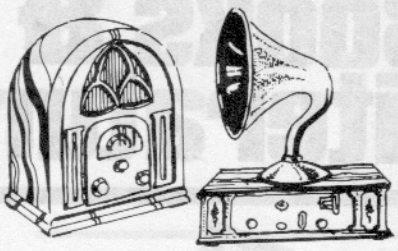
Vintage Radio

by PETER LANKSHEAR



The brief heyday of 'CATKINs'

No, *EA* has not branched out as a horticultural magazine! The catkins referred to are not willow flowers, but an interesting series of valves marketed by Marconi/Osram in England for a couple of years after their introduction in 1933.

The radio valve was a direct development of the electric lamp. Thomas Edison conducted investigations into the blackening of bulbs by deposits radiated from carbon filaments, and in the process noted that a unidirectional current could be made to flow to a separate electrode within the lamp. This 'Edison effect' as it was called, was later used by Professor Fleming in modified lamp bulbs for his first diodes, and Lee de Forest turned to a lamp manufacturer to construct his 'Audion' triodes, made by fitting a grid to the Fleming diode.

Thus, right from the start, the lamp industry was closely associated with valves, and used techniques with which they were familiar, such as the 'pinch' – a flattened tube in the base used to support the electrodes.

Naturally, glass was used for valve envelopes, and in general, its characteristics are ideal for this purpose. Although brittleness and lack of electrical screening were minor criticisms, it is strong, easily worked, heat resistant and above all, a good seal against a vacuum. Little wonder then, that it was used throughout the whole history of valve manufacture as the major envelope material.

Transmitting and special purpose valves have often used more exotic ceramics, however – including some incorporating beryllia, a known cause of leukaemia!

Had the valve not been tied to the lamp industry, it is likely that it would have evolved with a metal envelope. The early transistors reflected their valve associations and were frequently encapsulated in glass, but in their case, it was not long before metal and plastic took over.

Metal valves in 1923

Quite early on there was a realisation that valves might be better clad in metal. During 1923 the Belgian military, in a search for more rugged equipment, commissioned Philips to construct some metal cased valves. It was soon apparent however that fragility at that stage of valve development was not confined to envelopes, and the project was abandoned.

Twelve years later, the familiar and very successful American octal based metal valves made their highly publicised debut, and were eventually to become an international standard. Not so familiar were the earlier British made Marconi/Osram metal valves, which, although produced for only a few years, were to have a significant influence on the development of the octal series.

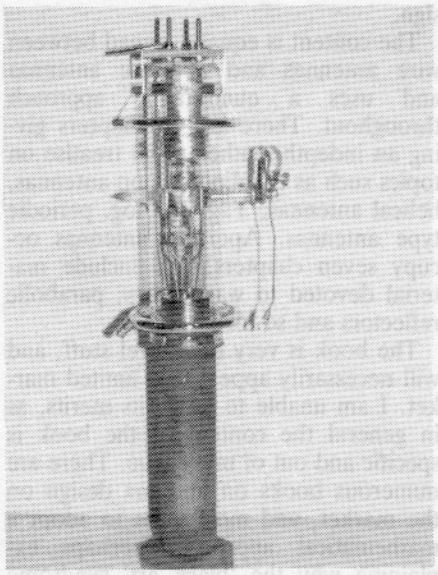


Fig.1: The Marconi water-cooled CAT9 transmitting valve, about 750mm tall. It operated upside down, with the anode surrounded by a water jacket.

Water Cooled Valves

The origins of these early British metal valves lie in high powered transmitting valves. A serious problem in the operation of early transmitting valves was the dissipation of heat, with the result that they were limited in size to a few hundred watts.

An efficient class C power amplifier generating a carrier of 1kW would be required to radiate 300 watts or so of waste energy, in the form of heat. The dissipation of class B amplifier generating the same power would be nearer 2kW. Anyone who has touched the output valve of a mains powered radio, typically heated only by about 10 watts, will appreciate the transmitting problem.

A practical solution for dealing with high powers is to have the cooling medium in direct contact with the anode, which must as a consequence form part of the valve envelope.

When this type of construction was first attempted, difficulties arose in maintaining a vacuum tight seal between the anode and the rest of the envelope. William G. Housekeeper of the Western Electric Company solved the problem in 1921 and made high powered valves possible, by an ingenious method of sealing a cylindrical copper anode to a glass envelope.

Today's transmitting valves have finned anodes cooled by air blasts, but the early transmitters used pure water in direct contact with the anodes. I have vivid memories of the problems of 40 years ago in dealing with an AWA 5kW transmitter which used a water cooled triode operating at an anode potential of 12,000 volts, whilst the water circulating pumps were at earth potential! The valve concerned was a Marconi CAT9 shown in Fig.1. 'CAT' stands for *cooled anode transmitting*, and the term has significance in our story.

Fig.2 (above): On the left is the MH4 Catkin triode with base and cover removed. Note the resemblance to the CAT9. The VMS4 variable-mu RF amplifier is at right.

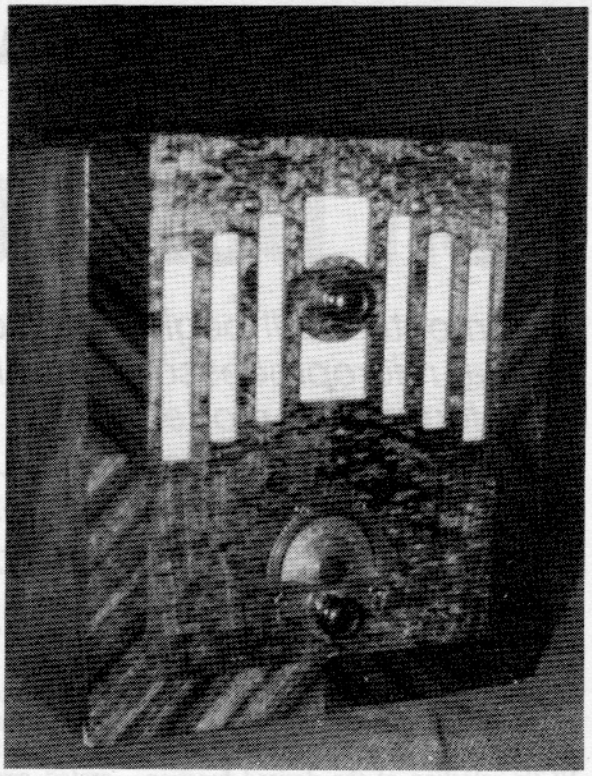


Fig.3 (right): The 'Dapper Five' Australian made receiver, which used three of the Catkin valves. It was made by Tasma, and sold under their own and the Genelex brands.

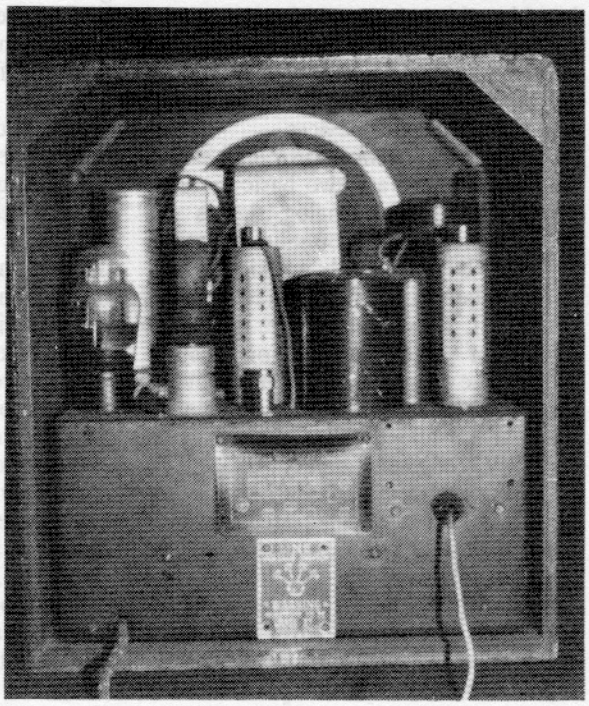


Fig.4: A look inside the back of the Dapper Five receiver shown above. Note the mixture of Catkin and conventional glass-envelope valves.

CATs in miniature

Despite the inconvenience of water cooling, these valves were widely used and during 1933, Marconi/Osram decided to adapt the construction technique of exterior anodes to some lower-power receiving valves – mercifully without the water cooling!

Just as with the transmitting valves, the anode was a vacuum tight copper cylinder with a glass base. The traditional 'pinch' was replaced by an annular ring, for electrode support in the base. Fig.2 includes a triode with the cover removed, and the physical relationship to the CAT9 is clear.

As these new valves were like miniature CATs, an obvious title was "CAT-KIN".

No attempt was made to create new electrical designs or designations for the catkins. Instead, several of the standard Marconi/Osram range of valves were produced in the new form and were interchangeable with the standard equivalents.

At that time it was common British practice to shield valves other than output types and rectifiers with a layer of conductive paint on the outside of the glass. Accordingly, many of the catkins were given distinctive metal shields with diamond shaped perforations. In the 5 pin series, there was no separate earthing connection, the shield being connected to the cathode pin. To avoid any risk of shorting the shield to the chassis, thin rubber washers are fitted to the bases of the shielded catkins.

The output pentodes and later production runs of the smaller valves were not shielded, so, be warned: In operation, unshielded catkins have anodes that are 'hot' in two ways!

As the series had no rectifiers, mixers or diodes, there were no completely catkin-equipped receivers. The Australian-made Genelex 'Dapper Five' receiver illustrated has a varied selection of valves, with an American 2.5 volt type 57 as a self oscillating mixer, a VMS4 intermediate frequency amplifier, MS4B detector and MPT4 output pentode. The rectifier is a glass U12.

In 1935, the American octal based metal valves were introduced and were soon dominating the market. Although the catkins were discontinued in 1936, they had played an important part in breaking away from the glass tradition, and had a significant influence on the development of the American metal valves. EA