

The Wireless World

THE
PRACTICAL RADIO
JOURNAL
26th Year of Publication

No. 888.

FRIDAY, SEPTEMBER 4TH, 1936.

VOL. XXXIX. No. 10.

Proprietors: ILIFFE & SONS LTD.

Editor:
HUGH S. POCOCK.

Editorial,
Advertising and Publishing Offices:
DORSET HOUSE, STAMFORD STREET,
LONDON, S.E.1.

Telephone: Waterloo 3333 (50 lines).
Telegrams: "Ethaworld, Sedist, London."

COVENTRY: Hertford Street.

Telegrams: Autocar, Coventry. Telephone: 5210 Coventry.

BIRMINGHAM:

Guildhall Buildings, Navigation Street, 2.
Telegrams: Autopress, Birmingham. Telephone: 2971 Midland (4 lines).

MANCHESTER: 260, Deansgate, 3.

Telegrams: Iliffe, Manchester. Telephone: Blackfriars 4412 (4 lines).

GLASGOW: 26B, Renfield Street, C.2.

Telegrams: "Iliffe, Glasgow." Telephone: Central 4857.

PUBLISHED WEEKLY. ENTERED AS SECOND
CLASS MATTER AT NEW YORK, N.Y.

Subscription Rates:

Home, £1 1s. 8d.; Canada, £1 1s. 8d.; other
countries, £1 3s. 10d. per annum.

As many of the circuits and apparatus described in these
pages are covered by patents, readers are advised, before
making use of them, to satisfy themselves that they would
not be infringing patents.

CONTENTS

	Page
Editorial Comment	241
Olympia Show Review	242
Dual Television Receivers	249
On the Short Waves	250
The New Receiver	251
Mechanical Highlights	253
Valves and Sets	255
Alexandra Palace Television Transmissions	256
Listeners' Guide for the Week	258
Measuring Instruments	260
Quality at Olympia	262
More About Olympia	263
Components	264
Broadcast Brevities	267
Developments in PA Equipment	268
Sideshows at Olympia	271
Latest Electronic Developments	272
Notes and News	273
Recent Inventions	274

EDITORIAL COMMENT

The Radio Show

Recording Impressions

IN this, the third special Show Number of *The Wireless World*, the technical staff having now had time to examine the exhibits more critically than was possible in the first rush days of the Exhibition, contribute their impressions of the principal features of technical interest in all sections of the manufacturers' products. With the aid of these critical summaries we hope our readers will be able to form an accurate idea of just what progress has been made in technical radio development in the past year.

In the years that have gone by receiver design has made very rapid strides, and on occasions the technical developments have been so numerous that either it has been impossible for manufacturers to take advantage of them all at once, or some manufacturers less cautious than others have introduced these innovations into their large-scale production of receivers before they had reached a stage when they were suitable for incorporation in receivers for the public. Sometimes considerable trouble in the way of servicing these receivers resulted. To-day manufacturers are more cautious; they do not rush to incorporate every new idea in their sets, but rather they strive to make the receivers as efficient and reliable as possible, whilst not omitting to include every new feature which has proved its dependability and worth.

Past Progress too Rapid

Receivers of this season might be regarded by technicians as showing less advance over developments of previous years, but the improvements which have been made and the addition of technical features since last year would, in any other industry, be looked upon as really startling developments, and if they are not so regarded in the radio industry to-day it is only because in the past we have been accustomed to progress which has been, if anything, too rapid.

The addition of short-wave ranges to so many types of receiver is the outstanding circuit change of the year, and it will be a matter of considerable interest to watch the reaction of the public to short-wave listening when these receivers get into their hands in large numbers. There can be no doubt that short-wave listening is very fascinating, but whether the public will maintain an interest in it, or whether the novelty will wear off, is a matter on which it would be risky to attempt a prediction.

Popularity of Portables

One interesting feature of this year's Show is the apparent increase in the interest in lightweight portable receivers on view. It would seem as if the publicity which has been given to the subject of car radio has attracted the attention of the public to the value of a wireless set which can be taken about. The portable set, in spite of the disadvantage that it has to be maintained with batteries, has the very definite pull over a set installed in a car that it can be used more flexibly and can be listened to without the necessity of sitting in the car in order to do so.

Television may be described as the "star turn" of the show; it is an amazing engineering achievement and there seems to be little doubt that, technically, television can go ahead as soon as the B.B.C. inaugurates a regular service. We would have liked to have seen the first television programme put out to visitors to Olympia the very best in the way of entertainment which the B.B.C. could expect to do in, say, the first six months of a television service. But, if what we have seen at Olympia is, from the point of view of entertainment value, regarded as good enough, we do not think the public will be wildly enthusiastic about it. We hope that the public will judge only the technical achievement of television on these first transmissions and will not be influenced to imagine that this is the best in the way of entertainment which could be provided for them.

A CONSIDERED ANALYSIS OF THE NEW RECEIVERS

NOW that we have had time to consider the true significance of the Olympia Exhibition, it becomes clear that although real technical developments may be fewer than in previous years, design is by no means stagnant; indeed, in most other spheres of activity the innovations of the present season would be hailed as almost revolutionary.

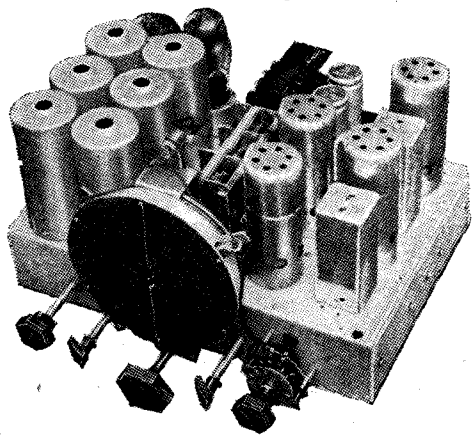
Television has been treated in our pages for more years than many of our readers have lived, but television receivers as regular articles of commerce are a distinct innovation which is now dealt with for the first time.

Next in point of interest, and at present with a wider appeal, come the all-wave sets, which have also become standard productions of the British wireless industry. In the basic design of normal broadcast receivers something approaching stability has been reached, but modification and improvement of details is still going on.

Developments of the season in other fields are treated under appropriate headings elsewhere in this issue.

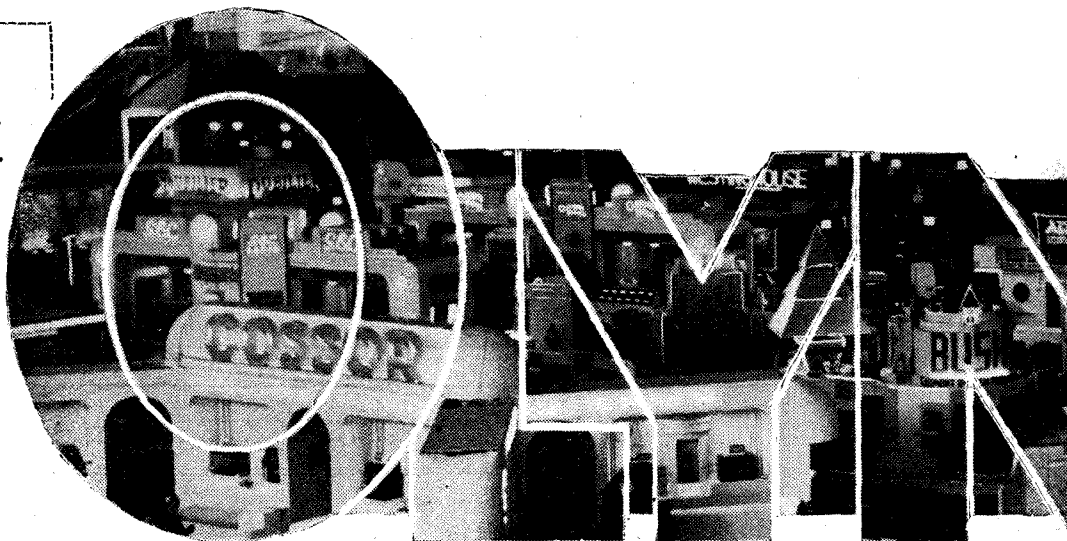
ALL-WAVE RECEIVERS

THE term all-wave receiver is generally used to describe any set having a wider tuning range than the customary 200-500 metres and 800-2,000 metres. It does not convey, therefore, that the receiver can be tuned to any wavelength within the enormous band used in wireless communication. It is more limited in meaning than this, and



Chassis of the R.G.D. Model 625 all-wave receiver.

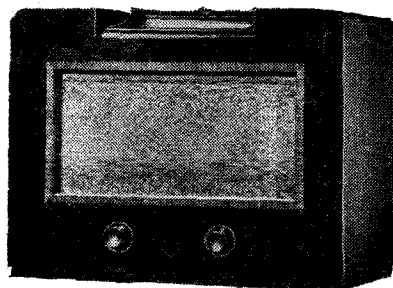
means precisely that the receiver includes one or more short-wave bands in addition to the medium and long. A set is all-wave



in the sense that it can receive short, medium and long wavelengths, but the different bands only rarely overlap to provide a continuous tuning range.

As one might expect, the less expensive types of receiver generally include only one short-wave range, but there is less uniformity in this respect among the costlier examples of the radio art. Some of the most expensive models include only two short-wave bands, while cheaper sets have three, and some still adhere to the single band. This divergency of view on the part of the designers is doubtless brought about by the fact that it is possible in a single range to cover all the more important short-wave broadcasting stations, and the addition of extra bands, while certainly giving some increase in the number of stations it is possible to receive, does not increase the number proportionately.

Multi-band receivers, however, are likely to give a somewhat better performance so far as the purely short-wave circuits are concerned, for the width of each band is usually rather narrower and it is easier to secure high efficiency. This does not necessarily mean, however, that of two

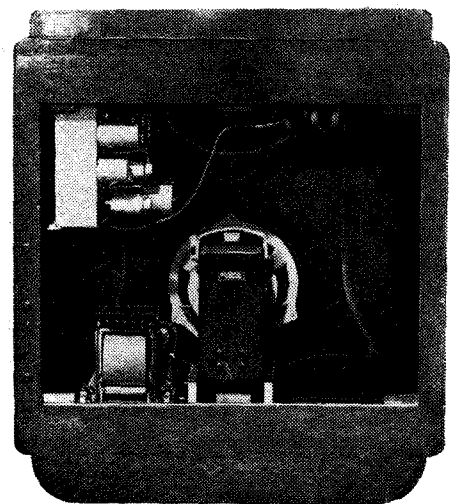


Philips 714B all-wave receiver.

sets of equal price the one with several short-wave bands is the better from the point of view of overall performance. A single short-wave range naturally costs less than two, so that the receiver with the one band may prove superior in selectivity or quality, it may be more sensitive or selective, it may have a better quality cabinet or be of more robust construction. It is thus reasonable to suppose that when two sets carry the same price the one having the fewer wavebands will give the

SHOW

better performance over its more limited tuning range, and a choice between the two must consequently be based on individual requirements. Either set will be



A rear view of the Sound Sales Radio-Gramophone.

the more suitable according to the purpose for which the buyer intends it.

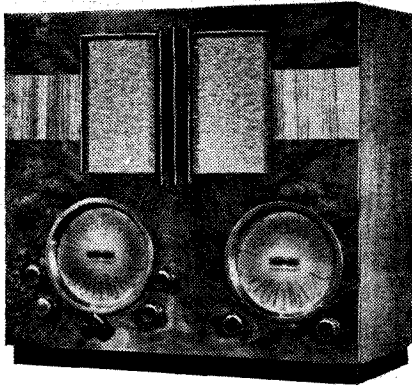
All-wave receivers have for some years been obtainable in the larger types of set, and one firm which has consistently included short-wave bands in its sets is R.G.D. The large model is the 1220, a radio-gramophone with a 12-watt output stage and using resistance-coupled push-pull amplification. Variable-selectivity is included, and a separate amplifier is fitted for AVC purposes. This firm, however, now produces a superheterodyne of moderate size with an attractive specification. It is the Model 625, and it includes a signal-frequency amplifier operative on all bands. This is followed by a triode-hexode frequency-changer and a single IF stage tuned to 465 kc/s. Variable-selectivity is provided in two steps, low and high, and is obtained by providing one transformer with an additional coupling coil which can be cut out of circuit

COMPILED BY "THE
WIRELESS WORLD"
TECHNICAL STAFF

REVIEW

by means of a switch when high selectivity is needed.

A duo-diode-triode provides detection, delayed AVC, and the first stage of LF amplification, and is followed by a triode output valve. Two short-wave bands—16.5-51 and 48.5-150 metres—are provided in addition to the medium and long wavebands, and the switching is arranged so that all unused coils are short-circuited. One feature of interest is that the aerial coupling coils are of high inductance and



The Dynatron Valkyrie all-wave receiver.

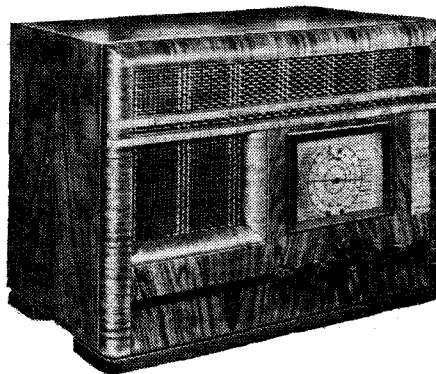
resonate at a lower frequency than any within the tuning range. The HF transformer primaries, however, are of low inductance and resonate at a higher frequency than any within the tuning range. In this way more even sensitivity over the waveband is secured, and the variations in selectivity over the tuning range are reduced. As a table model this set costs 25 guineas.

The Pye receivers are also of the two short-wave band type. The Model CAW costs 33 guineas and covers 13-33 and 30-80 metres, in addition to the medium and long wavebands. A signal-frequency amplifier is used and followed by an octode frequency-changer. There are two IF stages tuned to 465 kc/s, and a duo-diode

detector and source of AVC. This is followed by a single LF stage, feeding a push-pull output stage in which triodes are used. A QAVC system is incorporated, which depends upon metal rectifiers for its operation, and is fed from a third winding on the last IF transformer.

A smaller receiver produced by this firm, the T10, has the same tuning range but only a single IF stage, and the first valve is an octode frequency-changer. A duo-diode-triode is employed for detection, AVC and LF amplification, and the output valve is a pentode. This set costs 18 guineas.

The radio-gramophone produced by Sound Sales includes an all-wave set with a single short-wave band covering 16.5-50 metres. The receiver is actually *The Wireless World All-Wave Super Seven* with the addition of a phase-reversing stage feeding into the Push-Pull Quality Amplifier, which can be supplied for outputs of 4 to 12 watts. A dual-suspension speaker is fitted, and the cabinet is



Marconiphone all-wave superheterodyne, Model 346.

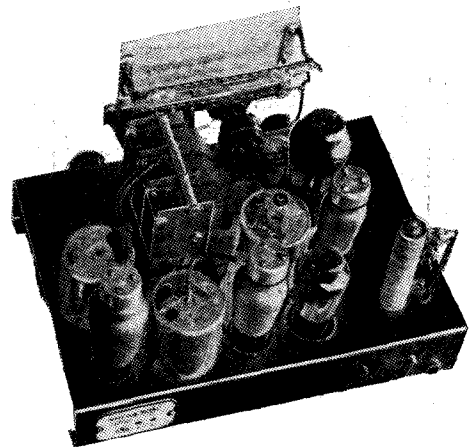
arranged with open sides to reduce box-resonance to a minimum.

The Dynatron all-wave apparatus is unusual, in that the short-wave equipment is quite separate from the main receiver. In the case of the Empress, for instance, the main body of the equipment consists of a straight set covering the medium and long wavebands only. Three HF stages are used, and there are six tuned circuits employing iron-cored coils. Special

arrangements are made to avoid the selectivity varying over the waveband, and the coupling of the band-pass filters is varied automatically with the tuning control in order to achieve this end. Variable-selectivity is provided, and the control varies both the circuit coupling and resistance in order to maintain a flat-topped resonance curve at low selectivity.

A diode detector is used and followed by a phase-reversing stage, which feeds the double resistance-coupled push-pull amplifier. A separate diode is used for AVC purposes with its own amplifier, and a further amplifier is provided for operating the tuning indicator. For short-wave reception, this equipment is preceded by a converter, which has a signal-frequency amplifier and a triode-hexode frequency-changer. There are two wavebands of 11-28 and 27-75 metres, and in order to avoid microphony not only is the gang condenser flexibly mounted but also the oscillator coil. Incidentally, all short-wave coils are iron-cored.

The H.M.V. Model 801 covers an unusually wide range in its three short-wave bands, for it gives continuous coverage from 7 metres to 140 metres, and can consequently be used for reception of the sound accompaniment to television. An HF stage is fitted, and the frequency-changer is a triode-hexode. There is one IF stage, followed by a duo-diode-triode, two LF valves, and a push-pull output stage. AVC is naturally included, and there are separate tone controls for the bass and treble. A dual-ratio tuning control is fitted, and a good point is the fitting of a vernier indicator to the dial. Smaller receivers produced by this firm have the



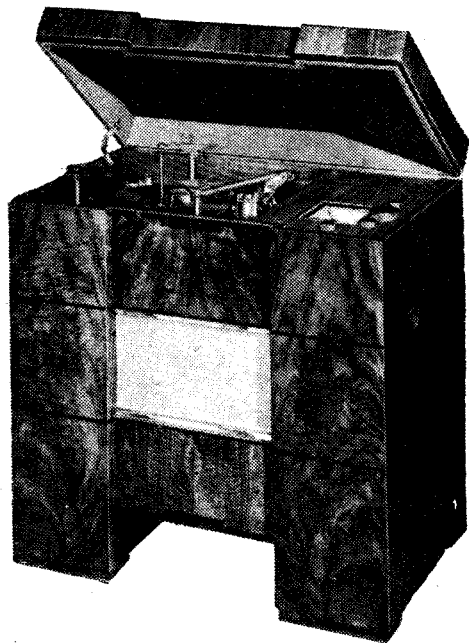
Chassis of the Halcyon Royal County receiver.

same wide tuning range and are similar in design up to the detector. The duo-

Olympia Show Review—

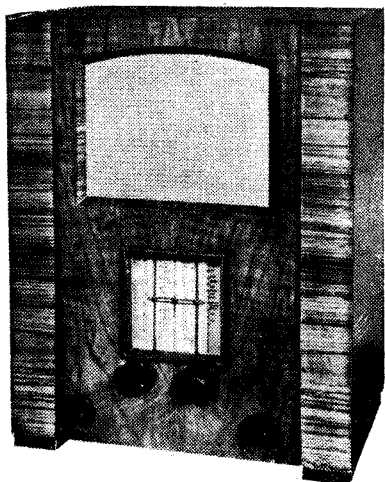
diode-triode used in this stage, however, feeds a pentode output valve.

The Marconiphone receivers also include a tuning range extending down to 7 metres. Signal-frequency amplification is used and a triode-hexode frequency-changer. The intermediate frequency is 460 kc/s, and the single amplifier stage is followed by a duo-diode-triode feeding an output pentode.



The G.E.C. Fidelity All-wave Record Changer Radiogram.

Receivers with a single short-wave band are probably in the majority, and among them must be mentioned the Halcyon Briton. This covers 16.5-51 metres and has an octode frequency-changer which is preceded by a band-pass filter on medium and long waves, but by a single tuned circuit on short waves. There is a single IF stage, followed by a duo-diode which acts as a detector, provides AVC, and feeds the output pentode. On medium waves a sensitivity of 18 μ V is claimed, while the figures for long and short waves are given as 100 μ V and 40 μ V respectively. The Royal County receiver produced by this same firm is

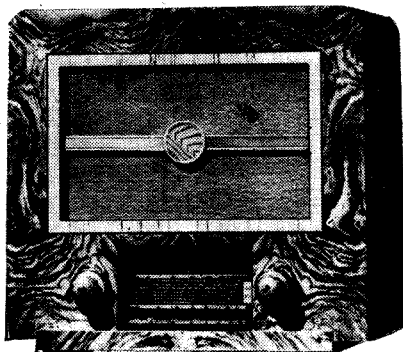


The Bush Radio S.S.W.33 all-wave receiver.

similar, but employs a duo-diode-triode for detection, AVC, and first-stage LF amplification, with the result that higher sensitivity is obtained.

The G.E.C. sets have a single short-wave band of 16-98 metres. The Fidelity All-Wave receiver has a screen-grid HF amplifier and a triode-hexode frequency-changer. There are two IF stages, tuned to 445 kc/s, for which HF pentodes are used, and this amplifier is followed by a duo-diode-triode which is transformer-coupled to an output pentode. A sensitivity of 3 μ V. is claimed, and the set can be supplied with a wavelength range of 16-550 metres continuously instead of the usual ranges which include the long wave-band.

The Mullard receivers have a short-wave band of 16.7-51 metres, and one of the smallest is the MAS3, which is listed at 11½ guineas. An octode frequency-changer is used, and there is one IF stage operating at a frequency of 128 kc/s. The output valve is a pentode, and the set is arranged so that inter-station muting can be obtained by pressure on the volume control knob.



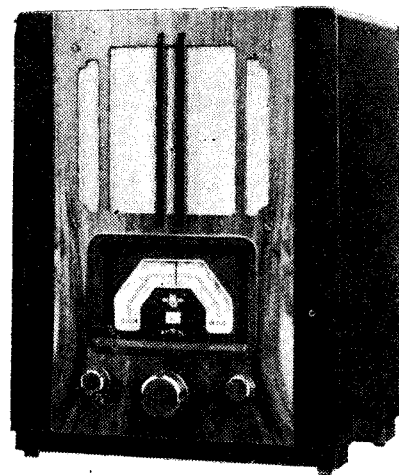
The Mullard MAS3 all-wave superheterodyne.

Kolster-Brandes also adhere to the single short-wave band, and for their sets the range covered is 19-50 metres. Several all-wave models are made; the K.B.560 is a superheterodyne with a triode-hexode frequency-changer, one IF stage, and a duo-diode-triode which feeds the output pentode. A band-pass pre-selector is used on the medium and long wavebands, but a single circuit on short waves. Provision is made in the design for the use of the Rejectostatic system of interference elimination, and the set is priced at 16 guineas.

A smaller receiver produced by this firm is the K.B.515. It has the same tuning range, but is a straight set with one HF stage, a triode detector and a pentode output valve. A similar receiver, the K.B.535, designed for battery operation, is listed at 8½ guineas.

The Invicta AW57 has three short-wave bands—five bands in all. It covers 13 metres to 550 metres without a gap, and there is the normal long waveband of 800-2,000 metres. An octode frequency-changer is used with one IF stage feeding a duo-diode triode. The output valve is a pentode, and the set costs 22 guineas in radio-gramophone form.

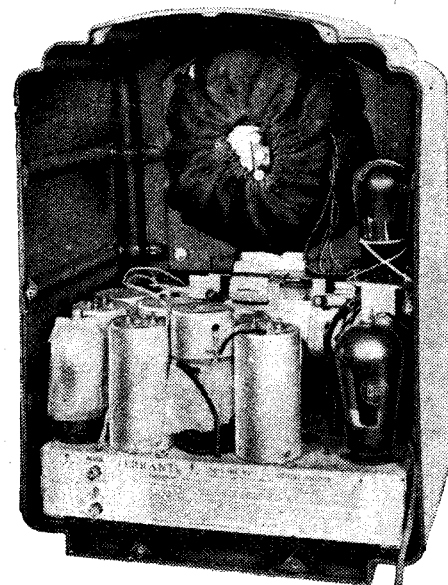
The smallest all-wave receivers are not of the superheterodyne type, but are straight sets of the HF, detector, pentode



The Kolster-Brandes Model 515 all-wave receiver.

class. Such sets naturally rely greatly upon reaction for their sensitivity on short waves, and rarely, if ever, can AVC be provided. Nevertheless, they are capable of giving a very good performance and meet many requirements admirably.

One set which falls into this class is the Ferranti Parva, which costs only 9 guineas. This firm does not, however, confine itself to small sets, but has a number of superheterodynes, among which is the Nova.



A rear view of the Ferranti Nova superheterodyne.

This has three valves, a heptode frequency-changer, one IF stage, and a duo-diode output pentode. It costs 12 guineas.

BROADCAST BAND RECEIVERS

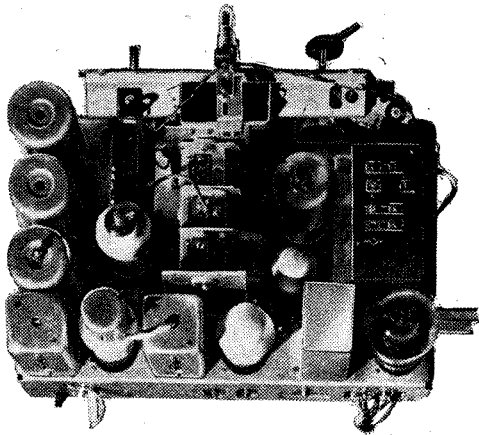
THIS year we have to record the disappearance of an old friend—the det.-LF set, which has served us well since the earliest days of telephony. Possibly a few sets of this type linger on in the manufacturers' catalogues, but, except for

Olympia Show Review—

specialised short-wave use, none were to be seen at Olympia. Except on sentimental grounds, there is little reason for regret; the det.-LF circuit has long outlived its usefulness for broadcast reception under modern conditions.

Another old friend, the HF-det.-LF three-valve circuit, seems to be holding its own quite comfortably both in mains and battery-driven versions, and is still satisfactory enough for those who listen mostly to the local station, with occasional foreign reception when conditions are suitable. The HF-det.-LF sets are now classified into two distinct categories—two-circuit and three-circuit models. The extra selectivity of the three-circuit sets, generally described as band-pass models, is naturally worth the slight extra cost it entails when facilities for occasional long-distance-work reception are desired.

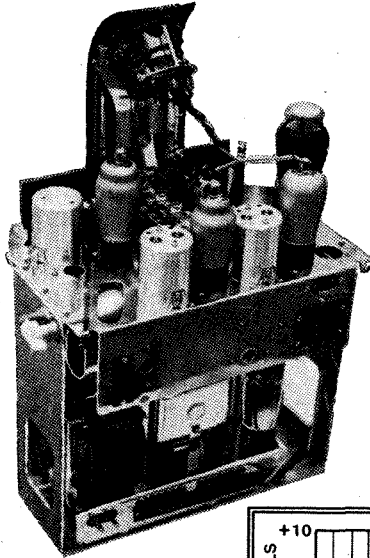
The backbone of the British wireless industry is still the small superheterodyne, and in this class of receiver most of the developments that have taken place are to be found in the all-wave models already dealt with. In the broadcast-band versions now under discussion, improvements are mainly of a detail nature; the basic circuit is sensibly unchanged. Most of the sets may be divided, as last year, into two classes—those with high-level detection and those with low-level detection. In the first class the detector feeds straight into the output valve without the intermediate LF amplifier that is a feature of the low-level set, in which the detector deals with relatively small inputs. Both methods have their advantages, but there is a tendency for the high-level system to be confined mainly to the less expensive sets in which a double-diode-pentode acts as a second detector, source of AVC voltage, and output valve. However, a number of the sets now employ separate double-diode valves, but the circuit is essentially



Chassis of Marconiphone Model 291 superhet.

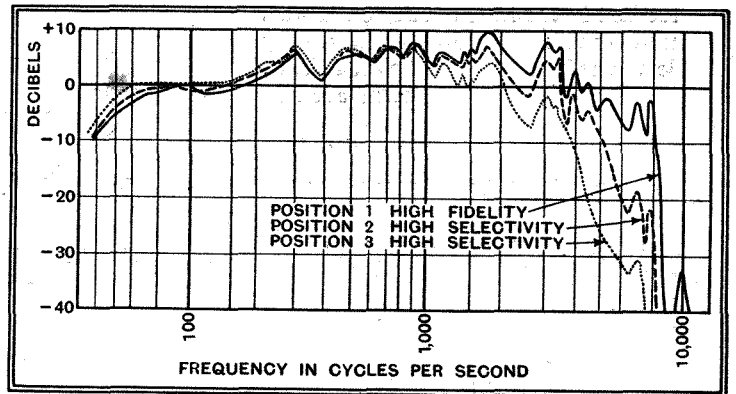
the same. With a few exceptions signal-frequency amplification is not found in the cheaper sets. As a rule, there is a band-pass input filter which, with the oscillator section, makes a total of three tuned circuits. The two-circuit set (single tuned input circuit and oscillator) does not appear to have made much headway, but it is attractive on the score of cost.

Talking of cost, there seems to be little change in prices this season, although values are undoubtedly better, due to improved workmanship and to the inclusion of refinements that did not find their way last year into standard models. Prices of the typical small superhet. vary from under £10 to some 12½ gns. for the table models; a guinea or so more may be charged for some sets with extra refinements.



Unconventional chassis layout of Ekco AC97 receiver.

Overall response curves (including loud speaker) as taken by the makers, of the Ekco AC97. Input 1,000 kc/s, modulated 30 per cent.; output measured at 12in. on axis of speaker. Note the sharp cut-off at about 8 kc/s.



A good example of the small superheterodyne with low-level detection is the Marconi Model 219, neatly housed in a well-made cabinet of attractive design, which costs 12½ gns. The circuit arrangement includes band-pass input, a heptode frequency changer, and single-stage IF amplifier working at 125 kc/s, which is followed by a separate double-diode valve. Next comes an intermediate LF stage, resistance-coupled to an output pentode which feeds an elliptical cone speaker. Refinements include AVC (now accepted as a matter of course) and a silent tuning switch which applies a saturating voltage to the grid of the LF valve in order that a signal may be tuned in by the help of the tuning indicator without distressing noises.

Another AC superheterodyne, this time typical of high-level detection practice, is the Kolster-Brandes KB540. Again there is a band-pass input circuit, a heptode frequency-changer, and a double-diode which feeds directly into the output pentode. Variable selectivity, which is included in this case, is admittedly not a refinement usually found in receivers of the 10- to 12-guinea class (this model costs 11½ gns.), but otherwise the circuit is typical, although in many other sets the

diode rectifier electrodes are included in the same bulb as the pentode output valve.

Still another small superheterodyne which has points of exceptional interest is the Ekco model AC97 at 12½ gns. This set includes a frequency changer, IF stage, double-diode-triode, and a triode output valve. In the LF amplifier there is a special filter network designed not only to eliminate 9 kc/s whistles, but also to give a sharp cut-off just below this frequency. The effect of this filter is clearly shown in the accompanying response curves. There is also a three-position selectivity control switch, which, in position 1 (high fidelity), imposes damping on the IF amplifier; in position 2 damping is removed and the IF amplifier is working at its maximum useful selectivity. In the third position, normally used only for long-distance reception when conditions are unfavourable, high-note response is reduced still further by attenuation in the LF section.

To compensate for the normal characteristics of the human ear, the volume control is arranged so that at low settings both bass and treble are accentuated. This is carried out by ganged potentiometers

working in a compensating circuit. The loud speaker is a special model with a curved cone which has a main resonance well below 50 c/s and a flux density of over 10,000 lines per sq. cm.

With the help of a silent tuning switch actuated by pressing lightly on the condenser knob, a paralysing voltage is applied to the IF amplifier through a circuit with a time-constant suitably chosen to prevent clicks. Thus it is possible, with the help of the cathode-ray tuning indicator provided, to tune in a station accurately without noise.

Turning to general tendencies, it would appear that iron-cored coils are more generally used in superheterodynes than last year, and figures in quite a number of cases in the IF amplifiers.

One swallow does not make a summer, but two or three low-priced sets include triode output valves instead of the more popular pentode. The Ekco set just described is one of these, and there is also a Bush model.

Apart from the comparatively simple and inexpensive straight HF-det.-LF sets already mentioned, the tuned radio-frequency amplifier still has its adherents in more ambitious receivers. In the Dynatron Ether Empress model, for