really is a bit more to it than that.

Sure it is a tapped loading coil but my design improvement incorporates a variable capacitor so that the resonance peak can be accurately obtained. Without this trimmer capacitor, the eight turns between the taps is much too coarse if the resonance point of a particular station is midway between taps.

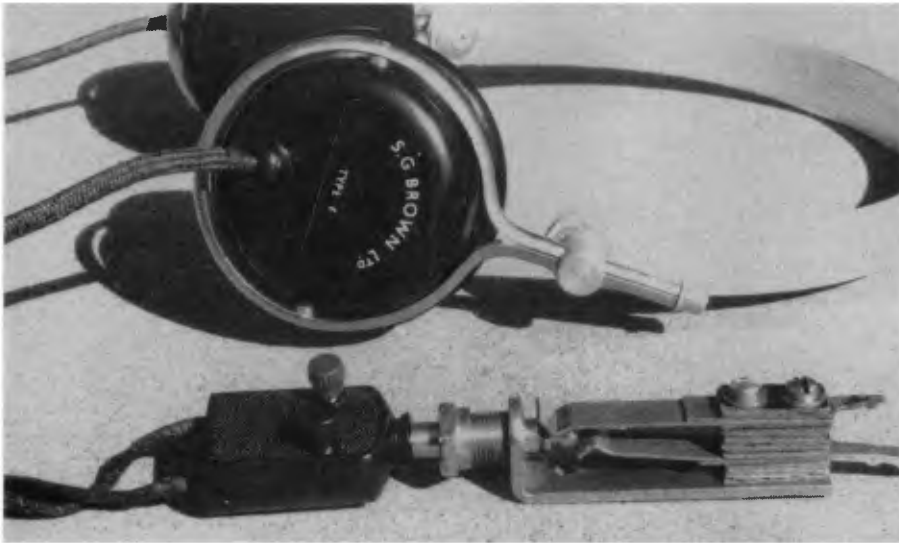
As far as I'm aware, a loading coil is nothing but a tapped coil in series with the aerial. It is often mounted on a separate board and operates independently of and outside the crystal set.

On the other hand, the accurately tuned RF coil in the Classic Crystal Set is inductively coupled to the detector stage by a variable coupling coil arrangement. That seems like a tuned non-amplified RF stage to me.

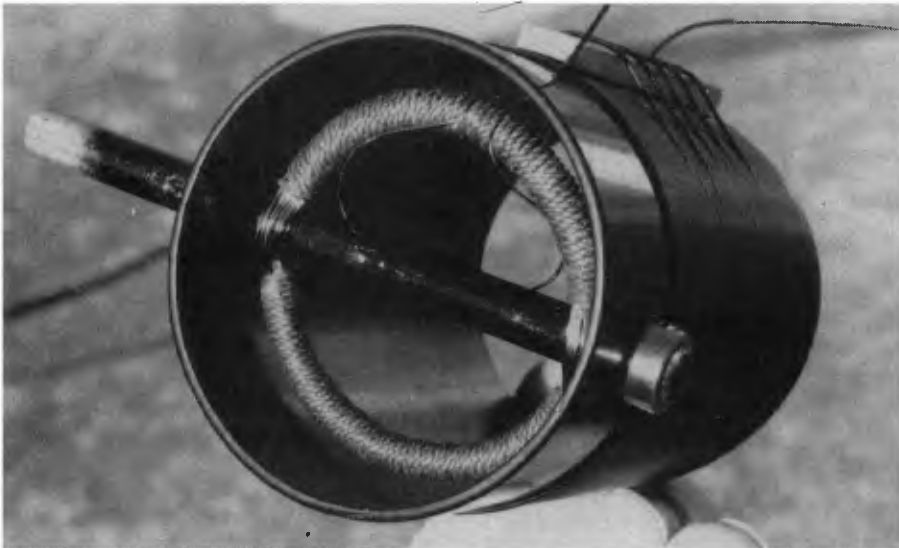
Anyway, whether you agree with me or not, you would have to admit that a TRF Crystal Set sounds intriguing and gives the receiver a bit of class. If anything ever needed its image lifted in this day and age, it would have to be the humble crystal set. So a TRF it is!

Collecting the parts

It is surprising just how long it takes to bring a simple crystal set project to completion. Just finding all the necessary bits and pieces was a major operation and quite a few hours were spent locating the required parts. Knowing that you have something and knowing where to find it are two dif-



A pair of Browns type F high-impedance headphones was used with the Classic crystal Set. Also shown is an adapter which allows phones with standard lead tips to be used with a quarter-inch phone jack.



The variable coupling coil setup was installed in one end of the detector coil. It is mounted on a hardwood shaft & the coil connections run through the shaft to the outside. Note that the coil is bound with thread to keep it together.

ferent things. Cleaning and repairing these parts took up a considerable amount of time too.

Mention should also be made of the convenience of having a lathe in one's workshop. The variable coupling coil control, in particular, would have been difficult to incorporate without the lathe.

The big advantage of a crystal set of this design type is that it is so selective, yet it seems to produce this selectivity without loss of volume which is contrary to what one would expect.

Selectivity is something that is really important in my locality because of a local 5kW station, 3CV (Central

Victoria) on 1071kHz. Not only is 3CV a mere 6km away from my location but it also occupies a central position on the dial. Most single coil crystal sets cannot handle such a situation and provide only single station reception – the strong local.

However, the Classic Crystal Set with its two tuned circuits, variable coupling coil and tapped detector coil enables the operator to tune out the local station to a remarkable degree. 3CV can be suppressed sufficiently to receive about eight other stations on those special nights when reception is particularly good.

Using an aerial that can only be

described in crystal set terms as being mediocre (20 metres long and 6 metres high), this remarkable little receiver can even pull in interstate stations. Adelaide and Sydney stations (5CL, 5AN and 2BL) sometimes come in at surprisingly good volume levels. Of course, they often fade to nothing for lengthy periods too. I must also stress that these interstate stations are in the 50kW class and this fact allows them to be received at great distances – even on a crystal set.

However, the most incredible reception feat that the Classic has managed so far is 4QD in Emerald, Queensland – 1500km as the crow flies. Once again, this is a powerful 50kW station. The original Technicraft Super Crystal Set will also receive 4QD.

It would appear that I'm in a good reception area for these particular transmissions. I might also add that listening to these distant stations is not damaging my hearing to any extent and nor are the headphones being greatly overstressed. They are loud enough to identify and that's about all.

Detector stage

Looking at the circuit (Fig.1), one can say that the detector stage of the receiver is just about as standard as a crystal set can be. There are no special techniques involved and attaching the antenna to the top of the detector coil would produce a fairly basic crystal set.

The secret of the set's brilliant performance must therefore be in the RF section ahead of the detector stage. The tuned RF coil and its accompanying variable coupling coil is where the performance comes from. This particular circuitry produces good selectivity without any significant loss in volume.

Tuning the receiver is a two-handed job and it takes a while to pick out those elusive stations. When a station is located, it needs to be logged on a chart so that it can be found again.

This is where it helps if the controls have numbered dials. In the case of the Classic, the tuning dial is numbered, the RF coil trimmer is numbered, the stud switch is numbered and the coupling coil control knob arrow operates best at around the 12 o'clock position. It is therefore easy to return to a station once these control positions have been accurately logged.



The finished receiver successfully captures the vintage look of the 1920s. The crystal detector was mounted high on the back of the front panel where it is out of harm's way.

Another stud switch for the detector coil taps would have been a good idea but there really wasn't room to accommodate it on the front panel. Instead, an internal wander lead and alligator clip is used. Once set for best results, it seldom needs moving.

The crystal used in the detector is not the usual lead sulphide natural galena type but a genuine "Neutron" crystal. These special man-made crystals have a surface which contains hundreds of small sparkling facets and good spots abound.

The Neutron crystal was actually

broken in half with a pair of side cutters so that the catswhisker operates on a freshly exposed surface of the crystal. When set on a good spot, the Neutron crystal performs equally as well as a germanium signal diode, although an ohm meter indicates otherwise.

Alternate switching from crystal to diode produced no difference in reception quality or sensitivity. However, the signal diode is a bit more convenient to use.

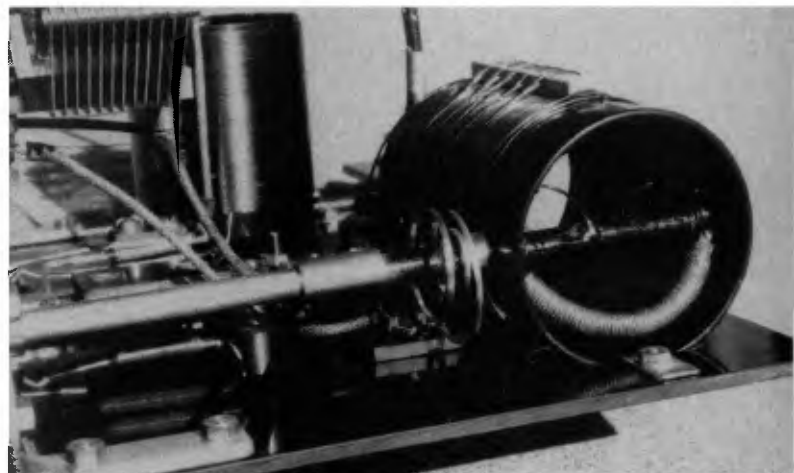
If you have an interest in simple radio receivers, then this particular

circuit will not only test your construction skills but will also reward you with a top performing crystal receiver. Whether it is operated in the city or in some remote country area, it will give a surprisingly good account of itself.

So it's off to the Hellier Award meeting at the weekend. I'll tell you how it all went next month. **SC**



The parts visible in this photo include the tapped RF coil, the rear of the stud switch & the trimming capacitor. The alligator clip at the left is used for selecting the detector coil taps & once set rarely needs shifting.



This view shows the variable coupling coil setup & the drive shaft to the front panel. Note the brass "clock spring" connectors on the shaft. Rotation of the coupling coil is restricted to half a turn.