

**Thermionic Rectifiers.**

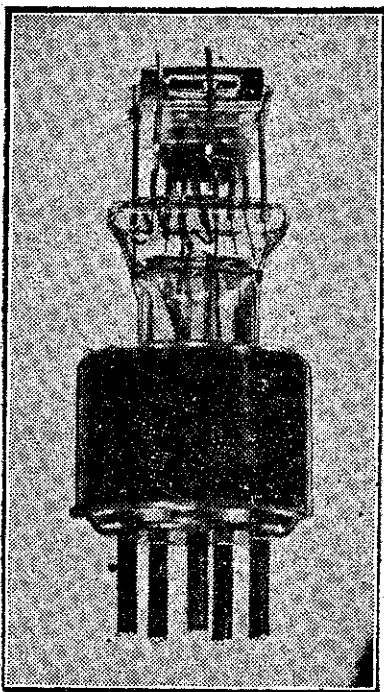
A VERY favourable solution is found in rectifiers with oxide-coated filament where the negative stream of electrons is obtained by a filament. Even small current intensities can be obtained, and the drop in voltage between the filament and auxiliary electrode is small. If such a filament and electrode are placed in a bulb we have a rectifying valve. The bulb must be evacuated of air and then filled with gas (argon) or vapour (mercury) under low pressure.

In the first case the voltage-drop in the valve is larger, but the valve can be used for the rectifying of higher voltages. In the second case a rectifying valve is created which is very suitable for the charging of small accumulators.

In order to use such a valve in combination with A.C. mains a transformer is necessary, which not only steps down the voltage necessary for feeding the rectifying valve filament, but which also enables adjustment of the current voltage for the second electrode (the plate) or anode to obtain the charging current.

A special quality of rectifying valves is that once the filament is first set glowing they can work without further filament feeding. The collision of the positive gas ions against the filament releases such an amount of heat that the filament remains glowing. This experience has, however, no practical use, as the current consumption of the filament is but small, and only a very small saving can be obtained, and on the other hand the risk of overcharging the filament is very great (concentration of emission).

Rectifiers with oxide-coated filament have proved to be most suitable for the charging of accumulators. Philips manufacture many types for 1.3, 3 and



The innards of an indirectly-heated A.C. valve. The thick piece of metal that can be seen passing through the centre of the grid is the cathode.

6-amp charging currents, while for anode or H.T. accumulators and for the slow charging of filament current

accumulators, 100 milliampere rectifiers have been placed on the market by many manufacturers. Practice has shown that this continuous charging is in no way detrimental to the life or efficiency of the battery.

Filament-rectifiers have the advantage that they can be easily handled, and are absolutely reliable and proof against short circuit. Therefore, they can be charged overnight without any supervision. The fact that filament rectifiers can work a long time without supervision or cost or upkeep makes them ideal for use with electric clock installation, signal devices, switching purposes, etc. Of course, pure direct current is not obtained, but a pulsating direct current which, with the rectifier type, 450 contains 100 impulses per sec., and with the small rectifier type 1017, 50 impulses per sec. This is the reason why an accumulator as used for a radio receiving set cannot be substituted by such a rectifier. In this case filament feeding could not be effected with direct current, but instead there would be a pulsating current which would cause hum by the periodic change in emission of the electrons.

However well a filament rectifier might work in this connection there is no advantage in this method by feeding the filament with alternating current (the number of pulsations being equally high. This is a problem which entails further consideration.

**"B" Supply.**

AS a second source of current for the radio receiving set we mentioned plate feeding or anode current. In the early days of the valve a battery of dry cells was always used for anode

voltage. The first types of receiving valves only required an anode voltage of about 80 volts, and a plate current of 1 or 2 milliamps only.

With modern radio reception strong loudspeaker reproduction is required for which 3 or more valves are necessary. Therefore, there is need for a last stage valve, requiring an anode voltage of 150 volts, and a plate current of about 10 mA, the latter, depending upon the correct negative grid voltage applied. When one considers that the other valves of a receiving set, together take a plate current of 5 to 10 mA, it will be evident that a modern 5-valve receiving apparatus takes an anode current of some 20 mA. With such a current supply the life of the "B" battery is considerably reduced. Moreover, the voltage of the battery becomes exhausted, volume decreases very much, and in addition parasitic noises are heard as cells become defective.

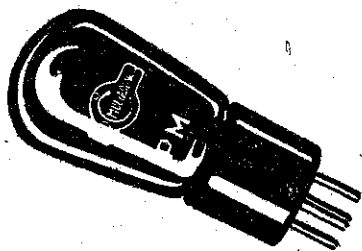
From this it may be deduced that a modern radio receiving set intended for loudspeaker reproduction cannot be satisfactorily fed with an anode battery except for short laboratory tests or demonstrations.

An accumulator can be used for plate feeding, but as such a battery consists, however, of about 80 cells, it is rather a bulky object, which cannot be handled very easily. A short circuit in the set can damage this battery and various other parts of the apparatus.

When the difficulties of "B" batteries were realised, attempts were made to obtain plate current from A.C. supply, with the result that high tension supply units came into being.

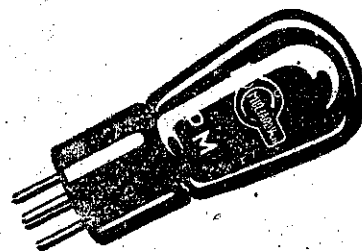
In these high tension supply units a

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TYPE A.C. 3.—Filament voltage 1.5 volts; filament current, 1.1 amps.; anode voltage, 50-150 volts; amplification factor, 10; internal resistance (impedance), 7,800 ohms.

Max. anode current, 6.5 M.A. This valve is the Mullard equivalent of the UX226 type of valve, and is generally used in the radio and first audio stages of all-electric receivers. Price 15/-.

TYPE A.C. 4.—Filament voltage, 5.0 volts; filament current, .25 amps.; anode voltage, 100-180 volts; amplification factor, 3.8; internal resistance (impedance), 1,450 ohms; max. anode current 30 M.A. This valve is the Mullard equivalent of the UX171A type of valve used for last stage speaker amplification where a high anode voltage is not in use. These valves are of particular value for use in push-pull stages of amplification where the constancy of characteristics greatly facilitates matching of the valves used. Price 20/-.

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