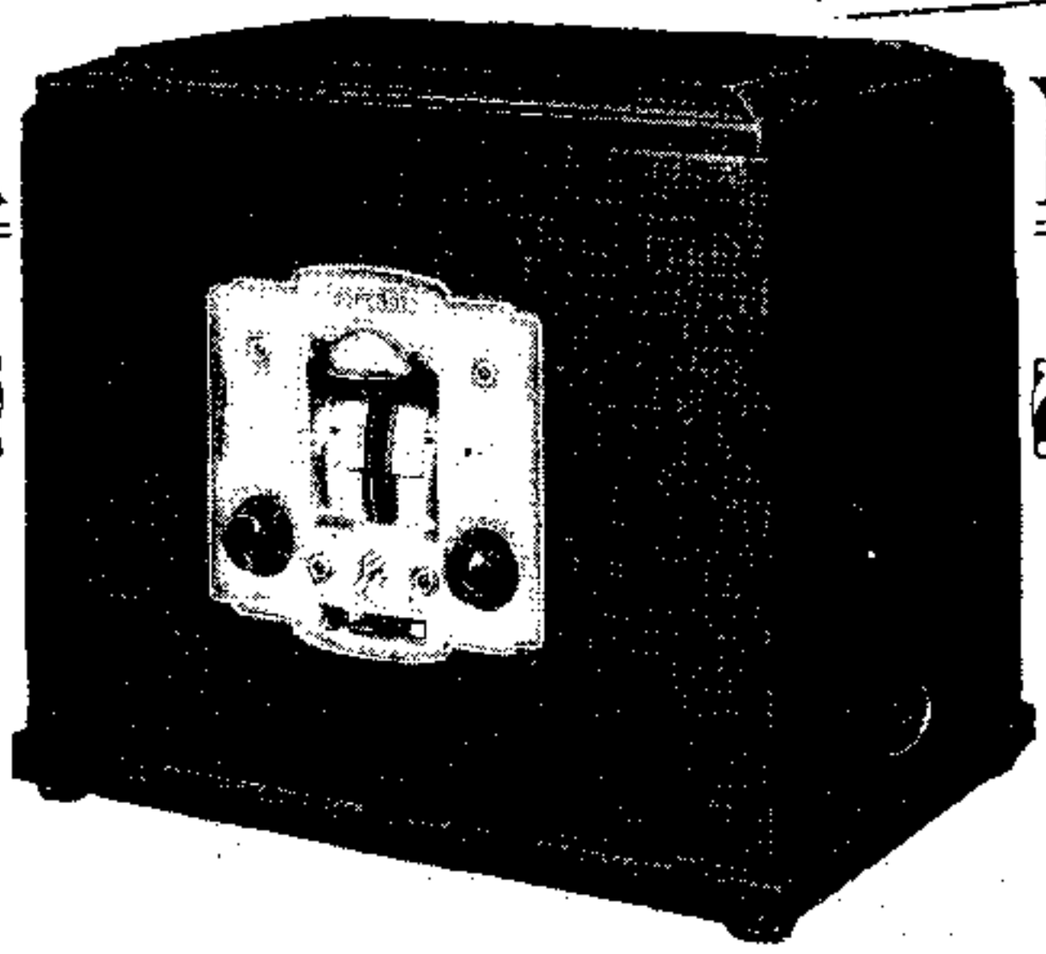
# COLUMBIA MODEL 307



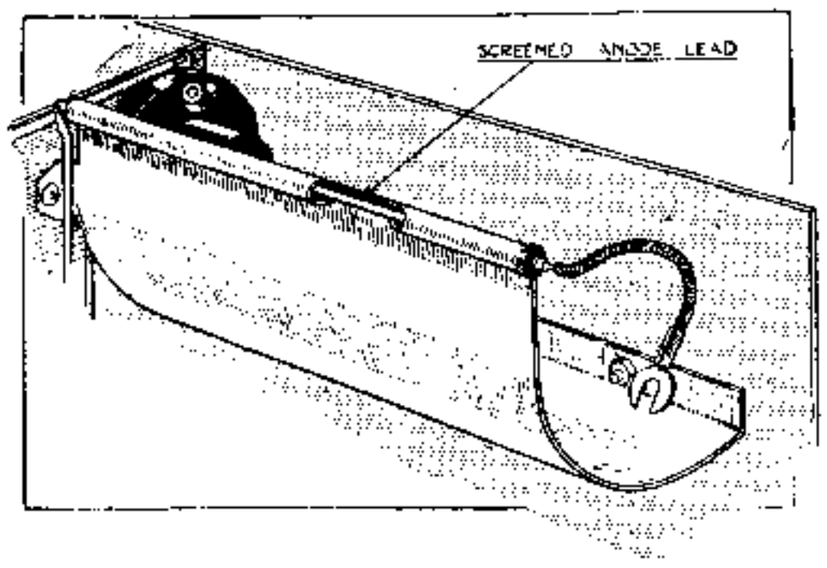
## A New Three-valve Receiver for A.C. or D.C. Mains.

## Technical Details and Performance of the A.C. Mains Model.

IN the Columbia range of broadcast receivers the Model 307 occupies an intermediate position between the simple two-valve twin-station Model 309 and the long-range 3-H.F. Model 304, which was reviewed in the November 27th, 1929, issue of this journal.

The three-valve circuit comprising a screen-grid H.F. amplifier, detector and pentode output valve is an arrangement which has proved itself capable of meeting present-day demands of selectivity, range and volume at a reasonable price, but careful attention to detail on the part of the designer is essential if the requisite degree of selectivity is to be attained with only a single H.F. stage.

In the Columbia Model 307 there are only two tuned circuits—an input tuned circuit across grid and filament of the screen-grid valve, and a simple tuned anode circuit in the output. Both circuits are tuned by side-by-side drum dial condensers which can be operated independently or simultaneously at will, and the anode condenser on the right is calibrated in wavelengths. The requisite degree of selectivity is obtained by loose-coupling the input tuned circuit to the aerial. This is done in two ways, (1) by tapping in the aerial feed at a point near the low potential end of the coil; (2) by controlling the aerial coupling through a three-electrode differential condenser. This condenser, which is of the solid dielectric type, is housed in a moulded case on the aerial terminal panel at the back of the set, and, once adjusted in relation to reception conditions in the neighbourhood and to the electrical constants of the particular aerial in use, requires no further attention. The advantage of the differential aerial condenser is that a satisfactory compromise between range and selectivity can be obtained without appreciably affecting the capacity across the aerial tuning circuit. The condenser can, therefore, be used also as a volume control for local station reception without disturbing the setting of the left-hand tuning dial.




**Method of screening the anode lead to the H.F. valve. The screen is cut away in the sketch to show the centrally spaced wire.**

As an indication of the effectiveness of this arrangement the short-wave performance of the receiver on a 50ft. outside aerial at a distance of five miles from Brookmans Park may be cited. The best setting for the aerial condenser, having regard to the retainment of adequate range, was found to be the first division from the zero or minimum ($\frac{1}{4}$ full scale), and with this setting the Regional transmitter (356 metres) occupied a band from 325 to 375 metres and the National transmitter was confined to the lower part of the tuning range from 275 metres downwards. That this satisfactory state of affairs was not obtained at the expense of range is indicated by the fact that thirteen foreign stations were tuned in clear of the local transmitters with the same setting of the differential aerial condenser. For the above results, of course, the best possible use was made of the reaction control.

### Two Pre-detector Volume Controls.

The selectivity on long waves is not of such a high order as on short waves, but is, nevertheless, sufficient to separate Radio Paris and Daventry 5XX. In all, seven stations were received at good strength on the long waves.

It has already been pointed out that the differential condenser can be used as a volume control, but an independent volume control described as an "Intensifier" is also incorporated in the aerial circuit. This takes the form of a high-resistance potentiometer across the tuned aerial circuit and regulates the proportion of the voltage induced across the aerial coil which is passed to the grid of the screen-grid valve. It follows that this volume control does not affect the input from a gramophone pick-up, and an additional external volume control is necessary when reproducing from records.

A compound switch similar in design to that used in the Model 304 serves to connect the pick-up in the grid circuit of the detector and also to change from long to short waves. Normally, the detector functions as a leaky-grid rectifier, and gramophone leads are short-

**Columbia Model 307.**

circuited to prevent interference from low-frequency induction in the pick-up leads. The operation of switching in the pick-up also changes the detector valve bias and so converts it to a L.F. amplifier. Incidentally, the grid bias for all three valves is derived from a common potentiometer, each tapping being thoroughly decoupled.

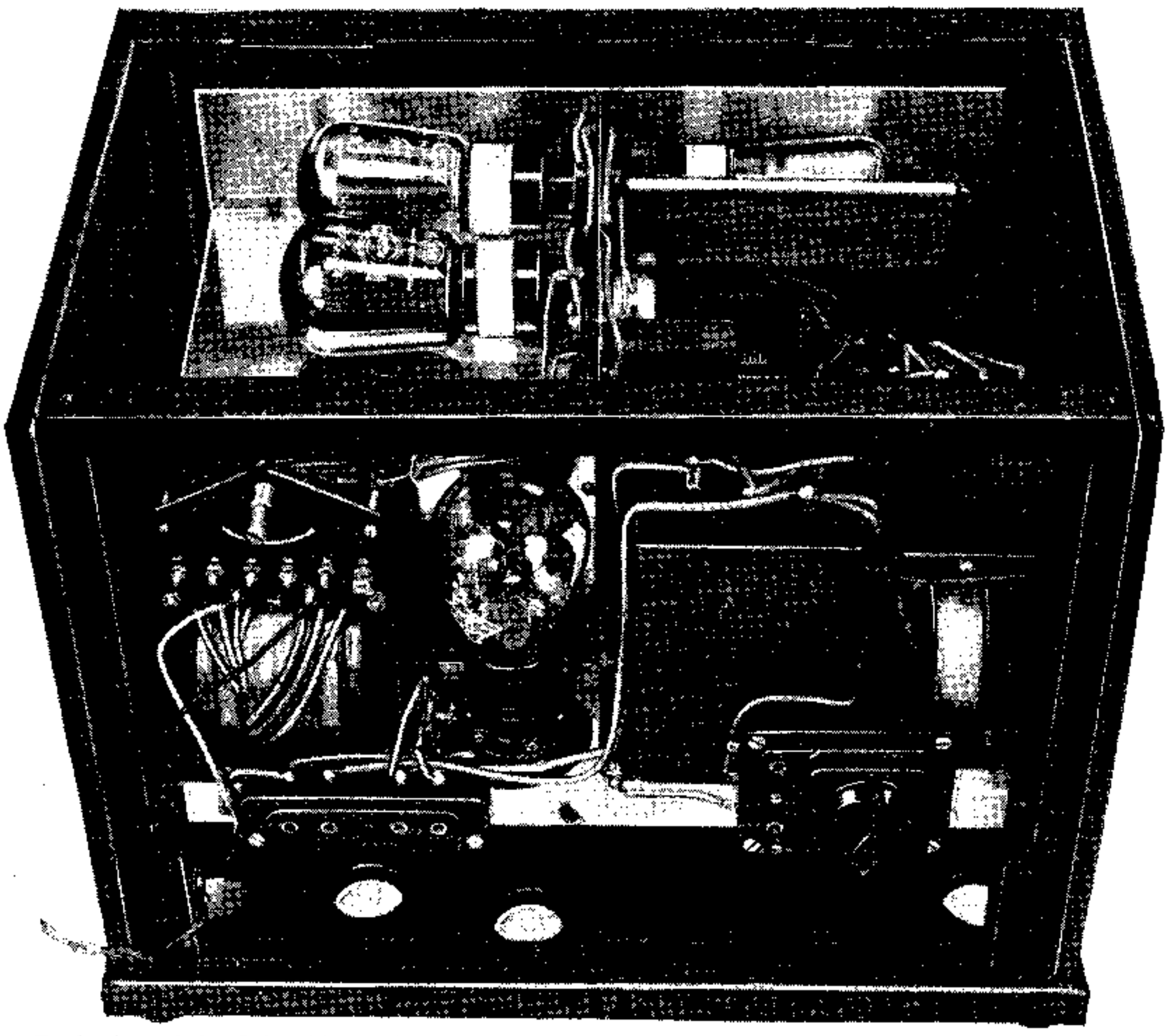
A resistance-capacity filter in the detector anode circuit deflects D.C. from the high-permeability type L.F. transformer coupling the detector and pentode power valve. The loud speaker terminals are connected directly in the anode circuit of the P.M.24 output valve.

It is well known that accentuation of the high frequencies is a characteristic of the performance of pentode valves, and for this reason a filter, consisting of a condenser and resistance in series, is connected between the anode of the valve and earth. The values of resistance and capacity have been chosen to give the high note correction required by the Columbia 325 and 326 loud speakers, and it is emphasised in the instruction booklet that unsatisfactory results may ensue from the use of other types of loud speaker. This point was borne out by experiments with a loud speaker having a good response up to 6,000 cycles which gave undue prominence to the sibilants in speech and needle scratch in gramophone records. It would appear that the filter circuit has been adjusted to give only a moderate restriction of the upper frequencies.

In the A.C. model tested the mains transformer is suitable for supply voltages from 195 to 245 volts with a total of six alternative primary tappings. A filament circuit potentiometer or "hum adjuster" is mounted on the same panel as the primary tappings and may be adjusted with a screwdriver from the back of the set. This component does its work adequately, and a well-defined minimum is easily obtained, at which point there is no trace of 50-cycle hum in the loud speaker.

The H.T. current is supplied through a Cossor BU/624 full-wave rectifier, and is very completely smoothed by chokes and a T.C.C. condenser bank. Both the screen grid and detector anode circuits are decoupled, and the screen grid potential is derived from a potentiometer consisting of two cartridge type resistances in series.

The arrangement of compartments in the aluminium chassis is well thought out, and it is interesting to note that a subsidiary screen is provided to prevent interference between the H.F. choke in the detector anode circuit and the tuned circuits associated with the H.F. valve. Another constructional feature worthy of mention is the method of screening the lead to the anode of the H.F. valve. The edge of the screening trough surrounding this valve has been turned over to form a tube and the anode wire is supported inside concentrically by small ebonite end bushes. The exposed end of the anode lead is, therefore, little more than an inch in length.



**Back view of the Columbia Model 307 with top and back panels removed. Note the differential aerial condenser on the aerial terminal panel in the bottom right-hand corner.**

The cabinet work is unusually sturdy, and both the top and back panels are easily removable, giving ready access to the receiving and rectifier valves respectively. Adequate ventilation of the interior of the cabinet (an important point where use is made of indirectly heated A.C. valves) is provided by large diameter holes drilled in the base and a long slot in the back panel.

A model designed for D.C. mains is also available, and the price of both A.C. and D.C. models is 20 guineas in oak and 21 guineas in mahogany. The same chassis is obtainable in a pedestal type cabinet, together with a built-in four-pole balanced armature cone loud speaker, the price being 30 guineas in oak and 31 guineas in mahogany. The makers are the Columbia Graphophone Co., Ltd., 102-108, Clerkenwell Road, London, E.C.1.