

Successor to the Valve?

First Details of a New Electron Multiplier Introduced at Radiolympia and its Application to Modern Radio and Television Apparatus

WE have already described in our pages the principles of secondary emission and electron-multiplying devices, but until this year's Radiolympia opened its doors the majority of these devices had been produced and used only in the laboratory. On Stand No. 18, however, Vacuum Science Products were showing not only a commercial version of an electron multiplier, but also broadcast and television receivers in which a standard multiplier was incorporated. The new tube is known as the "Augetron" and is an all-British invention. It is to be produced in this country (the samples on view at Olympia having been imported) and will shortly be on the market at a very reasonable cost.

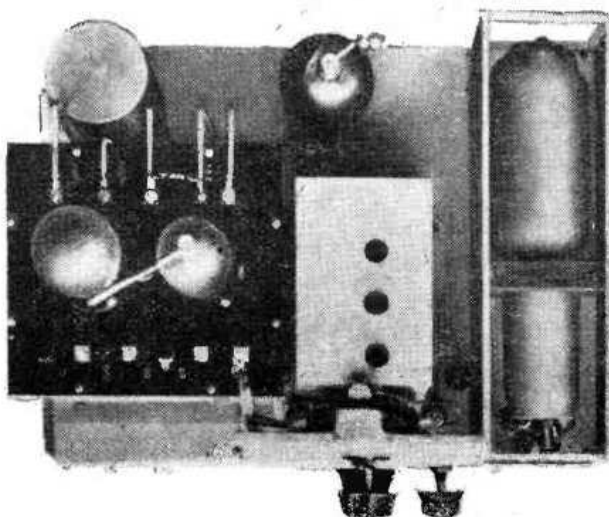
For the benefit of those who are not familiar with the principle of secondary emission, it may be stated briefly that when a surface is bombarded by electron streams certain electrons are released by the surface and these are known as secondary electrons. In modern valves the electron stream from the filament or cathode is directed to the anode, and obviously any hindrance or opposition which would be set up by secondary electrons would impair the efficiency of the valve. Accordingly, various steps are taken to avoid the effect, which is also, incidentally, present in the modern cathode-ray tube.

Electron Multiplier

In an electron multiplier, however, the phenomenon of secondary emission has been taken advantage of, and arrangements are made to pass on the emission from one electrode to another, each adding to the

stream and thereby increasing the final current which is obtained. In the "Augetron" each of the secondary electron emitting sources is in the form of a sensitised metal plate in which are a large number of holes in funnel-shaped depressions. The primary emitter, or first cathode, may be any form of electron source, such as a photo-electric or thermionic device, and grid control is provided as

current, and thus it gives, for the desired input of 10 micro-amperes, an output slope of 40 mA. per volt at 10 mA. current, a figure which is three or four times better than the best radio valves on the market.



A land-pass radio receiver with one of the Augetrons fitted.

in the standard valve. The final collector anode is in the form of a robust flat perforated plate, and the maximum current which may be handled by this anode is of the order of 20 mA. at 250 volts. Thus, in view of the amplification which takes place, the initial current may be very low indeed. The existing multipliers are designed to provide a gain of about 1,000, and thus the current at the input end is only 10 micro-amperes. The makers claim that by suitable design it has been possible to develop the device to have a mutual conductance of some four times the standing

Six-stage Multiplier

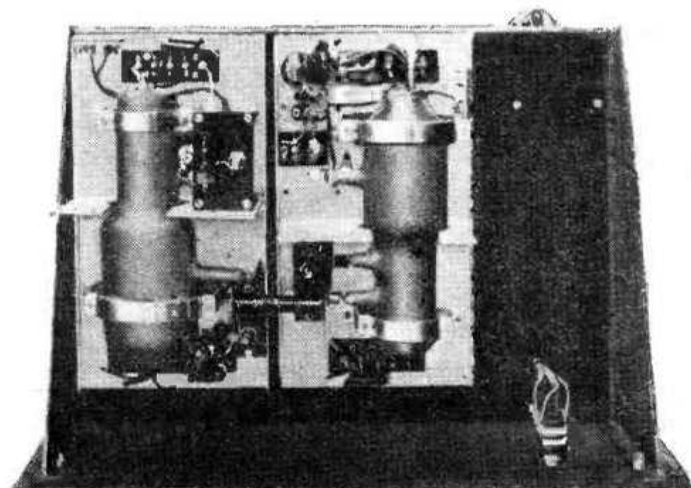
To obtain the overall gain of 1,000, a 6-stage multiplier has been standardised, and this runs at an overall voltage of about 2,000—or 300 volts per stage.

Under these conditions each normal secondary emitter gives a stage-gain of about 2½. The final anode is so arranged that it gives a gain equivalent to approximately 7. Inter-electrode capacities have been reduced and the tube is quite suitable for use on the ultra-high frequencies used for television. A complete television receiver was, in fact, in operation at the stand at Radiolympia and two of the tubes were employed on the H.F. side of the receiver, followed by the usual de-modulator, etc. Owing to the very high gain, much associated equipment found in standard radio circuits may be dispensed with, and as a result the noise level is kept down and increased amplification is possible. The essential data of the television "Augetron" is as follows:

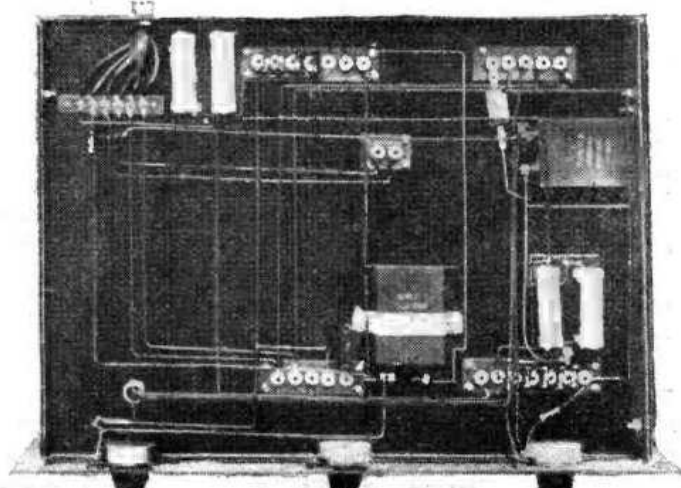
Heater voltage	2.0 v.
Heater current	1.5 A.
Accelerator voltage	300
Voltage per stage of multiplication	300
Maximum anode dissipation	1 watt
Recommended anode current at 125-v.	8 mA.
Input capacity	4 pF
Output capacity	7.5 pF



The new Augetron which is described here.



Here are two Augetrons in a vision chassis for television reception.



This underside view of the chassis shown on the left indicates how wiring is simplified.