

## The Telefunken Arcolette 3W

In 1903, German radio pioneer Count von Arco, with Professors Braun and Slaby, established the Telefunken wireless telegraph company. Telefunken, which literally means 'distance spark', rapidly came to be a world leader in radio technology and was represented in Australia and New Zealand by AWA. Their compact Arcolette 3 receiver of 1928 was an innovative design, and the fore-runner of the famous *Volksempfänger* or 'People's Radio'.

Telefunken became involved in all aspects of radio engineering — including, with the advent of broadcasting in the 1920's, the manufacture of domestic radio receivers.

In 1928, Telefunken issued a catalog of domestic radio equipment, celebrating their 25th anniversary. My reference copy, kindly lent by John Stokes, was originally distributed by Scott and Company of Queen Street, Melbourne. It lists loudspeakers, battery eliminators and six receivers — ranging from a simple little 'no cabinet' three valve battery powered set with plug-in coils, moveable for control of regeneration, to a five valve plus rectifier mains powered neutrodyne.

Intermediate in the range, and obviously named after the founder, were the three valve 'Arcolette 3' battery model and the subject here: the 'Arcolette 3W', its mains powered counterpart.

### Compact & simple

The Arcolette 3W is almost a cube, and compact — measuring only 200 x 200 x 240mm. The case has sheet metal sides, a Bakelite hinged lid and wooden base. There is no internal loudspeaker and the controls are simple, with only two thumbwheels and a slide switch visible on the front panel. On/off buttons are inside the cabinet.

Although the circuit is almost primitive, construction is typical of German-made equipment: innovative, and with considerable attention to detail and finish. There is no chassis, but instead all components other than the power supply are mounted on or under a small bakelised paxolin panel, which could almost be the forerunner of today's printed circuit boards!

However rather than being the familiar

etched foil of the modern printed circuit, the 'wiring' is stamped out of thin hard sheet copper and riveted into place. Tabs and lugs are formed in the stampings at appropriate positions, to provide mounting clips for capacitors and resistors, and to form the spring contacts for the valve pins. There are no separate sockets.

### Three tuning ranges

The two coils are of the diamond weave 'spiderweb' pattern, popular in simple receivers during the early days of home construction but perhaps not so common in commercial radios. Although they have a substantial external field, spiderweb coils have the advantages of space savings and efficiency. A simple slide switch selects coil taps to provide three overlapping tuning ranges, from 200 to 2000 metres. In modern terminology, this is from 150kHz to 1.5MHz, and

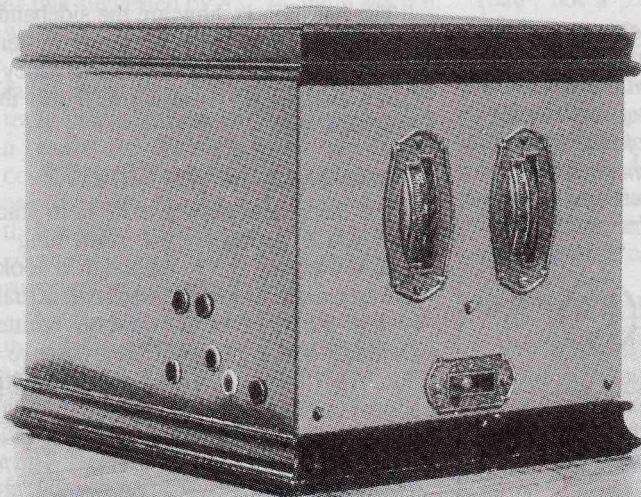


Fig.1: In 1928, radio cabinet fashion was in transition from the laboratory to something more like furniture. The Arcolette still retained a lift-up lid, but the controls were less conspicuous than the traditional calibrated knobs.

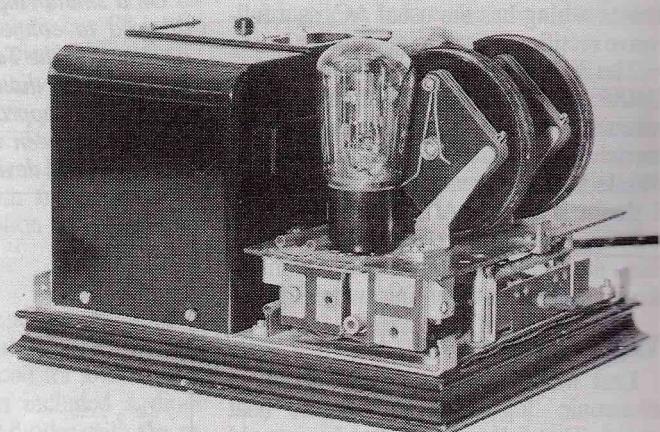
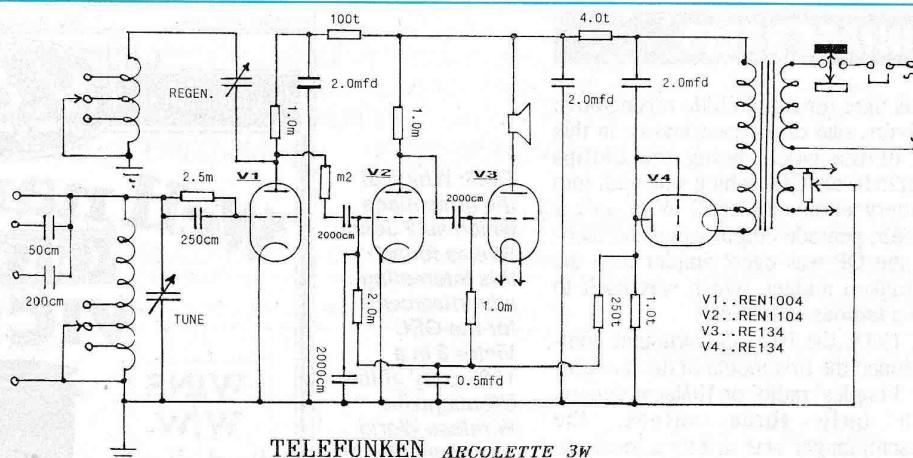


Fig.2: With the outer case removed, the solid dielectric variable capacitors attached to the sides of the thumbwheels can be seen to be very compact. The few resistors and capacitors fit under the paxolin panel.

**The schematic for the Arcolette shows that its circuit is as innovative as the physical construction. Note the use of a diode-connected triode as the rectifier, and the way it provides 'back bias' for the audio stages. The value of the smaller capacitors is given in 'centimetres', where 1cm is about 0.9pF.**



covers the European longwave, some marine frequencies, and the normal mediumwave bands.

Both thumbwheels have simple 0 - 10 scales on their perimeters, and drive the very compact solid dielectric variable capacitors used for tuning and reaction controls. No chances are taken with safety. The power supply is totally enclosed and a safety switch disconnects the mains if the lid to the rectifier compartment is opened.

Although the 3W is a very simple three valve regenerative receiver, the circuit is worth some study. The detector and first audio stage valves were from the first generation of indirectly heated cathode valves produced by Telefunken, the REN1004 detector having an amplification factor of about 33 while that of the general purpose REN1104 (a valve with roughly the performance of the American 227) is a modest 10. Originally a battery output valve, the RE134 directly heated

triode is capable of producing an output of about a half watt and, strapped as a diode, is also a satisfactory half-wave rectifier for the 17mA or so of HT current drawn by the Arcolette circuit.

The power supply capacitors are paper dielectric, with the 2uF units assembled in a tin box. The smaller capacitors all have mica dielectric and are specified in the old 'centimetre' units. One cm corresponds to 0.9 picofarad and for the record, 1000cm is equal to 1.0 jar (900pF)!

The resistors appear to be a deposited film on a ceramic rod and spirally cut, an advanced process commonly used today. Low value resistors are rated in thousands of ohms, with the suffix 't' the equivalent of the modern 'k'.

There are three antenna terminals. For very short aerials there is a direct connection to the tuning coil, and to reduce the loading of longer aerials there is a choice of a '50cm' (45pF) or '250cm' (225pF) series capacitor. No volume control is

provided, but overall gain can be adjusted to a certain extent by the setting of the reaction control C2. Surprisingly for such a modest radio, gramophone pickup terminals are provided. With the pickup connected, the RF input is disabled by being effectively short circuited.

The audio amplifier (V2) is resistance coupled, but the 1M anode load resistor is an unusually high value for the low impedance REN1104 valve. There is no output transformer, and a common bias voltage is used for both audio valves. With only very small filter capacitors and resistive filtering, HT supply hum would be excessive for a moving coil speaker system, but is satisfactory when used with a moving iron or horn speaker.

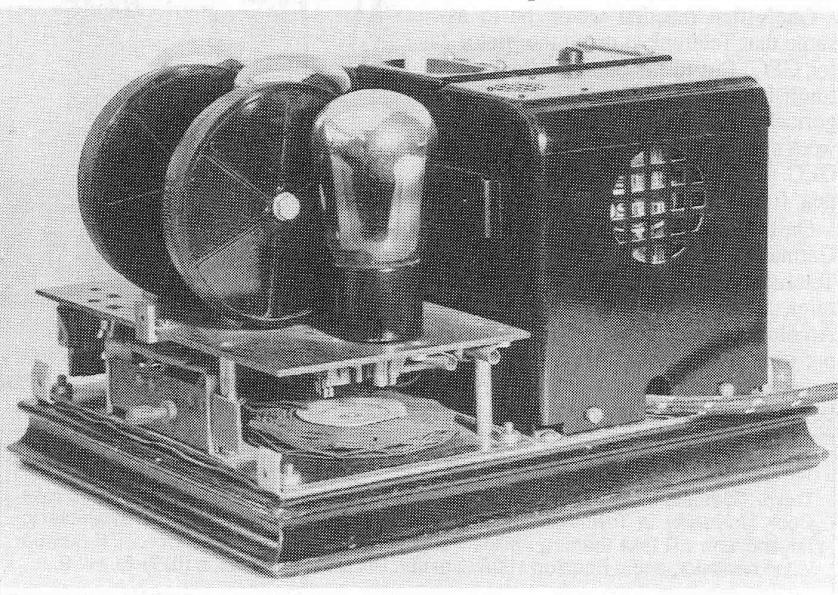
At first glance, the configuration of the power transformer wiring seems to be somewhat unconventional. What Telefunken have done is to connect the rectifier into the negative side of the supply. There is nothing wrong with this method, which was used to a certain extent in battery eliminators using half-wave rectification, but it is not practical for full wave valve rectifiers.

## The 'Volksempfanger'

Compared with its more complex contemporaries, the Arcolette has a limited performance and can be regarded as a strictly local station receiver. The regeneration control is not very smooth and worse, the detector is very prone to burst into an audio howl. Non-technical users would have found the set difficult to control, and once set up would have been tempted to leave it tuned to one station.

Other manufacturers found a demand

**Fig.3:** From this side, the flat 'spiderweb' tuning coil can be seen under the paxolin panel. The battery model is similar but without the power supply in the boxes at the rear.



## VINTAGE RADIO

at this time for simple little regenerative receivers, one of the best known in this part of the world being the Philips 2515/2516 or 'QP', which was built into a battery eliminator case! With only a detector, pentode output valve and rectifier, the QP was even simpler than the Telefunken midget, which was itself to have a famous successor.

In 1933, the Nazi Government commissioned the first model of the inexpensive 'Peoples' radio' or *Volksempfänger*. With only three valves, the Volksempfänger was strictly a local station receiver, with a regenerative detector and basic audio amplifier and with volume controlled by variable aerial coupling. It went through several developments, and by 1938 had been simplified to a rectifier and triode/pentode valve — and incidentally, with a thumbwheel tuning control.

Eventually more than three million Volksempfängers were made, and served well their intended purpose of providing the German workforce with an affordable receiver having limited ability to receive foreign broadcasts. Today they are prized collectors' items.

### A mystery

There is an unexplained coincidence surrounding the battery version of the Arcolette. In Britain, the General Electric Company was at the same time selling its Victor 3 model, and by comparing Figs.5 and 6 it will be seen that there is a remarkable similarity between the two.

Although I have not been able to make a side by side comparison, the simili-

**Fig.5: Which of the firms made which set? John Stokes found this interesting advertisement for the GEC Victor 3 in a 1928 copy of the UK magazine Wireless World. The similarity to the Arcolette is even more marked when viewed from other angles...**

NOVEMBER 14TH, 1928. THE WIRELESS WORLD ADVERTISEMENTS.

**The G.E.C. your guarantee** ELECTRICAL

**Well named!** GECOPHONE REGISTERED TRADE MARK **VICTOR 3**

**WINS W.W. Popular Vote!**

**The hit of the Season**

MADE IN ENGLAND. Sold by all Wireless Dealers.

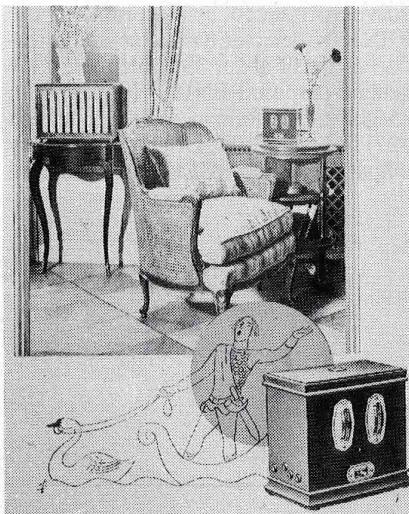
**In the "Wireless World" Olympia Ballot—the "GECOPHONE" Victor 3 came first in Class 2**

**for Receiving Sets of 4 Valves and less**

WRITE for Folder BC 4762 or full particulars of the "VICTOR 3" and Brochure BC 4765 for information regarding all the new season's GECOPHONE Radio Receivers, Loud Speakers, etc. SENT POST FREE.

**PRICE Complete with 4 Osram Valves £6.17.6 INCLUDING ROYALTY**

*Advt. of The General Electric Co., Ltd., Magnus House, Kingsway, London, W.C.2*



**Fig.4: This illustration of the battery Arcolette was copied from the 1928 Telefunken catalog.**

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### Collectors please note: old instruments available

Trevor Stahlfest-Moller, of the Electrical and Computer Engineering Dept. at James Cook University in Townsville, has three old test instruments that are available to anyone who will take them: a Philips PM5140 audio generator, a Marconi TF 885A/1 video oscillator, and a Boonton 160A Q meter. His phone number is (077) 81 4459.