

# SHOW

## Technical Tendencies

### New Broadcast Receivers

"Solid Work Has Been Done"

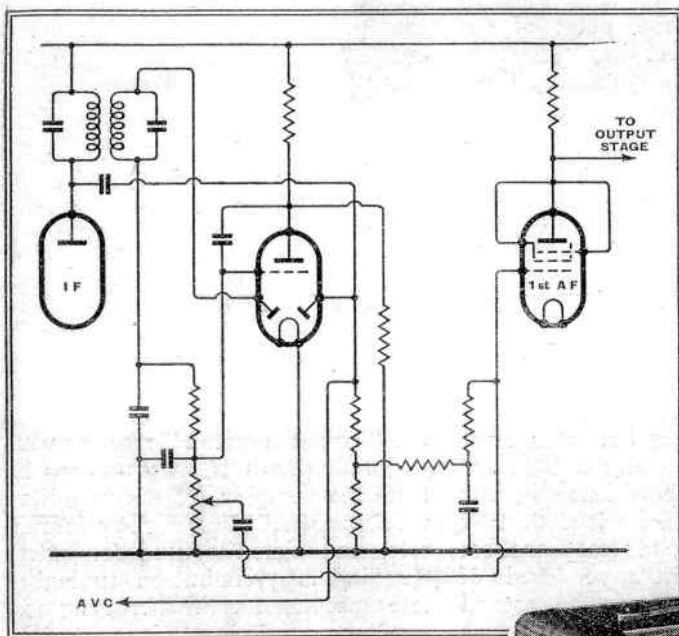
THOSE who last year foretold a period of stagnation in receiver design as the result of a shifting of the focus of publicity from broadcast sets to television have been proved indifferent prophets by the course of events. Relieved of the necessity of appealing to the eye, designers have been able to concentrate on performance, and some really solid work has been done on the clearing up of background noise and the improvement of tone.

In place of the struggle to outdo competitors in the number of valves, gadgets and exclusive selling points, one finds general acceptance of the four- or five-valve superheterodynes, with or without a

separate AF valve being included to take its place. The input circuit of the triode section is connected in parallel with the volume control and due to the Miller effect in the valve it represents a capacity the value of which will depend upon the amplification factor. On a strong signal the DC component of the rectified signal will bias back the valve and reduce the amplification factor, and hence the capacity across the volume control. With a weak signal, on the other hand, the valve will reflect a high capacity and so reduce the high frequencies developed across the volume control. Another interesting feature of this set is that the AF amplifier is also controlled by the AVC bias.

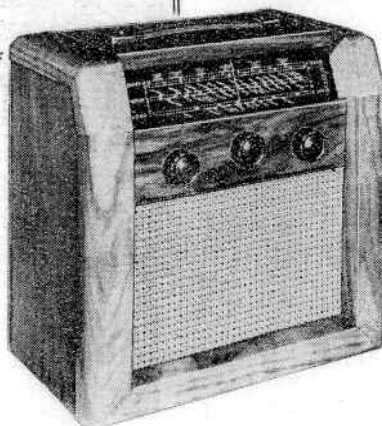
Successive economies during past years in the proportion of cost allocated to the output stage and loud speaker have been proved bad business and the pendulum has swung in the opposite direction. There is now keen competition to provide the finest possible quality of reproduction, and many of the current table models give results every bit as good as last year's consoles or radio-gramophones.

A battery receiver with an unusual circuit, the Cameo Model AWB, in which the triode section of the second detector is used for noise suppression and AVC is applied to the AF amplifier.

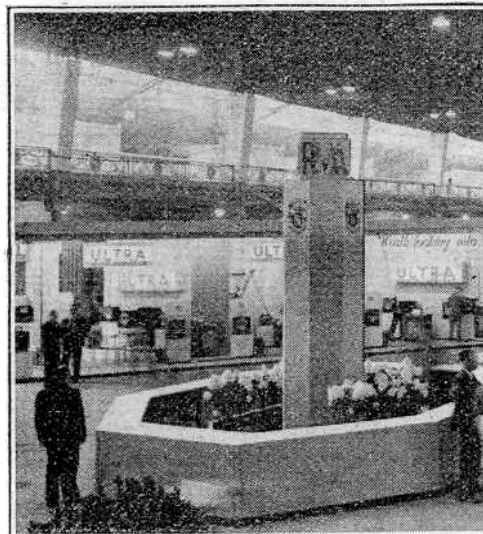


stage of RF amplification, as the circuit giving all the range and selectivity required by the average listener, and a concerted effort to make it as pleasant to the ear as it has always been to the eye.

Every effort is being made to rid the set of extraneous noises of all kinds, and the widespread use of valves designed to give the maximum signal-to-noise ratio is significant. Automatic noise suppression circuits are coming to the fore again, and a simple but effective method is to be found in the Cameo Model AWB designed by Gordon Elf, Ltd. In this superheterodyne receiver the triode portion of the second detector stage is allotted to noise suppression instead of AF amplification, a

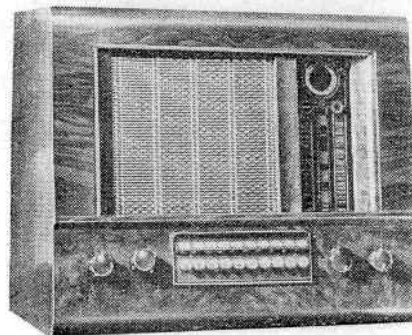


The improvement is due primarily to the general increase in the power-handling capacity of output stages; the 3 watts,



### Special Report Compiled by the

which was thought adequate two years ago, is found only in the cheapest models. No receiver with any pretensions to quality claims much less than 5 watts undistorted, and the tendency is for powers to rise considerably above this figure. The H.M.V. Model 1200, with 10½ watts, and the G.E.C. Model 4010, with 12 watts, are good examples of the trend towards in-

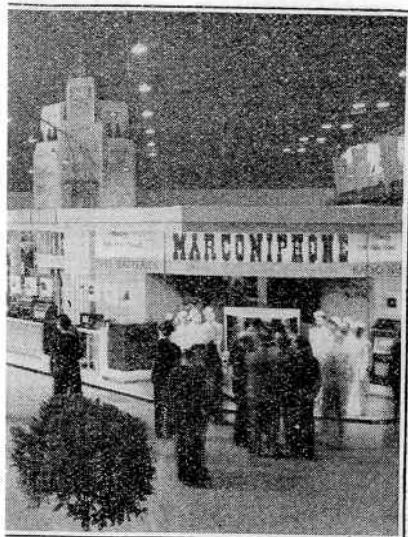


A 9 kc/s whistle filter is included in the Bush PB65.

creased power output in the better class of table models. Even higher ratings are to be found in the Alba Model 855 (16 watts) and Burndept Model 290 (18 watts).

There is evidence also that manufacturers are giving more attention to the reduction of harmonic distortion and that this drive is resulting in a return to the triode as an output valve. Cossor, who have consistently held to this type in many of their receivers, are using it in the Models 70 and 71, and in the Bush Model PB63 triode valves are used throughout the AF portion of the circuit. To compensate for the lower amplification available an additional triode stage has been inserted as a "driver" before the output stage.

Next in importance to the improvements in output circuits is the work that has been done on tone control. In place of the crude resistance-capacity circuit giving a wholesale cut in the treble which extends well down into the middle register, scientifically designed tone controls, usually with four positions, give exactly the right frequency response for the recep-



# REVIEW

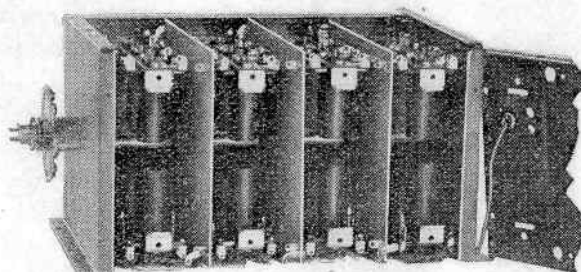
## Revealed at Olympia

filters in standard production models is indicative of the extension of the usable frequency range, and the Ekco PB515 and Bush PB65 may be quoted as examples. Ten-inch loud speaker diaphragms are the order of the day in table models, and with the judicious lifting of bass in the circuits, really good low-frequency response free from the defects of resonance is obtained from receivers such as the R.G.D. 166.

So much for the table model sets which form the backbone of the industry. What of the developments in other directions? The table model radio-gramophone can

the principal stations in their correct order. As far as we are aware, this is the first instance of accurate station calibration on short waves. The oscillator circuit for each band is tuned by a stable fixed capacity in conjunction with a separate short-wave variable section of the main tuning condenser. Separately adjusted image rejection circuits are also provided for each waveband.

Highly efficient short-wave circuits are also to be found among the products of the luxury set manufacturers. The export model of the de luxe McMurdo Silver receiver employs coils wound on polystyrene formers. The windings of the aerial transformers are separated by electrostatic shields and on the lowest waveband unity coupling is achieved by



Short-wave coil assembly in the Murphy 76.

of "The Wireless World" conditions which fall under the heads of "High-Fidelity," "Normal," "Foreign" and "Long Distance."

In the McMichael sets a switch effects table combinations of two degrees of activity in the IF stages with bass boost" by selective negative feed-back the output stage. Ekco favour a continuously variable tone control which simultaneously adjusts bass and top lift works included in the negative feedback circuit, while in the G.E.C. sets adjustment is made for both bass and top in AF coupling circuits after a general increase of overall amplification. The new Philips tone control is designed to give a sharp cut-off of high frequencies without affecting the middle register. Instead of returning to earth, the by-pass circuit passes the anode of the output valve divides the high-frequencies into the negative feedback circuit, thus giving a much sharper cut-off. The normal feed-back is variable and is coupled to the volume control in the latest Philips set. Back coupling is greatest when the volume control is turned down on a strong local signal; with the volume control at maximum on weak stations, feed-back is reduced and full amplification restored to circuit.

The introduction of 9 kc/s whistle

hardly be hailed as new, but the McMichael Model 903 and the Decca 39TGM point to a revival of interest in what is undoubtedly a very attractive type.

There is also a tendency to separate mutually conflicting interests in broadcast listening and to provide, within a given price limit, specialised receivers for good quality reception of signals of outstanding programme value or, on the other hand, highly sensitive sets for long-distance short-wave transmissions. The Murphy 74 and 76 are good examples of this policy. In the latter, separate tuned circuits are allotted to each of the principal short-wave broadcast

passing the primary through the silvered copper tube which forms the secondary. To preserve the high "Q" of the coils the connections to earth and to the tuning condenser are made with multi-strand silvered braid. Another interesting feature of this particular set is a direct-coupled system of AF amplification giving a considerable extension of level frequency response at both ends of the scale.

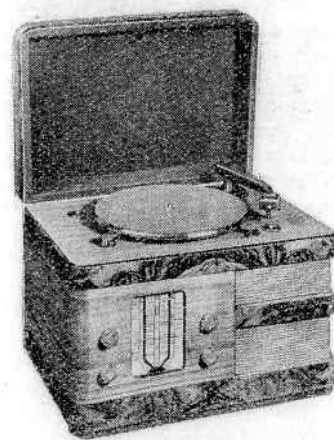


Individual calibration of short-wave stations is a feature of the Pye "International" tuning dial.

bands and the tuning of each band is expanded to the full depth of the tuning scale.

The Pye "International" is another receiver in which band spread tuning has been applied in the short-wave range. Each band is calibrated not only in wavelengths but with the settings and names of

The Dynatron "Commander" chassis shown on the Keates-Hacker stand is virtually three receivers in one. A straight circuit is provided for local station reception, a "normal" superheterodyne with a redesigned variable selectivity system giving true band pass characteristics even at 4 kc/s band width is employed for general

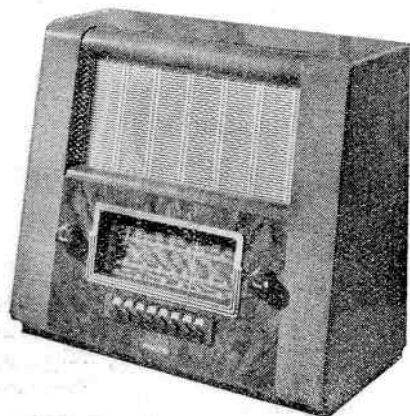


Michael table model radio-gram. Model 903.



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reception, and on short waves a double superhet. circuit with *two* RF stages is brought into operation. There are twenty-

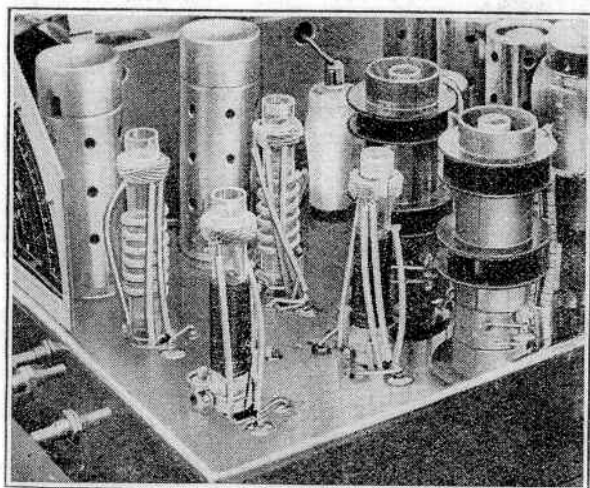


Philco B.2 all-dry battery superhet with push-button tuning.

five valves in the circuit, four of which are triodes working in push-pull to give an undistorted output of 20 watts. Refinements include noise suppression circuits, a manually operated adjustable whistle filter and a cathode ray indicator for grid current in the output valves. The chassis is built on a machined aluminium casting and costs £165.

The humble portable has this year provided one of the most interesting and practical technical developments. New valve types have been introduced which enable the filament current to be derived from dry cells which in some cases are built into a unit with the HT battery. The capacities of both batteries are adjusted so that they run down together and a life of 250 working hours may be taken as an average. Usually the HT battery is arranged to run down just before the LT, as the efficiency of the valves is quickly affected by a fall in the filament volts, which should not drop much below 1.1 volt. With the standard batteries available these conditions will be met by allowing for an LT current of 0.25 amp. and an HT current of 10 mA.

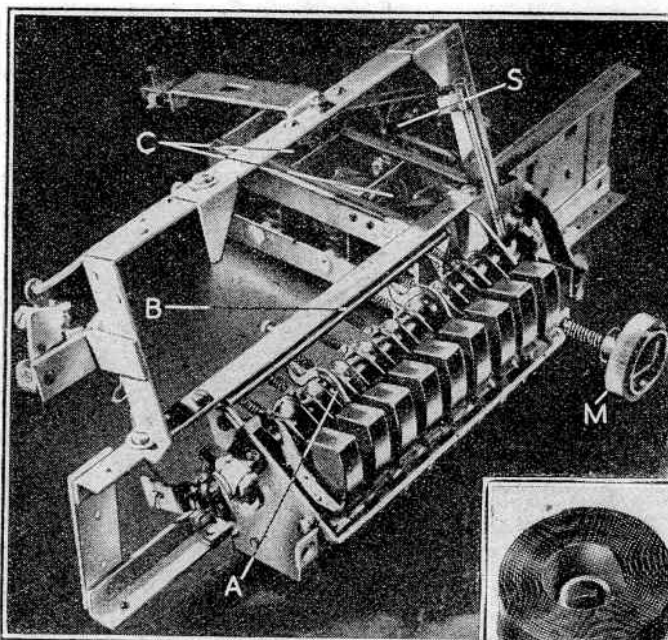
The circuit usually adopted is a 4-valve



superhet., and the Philco P429 was one of the first portables of this type to be produced in this country. Other notable

examples shown at Olympia are the Decca-Brunswick Model 42 and the Vidor Model 320. The advantages of all-battery operations are equally important to the country dweller, and there are signs that we shall see a number of table model receivers working on this principle. In the meantime, for those who wish to acquire a set of this type, there are, among others, the Ferranti Model 539 and the Philco B2, the latter with push-button tuning.

The alternatives of dry battery or accumulator supplies for LT current are available in the Cameo Model ARP. This set uses standard 2-volt valves which may be run direct from an accumulator, or from a 3-volt battery through a barretter lamp. Yet another alternative source of power supply is provided in the

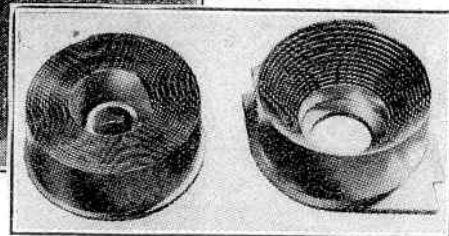


motor is used to select the appropriate pre-tuned circuits. The simpler mechanical systems which call for separate operation of the wave range switch are generally supplied with much clearer indications of the waveband in use, and a good example is to be found in G.E.C. sets in which a "fluorescent" bar of colour shows immediately above the row of controls.

In the new Philips direct-action mechanical tuning system, wave changing is effected automatically by an auxiliary link motion associated with three of the operating keys. A rocker bar B connected to the wave-range switch S is pulled forward by the claw A when one of these keys has been set up for a long-wave station. When the key is required for a medium-wave station the claw is

dropped and a second bar, not shown in the photograph, is pushed forward by a cam underneath the key which restores the switch to the medium-wave position. A special ad-

Philips push-button tuning system with automatic wave-range selection, and (inset) the modified condenser vanes giving straight line frequency characteristic.



Philco "Twin Miracle" portable. This includes a rectifier and smoothing circuits for operating the set from AC/DC mains in addition to the self-contained all-dry battery supply. A relay is included which automatically changes over the supply circuits and keeps the set operating without any break in the programme if the mains supply fails.

Push-button tuning systems, many of which were rather hurriedly produced for last year's show, have overcome their teething troubles and have been further simplified in operation. Most of the permeability-tuned sets now make use of the improved switching arrangement which

justing tool is provided, and the wave range obtained depends on whether or not the key is depressed when the adjustment of the station is made. The tuning condenser C is of the linear action type used last year, and for manual operation the vanes are engaged by a screw thread operated by the knob M. The spiral vanes in this year's type are shaped to give linear frequency response.

Important modifications have been made to the Ekco motor-driven automatic tuning system. The contacts of the homing disc are now provided by metal rollers, designed to overcome the inaccuracies which result from sparking and burning of the edges of discs of the normal type. New selector clips with machine-cut key-type contacts have been developed for use with the new roller contacts, and high accuracy of location is claimed.

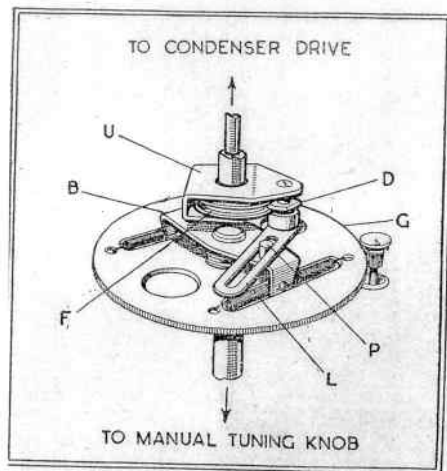
The driving mechanism has been speeded up, and is provided with a reverse-vernier device of clever design: The gear wheel G driven by the motor pinion carries a bridge B with a peg P engaging in a slot in the link L. When the

In the McMurdo Silver de Luxe export model the short-wave coils are wound on polystyrene formers.

automatically switches on the set when any button on the receiver is pressed, and in the Murphy remote control system a

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motor is first switched on the peg travels to the bottom of the slot and drives round the bracket U, to which the tuning condenser is coupled, at the same speed as G. When the contacts on the homing disc reach the appropriate selector clip they overshoot slightly and the motor is reversed. The peg now travels along the slot and imparts an angular movement to



Reverse-vernier mechanism in the Ekco high-speed motor tuning system.

the link L, thus engaging the friction wheels D and F. Since F is fixed the rotation imparted to U and the condenser drive is opposite to the direct drive and the gear ratio is enormously increased by the combined action of the link motion and the reduction introduced by D and F. Incidentally, the edge of the friction wheel D is cut away so that it disengages when the peg is in the bottom of the slot during the high-speed drive.

The final centring between the roller contacts of the homing disc is made with such precision that the need for AFC circuits in the receiver is eliminated. Adequate steps have been taken to offset the possibility of increased wear with the higher initial motor speed and suitable shock-absorbing springs have been included in the drive.

In principle the waveband selector mechanism, termed by Ekco the "Radio rain," remains the same as last year, but corresponding increase in speed of operation has been met by the introduction of all contacts.

Special apparatus for life-testing of automatic tuning systems was shown in operation by Ekco, Philips, and a number of other firms and the severity of the tests applied should convince sceptics of the reliability of this year's designs.

## Television Receivers

### No Standardisation Yet

TREND in the development of television receivers which was clear last year has now become normal practice the use of electromagnetic deflection and focusing instead of electrostatic. Nearly all the receivers are of the magnetic type. This is not necessarily due to any

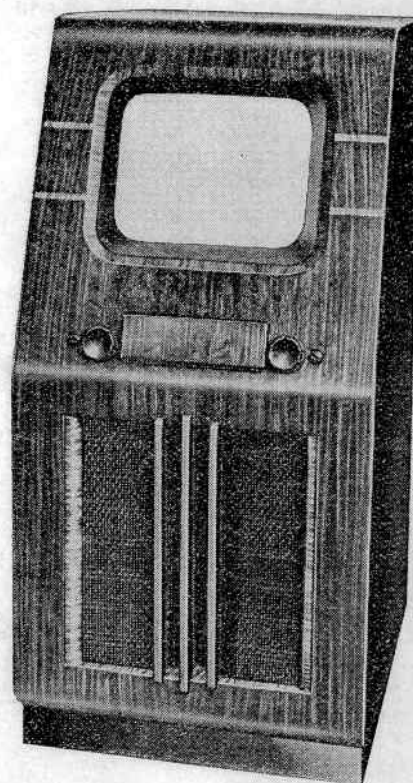
inherent technical superiority of the magnetic system, but usually to the economic element. Most people find it easier and cheaper to obtain a given standard of performance from a magnetic tube than from an electrostatic. Not everyone does, however, and electrostatic tubes are still to be found, especially in the smaller types.

Probably the most obvious trend this year is towards the use of larger tubes; there are now fewer sets with tubes less than 7in. diameter and more with tubes over 12in. Tubes of 14in. and 15in. diameter are, in fact, not uncommon, but the most usual sizes are still 9in. and 12in.

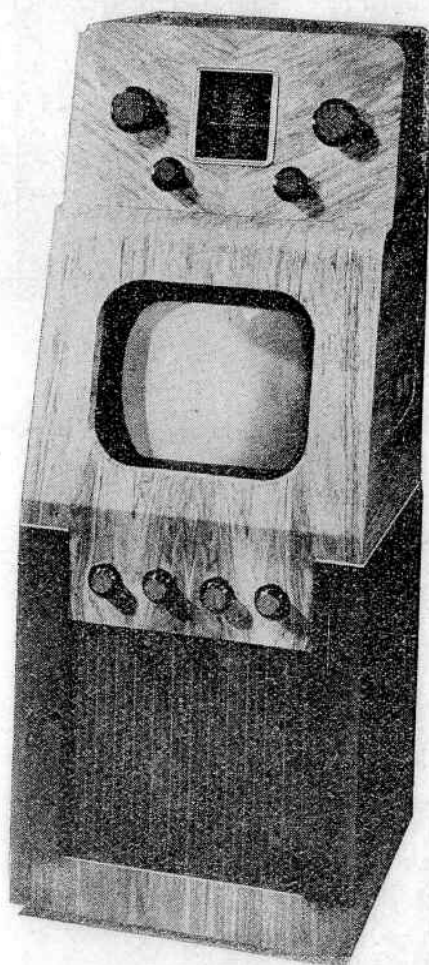
The superheterodyne is still the favourite type of vision receiver, although there are quite a number of straight sets to be found. The usual procedure is to employ one RF stage, frequency-changer, three IF stages, a diode detector, and one VF stage. Insofar as television has achieved any degree of standardisation, and it is still very small, it is in this valve arrangement. But although this may be the basis of many vision receivers there is a much greater lack of uniformity about the arrangements for sound reception. It is usual to make the early stages function for both channels, but the number of stages in common varies in different sets. There is probably a greater tendency than

fies the arrangements necessary for operating the sound receiver alone—a facility which most sets now include. It is clearly wasteful if one has to operate the whole vision equipment if television sound only is wanted.

The small degree of standardisation to be found precludes any general discussion and it is much more informative to consider in some detail a few representative examples of modern practice. Murphy Radio, for instance, adopt a superheterodyne. The RF stage is followed by a two-valve frequency-changer and an IF stage which has a sound rejector in its cathode



In the Pye receiver "occasional controls" are behind a small panel.



Murphy V88 receiver with all-wave sound equipment.

before to make the vision and sound receivers entirely separate, since this simpli-

circuit; these three stages function on both sound and vision channels. The signals are then separated and each has a further IF stage of its own. The vision channel feeds a diode detector which in turn feeds a VF stage. The tube is fed from the anode of this and the sync separator, which consists of a duo-diode, from the cathode. Gas-triode time-base oscillators are used with tetrode amplifiers feeding the line and frame deflecting coils.

In the case of the sound channel, following the common first IF stage the signal passes to a second stage and thence to a diode detector and noise suppressor. The AF output is taken to the last IF valve, which is thus reflexed, and finally to the output pentode.

The noise suppression circuit is an interesting variation of the common peak limiting circuit in which a diode is biased so that it is non-conductive over the range of signal modulation voltages, but conducts and virtually short-circuits the output on higher voltage peaks. In this case a fixed diode bias is not used but the signal itself



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provides the bias. The bias is actually the signal derived from another point in the circuit and fed to the diode through a delay network. It is claimed that much more effective noise suppression is obtainable in this way.

In its smallest form this receiver is the V84 giving a picture 7½ in. by 6 in., but it is available with substantially the same circuit with a 12 in. tube.

A receiver of an entirely different type is the Pye. This is a straight set with five RF stages using band-pass intervalve couplings. An anode-bend detector is used and its output is fed to the cathode of the CR tube. A duo-diode sync separator is used and is followed by an amplifier. A single hard valve forms the frame time-base oscillator, but for the line scan the oscillator, which is again a hard valve, is followed by an amplifier. Magnetic deflection and focusing are employed.

An entirely separate receiver is used for sound and this has two RF stages, detector and output valve. The mains equipment for vision and sound channels is also separate.

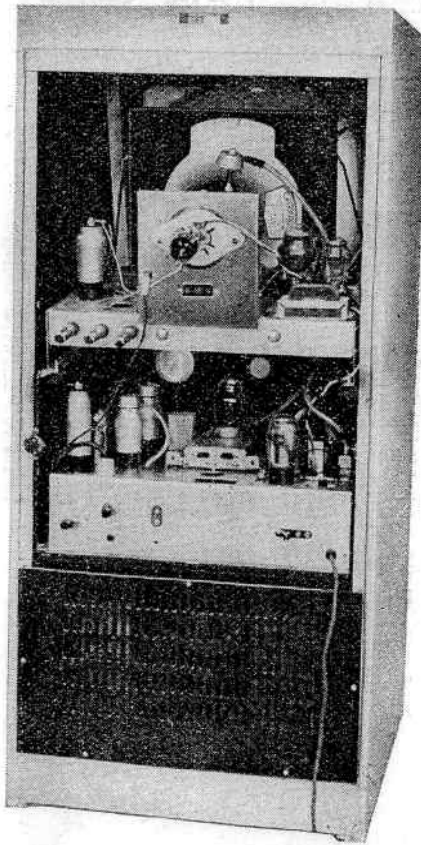
One very interesting feature of this apparatus is its mechanical arrangement. All the "occasional controls" are mounted on the front of the chassis and accessible from the front through an opening which is normally covered by a small hinged lid. For servicing, it is only necessary to undo two screws. The chassis then slides backwards and downwards on sloping supports until two large hooks on its rear edge engage with a horizontal bar across the cabinet. The chassis is then

ing the chassis in this position are even provided.

The model 12C has a 12 in. tube and is also available with an all-wave receiver or with a radio-gramophone. There is also a smaller set, the 9C, with a 9 in. tube.

Baird also adopt a straight set for vision and use two RF stages with secondary emission valves, a diode detector, and one VF stage. A triode sync separator is employed and feeds the time-base oscillators through separate diodes. Hard valves are used in the time-bases. There is one valve for the frame scan, and another for the line, but this is provided with a damping diode. The oscillators feed the deflecting coils without the intermediary of an amplifier.

A separate receiver is employed for sound and consists of a superheterodyne with a triode-hexode frequency-changer, one IF stage, duo-diode detector and AVC system, a pentode AF stage and a pentode output valve. This is a three-band broadcast set; for television sound the same receiver is used, but then the AF stage is reflexed and acts as an RF stage also.



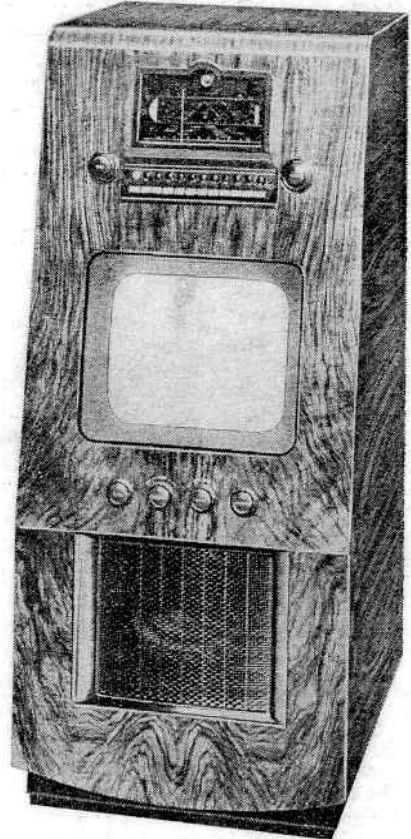
The Baird T27 television receiver.

This is the model T25 with a 12 in. tube. Both smaller and larger sets are available, with 9 in. and 15 in. tubes, and they are also available with provision for television sound only.

Bush receivers are again of the straight type. Three RF stages are used with a diode detector and one VF stage. Gas-triodes with pentode amplifiers are used in the time-base, however, and the 12 in. tube has electromagnetic deflection and focusing. Separate power units are employed

for the vision and sound receivers, the latter being a superheterodyne with push-button tuning.

Another adherent of the straight set is Ekco. Three RF stages, diode detector, and one VF stage are used. Band-pass coupling is employed and a wavetrap is included in the suppressor grid circuit of the second RF valve in order to avoid in-



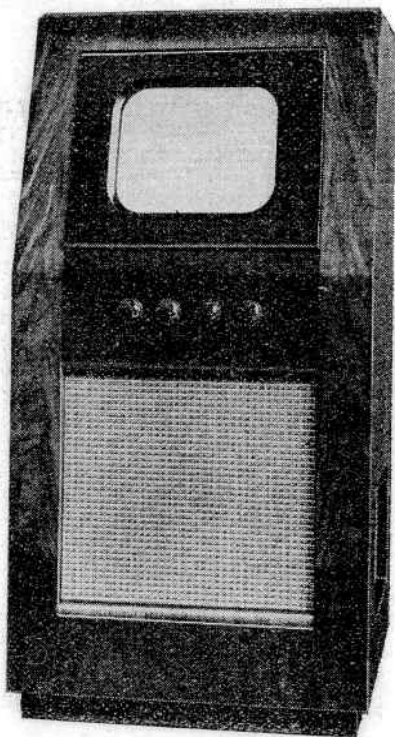
H.M.V. 1850 all-wave broadcast and television receiver.

terference from the sound channel. The contrast control varies the bias of both control and suppressor grids of the first stage, this dual control being adopted in order to maintain the input resistance and capacity of the valve at a nearly constant value.

Two diodes and a pentode are used for the separation of the sync pulses and their subsequent amplification and in the time-bases gas-triode saw-tooth oscillators are used. The tube is of the electromagnetic type.

For sound reception a separate receiver is used with two RF stages followed by a duo-diode-triode. In the case of "add-on" units the output of this valve is brought out for connection to the pick-up terminals of any standard broadcast set. In other models it feeds a pentode output valve.

Both H.M.V. and Marconiphone adopt the superheterodyne and have very similar receivers. The details vary somewhat in the different models, but the H.M.V. 1802 and the Marconiphone 712 both start with an RF stage and have a triode-hexode frequency-changer followed by two IF stages. All these stages are common to both vision and sound channels and their

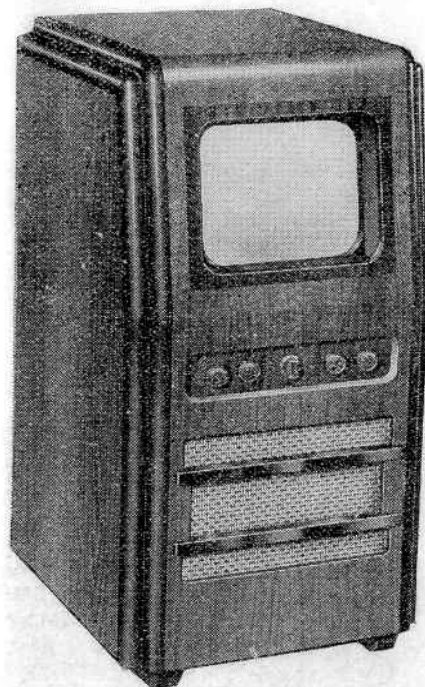


Ekco Model TSC902.

pivoted on this bar and can be swung right out and examined and operated in an inverted condition. Folding struts for hold-

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separation is accomplished after the second IF stage. Each channel then has a further independent IF stage.



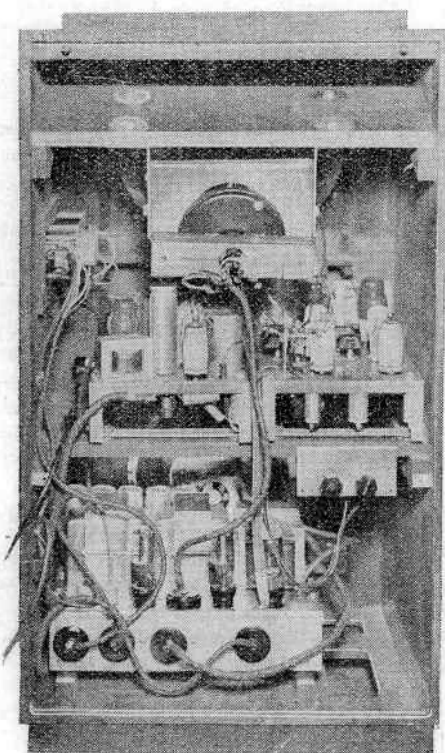
The Corossor 131 with 13½ in. tube.

The sound IF is fed to a duo-diode, which acts as a detector and noise suppressor and is followed by a triode AF amplifier and tetrode output valve. On vision a diode detector is used with one VF stage and the output of this is fed to the cathode of the CR tube. A diode followed by a limiter is used for sync separation. Hard-valve saw-tooth oscillators are used in the time-bases and are provided with tetrode output valves. Focusing and deflection are both electromagnetic. The tube has a diameter of 14 in. and so gives a picture 11½ in. by 9½ in.

Corossor are also adherents of the superheterodyne. The model 131 is for television only and has a 13½ in. tube; the pic-

somewhat smaller picture than usual for the tube diameter a much flatter picture is secured. Magnetic focusing and deflection are adopted and a permanent magnet is employed for focusing, an arrangement which is also adopted by Ferranti. Rough adjustment of the field is obtained by a sliding sleeve on the magnet and precise adjustment by a small variation of gun volts.

The receiver has one RF stage and a triode-hexode frequency-changer followed by three IF stages for the vision channel and two for the sound. The output of the latter is taken to the detector, with which is incorporated a noise suppression circuit. The output valve is a pentode. On the vision side a full-wave diode detector is



The interior of the R.G.D. 393 television receiver.

used, followed by one VF stage, and a split-anode pentode for sync separation. Hard-valve saw-tooth oscillators are employed with pentode amplifiers.

A similar receiver incorporating an all-wave broadcast set is also available. This is the model 151. It has a 15 in. tube giving a picture 12 in. by 10 in. and for broadcast reception the major part of the television sound equipment is used and preceded by a frequency-changer. Push-button tuning is provided with permeability trimmers and allows of four MW and two LW stations being obtained. Provision is made for manual tuning over three wavebands.

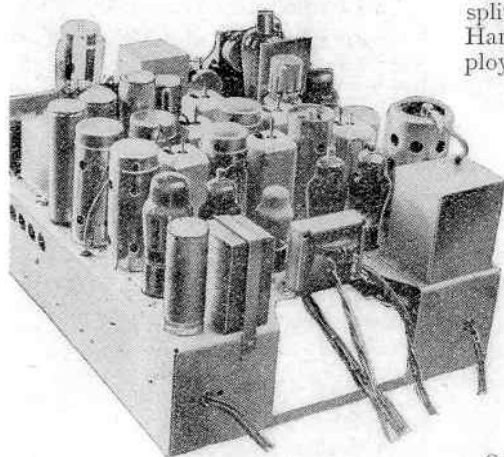
Superheterodynes are used by the G.E.C., but the method of deflection varies. In the case of the smaller models electromagnetic deflection is used. These are the BT.0091 and BT.0092 and are

similar save that the former provides only television sound while the latter includes a broadcast set. They have a 9 in. tube giving a picture 7½ in. by 6 in. The large receiver, BT.0124, has a 12 in. electrostatic tube and gives a picture 10 in. by 8 in. This model includes an all-wave receiver and gramophone equipment with an automatic record-changer.

In the R.G.D. superheterodyne the frequency-changer, which is preceded by an RF valve, is of the two-valve type and consists of an RF pentode mixer with a separate oscillator. The sound and vision channels separate immediately after the mixer and on sound there are an IF stage, duo-diode-triode, and pentode output. On vision three IF stages are adopted with diode detector and one VF stage. The sync separator comprises two diodes with an amplifier for the frame pulses. The saw-tooth oscillators are gas triodes with pentode amplifiers. Magnetic deflection is used. There are two models—the 393 with a 12 in. tube and the 391 with a 9 in.

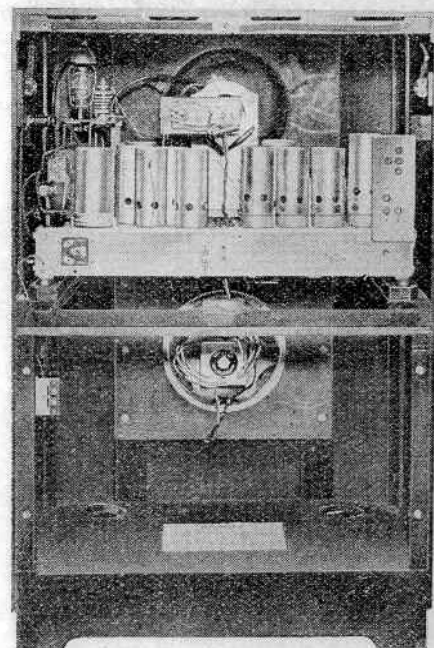
Decca models are superheterodynes and magnetic deflection is used with a 12 in. tube. There is an RF stage and sound and vision are separated just after the frequency-changer. Two IF stages are used on vision and there is one VF stage.

The Philips and Mullard receivers are unusual in that only the RF stage is common to vision and sound. Two frequency-changers are used, the vision IF being taken from one and the sound IF from the other. Secondary emission valves are employed. The picture size is 7½ in. by 5½ in. in the case of three models, but there is also one giving a picture 10 in. by 8 in. and in addition this firm makes a projection model with a picture 18 in. by 14½ in.



Chassis of Marconiphone television receiver.

re obtained is 10 in. by 8 in., the usual size for a 12 in. tube. By designing for a



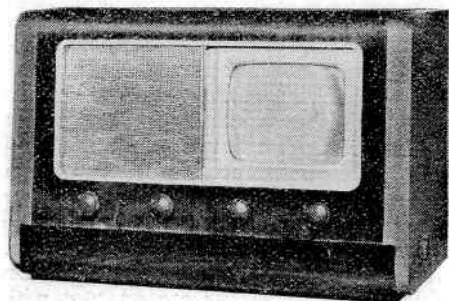
G.E.C. Type BT.0092 with all-wave broadcast set.

The Scophony receivers differ from others in being mechanical. The smallest gives a picture 18 in. by 14½ in. The vision



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receiver is a straight set with two RF stages and a diode detector followed by a VF stage. Then comes a DC restoration



Philips 2405 table-model television set.

circuit and the modulator for the oscillator which drives the quartz crystal of the light control cell. The sync pulses are separated and amplified, and used to control the motors driving the scanning drums.

## Electronic Devices

### Valves—CR Tubes—Multipliers

SO far as valves are concerned the trend of development has now taken two distinct branches and although there is a possibility that in the future these branches may reunite, it seems more probable that they will continue to diverge. The two branches are television types and ordinary receiving valves, and the fact that their development is proceeding on different lines does not mean that they have not some improvements in common nor that their uses are rigidly confined to their classification. So-called television valves are sometimes used in apparatus other than television receivers.

The general trend among television RF pentodes is towards higher values of mutual conductance with low values of

tance and with a given valve construction the one increases as the other decreases. New forms of construction are being adopted, therefore, in order to improve matters, and some of the latest types have perhaps the same mutual conductance as older specimens, but a much higher input resistance.

This increase of resistance is obtained by reducing the length of the internal leads of the valve, and this also reduces the capacities. The methods adopted by different makers, however, vary considerably. Some firms use a modified pinch for the electrode supports, others abandon it and use a short glass seal or even a glass ring forming part of the envelope.

The Mazda SP41 and SP42 have been available some time and are, consequently, quite well known; they have mutual conductances of 8.4 mA/v. and 9.0 mA/v. respectively, and the former has an input resistance of some 2,300 ohms at 45 Mc/s. The valves have the Mazda octal base. Marconi and Osram have the Z62 with a mutual conductance of 7.5 mA/v. and an input resistance at 40 Mc/s of 4,000 ohms; it is a pentode with the International octal base.

Mullard have two types. One is of more or less conventional type. This is the EF50, with a mutual conductance of 6.5 mA/v. It is a single-ended all-glass valve with a "ring" construction and 9-pin base. The other is the EE50 with a mutual conductance of 14 mA/v. This is of similar construction, but is a secondary emission valve.

Apart from RF pentodes, new television valves are chiefly low-resistance and low-capacity diodes. Mazda have the D1 with a 4-volt 0.2 A. heater, while Mullard have the T4D and EA50 with 4 v. and 6.3 v. heaters respectively, and the Marconi and Osram type is the D43 rated for 4 volts.

Listed for television application, although by no means confined to this, is a new triode-hexode frequency-changer, X62. This is a Marconi and Osram valve and has a conversion conductance of

A duo-triode, the BL62, with separate cathodes, is another valve having interesting possibilities, as is also the UR34. This is a most unusual valve since it consists really of two separate full-wave rectifiers, each with a rating of 350 v. 100 mA., in one envelope.

Cossor also have a triode-hexode of high conversion conductance, the 4THA, and a triode-pentode which is not intended to act as a frequency-changer. This is the 4TP and it is essentially a time-base valve. The pentode is designed to act as a discharge valve and the triode as a paraphase amplifier.

Turning now to non-television types, probably the most striking development is the production of valves for dry battery LT supply. These valves have 1.4-volt filaments and most types consume 0.05 A., but output pentodes naturally take rather more. Tungsram have a range with the American octal base which are the counterparts of American types. Mazda valves of this rating, however, are provided with

the Mazda octal base. The range includes a heptode frequency-changer, an RF pentode, a single-diode-triode and an output pentode, and the valves are rated for a 90-volt HT supply. The valves, of course, have lower values of mutual conductance than the ordinary 2-volt type.



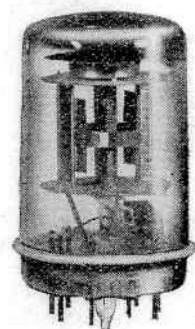
Mazda SP42 RF pentode.

Marconi and Osram adhere to this latter rating and have a triode-hexode which consumes only 0.2 A. filament current. This is the X24, and in a new output tetrode, the KT24, the current has been kept down to the same figure. The HD24 duo-diode-triode takes only 0.1 ampere.

These firms have also added high-slope valves to their 6.3-volt range. There are the KTW61 RF tetrode and the KT61 output tetrode—the latter having a mutual conductance of 10 mA/v. A complete range of 6.3-volt valves taking only 0.16 A. current has been introduced; this is the Uniwatt range, and in view of the low current it is of particular interest for car radio.

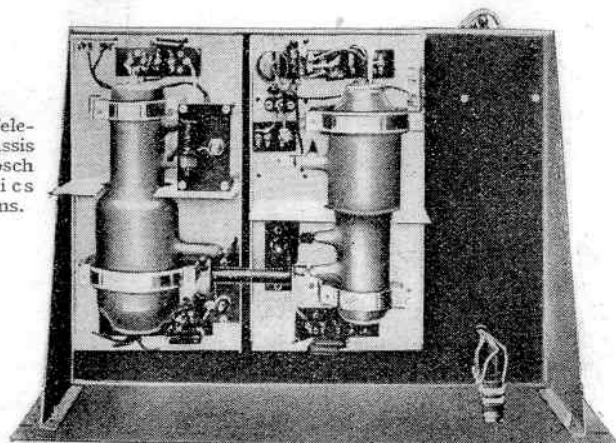
Changes have also been introduced in Cossor battery valves. Probably the most noticeable is the 210 VPA, which is substantially the same as the older 210 VPT, but has lower inter-electrode capacities.

A development of considerable interest is the electron multiplier. Although most obviously useful for television, it has many other applications, and a six-stage model has been developed by Bosch Electronics and is known as the Augatron.



Mullard EF50 all-glass valve.

(Right) Television chassis with Bosch Electronics Augetrons.

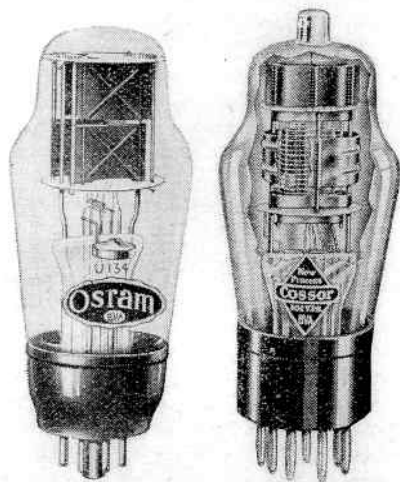


interelectrode capacity. This, however, is coupled with a marked effort, present in all classes of RF pentode, to obtain a higher input resistance at ultra-high frequencies. At these frequencies the limit to possible stage gain is set by the product of mutual conductance and input resis-

1.75 mA/v., while the triode section has a high mutual conductance. Of particular interest is the fact that the cathode has two separate connections to separate pins in the base in order that interaction between the various circuits may be kept at a minimum.

## Show Review—

It requires some 300 volts per stage, or nearly 2,000 volts per tube. This high voltage does not seem of great drawback for television, since there appears to be no reason why it should not be obtained



Osram U134 double full-wave rectifier, and the Cossor 302 VPB pentode.

from the CR tube's high voltage supply. The multiplier has an overall mutual conductance of 40 mA/v. and an input resistance of over 20,000 ohms at 45 Mc/s; a gain of the order of 1,000 times is realisable from a single multiplier.

Turning now to cathode-ray tubes, Mullard have both triode and hexode types in both 9in. and 12in. sizes. The triodes are the MW22/3 and MW31/5, while the hexodes are the MW 22/2 and MW 31/6. The hexodes have two anodes so one of which a potential of about 250 volts is applied. Both types are for electromagnetic deflection and focusing.

Mazda tubes are of the short type and again are for magnetic deflection and focusing, while Cossor have both electrostatic and electromagnetic types. Oscillograph tubes, as distinct from television types, are listed by most firms and have screens ranging from about 1½in. to 4in. in diameter. Cossor have a split-beam tube.

Marconiphone have a range of television tubes ranging from 5in. to 14in. in diameter. These are of the triode type or electromagnetic deflection and focusing. Hexode tubes for magnetic deflection and electrostatic focusing are also listed.

## Components and Accessories

### New Products Reviewed

FOR some time past now the components that have been shown each year at Olympia have fallen within one of two distinct categories. On the one hand there are those parts designed and produced exclusively for set makers, while on the other are the components available to home constructors. The

former are very largely sample productions showing the main features only, since modifications may have to be made to meet particular requirements.

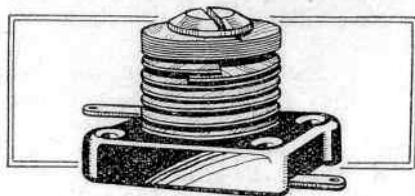
So far as the broadcast listener is concerned, their main interest lies in the ability to examine and appraise the technical skill and workmanship devoted to the many individual items that go to make up a modern broadcast set.

Press-button tuning systems can be divided into two main categories, those that operate on the principle of mechanically rotating the gang condenser and those that consist of a series of switches to bring into use circuits previously tuned to the desired stations.

Motor-operated condenser units are shown by Garrard and by Plessey, while examples of the mechanically operated condenser can be found on the Polar stand.

Switch units are being shown by Bulgin, Plessey, Polar and Wearite, the last-mentioned embodying permeability-tuned coils.

With the introduction of this system of tuning a demand arose for fixed and semi-variable condensers of high stability, that

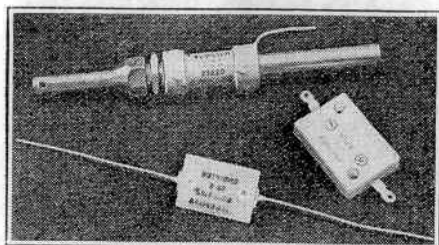


T.C.C. air-dielectric trimmer.

is to say, condensers that maintain their capacity unchanged over a long period and in varying temperatures. Actually this problem has occupied the attention of condenser makers for some time past, but even so improvements are still being made.

One method of construction is to deposit metal on sheets of mica, another is to use a base of ceramic material, while a third takes the form of air-dielectric condensers. Dubilier are showing examples of all three varieties and so are T.C.C. A series of metallised mica condensers, having protecting side plates and wire connections and with tolerances of two per cent. in capacity, have now been made available to the home constructor, while sundry improvements and extensions of range have been effected in other patterns.

There is a T.C.C. air-dielectric trimmer

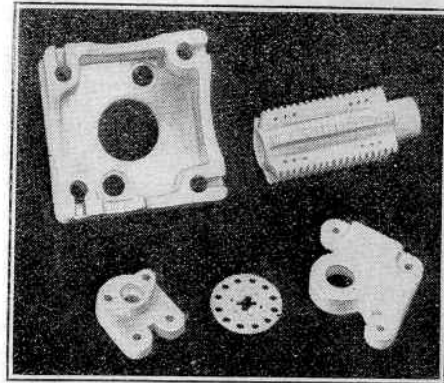


Dubilier air-dielectric trimmer and metalised mica condensers.

constructed on quite a new principle, as both moving and fixed vanes are cut in

the form of a continuous spiral, the former interleaving with the latter when the adjusting screw is rotated. The idle portion of the moving vane concertinas into a compact space at the top of the unit. A feature of the condenser is its very small size, as the base measures in. x ¾in. only.

Bulgin has an improved range of silvered mica condensers, while other

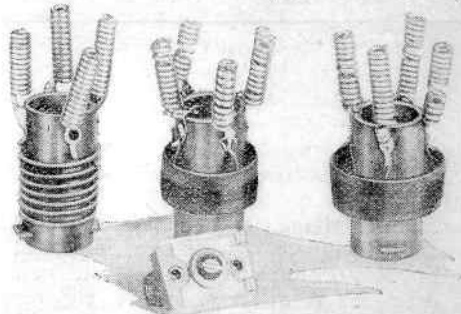


Selection of low-loss Frequentite mouldings shown by Steatite and Porcelain Products.

examples of a similar pattern are among the products of Polar-N.S.F.

The very large number of parts that now has to be accommodated on the chassis of a modern set, quite apart from television sets, has led to a demand for components of extremely small dimensions. One need only examine any of the chassis exhibited to realise this fact. Yet despite this, the quality has to be maintained.

The Drilitic condensers made by Dubilier are largely the outcome of this demand, as they are approximately only



New unit coils with trimmer made by Bulgin.

one-quarter the size of a condenser of equivalent capacity produced a year or so ago. In a metal container measuring 1½in. diameter, T.C.C. has now fitted three separate wet electrolytic condensers, whereas last year this size case held only two. Capacities made are 8-8-8, 8-10-8 and 8-10-4 mfd.

The introduction of the all-wave receiver possibly had a greater effect than any other single factor on the development of high-frequency insulating materials, though the need for low-loss insulators had long been voiced by short-wave amateur experimenters in this country.

As a result rapid strides have been made



## Show Review—

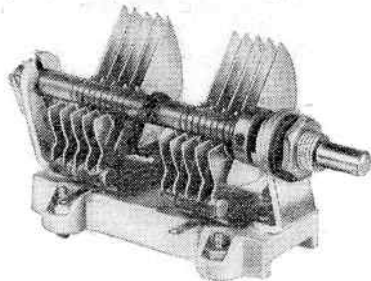
in the production of moulded parts for condensers, valve bases, valveholders, coil supports, switches and formers of every



Varley dry accumulator.

conceivable kind. The display of these parts made from Frequentite and shown by Steatite and Porcelain Products well exemplifies the progress made in this field. Many of the new short- and ultra-short wave components, such as, for example, the range of variable condensers shown by Polar, are assembled on Frequentite bases.

Coils of the skeleton type for use in home-constructed sets have been given due attention by component makers, particularly by Bulgin, who this year show a



Type E Polar ultra-short wave split-stator condenser mounted on Frequentite.

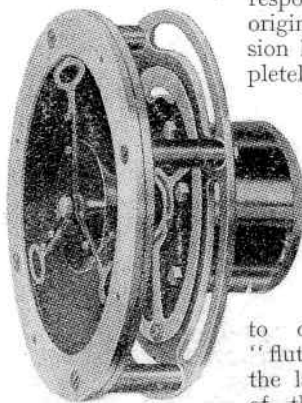
new range covering all wavelengths from about 7 to 2,600 metres. This firm has introduced numerous new lines, extended some of their existing series, and improved others. For example, a complete new range of HT vibrators for working voltages of from two to thirty-two can now be obtained. Likewise Belling and Lee have devoted much time and thought to the development of new parts, as their series of insulated connectors, particularly for use in television sets and high-voltage circuits, testifies.

Two interesting contributions have been made by makers of batteries for portable sets. One is an extension of the range of dry-cell LT batteries for the latest 1.4-volt valves, and the other is a dry accumulator introduced by Varley.

Basically, the new Varley accumulator is the same as the familiar free-acid lead cell and its potential is two volts, but each cell is solid and contains no liquid electrolyte at all. Possessing the cleanliness of a dry cell, it has the added advantage that the cell can be re-

charged in exactly the same way as an ordinary free-acid accumulator. These new cells are made in a wide range of sizes up to 80 Amp. Hours capacity.

Loud-speaker developments, with one exception, are not apparent to the eye, but if the ear can be relied upon under the rather noisy conditions inseparable from an exhibition, the general quality of the units now being installed in sets is much better than during the last two or three years. The Goodmans "Infinite Baffle" unit is both aurally and visually an improvement on the experimental model shown last August.

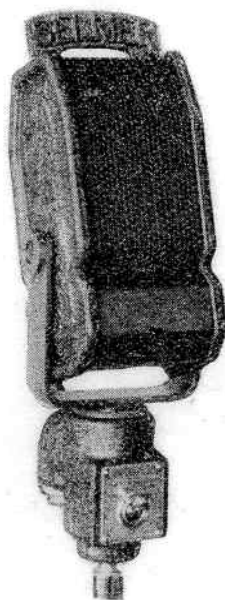


The Goodmans "Infinite Baffle" loud speaker with redesigned cone suspension.

to overcome the "flutter" due to the large excursion of the diaphragm at low frequencies.

A large diameter rear centring spider is used in conjunction with a three-point radial support instead of the tapes which were employed in the earlier model.

As with the loud speakers, improvements in PA equipment are not readily discernible to the eye, but the ear will be able to differentiate between this and last year's models. Better quality of reproduction, coupled with the use of higher grade microphones, constitute the main line of development. E.M.I. Service has a long range of fixed and portable models containing many improved features,



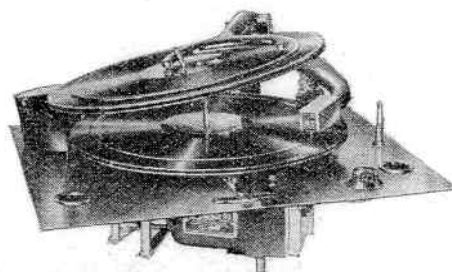
New ribbon-microphone embodying input transformer, made by Henri Selmer.

whilst an entirely new range of Truvoice units has been introduced by Henri Selmer. Carbon, moving-coil and a new design of ribbon microphone

are included in the latest products of this firm. Developments in gramophone equipment are chiefly bound up with record-changers and pick-ups. The mechanism of

record changing has been taken a step further in simplification and reduction of cost in the Garrard RC10 and RC50 units,

and the shape of things to come is seen in an experimental model of a new record-turning unit (RC100) which plays both sides of ten discs.

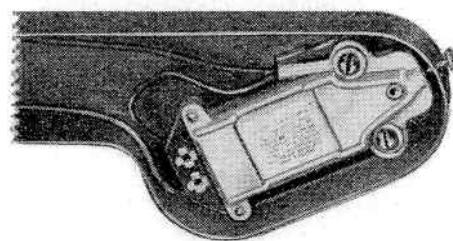


In the Garrard RC50 record changer the selector mechanism has been further simplified.

Most of the progress in pick-up design is epitomised in the exhibit of R. A. Rothermel, Ltd., who are showing piezo electric pick-up cartridges in various stages of manufacture. The torsion type is coming into favour, and a very neat housing has been arranged for it in the new Rothermel "Junior" pick-up.

Apart from the seasonal improvements made in servicing and testing equipment, this year has seen the introduction of several new test sets designed exclusively for adjusting television receivers in the absence of a wireless signal.

The Baird Sync Pulse Generator, which has been produced to enable dealers to install a television set and make all essential adjustments, such as frame and line time-base settings, check for synchronisation and general operation of the set in the purchaser's house without having to wait for



Underside of Rothermel "Junior" pick-up head.

Alexandra Palace to commence transmitting, is quite a small self-contained unit.

An RF output at the correct frequency is provided and this is modulated so that it produces the familiar B.B.C. test cross on the CR tube in the receiver. Alternatively the RF signal can be modulated from an external source so as to give a pattern consisting of vertical bars, these being used to check the overall performance of the receiver.

The user then only has to make a few minor adjustments, such as brilliance and focusing when the transmission starts to ensure obtaining a perfect picture. As the output is adjustable between 200 microvolts and 2 millivolts it allows for satisfactory tests to be made in districts of widely different field strengths. The price complete is £15 15s. od.

## Show Review—

Another test set of this kind, but built on much more ambitious lines, can be seen on the Marconi-Ekco stand. Here it takes the form of a large rack-built assembly, being intended for installation in factories and production test shops. Known as the Scophony Pulse Generator Type OA.134, a video signal, which appears on the CR tube in the set as a lattice pattern of rather complicated design, is produced in addition to the correctly phased synchronisation pulses. The complexity of the pat-



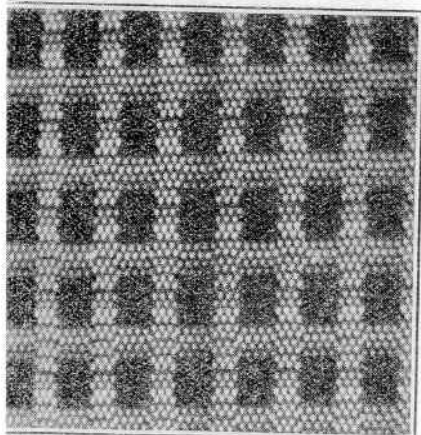
Baird Sync Pulse Generator.

tern enables adjustments to be made for exact focusing and linearity of the time-base circuits. In addition a sound carrier modulated at 400 c/s is produced for checking the sound portion of the set. This test rack can be used with CR tubes with mechanical scanners.

Full monitoring facilities are included, there being three small CR tubes for checking the waveform at different parts of the equipment and a standard receiver with a large tube for checking the overall performance and comparison with sets under test. It is, in fact, a complete television transmitter, but modulated with a lattice pattern of fixed design for video testing. Both RF frequencies are exact, being generated by crystal controlled oscillators.

The output is applied to a number of buffer amplifiers with an output impedance of 80 ohms and these can be fed to different testing booths by low-impedance transmission lines.

The extent to which cathode ray tubes are now used in general test and servicing work is exemplified by the large number of self-contained units and oscilloscopes

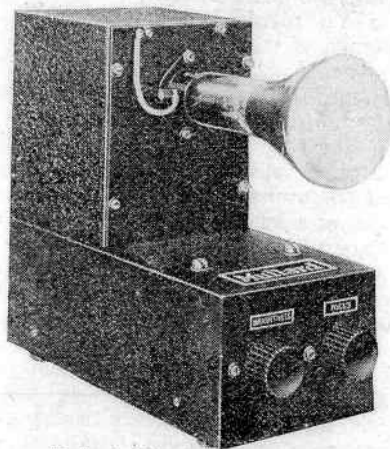


Test pattern produced by Scophony Pulse Generator made by Marconi-Ekco.

shown this year. E.M.I. Service have several models, one of which is a CR tube voltmeter of laboratory pattern, while Cossor has developed a Radio Service Equipment Rack in which is included one of their double-beam CR Oscillographs, Ganging Oscillator, a new Square-Wave Generator and an AC Impedance Bridge. This comprehensive assembly of apparatus enables every kind of test likely to be required by the service engineer, or in a factory test room, to be carried out. Each unit is self-contained and can be supplied separately so that the equipment may be built up in easy stages.

A rack for the two basic units, CR Oscillograph and Ganging Oscillator with switches and input points costs £3, while an extension for the two other units is available at £2 10s. The price of the new Square Wave Generator is £30.

Mullard continue to improve, extend and devise new applications for their CR equipment, the use of oscilloscopes in checking the waveform at different stages in a television set being demonstrated and explained.



Mullard CR tube Model Broo.

An inexpensive self-contained unit comprising a 3-inch hard tube with HT and grid bias supplies and having all high voltage circuits adequately protected, has been introduced this year. The unit, which costs £8 8s., would form the nucleus of a complete oscilloscope, as circuits for time bases and amplifiers are available if required.

The expansion of television reception is exemplified by the large number of firms making a special display of dipoles and other forms of television aerial. Belling and Lee have a comprehensive range, including plain dipoles and reflector types, so also has Antiference, who include twelve different models in the range.

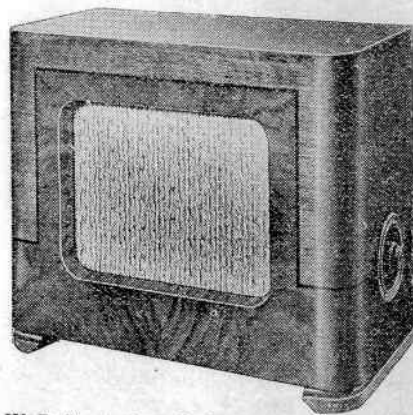
The Belling-Lee Skyrod vertical aerial (for anti-interference broadcast reception) has been improved by making the aerial transformer as an easily replaceable plug-in unit, while the method of installation has been simplified.

E.M.I. Service has developed a new compressed dipole which can be used with or without a reflector, while the new Tilted-wire aerial provides an example of the latest developments made in this field to ensure a good signal in localities where in-

terference is particularly bad, or where one with good direction discriminating properties can be employed to the best advantage.

## W. B. STENTORIAN SPEAKERS

New Cabinet Designs for Extension Units



W. B. Stentorian "Senior" cabinet extension loud speaker, Type 40SC.

FOR the coming season the Senior, Junior, Baby and Midget Stentorian loud speakers are being continued without major alteration. A new range of cabinets has, however, been designed and the "Baby" cabinet model is now housed in a horizontal-type cabinet and costs 29s. 6d. complete with volume control.

In the new "Cadet" the constant impedance volume control includes a push-button for use in conjunction with the "Long Arm" remote control device. The cabinet has a plain opening with a thickness of nearly an inch and the corners are rounded. Contrasting veneers are separated by an inlaid dark line.

The "Junior" and "Senior" cabinet models are of similar design and progressively increasing size. The prices are 49s. 6d. and 63s. respectively. Other cabinet models include the "Pendant" model at 59s. 6d., the "Regent" at 5 guineas, and the "Emperor" at 7 guineas.

All the chassis types are available with the Stentorian universal matching device or with direct speech coil connections at slightly lower prices.

Replacement universal output transformers are supplied at a retail price of 5s.

## The Wireless Industry

THE 1940 catalogue of the Premier Radio Co., 167, Lower Clapton Road, London, E.5, contains information of many new lines including vibratory power units, mobile amplifiers and an inexpensive cathode-ray oscillograph. It is well illustrated and contains much useful information, including a 20-page valve section. The price, as usual, is 6d. per copy.

The Dubilier Condenser Co. (1925), Ltd., Victoria Road, North Acton, London, W.3, have prepared a new catalogue of condensers and resistances of interest to home constructors and radio and television service engineers. A useful abac for calculating resistance ratings is included.

A trade list of components and accessories has been received from Norman Rose (Electrical), Ltd., 43, Lambs Conduit Street, London, W.C.1. In addition to standard replacement parts the list includes many tools and materials useful to the serviceman.

## Garrard Record Changers

The Garrard Engineering and Manufacturing Co. asks us to point out that, in the advertisement in last week's issue, the illustration showed Model RC10, and not Model RC50, as stated.