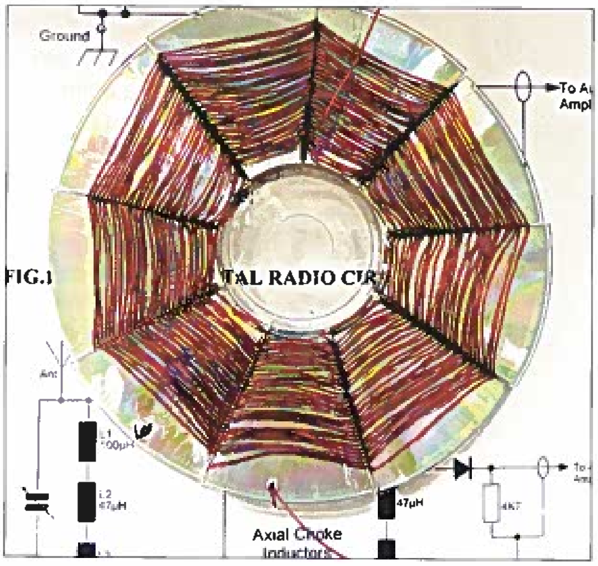
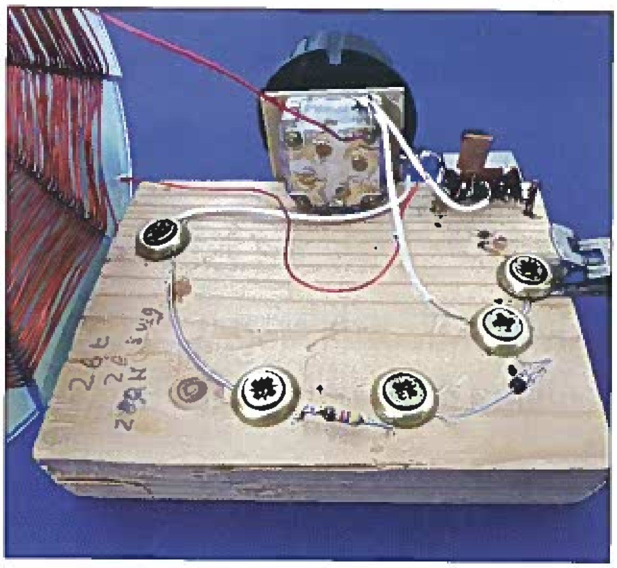


The hi-tech solution (left) to permeability tuning, with a foil-covered piece of cardboard cut to slide beneath the coil.



The spider web coil (right) can be seen clearly in this photo of the finished radio.

support the CD on the edge of a work bench, a 'workmate' or a large vice and cut the slots carefully with a junior hacksaw. The coil is completed by weaving the wire through the slots, as can be seen in the photographs.

Using 26 s.w.g. enamelled copper wire, I managed to get 27 turns of wire around the spider web former. This gave me a measured inductance of some 280μH (micro-Henries). This coil becomes L1 in **Fig. 1(a)**. Capacitor C1 can be a polyvaricon variable capacitor with a high nominal value. The G QRP Club sells a two gang 295pF + 295pF polyvaricon and Spectrum Communications sell a 266 + 266 + 20 +20pF polyvaricon.

These values of inductance and capacitance tune the upper end of the a.m. band. Radio 5 came blasting out of my prototype. Lower frequency a.m. stations would require adding some capacitance in parallel with C1. I added a switch to experiment with additional capacitance. Another alternative is to arrange to switch in one or both gangs of the polyvaricon.

Permeability Tuning

Having made a spider web coil, my next experiment was to attempt a form of permeability tuning with the coil after the manner of Dave NM0S. I tried several methods but the best results were had using the arrangement shown in the photograph. It requires a means of being able to slide a piece of cardboard covered with kitchen foil across the spider web coil.

An A5 envelope with a stiff card back more than covered the area of the coil. This can easily be taped to the coil. I cut a piece of cardboard (the side of a cornflakes box) to a size that would slide freely within the envelope. The card was then covered with kitchen foil with a short length of plastic tape to act as an operating tab. The spider web coil was taped to the envelope and the foil covered card inserted into the envelope.

Sliding the card in and out of the envelope gave a reasonable tuning range. It was able to tune in four stations at the high end of the a.m. band. I used the permeability tuning in conjunction with the polyvaricon capacitor. This could be replaced by a fixed capacitor or two or three switched capacitors to give a few ranges of tuning. It is a viable method of tuning a crystal set and certainly very inexpensive.

Circuit Alternatives

The illustration Fig. 1(a), shows a typical crystal set circuit with the audio output going to a pair of high-impedance headphones. The headphones need an impedance of at least 1,000Ω and such headphones are not easy to find. One alternative is to use a crystal earpiece as shown in Fig. 1(**b**). The impedance of the earpiece will be too high so it is wired in parallel with a fixed resistor as a suitable load for the detector circuit.

The crystal set can also be used as a tuner ahead of an audio amplifier. I guess that most readers have a small audio amplifier that could be used in place of headphones. My LM386 bench amplifier worked well with the crystal set as did an amplified speaker bought at a Pound Shop. The simple output circuit is shown in Fig. 1(**c**).

Having built a crystal set with a novel tuning coil, I wondered about using very small coils to make a tiny crystal radio. I have a small stock of axial chokes, miniature inductors that look like fat resistors. Internally they have a very fine wire coil wound on a ferrite core. They are conveniently small but lack the higher Q of larger inductors.

As with all inductors, when connected in series the total value of inductance is the sum of the individual values. My stock of high value chokes was limited so I used the arrangement shown in **Fig. 2(a)**. Inductors L1, L2 and L3 add up to 247μH (100 + 47 + 100) μH, which allows tuning at the higher end of the a.m. band. The version shown in Fig. 2(**b**), where the diode is tapped 100μH down from the top of the total inductance, gave slightly improved results from the better match between the tuned circuit and the detector circuit. Note that I am taking the audio output to an amplifier, as described above.

Crystal set experts, and there are more than a few on the internet, lay great store by having loose coupling between the tuned circuit and the detector. The illustration, **Fig. 3** shows my simple experiments with inductive coupling. The existing (100 + 47 + 100) μH inductor is used in the tuned circuit and, rather than direct connection to the detector circuit, another 47μH axial choke is used to inductively couple the tuned circuit and detector. This is done by laying the 47μH chokes together so that they touch. The signal is passed without a direct connection and I found that the selectivity of the radio improved. Note that the ground connection from the detector circuit is a dotted line. The inductive coupling works well without a ground connection although this will probably depend upon the earth connection used. So the dotted line is saying, "Try it and see". I did not use a proper earth connection at all.

The diagram **Fig. 3(b)** shows another alternative coupling arrangement. The increased ratio of turns between the 100μH and 47μH inductors gives a small improvement in receiver output.

So plenty of crystal radio experiments to try – have fun!