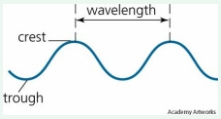
Hands On Learning
with Reading Museum Service

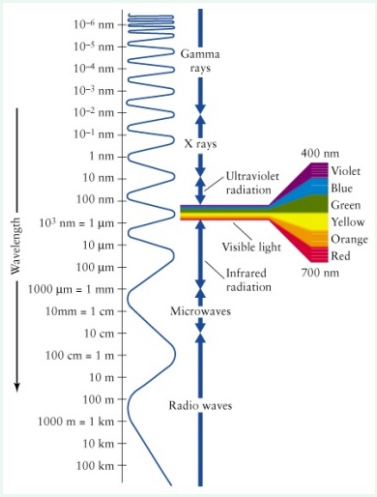
CRYSTAL WIRELESS SET H12

Background

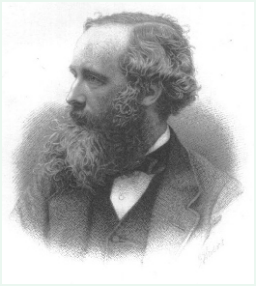
Our eyes are sensitive to light. Light is a form of electromagnetic wave. In the late nineteenth century it was realised that there were all sorts of other electromagnetic waves that our bodies are unable to detect. X-rays are electromagentic waves. Radio waves are another kind of electromagnetic wave.

Electromagnetic waves are measured by their wavelength (right). Some electronic waves have a short wavelength and others have a long wavelength. The diagram on the left shows the range of electromagnetic waves that exist. At one end (short wavelength) there are gamma-rays, at the other end are radio waves (long wavelength). As the diagram also illustrates, the range of electromagnetic waves which our eyes can detect represent only a tiny fraction of the possible electromagnetic radiation.





In the 1860s a brilliant Scotch scientist called John Clerk Maxwell (right) produced some mathematical calculations which predicted the existence of electromagnetic waves outside the range of human sensitivity. However it wasn't until the late 1880s that the German scientist Heinrich Herz devised machinery that proved these waves really did exist.



Herz said that his experiment 'proves Maestro Maxwell was right - we just have these mysterious electromagnetic waves that we cannot see with the naked eye. But they are there.' However, when asked what practical purposes his discovery might have, commented - 'Nothing, I guess.'

If Herz could not see the use to which electromagnetic waves could be put, others most certainly could. Perhaps the most famous was Gugleilmo Marconi. Marconi patented and made a number of radio transmitters. For the first time human beings were able to send messages over long distances without using sight or sound, or needing electrical cables. Early radios were quickly adapted for use at sea. The Titanic, for example, could send and receive radio messages - although this couldn't prevent it sinking on its maiden voyage in 1912.

Hands On Learning
with Reading Museum Service

CRYSTAL WIRELESS SET H12



Speech or music broadcasts, rather than simple Morse code, needed amplification to be heard by general listeners. This was made possible by the development in Britain in 1904 of the thermionic valve (right) by J. A. Fleming. In 1907 an American, Lee de Forest, produced a modification that turned these valves, or 'tubes', into devices capable of amplification (left). For 50 years valves were a fundamental component in all radio equipment until they were replaced by the transistor.



The introduction of valve technology was slow, but by about 1920 it was ready to be exploited on a wider scale. The radio equipment manufacturers realised that there was potentially a huge new market for the sale of radio receivers if entertainment programmes were allowed to be broadcast.



In Britain the government allowed the Marconi Company one experimental evening of broadcasting a week, but public response and pressure from industry led to further trials. In 1922 a consortium of manufacturers set up the British Broadcasting Company (BBC). Its first broadcast came from the ex-Marconi station 2LO in London on 14 November 1922; other British towns and cities soon followed.The photograph on the left shows the cover of the *Radio Times* for Christmas 1923.

This company continued until its licence expired at the end of 1926. It then became the British Broadcasting Corporation, a non-commercial organisation. Its governors are appointed by the government but they did not answer to it.



Unfortunately, the first valve receivers with loudspeakers were too expensive for most people. Consequently many people listened in on cheaply made crystal sets with headphones such as the one in this box. The heyday of crystal sets was the 1920s. By the 1930s the price of radio sets (right) had started to drop and soon listening to the wireless in the living room at home was a familiar experience for millions.

Hands On Learning
with Reading Museum Service

CRYSTAL WIRELESS SET H12

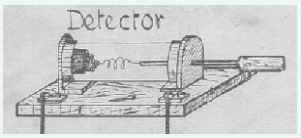


A crystal radio is a very simple kind of radio receiver. It needs no battery or power source except the power received from radio waves themselves.

Radio transmitters send out enormous amounts of energy (tens of thousands of watts). However, because transmitters are usually far away, by the time they reach the receiver they are much weaker. Each crystal radio had a long wire aerial to pick up this signal, although the amount of energy received by a crystal radio set is measured in fractions of a watt. The aerial wire is missing from this example.



The tiny amount of energy from the radio wave that is picked up by the aerial is taken to a coil of wire. The length of the coil of wire decides the frequency of the signal that is being received. The coil of wire is hidden inside the body of this example.



Fine tuning was achieved by means of a 'cat's whisker' detector (left). A crystal, often a small piece of galena (lead sulphide), was enclosed in a glass tube to exclude dust. The end of a very fine wire - the cat's whisker - was dragged across the surface of the crystal until the best resonance was found. As the crystals were quite soft regular replacements were essential (below).

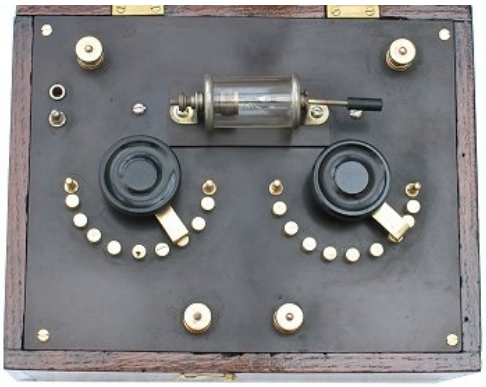
The weak signal was heard using headphones. Listening to radio on a crystal set was a solitary experience!

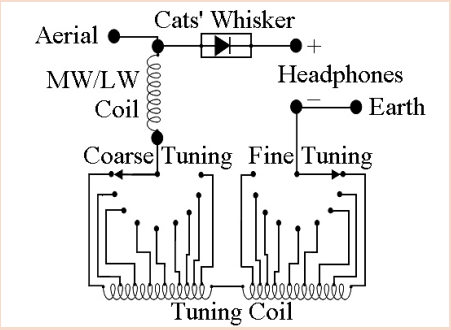


Hands On Learning
with Reading Museum Service

CRYSTAL WIRELESS SET H12

Unfortunately there is no maker's label on the crystal radio in this box, so it is impossible to be certain about its manufacturer or date. However, it is very similar in appearance to crystal sets made and sold by the Radio Electric Company of Wolverhampton. A photograph of a set known to have been made by this company can be seen on the right for comparison.





The Radio Electric Company of Wolverhampton was typical of many small businesses which were created to cash in on the crystal radio craze of the 1920s. It opened for business on 10 July 1922.

A simple electrical diagram of an REC crystal radio shown above can be seen on the left. The two big knobs are for tuning. The one on the left is coarse tuning and the one on the right, fine tuning. Turning them effectively increases or decreases the length of the coil inside the body of the set.

The two terminals on either side of the cat's whisker detector are probably for the aerial. The other two terminals are probably for the headphones - in this case the headphones are made by Ericsson of Beeston, Nottingham.

The REC set which is photographed above right has another plug and socket on the far left that is for attaching a Medium or Long Wave coil. This is missing from the set in this box, so it probably could only receive short wave transmissions.

This is clearly a simple and cheap receiver, aimed at the bottom end of the market. Its performance was probably poor, but it would have been affordable to almost anyone and so would have helped to bring radio to the masses at a time when valve receivers were still very expensive.

