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EDITORIAL COMMENT.

Future of the Tuning Note.

THERE is evidence of a growing dissatisfaction with the B.B.C. tuning note in its present form. It is criticised not only on account of the inordinate length of time for which it is frequently allowed to persist, but also because of the irritatingly high pitch of the note.

The B.B.C. assert that the tuning note is "a technical necessity for the adjustment of all transmitters," but we have always understood that it was introduced originally to enable listeners to adjust their own sets properly and so reduce the chorus of heterodyne whistles which invariably accompanied the opening of every programme in the days when the oscillating detector type of receiver was almost universal. With modern sets and the increased skill exhibited by the average listener, the oscillations nuisance has almost completely disappeared, and we fail to see why the tuning note should be a technical necessity for the adjustment of modern transmitters. At Writtle in 1922 perhaps yes, but surely not at Brookmans Park.

There can be little doubt that the tuning note in its present form serves no useful purpose to the listener, but there is no reason why it should not be modified to provide useful data for the manufacturers of broadcast receivers and the serious amateur. Instead of modulating at a fixed frequency we would suggest a continuously rising tone covering the full range of frequencies normally used in the B.B.C. transmission. The degree of modulation would be constant throughout or, better still, might be made to conform to the average frequency characteristic of the station. By fixing a definite rate of increase of frequency the upper and lower cut-off and any major resonances in the receiver could be determined by noting the time interval from the commencement of the transmission. This could be marked conveniently by a 1,000 cycle "pip" which even the worst of receivers could hardly miss.

We suggest, therefore, that the tuning

note in programme hours should be dropped in favour of a special transmission of the above type.

A transmission of this character would find wide acceptance and could not fail to promote a fuller appreciation of the possibilities of high quality reception. Is it too much to ask the B.B.C. for this small service in the interests of better reception of their own programmes?

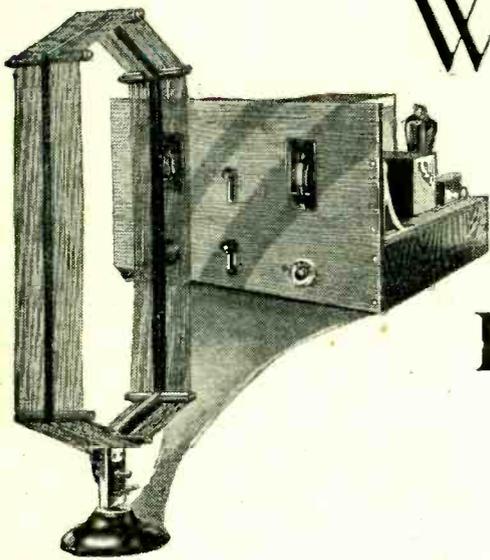
Stability.

WE doubt whether there is any other industry in the history of civilisation which has been effected by changing conditions to the extent which has occurred in the case of wireless. Only five or six years ago we could carry in our heads the names of the broadcasting stations operating in Europe, mutual interference of broadcasting stations was unknown, and the most unselective sets were entirely satisfactory for broadcast reception.

The number of stations in Europe increased at a prodigious rate and year by year the standard receiving sets became obsolete and had to be replaced by more up-to-date and selective equipment.

The position to-day is that the number and power of the stations in Europe has increased to a point which makes requirements of selectivity in receivers very stringent. Looking ahead, it seems unlikely that there can be any serious increase in the selectivity problem in Europe because stations are already at the point of overlapping in wavelength, and the position cannot get much worse before a halt is called in Europe. This being so, we must surely have reached a stage of some stability in receivers, for although in the future all sorts of improvements and refinements in broadcast receivers may be expected, yet the selective receivers of to-day will continue to be serviceable.

We believe that the public can have confidence that in acquiring a good selective receiver of to-day's make they will not be in the position of having to discard this as the result of any changes in broadcasting in Europe.



WHEN A FRAME AERIAL IS WORTH WHILE

The Virtues of the Centre-Tap.

By A. L. M. SOWERBY, M.Sc.

NO one, least of all the writer, would claim that in ordinary circumstances a frame aerial is a satisfactory substitute for an open aerial of the ordinary kind. Even when a proper outside aerial, stretching the whole length of the average small garden, cannot be erected, the frame aerial is usually beaten, so far as results are concerned, by a modest indoor aerial, or by even the shortest and most inefficient erection to which the term "outside aerial" could be applied.

Its relative inefficiency as a collector of energy accounts for only part of the present unpopularity of the frame; its awkward bulkiness and its complete failure to add dignity to even the most angularly modernistic of furnishing schemes provide the average listener with very good additional reasons for using in its stead the unobtrusive wire round the picture rail. And then, to make matters worse, the frame is inherently flimsy—all the more so because it has to be supported in such a way that it can be turned round when necessary. The average frame, whose windings are more or less exposed, will do well if it can survive the daily dusting for a year without suffering some harm or other.

Disturbers of Ethereal Peace.

On the credit side there is little to be said for the frame in average circumstances. The small amount of energy picked up makes it easier to tune out the local station, but one must set against that the fact that it is correspondingly harder to tune the distant station in. The apparent selectivity of a set goes up when a frame is substituted for an open aerial, but, unless there is a large reserve of sensitivity, this selectivity is of no practical use because the distant stations are now too faint to be heard. Only if the set possesses the necessary very high sensitivity is the substitution of a frame for an open aerial likely to increase the total number of stations that can be logged free of interference, even if the directional effect of the frame is also called in as an additional aid to selectivity.

There is a second, and little-known, advantage in the frame which can at times lead one to consider very seriously whether, in spite of its manifold drawbacks, it is not

worth while to adopt it. In places where there is a good deal of electrical machinery it is often found quite impossible to receive any station at all, other than the locals, without hearing at the same time a background—or in a bad case it may even be a foreground—of cracks, crashes, bangs, whirrs, and buzzes that kill all possible enjoyment in listening to the distant station. So far as the writer knows, there is no means

IN populated places where there is considerable electrical machinery it is often found impossible with an open aerial to listen even to the local station without a background of interference which kills all enjoyment of broadcasting. The author points out that in these circumstances a properly balanced frame aerial will reduce considerably the noise-signal ratio, and, incidentally, reception should not be accompanied by side-band heterodyning, which even tone control cannot remove.

of reducing this type of interference to complete silence save by operating upon the machines that are disturbing the ethereal peace. But a frame aerial, if properly built and connected, will generally reduce the interference to a mere fraction of the intensity it has when an open aerial is used.

This reduction of noise-level is not due, even partly, to the fact that the frame is less effective as a collector of energy than an open aerial. If this were the sole reason for the lessened noise, one would really be no better off, for, on increasing the sensitivity of the set to get the signal back at full strength, the noise would simultaneously come back to its original level.

In practice, this does not happen, for the frame manages to discriminate between signal and noise to some extent, picking up far more of the signal in proportion to the noise than does the open aerial. In other words, the use of a frame provides a very substantial increase in signal-noise ratio.

This difference between frame and open aerial depends upon the fact that the mechanism of collection is radically different in the two cases. The aerial acts as one plate of a condenser of which the earth

forms the second plate; the whole system is reproduced in little when a metal plate is put into the top of an all-mains set to act, in conjunction with the "earth" formed by the metal chassis beneath it, as a miniature aerial system for local reception.

A condenser of this type, with its plates widely separated, may be looked upon as tapping the energy of the oncoming wave by having its two "feelers" at points of different electrical potential. The continually changing charges produced on these plates as the wave passes by gives rise to currents in the wire joining them, and it is these currents that we send through the aerial coil of the set to feed it with the signals it requires. The essence of the whole scheme is that we receive on a condenser, making use of potential differences to do so.

Electro-magnetic Waves.

With a frame aerial the method of operation is quite different. A frame is nothing more than an overgrown tuning coil, and if properly designed and connected does not act as a condenser at all. Instead of making use of the electric component of the wave being received, the coil aerial makes use of the magnetic component, and has currents induced into it by the changing magnetic field of the passing wave.

Now, part of the theory of the electromagnetic waves by which all broadcasting is transmitted tells us that the magnetic and

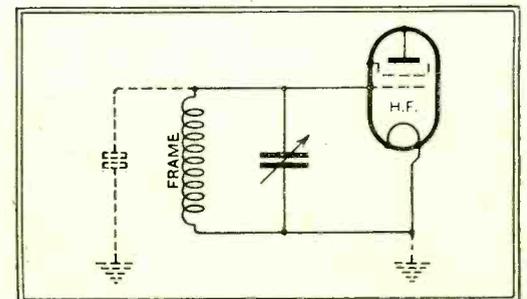


Fig. 1.—The usual method of connecting a frame. By the capacity of the top end to earth (shown dotted) it acts also as an elevated aerial.

electrical components of the wave carry equal amounts of energy. It would therefore appear to be a matter of complete indifference whether we derived the energy for our set from the one or from the other. When we consider reception from a considerable distance, this is undoubtedly true, so that

When a Frame Aerial is Worth While.—

we can receive our distant station equally well on either type of aerial. But there remains the fact that the magnetic and electric components do not necessarily establish this equal balance until the wave has travelled some distance from its source. Put in more human terms, we may say that the wave requires time to get into its stride.

The sources of disturbance that tend to blot out the distant stations we wish to hear are all fairly close to our receiver, so that we have every encouragement to hope that the electromagnetic wave has not yet settled down to its electromagnetic equality by the time it reaches the set. If its energy is still chiefly magnetic, we will try to minimise it by receiving on an aerial; if chiefly electric, we will achieve the same end by using a frame.

Motors and machinery send out most of their radiation by virtue of the fact that they transmit their disturbances down the supply mains that feed them, and these, being long,

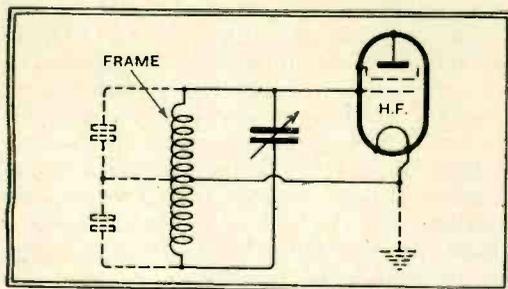


Fig. 2.—A centre-tapped frame, connected as shown, goes far to prevent "aerial effect." Both ends now act as elevated aeriels by their capacities to earth, but the resulting currents are in opposite directions and balance out.

radiate like aeriels. The wave emitted is therefore almost entirely electric near its source; an open aerial will be affected very strongly by it, and comparatively little will be picked up on a frame.

The Centre Tap of the Frame.

All this is just pure theory, but it is practical, too. The writer, who lives right in London, has long since found that in his particular locality all but the loudest foreign stations are drowned in a welter of noise if reception is attempted on any form of open aerial, whereas, by using a frame, the disturbances can be so reduced that quite a number of stations can be listened to with enjoyment. There must be many other listeners whose local conditions are similar, and who would find that a frame aerial would be of considerable help in eliminating the irritating noise from which they may now be suffering.

In putting the frame to practical use as a disturbance-reducer one has always to bear in mind that its virtue arises entirely from the elimination of electrical pick-up, and one must so arrange matters that it collects signals entirely in its function as a coil. If a frame is connected in the simplest and most usual way, as shown in Fig. 1, only a fraction of the possible benefit will be obtained. The reason for this is not far to seek, and is indicated by the dotted condenser in the diagram.

The frame is large, and is elevated above the earth, to which the set is either directly connected, or to which, at least, it has a large

capacity. That end of the frame which is connected to the grid of the valve has a capacity to earth, and so picks up a certain amount of signal in just the same way as if it were an ordinary open aerial. With that small amount of extra signal is picked up a disproportionately large amount of noise—which, it will be remembered, is picked up almost exclusively by an aerial of normal type. One might call a frame so connected an "elevated frame," in recognition of the fact that it is not a pure frame, but acts as an elevated aerial as well.

Balanced Frame.

If the frame is tapped at its centre-point and connected to the set in such a way that the tap is earthed, while one end goes to the grid of the first valve and the other end is free, it becomes much more nearly a true frame. Each end of the winding picks up a small signal by acting as an elevated aerial, but the currents in the two halves of the frame due to this unwanted energy flow inwards towards the centre, and so balance one another out. The currents picked up by the legitimate action of the frame, however, are all in the same direction, and so are not involved in this cancelling process.

To reduce the proportion of noise collected to the minimum, it is therefore necessary to make use of the centre-tapped "pure" frame of Fig. 2, and not to be content with the much less effective "elevated" frame of Fig. 1.

There are practical points, too, bearing on the "purity" of the frame. It is not good practice, for example, to mount the tuning condenser on the base of the frame and then to connect the combination to the set by two leads in the manner suggested in Fig. 3. If this is done, the whole length of the wire from the aerial terminal of the set to the frame is acting as an elevated

symmetrically by three wires, as in Fig. 4.

Careful comparisons have shown that the improvement made by changing from an elevated frame (Fig. 1) to a balanced frame properly connected (Fig. 4) is at least as great as that obtained by substituting an elevated frame for an open aerial. It is possible that if the detailed arrangements of the

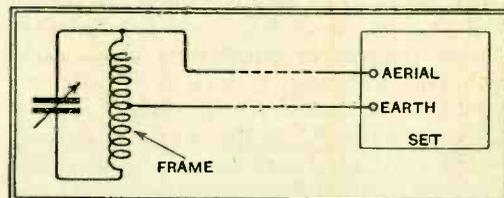
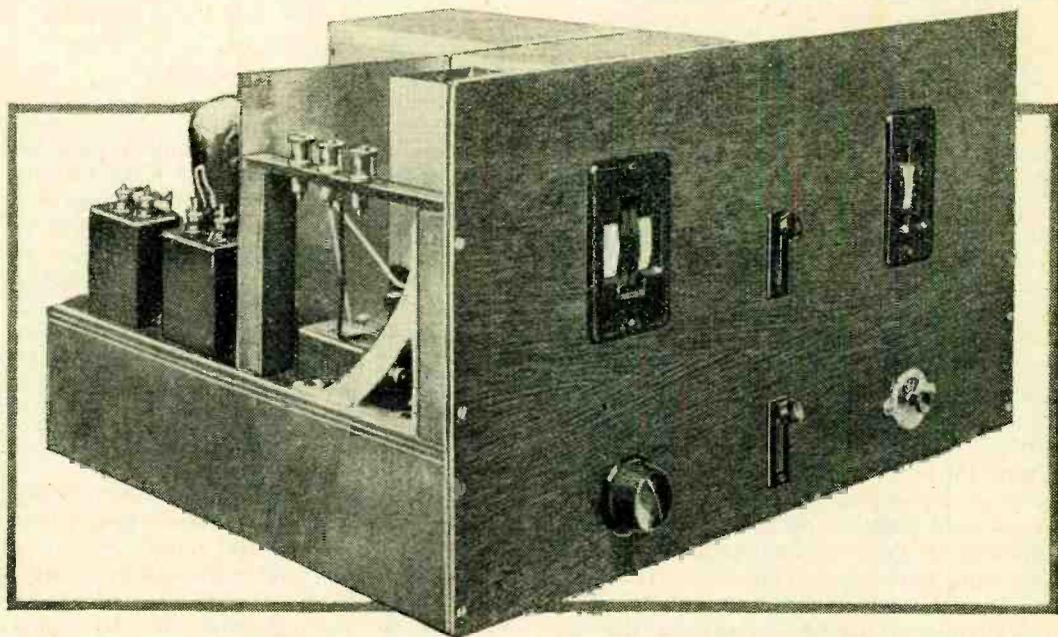


Fig. 3.—If the tuning condenser is mounted on the frame and the combination connected to the set by two leads, that connected to the aerial terminal acts as an elevated aerial and brings in the noise we are trying to eliminate.

balanced frame had been carried out in real laboratory style the local disturbances might have been even more completely eliminated.

For those who wish to make practical application of the circuit of Fig. 4, it may be helpful to give the full precautions that theory would demand for absolutely perfect elimination of elevated-aerial pick-up. They will then know what they ought to do, and will make as close an approximation to it as they feel inclined.

First, the two halves of the frame should be absolutely identical, and should be infinitely closely coupled. Next, the two outer leads should be exactly equidistant from the centre (earthed) lead, while these outer leads, and the ends of the frame, should be symmetrically disposed with regard to neighbouring conductors. Since perfect symmetry cannot usually be obtained where the wires join the tuning condenser and are connected to the grid and filament of the valve, the region in question (and prefer-



"The Wireless World" Band-pass Superheterodyne described in 1930. Terminals for the connection of a centre-tapped frame aerial can clearly be seen.

aerial, and is busy picking up the noise we are trying to get rid of. It is necessary to balance the connecting leads as well as the frame, for which purpose the tuning condenser must be situated in the set (or just beside it), and the frame must be connected

ably the whole set) should be enclosed in a screen of earthed metal gauze or sheet.

Of the demands made, the only one which cannot be fulfilled fairly readily by anyone who really sets out to do things properly, irrespective of the trouble involved, is that

New Dual Loud Speaker.— steady anode voltage by the condenser C_1 . So much for the theoretical considerations of the separation of the audio-frequency output into the two desired channels; we must now put this into practice.

The electrostatic loud speaker requires a polarising voltage of 200 to 250 volts, and in Fig. 1 it will be seen that the potential difference between the anode of V and H.T. can be used for this purpose. If the circuit of Fig. 2 has to be adopted, then this source of polarising voltage is removed; some other means must also be found in cases where the voltage on the anode of the output valve is in excess of 250 volts, as the electrostatic loud speaker is not designed for such voltages.

Polarising Voltage.

If the moving-coil speaker has a D.C. excited field of appropriate voltage then this will form a suitable source of supply, otherwise the polarising voltage must be derived from the eliminator in some way. If the maximum H.T. is 250 volts and the output valve is directly heated, no special precautions are necessary, but in the case of an indirectly heated cathode type of output valve it is advisable that the rectifier, if the eliminator is of the A.C. type, be also an indirectly heated valve, to prevent excessive voltages being applied to the electrostatic speaker before the output valve warms up. If the output valve calls for 400 or more volts on the anode, a potentiometer must be added to break down the voltage to the desired figure. These various arrangements are shown in Fig. 3, which also shows a filter system in the supply. The choke L_3 , as well as reducing mains hum, is essential to prevent audio-frequency energy being diverted

from the electrostatic loud speaker into the supply system. The resistance R is also required in order to pass a small D.C. current through the choke, otherwise there will be no smoothing of mains hum.

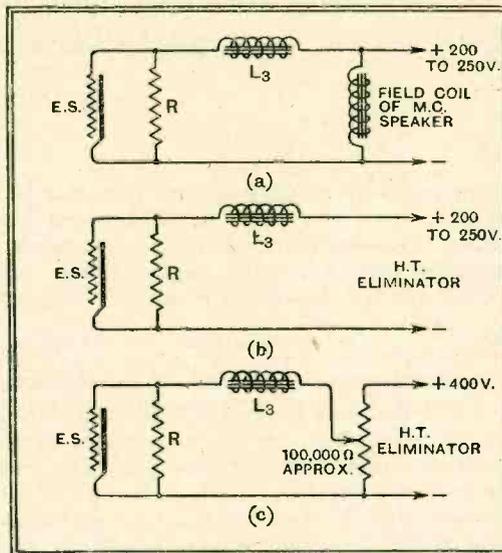


Fig. 3.—Various methods of obtaining the polarising voltage. The potentiometer in (c) should be adjusted so that the voltage applied to E.S. is about 220.

All the foregoing has been based on the assumption that the impedance relation between the electrostatic speaker and valve is such that the speaker forms an efficient load towards the upper limit of the frequency required. Where this is not the case, and, on the whole it will be exceptional, it will be necessary to feed the electrostatic speaker through a step-up or step-down transformer, according to the type of valve used. A step-down ratio will be required for valves of

very high impedance, and a step-up for super power valves of unusually low impedance, especially when such valves are used in parallel. For experimental purposes, a good quality audio-frequency transformer of about $3\frac{1}{2}$ to 1 ratio, and of low self capacity, will be quite suitable. Fig. 4 shows the connections.

Compensating Unit.

We are now in a position to construct the compensating unit for the two loud speakers. Fig. 5 gives all values and connections, and the reader is advised to study it closely. It will be seen that a choke of one henry inductance, L_1 is connected in series with the valve and the moving-coil output transformer, the function of which, as we have seen, is to prevent the higher frequencies from reaching this unit. The electrostatic loud speaker is in parallel with this; it is insulated from the steady anode voltage by C_1 of one microfarad capacity. The inductance L_2 of 0.2 henry and the electrostatic loud speaker E.S. together form a resonant circuit which is tuned to the desired cut-off frequency by the tapings on L_2 . The polarising voltage for E.S. is obtained from any convenient source and is fed through the filter system L_3 and R , L_3 being of 100 henries inductance and R 250,000 ohms.

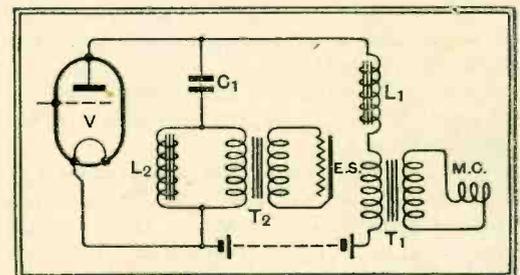
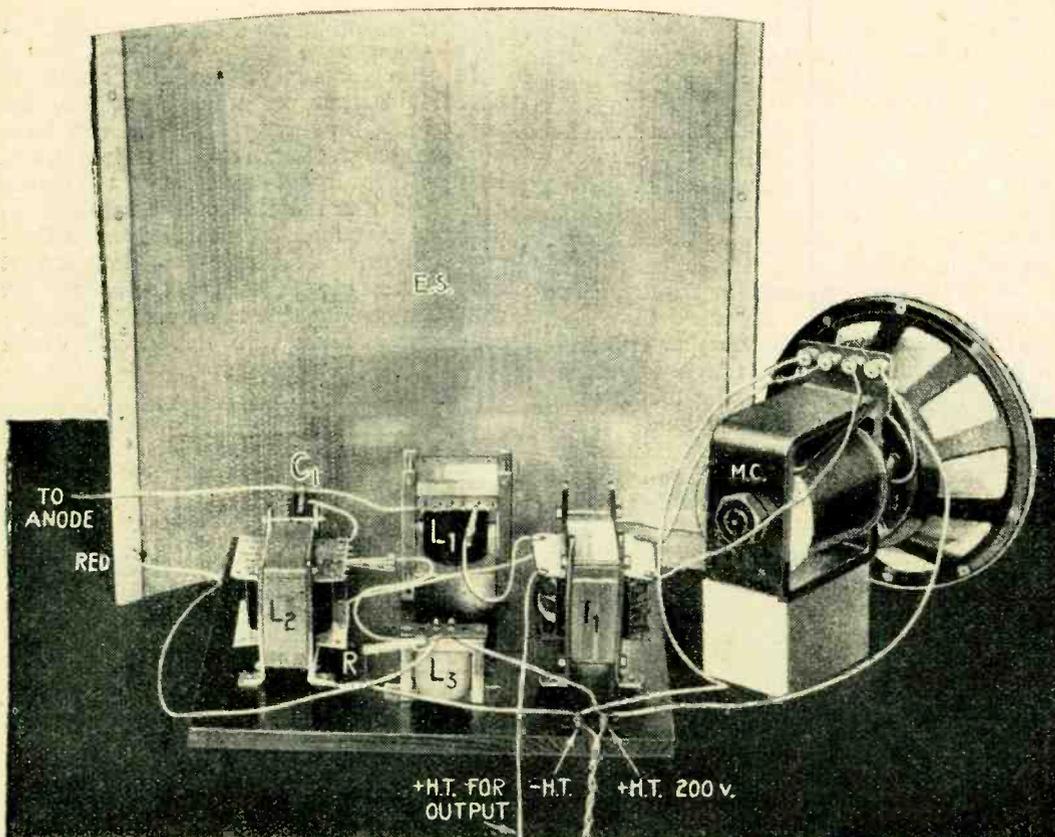


Fig. 4.—Where the impedance of E.S. is either too high or too low to act as an efficient load on the valve, the transformer T_2 is used to match the impedances at high frequencies.

First of all, it is necessary to balance the two loud speakers for sensitivity. Fig. 6 shows the connections of both speakers for this test, diagrams being shown for sets with direct output transformer feed, or choke feed. Arrangements should be made so that the circuits can be broken at the points X. Tune in a station with E.S. connected and M.C. broken at X (one of the leads from the secondary of the output transformer), then, as quickly as possible, break the lead between E.S. and H.T.—and connect in M.C. If the volume of sound, making allowance for the different character of the reproduction, appears to be about the same on both speakers, nothing more need be done, but if the moving-coil loud speaker seems to be the louder of the two an attempt should be made to reduce its sensitivity by adding a series resistance to the field coil. This method, although not the best which can be used in ordinary cases, is forced on one here, as the usual procedure, by adding a resistance to the output circuit, will affect the performance of the electrostatic. If of the permanent magnet type the sensitivity will probably be approximately equal to that of the electrostatic. On the other hand, the moving coil unit may be one of the inexpensive type now so popular, when the sensitivity will definitely be less; in this case nothing very much can



Experimental layout showing connections of electrostatic and moving-coil units together with filter components.

New Dual Loud Speaker.—

be done, as it is difficult to "desensitise" the "Primustatic" without impairing its performance.

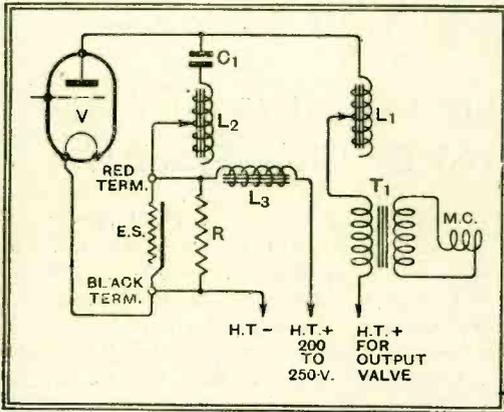


Fig. 5.—The complete schematic diagram. L_1 , 1 henry (tapped); L_2 , 0.2 henry (tapped); L_3 , 100 henrys; C_1 , 1 mfd.; R , 250,000 ohms; T_1 , moving-coil output transformer; M.C. moving-coil loud speaker; E.S. "Primustatic" loud speaker; V , output valve. If the matching transformer T_2 of Fig. 4 is required, one winding replaces E.S. in the above diagram, and E.S., R and L_3 are connected to the other winding.

Assuming now that we have the two loud speakers of approximately equal sensitivity, and that the complete unit has been assembled, a local station should be tuned in and the lead removed from the red terminal of the "Primustatic" loud speaker. The tapping on the choke L_1 must now be adjusted until there is a marked cut-off at 1,000 cycles on the moving-coil speaker. The reader may well ask how he will know when his cut-off is at this figure. It can be said that speech and music should sound very "woolly" and, if the loud speaker normally "peaks" at about 2,000 cycles (a common fault), all trace of brightness or shrillness must be removed. Now reconnect the "Primustatic" loud speaker and remove the

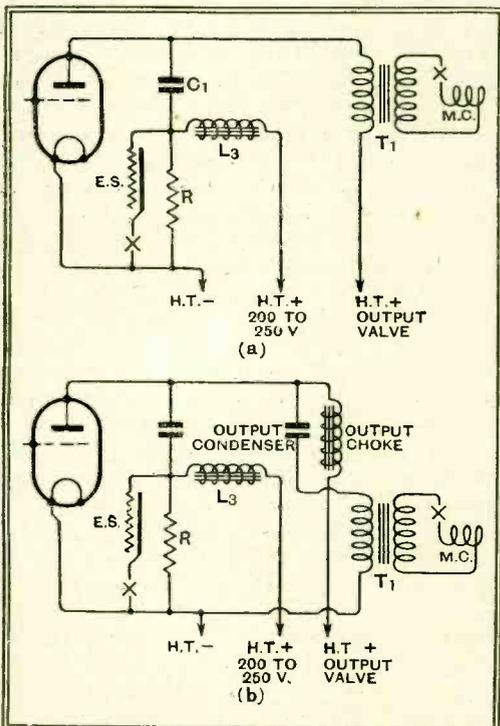


Fig. 6.—Connecting the two loud speakers for matching sensitivity. (a) Straight transformer output; (b) Choke output.

field supply from the moving-coil unit; if of the permanent magnet type disconnect one of the leads from the output transformer secondary winding. Adjust the tapping on the choke L_2 until all trace of lower frequencies has disappeared and the reproduction is so shrill as to be irritating. We can assume, somewhat casually, no doubt, that frequencies up to about 1,000 cycles have been removed. Returning the moving-coil speaker to its normal condition will result in a combination which ought to sound very pleasant indeed, but if the higher frequencies sound weak, it will be advisable to experiment with a suitable transformer feeding the electrostatic loud speaker as suggested earlier in this article and illustrated diagrammatically in Fig. 4.

It should be borne in mind that the dual unit has no better bass performance than the moving coil alone, and if this latter "grunts" at low frequencies, the combination will grunt also. The high-frequency response will, however, be so greatly improved as to commend the dual loud speaker to all discriminating listeners. The moving-coil loud speaker shown in the illustration has

been chosen as one not hitherto on the market, and it is hoped thus to avoid criticism from the maker of any particular brand of loud speaker who might object to any public attempt to alter the performance of his product, or from competitive makers who might equally strongly object to any one make being singled out for rejuvenating treatment. The device will work with any moving-coil speaker, and the excellence or otherwise of the original bass response will be a measure of the total excellence of the whole. The normal power-handling capacity of the "Primustatic" loud speaker is rather less than one watt, but the combination will handle 5 watts A.C. without distress, and readers with output valves of the L.S.6a type need have no hesitation in making up the arrangement as described. If the two loud speakers are not to be built into one cabinet, they should be as close together as possible, to avoid hearing separately the complementary halves of the frequency response of the two loud speakers. As there is only slight focusing of the high frequencies from the electrostatic speaker, the general diffusion of sound will be found very pleasing.

NEWS BY TELEVISION.

A New Marconi System.

APPARATUS has now been evolved by the Marconi Company for the commercial transmission of news by television. This is one of the applications of television which do not necessarily involve the use of wide frequency bands; the new instrument can be operated satisfactorily on a medium long wave of 1,000 metres.

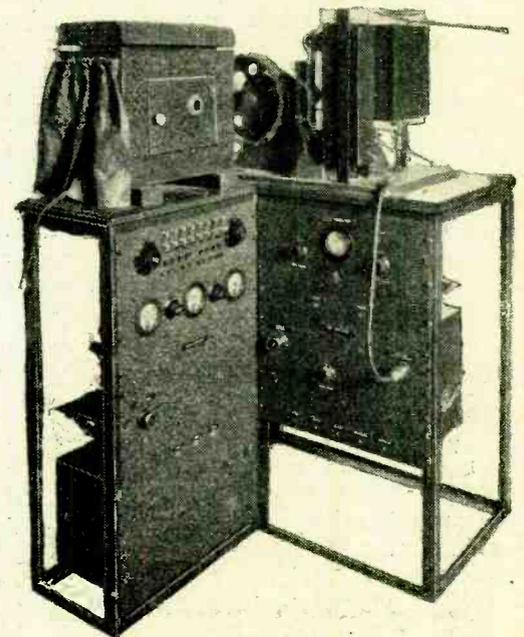
It is designed to transmit images of a moving tape on which characters are printed by a special typewriter. The light source is a 1,000-watt gas-filled metal-filament projector lamp mounted vertically with a reflector behind it. The light passes through a spherical condenser lens system, on to a reflecting mirror and an aperture, and thence through a system of lenses mounted in a spiral on a lens drum. There are fifteen such lenses on the drum, and the picture repetition frequency corresponding to the speed of the drum is twenty per second.

The Photo Cell Amplifier.

A sharp image of the aperture is projected by each lens on the tape, and is swept over it by the lens drum motion. The tape is carried vertically between two rollers, the bottom one of which is driven through suitable gearing by the same motor that drives the lens drum, and the tape can be given a speed of either 60 or 120 w.p.m. Behind the tape is mounted the photo cell and photo cell amplifier, both of which are contained in a single shielded unit. The lens drum driving motor is maintained at constant speed by means of a synchronous motor controlled by a tuning fork mounted in the bottom of the frame under the lamp house. Above the tuning fork is the fork amplifier unit, and above that is the control unit for the whole system. The frame which supports the lens wheel and tape drive carries two panels, the lower one being the line amplifier and the other the synchronising circuit, which sends out a special signal with the picture signal for the purpose of keeping the receiver scanning motor in step.

In this type of transmitter the frequency band necessary depends on the number of letters shown at the same time in the picture,

and a convenient method of adapting the television transmission to any width of band available is therefore to alter the length of the picture, which alters the number of letters shown accordingly. Thus, the frequency band required by the apparatus described is 13 k/cs., but by reducing the distance between the lenses on the drum which shortens the picture length and reduces the number of letters shown this band width can be reduced to any convenient value.



The new Marconi television transmitter designed for operation on the long waveband. The visual transmission of typed news bulletins is suggested.

The receiver shows a long, narrow picture having a size dependent on the power of the modulated light source, and with existing facilities pictures can be obtained from a few inches in length up to several feet.

STANDARD "MICROMESH" A.C. VALVES.

Remarkable Mutual Conductance
Achieved by Close Spacing.



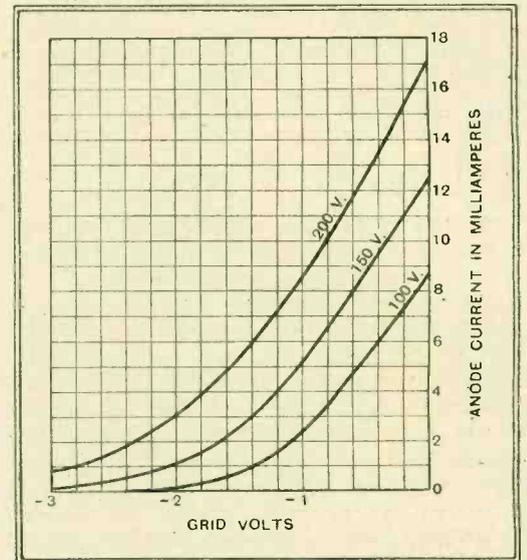
in "Micromesh" valves. Both anode and grid are fitted with large rectangular fins which serve the dual purpose of supporting their respective element and provide a large area for the radiation of heat.

The grid consists of a series of wires welded at either end to each half of the cooling fin, the welding extending as far as the

the heater wires are crimped and then threaded through twin bores in a Magnesia-insulating tube; this, in turn, is arranged to grip the cathode firmly, but the whole structure is permitted to move in an axial direction to compensate for thermal expansion. A guide wire is inserted, therefore, in the upper end of the assembly and passes through a guide fixed to a mica bridge held in position by extension of the anode- and grid-supporting wires.

Normally, the cathode runs at a dull-red heat and takes about fifty seconds to attain the full-emission state, which comparatively long period is due to its robust construction, giving good mechanical strength in addition to adequate electrical shielding. The heater requires about 1 amp. at 4 volts.

The assembly of the grid and anode electrodes and the method employed for mounting them is of paramount importance, for, as mentioned above, it is only by providing for rapid dissipation of heat, especially in the case of the grid, that it has been possible to work to such close clearances as obtained



Curves connecting anode current and grid volts for "Micromesh" HLA1 valve.

THE recourse to extremely small clearances between the electrodes in a valve to obtain improved characteristics has always been regarded as a theoretical possibility. Hitherto this has only been attainable in laboratory-made specimens, but hardly practicable where valves are made under conditions of quantity production.

Mechanical rigidity and the difficulty of avoiding undue temperature rise of the grid electrode in particular appear to have been the limiting factors, since if its temperature rises above a certain level grid emission ensues.

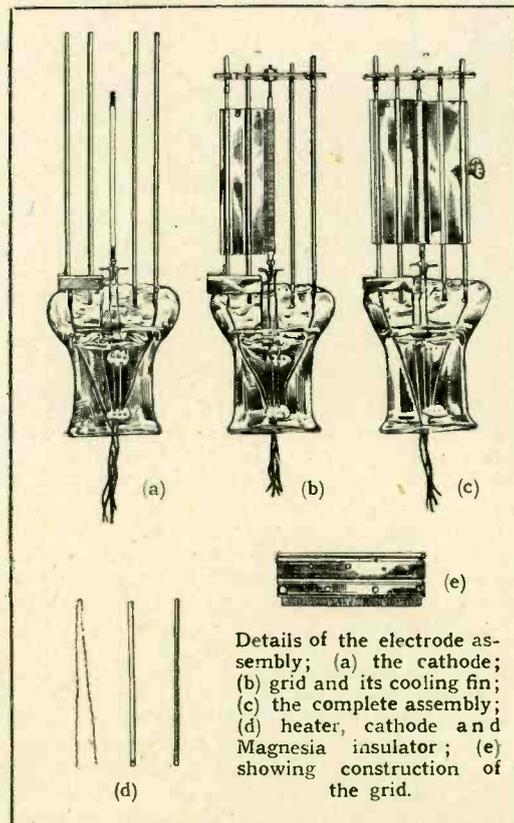
These difficulties have now been overcome successfully in the new "Micromesh" valves made by Standard Telephones and Cables, Ltd., and, although the clearances between the various electrodes are extremely small, indeed much smaller than it has been found possible to adopt by normal methods of construction, effective cooling of the grid has been achieved and a mechanically strong structure evolved. So effective is the cooling that, even though the cathode and anode are raised to a dull-red heat, there is no trace of grid emission.

As a result, exceptionally high amplification properties and very good mutual-conductance values are obtained, while the particular method of construction adopted has proved entirely satisfactory in quantity production.

Magnesia Insulation.

Emerging from the pinch of the valve are seven wires; in the middle is the cathode support, with the two heater connections adjacent, while on one side are the two grid-supporting wires, and on the other the two anode supports.

Since the cathode must of necessity be adequately insulated from the heater, but at the same time make good thermal contact,



Details of the electrode assembly; (a) the cathode; (b) grid and its cooling fin; (c) the complete assembly; (d) heater, cathode and Magnesia insulator; (e) showing construction of the grid.

inside channel in the fins. Thus perfect thermal contact is assured and the structure is very strong mechanically, an essential feature in view of the very small clearance allowed between adjacent electrodes. When finally completed, the grid takes the form of a flat fin having two longitudinal channels which embrace the supporting wire, while the effective portion consists of a series of wire loops enclosing the cathode.

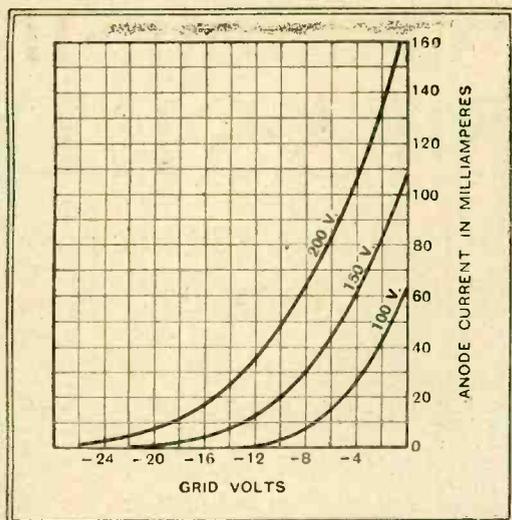
Exceptional Characteristics.

The anode is assembled in a somewhat similar manner, but with the exception that the portion enclosing the grid is fashioned in the form of a tube with a longitudinal slot through which passes the grid fin.

That this novel method of construction has been fruitful in producing valves of outstanding merit is well exemplified by the exceptional characteristics exhibited by the advanced specimens sent in for test. These consist of a detector, a power amplifier, and a mains rectifier. The detector, which is given the designation HLA1, has the following characteristics when measured with 100 volts H.T. and zero grid bias:—

- A.C. resistance, 10,000 ohms.
- Amplification factor, 80.
- Mutual conductance, 8 mA./V.

Although the maximum anode potential is 200 volts, as a cumulative grid detector



Anode current-grid voltage curves of "Micromesh" power valve, the PA1.

it functions quite satisfactorily with but 100 volts on the anode. For power-grid detection the valve may be operated with any value of H.T. up to the maximum, the only limiting factor being the current-handling capacity of the components in its anode circuit, for, as a matter of interest, the valve will pass up to 25 mA. without sustaining damage.

A Slope of 12.6.

The HLA1 is admirably suited to the amplification of small input voltages, and can be employed, with advantage, in the first stage of a gramophone amplifier, but it is often more convenient to utilise the detector and output valves of the broadcast receiver for this purpose.

Despite the high amplification of the valve and the very small clearances between the electrodes, by careful design the anode-to-grid capacity has been kept down to the very low figure of 5 m-mfds., so that the damping of the grid circuit is by no means as great as the high mutual conductance might seem to imply.

Under normal operating conditions the temperature of the glass bulb becomes some-

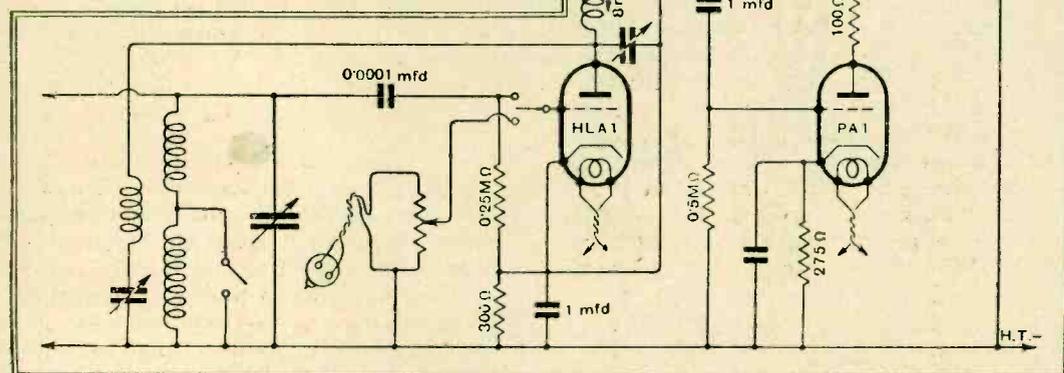


Fig. 1.—Suggested arrangement of detector and output stages using "Micromesh" HLA1 and PA1 valves

what higher than usual for valves of this type, and it will be necessary to provide adequate ventilation of the cabinet. For unless this precaution is observed it may nullify the cooling effect of the grid and anode fins.

The power valve of the series, which is given the type number PA1, has the following exceptional characteristics:—

A.C. resistance, 1,050 ohms.
 Amplification factor, 12.
 Mutual conductance, 12.6 mA./V.
 Measured at 100 volts H.T. and zero grid bias. Its normal operating conditions are with 200 volts on the anode and a grid bias of about -11 volts, which allows an anode current of 40 mA. to pass.

Thus, under normal operating conditions the anode dissipation is some eight watts and the maximum undistorted power output, allowing about 5 per cent. of second harmonic, is between 1.5 and 1.8 watts when working into a load of approximately 2,000 ohms. The input transformer fitted to present-day moving-coil loud speakers will be found, as a rule, provided with a tapping on the primary winding to give the correct matching between the valve and the loud speaker.

Preventing Parasitic Oscillations.

The correct value for the grid-bias resistance with the maximum anode potential is 275 ohms, but as this is not a standard size it may be necessary to employ two separate resistances connected in series, the one-watt type being quite suitable in the present case.

Very low impedance valves, particularly if they possess a high mutual conductance, often generate parasitic oscillations of a very high frequency and result in a considerable increase in the anode current accompanied by a falling off in the power output. However, the inclusion of a small non-inductive resistance of about 100 ohms connected directly to the anode terminal on the valve holder usually suffices to remedy the trouble.

The complete circuit of a detector and output stage embodying both "Micromesh"

to be 275 volts, being the smoothed D.C. output from the "Micromesh" R.I. rectifier at the full load of 60 mA. This valve gives full-wave rectification and is of the indirectly heated type, the cathode being connected internally to one end of the heater. There is no mark on the valve indicating to which filament pin the cathode joins, but if the valve holder is mounted so that the anode terminal is on the right hand the cathode connection is the filament pin nearest to the observer. Fig. 2 will, perhaps, make this clear.

The particular features of interest relating to this valve are that, although it gives an unsmoothed D.C. output of over 280 volts at 60 mA., the A.C. potential on each anode is but 250 volts R.M.S., and there are only 15 volts dropped across the rectifier at full load. The heater requires 4 volts at 1 amp., approximately, the supply being obtained from a separate L.T. winding on the mains transformer.

"Micromesh" valves will be distributed through the usual channels at B.V.A. prices current for valves of their respective types, but, in addition, arrangements have been made by the Electrical and General Distributors, Ltd., 154, King's Cross Road, London, W.C.1, to have stocks of all types available for immediate delivery.

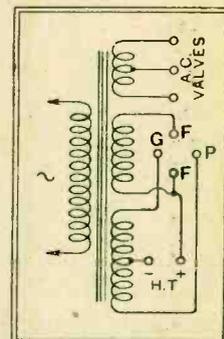


Fig. 2.—Showing connections to valve holder for the "Micromesh" indirectly heated H.T. rectifier type R.I.

NEW BOOKS.

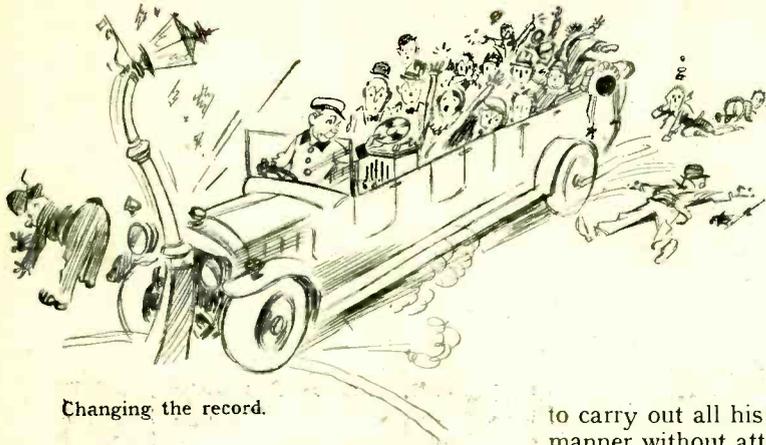
"Tin Solders."—A modern study of the properties of tin solders and soldered joints, by S. J. Nightingale, with an introduction by R. S. Hutton, D.Sc. The nature, properties, and strength of solder alloys, strength of soldered joints, fluxes, practical considerations, etc. Pp. 89+vi., with 44 illustrations and diagrams, including photomicrographs of various alloys and joints. Published by the British Non-ferrous Metals Research Association, London. Price 5s.

Studies on Industrial Relations, II, being the Report of the International Labour Office (League of Nations) upon the history, development, policy, conditions of employment, and relations between employers and employed in the following works: Zeiss Works, Jena; F.I.A.T., Turin; Philips Lamp Works, Eindhoven; and Sandvik Steel Works in Sweden. Pp. 162. Published in the United Kingdom for the International Labour Office, by P. S. King and Son, Ltd., Westminster, S.W.1. Price 3s. 6d., or 80 cents.

Testing Radio Sets, by J. H. Reyner, B.Sc. 2nd edition, revised and enlarged especially with regard to superheterodyne receivers, laboratory tests and component testing. Pp. 207+viii., with 95 illustrations and diagrams. Published by Chapman and Hall, Ltd., London. 1932. Price 10s. 6d.

Thermionic Emission.—A survey of existing knowledge with reference to the filaments of radio valves, compiled by W. S. Stiles, Ph.D. (Radio Research Board, Special Report, No. 11). Pp. 116, including bibliography of all the important papers on the subject published up to December, 1930. Issued by the Department of Scientific and Industrial Research, and published by H.M. Stationery Office, price 2s. 6d. net.

Handbuch der Bildtelegraphie und des Fernschens, by Dr. Fritz Schröter. A text-book of phototelegraphy and television. Pp. 487+xvi., with 365 illustrations and diagrams. Published by Julius Springer, Berlin, price Rm. 53.



Changing the record.

Sharrybang Radio.

I HAVE just been privileged to make a trial trip in two types of what I was told were the first wireless-equipped motor coaches. The first coach in which I travelled was one of the large saloon types intended for long-distance runs, and at the back of every seat there hung a pair of headphones. An aerial was concealed in the roof, the controls of the set being fixed in such a position that they were inaccessible to the driver unless he stopped the coach and left his seat; this latter arrangement was made in order to prevent him risking an accident by attempting to drive with one hand and to pull in distant stations with the other.

I was very impressed by the complete absence of interference from the ignition system, to eliminate which, I was told, exhaustive experiments had been carried out over a long period. The receiver itself was a specially made superheterodyne of exceedingly compact design, and it was normally tuned into the nearest station, although its range and selectivity were such that more distant transmissions could be received if occasion demanded.

It was hoped later on to carry out experiments with a view to providing alternative programmes by using two receivers, and two plug points associated with each seat. I suppose that even if the driver could drive with one hand and change a record with the other, it would be too much to expect a radiogramophone to provide an alternative programme, *via* the 'phones, as the vibration of the coach would merely joggle the needle off the record.

For Rubber-Neck Tours.

The other coach was an open air vehicle intended to carry out rubber-neck tours, as the Yanks call them, through large cities. In addition to the driver it carried the inevitable guide, whom, in London at any rate, one may see on any fine summer morning in the middle of a motor coach full of be-spectacled and gum-chewing Americans, making his voice heard above the din of the traffic by bawling through a megaphone.

In this latter coach the guide was ensconced by the side of the driver, a special microphone, designed to keep out extraneous sounds, being attached to him; the arrangement of the microphone was, in fact, rather similar to that adopted in the case of the mouthpiece associated with the speaking tube used by an aeroplane pilot for communicating with his mate. Thus, the guide was able

to carry out all his explanations in a normal manner without attracting undue attention to the coach, whilst those passengers who did not wish to listen to a recital of all the numerous hostilities in which Queen Elizabeth indulged her passion for beds merely had to refrain from donning the 'phones, although, from my personal experience of tourists, I cannot imagine any one of them doing so.

I thought that this avoidance of the use of a loud speaker showed unusual foresight on behalf of the coach proprietors who probably realised that such an instrument would cramp the style of women and other passengers who might prefer to indulge in idle chatter rather than to improve their minds by listening to the remarks of the guide.

A Costly "Extra."

I SUPPOSE that most of you, especially those like myself who are family men, are at this time of the year engaged in delivering yourselves over into the rapacious hands of the seaside landlady. I have myself but recently returned from a few days' seaside sojourn with the little Grid Leaks. When I arrived at my temporary home I was pleasantly surprised to find that there was a pair of headphones hanging over each bed. Unfortunately, however, all the well-meant efforts of the establishment were set at naught by the fact that the wiring was carried out with twin-laid bell wire which, owing to its unduly high self-capacity, well and truly chopped off everything worth listening to.

In disgust, I put down my 'phones and prepared to read in bed, only to be enraged at finding that the room was supplied with nothing more than a 20-watt lamp at the far end. This extra piece of rapacity on the part of the landlady put me, the next morning, to the expense of purchasing a 100-watt lamp, and since the voltage differed from that at home it was not worth bringing away with me, and so I was compelled, on the day of my departure, to present it to the owner of a miniature rifle range on the pier.

To add insult to injury, when I received my bill at the end of my stay, I found that wireless was charged as an extra.

My Name: An Explanation.

I HAVE just been the embarrassed recipient of an extremely neat and tasteful pocket wallet from a kind-hearted reader who lives at Southport. My embarrassment arises from the fact that the gift is engraved, or embossed, with another man's initials, the donor being under the mistaken impression that they are my own. In order to avoid further misunderstanding in this matter, perhaps I had better

UNBIASED

By

FREE GRID.

mention that my own initials are actually F. G.

The derivation of my ancient family name of "Grid" is wrapped in the mists of time, although my great-grandfather (peace to his ashes), who made no small reputation for himself in the culinary art during the latter part of the eighteenth century, always attributed it to his calling, which the family had followed for generations past. My uncle, on the other hand, held the opinion that we are descended from Hubert de la Grille, who, it will be remembered, came over with William the Conqueror on a cheap day-excursion from Boulogne, and that Grid was merely an anglicised form of the name.

Whatever be the origin of the surname, the cause of my rather unusual Christian name of "Free" is well known. My father, who was one of the earliest pioneers of wireless, was, at the moment of my birth, engaged in experimenting with an outsize in amplifiers, using valves which were the forerunners of the modern L.S.6A type, costing nearly five guineas apiece. The nurse startled him by coming in the room with the announcement "It's a boy!" at the moment when he happened to have his hand on the grid bias wander plug, with the result that he unfortunately jerked the plug out, with disastrous results.



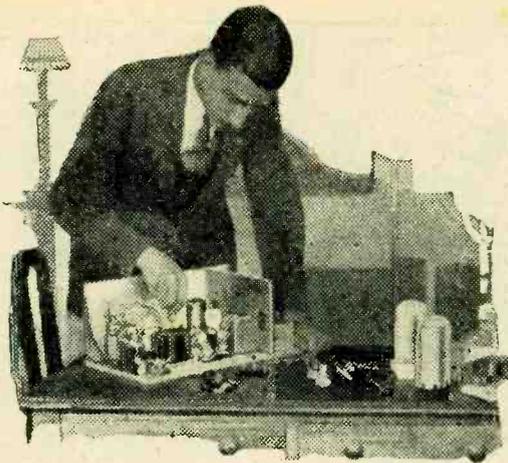
"It's a boy!"

Although it would seem obvious that my name was the result of a brilliant inspiration on his part, due to the fact that the announcement of my advent in the world had caused the grids of his costly valves to become free, he always alleged that the name was given sarcastically, after the manner of the ancient Greeks, who formed the habit of bestowing names on things which were the antithesis of the qualities which they happened to possess.

Nevertheless, public thanks are due to my Southport reader. Had I known him five years ago, when I spent a somewhat uncomfortable night on the pier waiting for the total eclipse of the sun, he would doubtless have offered me his hospitality and so have prevented me losing my hat and umbrella and suffering other indignities in the mad scramble for breakfast.

PRACTICAL HINTS AND TIPS.

AIDS TO BETTER RECEPTION.



THE scope of designers of D.C. sets is at present slightly restricted by the fact that the range of indirectly heated valves for direct-current working is rather less complete than that of the corresponding A.C. types. This handicap will probably disappear entirely in the near future, and there will remain only the limitation of a restricted H.T. voltage supply, which, of course, is inherent in a D.C. system.

A.C. Valves

in

D.C. Sets.

In the meanwhile, there are indications that many D.C. users would like to try circuits that have been devised specifically for A.C. valves. They realise that current consumption will inevitably be somewhat heavy, but are mainly deterred from embarking on their projects by fears that A.C. valves will not stand up to the work on D.C. supply systems.

There is some slight justification for these fears, although there has been a tendency in the past rather to exaggerate the risk of damage. The point to remember is that an A.C. valve-heating element is designed to work under constant voltage conditions, while the corresponding element of the D.C.-mains valve is made to operate at a fixed current, the voltage drop across it being a matter of rather secondary importance.

Having appreciated this somewhat subtle difference in design, it is not difficult to see how A.C. valves may be connected in series

current at roughly this value, and then to shunt each heater with a rheostat (of 30 ohms or so), which is adjusted until exactly 4 volts, as measured by a good high-resistance meter, is "dropped" across each valve. Several readjustments, both of the main voltage-regulating resistance and of the individual heater shunts, may be necessary, but the operation takes little time, and is by no means difficult.

For purposes of illustration, the cathode-heater circuits of an imaginary H.F.-detector-L.F. three-valve set, originally designed for A.C. feed, but which is to be operated from D.C. mains, is given in Fig. 1. Shunt resistances (R , R_1 , R_2) are provided for each heater, and the appropriate cathode connections are also shown. Further, the H.T. supply system and the feed circuits for a variable- μ H.F. valve are indicated; the values given will not be applicable to every type of valve without some modification, but, assuming a D.C. supply of 220 or 230 volts and a smoothing choke of reasonably low resistance, they will be near enough to act as a guide.

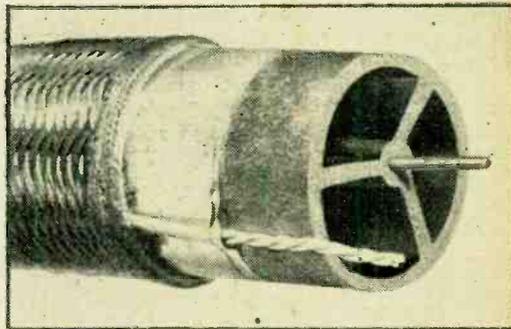
THOSE of us who are not blessed with a good musical ear are often at a loss to say precisely in what respects our receivers are deficient in quality of reproduction; we may feel certain that something is lacking at the upper or lower end of the frequency scale, or that there is a marked resonance, but are unable to form clear-cut opinions as to the true nature of the imperfections of the set.

Long-Distance Listening: Another Version.

Now, it is useless to attempt a cure until the complaint is known, and, as an aid to diagnosis, it may be pointed out that, by listening critically at a considerable distance

limit of audibility, nothing but low-pitched and unintelligible sounds can be heard when speech is being transmitted. Conversely, a serious deficiency in bass response is equally easily detected in a similar way.

An A.C. receiver, of which the reproduction was distinctly unpleasing, was recently subjected to a "distant listening" test; the opinion was formed that high notes were being severely "cut," and that there was also a marked over-emphasis of a narrow band of frequencies in the upper middle register. Subsequent tests, made in a more scientific manner, proved this diagnosis to be essentially correct; stray reaction was responsible for severe sideband cutting in the tuned circuits, while the loud speaker was found to have a well-defined resonance.



The uses of screened H.F. cable for aerial down-leads, etc., was recently mentioned in these columns. The illustration shows the construction of another type of low-capacity shielded cable, as produced commercially in Germany. Rubber is used as an insulating material.

This instrument was returned to its makers, and replaced as defective; the decoupling system of the H.F. amplifier was put to rights, and all was well.

THE electrical connection between the rotary contact brush of a potentiometer and terminal is a fairly common source of background noises; these do not of necessity occur only when the knob is being turned.

Spindle Connections.

Although many potentiometers are cleverly designed to ensure good and consistent electrical continuity throughout, some of them depend on contact between a spindle and bush designed entirely from the mechanical point of view. Even when a spring contact is fitted, its functioning may be impaired, in the course of time, by an accumulation of dust or dirt between the contacting surfaces.

A temporary "pigtail" connection of flexible wire, made directly between the rotary brush and the terminal, will soon show whether background noises are due to this cause. If they are, a cure may generally be effected by cleaning the bush and spindle, etc. Better still, recurrence of the trouble may be avoided by fitting a permanent "pigtail," so that it will no longer be necessary to depend on rubbing contacts.

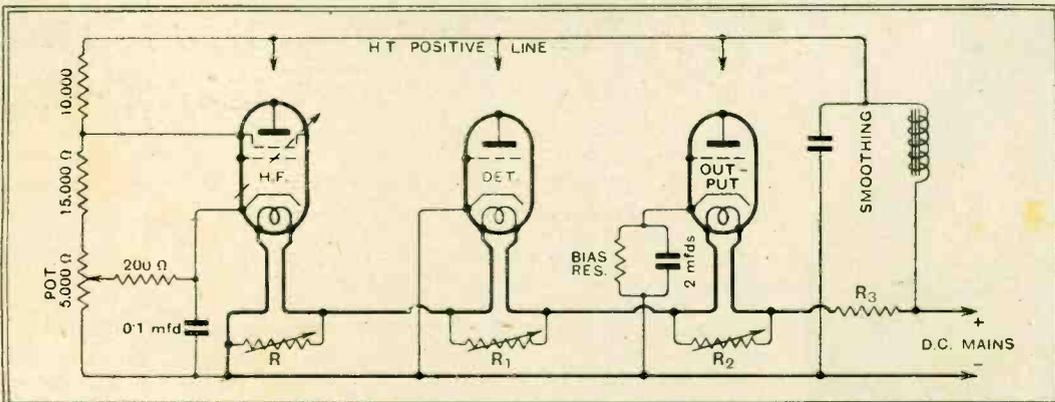


Fig. 1.—A receiver with A.C. valves, originally designed for A.C. mains working, but rearranged to operate from a D.C. supply system.

and joined through a suitable voltage-absorbing resistance across D.C. mains of normal voltage. The usual procedure is to adjust the resistance so that the current through the chain of series-connected heaters is exactly 1 ampere; it is better, in order to ensure constant-voltage conditions, to set the

from the loud speaker, it is generally possible to form a useful opinion of the trouble, even without any special ability in this direction.

If dull reproduction is due to severe high-note loss it will be observed that, as distance between the instrument and the listener is gradually increased towards the

News of the Week

Current Events in Brief Review.

Signals from the Stratosphere.

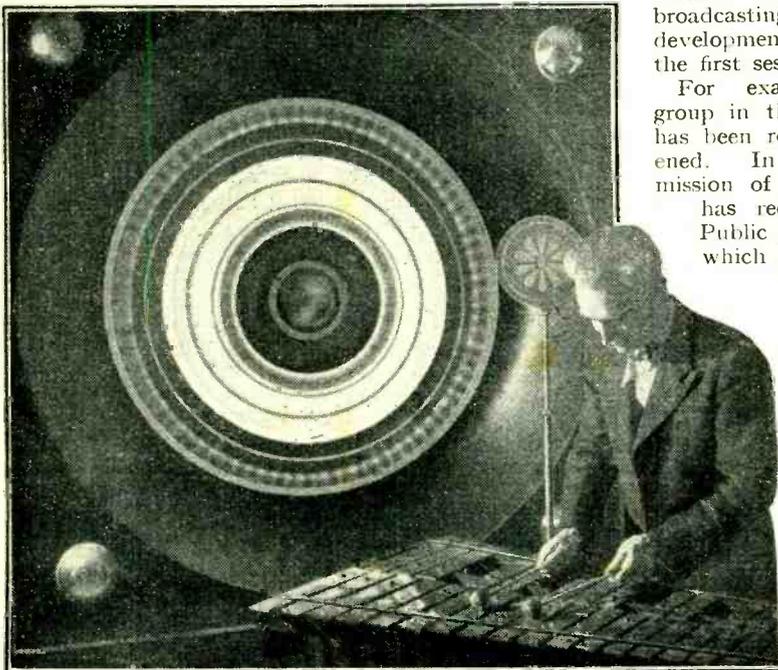
WAVELENGTHS of 41, 42.8, 75 and 85 metres are to be used by Professor Auguste Piccard, the Belgian balloonist, for radio transmissions during his new ascent into the stratosphere within the next few days.

It will be remembered that the professor achieved a record height of 52,000 feet in May, 1931. On that occasion he carried only a receiving set, and the lack of a transmitter rendered it impossible to locate him for several days after his descent in the Austrian mountains. When Professor Piccard makes his next ascent, from Zurich, he will be accompanied by M. Max Coseyns, who has installed the apparatus in the small round steel cabinet of the balloon. Both transmitter and receiver are built on the smallest possible scale. The transmitter has a power of 50 watts, derived from dry batteries, and the receiver, a four-valve instrument, is only about 8 in. square.

As the start of the attempt depends entirely on the state of the weather, it is, of course, impossible to provide any sort of schedule for radio observers or broadcasting authorities who might care to relay the transmissions for the benefit of European listeners. Watchful amateurs have, however, an excellent opportunity of creating reception records.

A New Excuse.

A WIRELESS pirate at Whiston, Lancs, told the Preston Bench last week that he had been waiting for the Post Office collector to call. He was fined £1.



THE COLOURPHONE. "Combining the use of Hertzian waves and the Baird scanning disc system," Mr. A. L. Smith, of Los Angeles, seen above, has devised this whirling disc instrument to express different colour formations representing varying musical tones. Its most practical application is to indicate visually the misdeeds of broadcast sopranos.

"Double-Modulation" for Television.

AN ultra short-wave transmitter which can send television images and sound simultaneously on the same wavelengths has been evolved by the engineers of the Columbia Broadcasting System, and, according to our Washington correspondent, the Columbia group has now applied to the Federal Radio Commission for a band of ultra short waves between 3.75 and 7 metres to carry on the experiments.

The new development is termed "double-modulation." Its inventor is William B. Lodge, a recent honours graduate of the Massachusetts Institute of Technology.

Radio Conscription in Iceland.

LACK of broadcast talkers in Iceland is responsible for a remarkable Bill which is to be introduced in the Icelandic Parliament. The Bill rules that every civil servant in Iceland will be conscripted for radio service during two months in every year. He may be required to serve in a variety of ways, one of them being to deliver lectures before the microphone without payment. Speakers will be merely paid their travelling expenses from the station of departure to Reykjavik, where the broadcasting studio is situated.

Hope Springs Eternal.

FRENCH radio enthusiasts are the most sanguine folk on the earth. According to our Paris correspondent, there are well-founded hopes that the new Parliament will endow France with a well-established broadcasting system. Significant developments marked the close of the first session.

For example, the "Radio" group in the Chamber of Deputies has been reorganised and strengthened. In addition, a new Commission of the Postal Department has received the report of a Public Works Commission which has been collecting reports for several months. Nor does this fill the cup of anticipation. The President-Deputy, M. James Schlafer, who has specialised in wireless matters, has strong convictions on the question of State help for broadcasting. The predominating opinion is in favour of State control.

M. Renaitour, a deputy who owed his election largely to wireless amateurs in his constituency, predicts that a wireless law will be voted without fail in 1933.

New Ideas in Radio Cabinets.

NEW designs for radio-gramophone cabinets are included in the display of competitors' efforts in the ninth annual open competition of Industrial Designs organised by the Royal Society of Arts. The exhibition is being held in the galleries of the Imperial College of Science and Technology, Imperial Institute Road, South Kensington, London, S.W., until August 31st.

Tit for Tat

AN interesting sidelight on the never-ceasing battle for broadcast power is afforded by a letter published in a French contemporary. It emanates from the Hungarian broadcasting authorities, and is a reply to the journal's statement that the construction of the new high-power transmitter in Hungary would not favour peace in Central Europe.

"The true object in building so costly a transmitter," protest the Hungarian authorities, "is that the high-power stations of Austria, Czecho-Slovakia, Germany, Poland, and Italy, which surround our country, menace the good reception of our 20-kilowatt station and the high reputation which it has hitherto enjoyed in Europe. We are compelled to install a station of equivalent power."

And so it goes on!

Radio Shows in Brussels and Paris.

THE 1932 Brussels Wireless Exhibition is to be held from September 3rd to 12th, thus clashing to some extent with the Paris Radio Salon, which opens on September 8th and runs till the 18th.

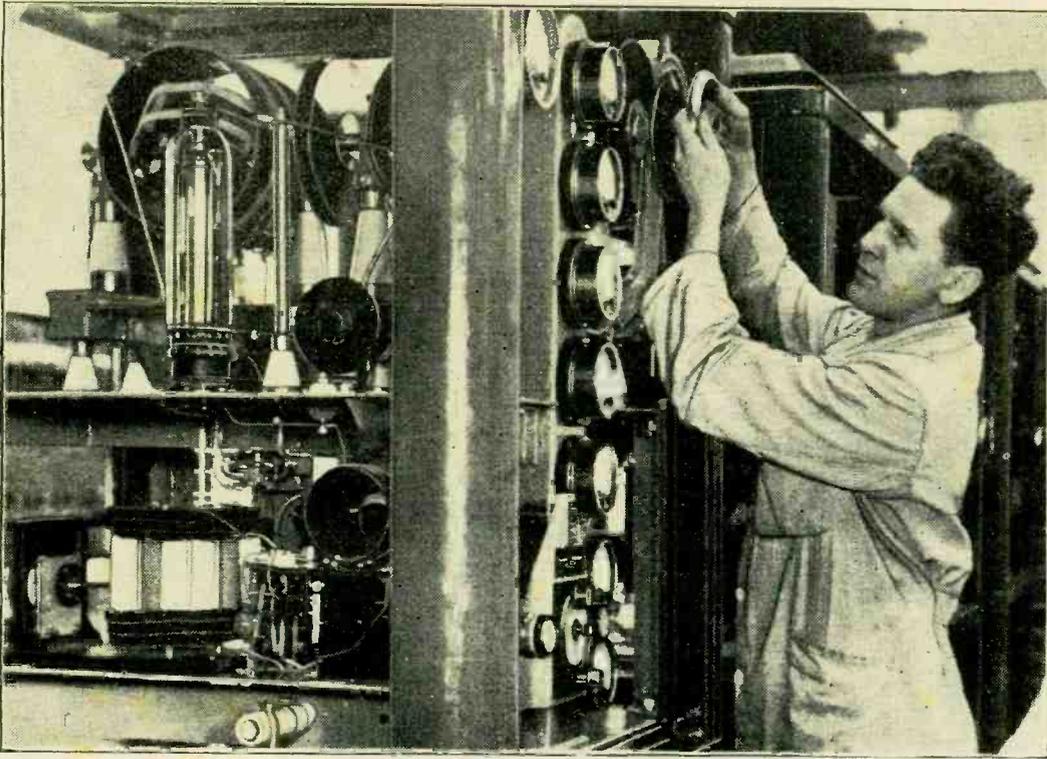
Impasse in Spain.

THE Spanish Government is in conflict with Catalonia on the question of broadcasting. According to a correspondent, the Spanish Government desires to control all the stations in the peninsular, including those in Catalonia, where, however, there is a strong demand for independent broadcasting; in fact, Catalonia demands stations of from 60 to 100 kilowatts and treats with contempt the Spanish plan for 20-kilowatt stations at Barcelona and other regional centres.

In view of the present troubles the Spanish Government is delaying the issue of contracts for the proposed regional scheme.

More Floods in Holland?

THE broadcasting of physical culture lessons recently brought a complaint from Austrian landlords that listeners indulging in the exercises were bringing down ceilings and damaging gas and electrical installations. People are now asking what will be the sequel of the swimming lessons which are about to be broadcast from Hilversum. Will enthusiastic learners place their baths beside their receivers and, obeying the energetic voice of the instructor, flood their own apartments and damage the ceilings of their unfortunate neighbours in the basement?



GERMANY'S MOST POWERFUL BROADCASTER. The first of the seven stages in the new 120-kW. transmitter to be installed by the Lorenz Company at Leipzig.

German Relay Wavelengths.

A NUMBER of German relay stations still work on international common waves or on wavelengths "lent" by other countries. With the closing down of the Cologne relay station, the 227.4-metre wave, which is exclusive to Germany, became free for use by other German stations. Recently the Hanover relay was put on this wavelength, and it has now been decided to use the same wavelength for all the North German relays, though Kiel will temporarily retain its present wavelength of 232.2 metres.

Regional Radio Shows.

SMALL regional radio exhibitions are to be organised in Switzerland during the winter in place of the all-Swiss Exhibition which was held last year. It is believed that this arrangement will enable more enthusiasts to become acquainted with the latest developments.

English Broadcasts from Brazil.

THE Brazilian Embassy announces that the Radio Club de Rio de Janeiro is broadcasting daily at 11.30 (B.S.T.) in English, French, German, Spanish, and Italian a programme of local news from Brazil on a 31.58 wavelength.

Any information regarding these transmissions will be welcomed by the Radio Club de Rio de Janeiro (Brazil).

Radio Doctoring in the Jungle.

RADIO doctors in the jungle country of the New World take on strange commissions. Mr. Armstrong Perry, director of the U.S. National Committee on Radio Education, reports that a friend now domiciled in Guatemala City recently received an urgent request from a coffee plantation owner in Coban, near the Mexican border, to come by aeroplane to repair a radio receiver. He was offered a fee of \$50 and four days' travelling expenses, the trip taking two days each way. Upon arrival he found it was only necessary to replace a 50 cent. resistor. Once before, he rode through the jungle on mule back for two days to answer a repair call; when he arrived he found that a valve had merely worked loose in its socket!

A Runner-Up.

AMERICA'S claim to have the second tallest wireless mast in the world—the 878ft. mast at WSM, Nashville—is being contested in Germany. It is declared that Nauen's two masts are each 880ft. high, which means that the American claim is beaten twice.

Eiffel Tower remains the highest radio mast in the world.

"Stenode."

A PARTICULARLY interesting brochure entitled "Stenode" has just been issued by Burne-Jones and Co., Ltd., 296, Borough High Street, London, S.E.1. Commencing with a brief survey of the principles involved it continues with extracts from the leading daily and technical journals, and cites the "Wireless World Monodial" as a typical example of modern practice embodying the "Stenode" principles.

It concludes with a description, operation notes and illustrations of the Burne-Jones A.C. "Stenode," a seven-valve radio-gramophone embodying a superheterodyne circuit. Copies are obtainable free on request.

State Ownership for German Broadcasting.

THE German broadcasting organisation is to be transformed, the Cabinet having now definitely decided to take over control. Under the new scheme, which was outlined in our issue of July 22nd, the German broadcasting companies will be invited to sell their shares to the Government; if they should refuse, the concession will be summarily taken over so that new State control can be inaugurated.

In Bavaria the State is already sole owner of the Broadcasting Company and in many other cases over 75 per cent. of the shares are already in the hands of the State-owned Radio-Reichs-Gesellschaft.

There are to be two Federal broadcasting commissioners, one responsible for finance organisation and technical matters and the second for programmes and political broadcasts.

Each regional company will have a special State Commissioner, who will take his orders direct from the Government.

Blow for American Listeners.

AMERICA, the land of free ether, seems at last to be having a taste of official restrictions at the microphone. The Eastern Inter-Collegiate Association has barred the microphone from the football game to be played by Harvard, Yale and other universities during the coming autumn, the feeling being that broadcasting definitely reduces gate money.

At present there is little public protest, but farseeing sports journalists predict that when the football season returns the radio public will raise a loud and vigorous outcry which will force the authorities to reverse their decision. Unfortunately, from the listener's point of view, the broadcasting authorities are not likely to fight in their defence for the simple reason that there is no financial return whatever in broadcasting these games. They involve heavy expense for a "sustaining" or non-commercial feature that wins only goodwill from the radio audience. So it rather appears that, whether they complain or not, American listeners will lose their football broadcasts next season.

To Stop Man-made Static.

AN "Anti-Static Congress" which will draft a Parliamentary Bill for the suppression of electrical interference with broadcast reception is to be held in Paris in the late autumn. Representatives of radio clubs, the leading technicians, and a large number of legal lights will be invited to attend. Mayors and municipal councillors will be asked to report on the prevalence of the trouble in their different districts.

"The Wireless World" Index and Binding Cases.

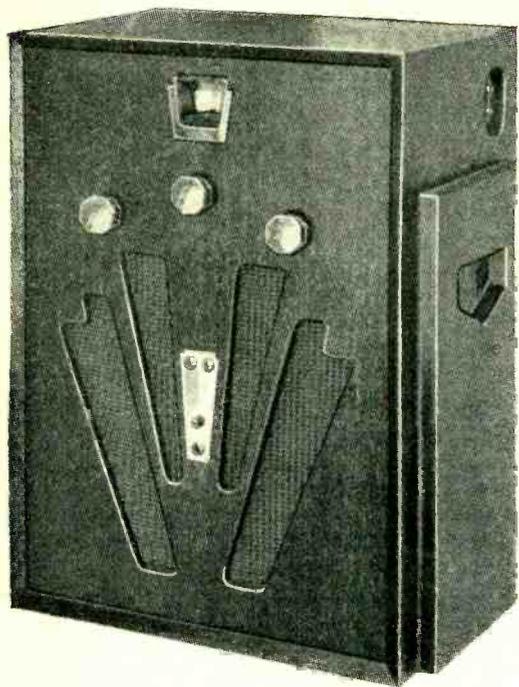
THE index for Volume XXX., January to June, 1932, is now ready, and may be obtained from the publishers, price 4d. post free, or with binding case, 3s. 1d. post free.



A 1-KILOWATT AMPLIFIER. The Tannoy battery-operated gramophone console and amplifying equipment installed in the "Daily Mirror" van now touring the health resorts.

MARCONIPHONE TYPE 248 RECEIVER.

A Two-valve Battery Set for Less than £5.



IN the early days of broadcasting the listener with limited means had no difficulty in equipping himself with adequate apparatus for receiving the B.B.C. programmes. Crystal sets and single-valve receivers for use with headphones were plentiful, and there can be little doubt that this factor was responsible for the rapid establishment of the broadcasting service in this country. The market for inexpensive battery-operated receivers has never diminished, but during the past two or three years the leading firms seem to have neglected it in their efforts to supply the demand for all-mains receivers—chiefly of the 3-valve type, costing about £20.

There are signs, however, that the balance will soon be restored, and the Model 248 Marconiphone set is an excellent example of the type of receiver which is required. It is a quality job throughout, and definitely disproves any suggestion that a receiver costing less than £5 must necessarily be skimped either in specifications or materials.

High Standard Maintained.

The cabinet, for instance, is constructed of solid oak, and in design and finish is not in the least inferior to any of the more expensive sets in the Marconiphone range. The same high standard is maintained in the receiver unit, which consists of a channel-section aluminium chassis mounted above the loud speaker cone inside the cabinet. The press-work and riveting have been exceptionally neatly executed, the materials are obviously of the best, and the switches and condensers work smoothly and with precision. An Exide 2-volt 20-ampere-hour battery is used for the L.T. supply, and one of the reintroduced Marconiphone dry batteries provides both H.T. and grid bias. Marconi valves are, of course, included.

The circuit consists of a metallised HL2 detector, followed by an LP2 power valve. Special attention has been paid in designing the tuning coils to the problem of selectivity, and three alternative tapings are provided to meet all possible local conditions. Both the tuning and reaction condensers are of the bakelite dielectric type, and the tuning con-

denser is driven through a friction slow-motion dial. A very simple and efficient rotary switch performs the combined functions of switching on the filaments and changing the wave-range.

The anode circuit connections of the leaky-grid detector are interesting on account of the unconventional position of the by-pass condenser. Instead of being connected directly between the anode and earth, it is joined to the "output" side of the reaction feed condenser. This arrangement has been found to give better distribution of reaction over the tuning scale, particularly on long waves.

Adequate Selectivity.

The transformer coupling the detector to the power valve is of universally generous design for a set of this type, and the windings of the balanced armature loud speaker unit have been specially wound to provide the correct working impedance for the LP2 output valve. As a result the reproduction is clear and remarkably free from harmonic distortion. The volume, too, can be increased to a higher level than is normally required in the average living room without signs of distress. One does not expect the same degree of response in the bass as one would demand, say, in a set equipped with a moving-coil loud speaker, but even so the quality of reproduction of music is definitely pleasing and is of a type that can be listened to for long periods without tiring. Speech is clear, and the character of individual voices faithfully rendered.

The makers' claims in the matter of selectivity were amply substantiated by a test at a distance of five miles from Brookmans Park. Here no difficulty was experienced in obtaining clear separation of the twin transmitters even in the least selective of the aerial tapings (A₁). Further, the overall sensitivity of the set was exceptionally good, having regard to the high degree of selectivity provided. There can be no doubt that alternative B.B.C. programmes would be available even in remote parts of the British Isles, while under favourable conditions five or six foreign stations would be received at moderate volume. The number of strong carrier waves to be found on the

medium waveband considerably exceeds this figure, but difficulty was experienced in resolving all but those with fairly deep modulation.

On long waves the Brookmans Park stations showed a tendency to break through near the bottom of the scale, but this effect was not serious outside a radius of ten miles. Daventry (5XX), Radio Paris, and Eiffel Tower all came in at good volume, with Hilversum, Motala, and one or two others in reserve at moderate strength.

FEATURES.

General.—Two-valve battery-operated receiver incorporating a balanced armature loud speaker. Designed for use with an external aerial.

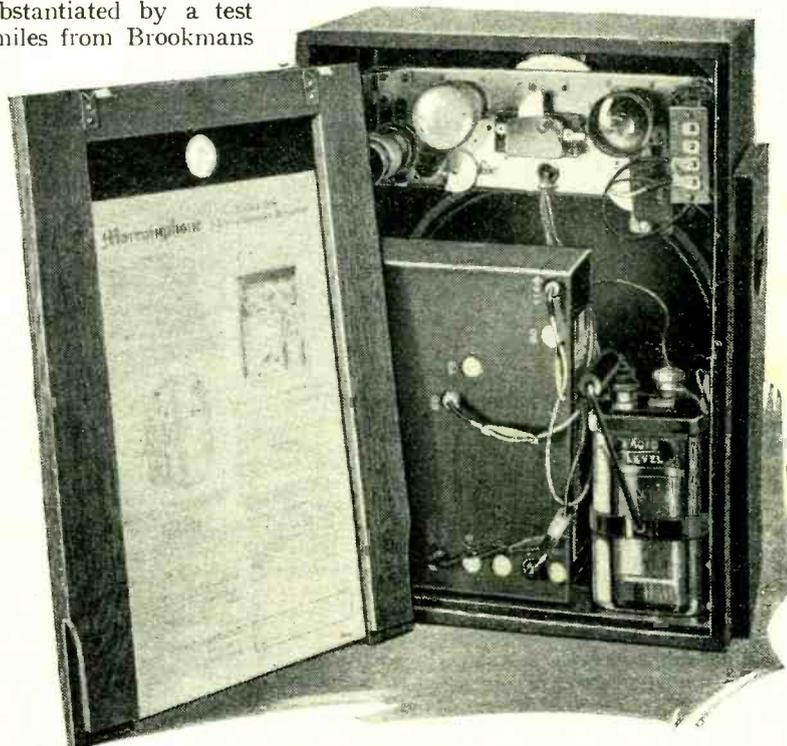
Circuit.—Single-tuned input circuit with alternative aerial tapings. Metallised grid detector with reaction, transformer coupled to three-electrode power output valve. Provision for an extra loud speaker.

Controls.—(1) Tuning, with slow-motion dial. (2) Reaction. (3) Combined wave-range and on-off switch.

Price.—£1 19s. 6d., including valves and batteries.

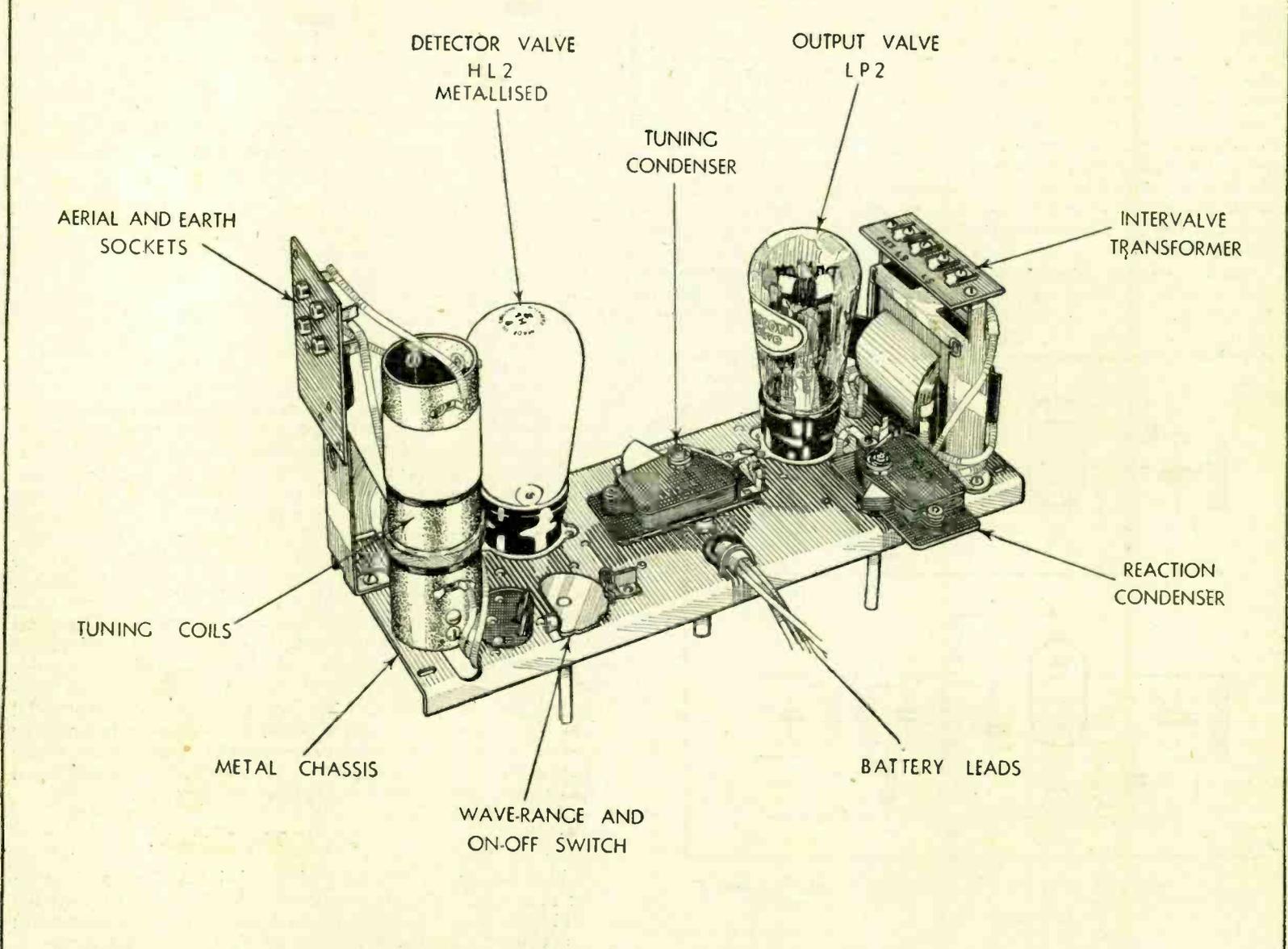
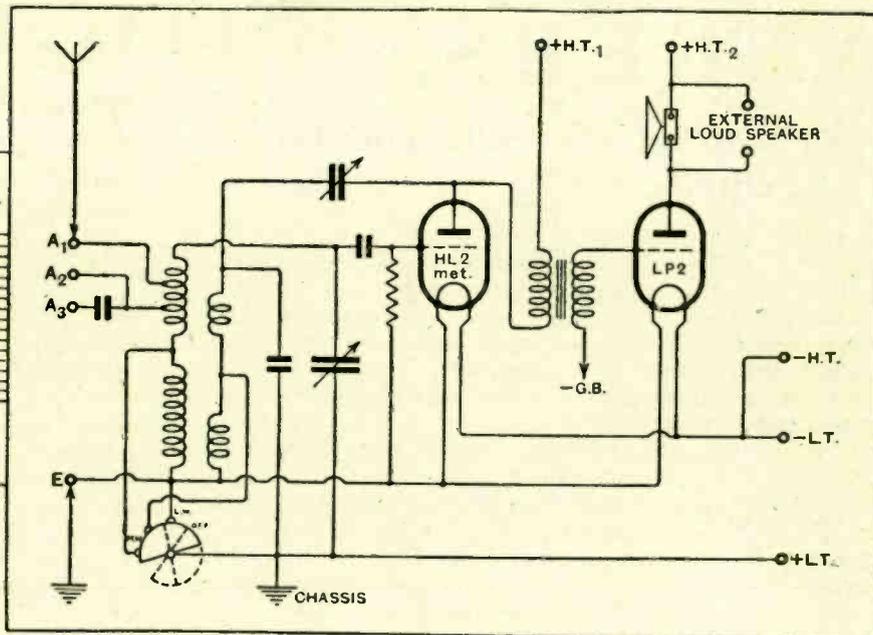
Makers.—The Marconiphone Co., Ltd., 210-212, Tottenham Court Road, London, W.1.

Without a shadow of doubt, the purchaser of a Marconiphone Type 248 set receives a very full measure of value for his money. High-tension battery replacements cost 11s., and should last at least six months as the current consumption of the set is very low. In the model tested it was 4.3 mA., or less than half that of the average portable.



The back panel, which carries full operating instructions, is completely detachable, giving ready access to valves and batteries.

A NEAT TWO-VALVE BATTERY RECEIVER.



A high standard of workmanship and simplicity of design characterise the receiver chassis in the Marconiphone Type 248 set.

SINGLE-VALVE FREQUENCY CHANGERS.

Part II.—The Development of the Self-Neutralised Pentode.

By W. T. COCKING.

THE experiments described in last week's issue made it abundantly clear that a screen-grid valve was unsuitable for a single-valve frequency changer, and it is obvious that a triode is equally unsuitable. The next step, therefore, was to try out the bi-grid, a four-electrode valve designed chiefly to act as a single-valve frequency changer. A commonly employed circuit is shown in Fig. 5a, and a modified form of greater efficiency in Fig. 5b; the signal input is applied to the outer grid which is biased negatively, in Fig. 5a by the flow of grid current through the grid leak, and in Fig. 5b by the flow of anode current through the cathode resistance. The tuned oscillator circuit is connected to the inner grid, and reaction is provided from the anode circuit.

Satisfactory oscillation can be readily secured, although a considerably tighter reaction coupling than usual is necessary, and some care is needed in securing freedom from "squegging" effects. The efficiency of the arrangement is very low, however, and this is to be accounted for by the low mutual conductance, some 0.25 mA./v., of this type of valve. Circuit interaction, however, is negligible, and in this respect the bi-grid represents a distinct improvement on the types of frequency changer already described in this article.

capacities cannot be greatly lower than those of a screen-grid valve, and the same degree of coupling is to be expected. This is confirmed by measurement, which shows that the outer grid-inner grid capacity is about 9 m-mfd.

The oscillator and pre-selector circuits, therefore, are as tightly coupled as in a screen-grid circuit, and yet circuit interaction is negligible. The explanation of this apparent anomaly is to be found in the fact that in the bi-grid the control grid-anode capacity is of the same order as the control grid-oscillator grid capacity, whereas in a screen-grid valve, the control grid-anode capacity is very much smaller than the control grid-screen-grid capacity.

If the circuit of Fig. 6 be studied, in which the valve capacities are shown at C_1 and C_2 , it will be seen that the potential across the tuned oscillator circuit causes a current to flow through C_2 , and, therefore, a potential at oscillator frequency to be developed on the control grid. In the anode circuit the same thing happens; the potential across the reaction coil causes a current to flow through C_1 , and another potential of oscillator frequency to be applied to the control grid.

Now, these two potentials are in opposite phase, so that if C_1 and C_2 are equal, and the oscillator voltages on the anode and the oscillator grid are also equal, the effective voltage developed on the control grid at oscillator frequency is zero. In other words, the circuit is self-neutralised as regards the oscillator circuits. Even if the capacities be unequal, the neutralising action can be obtained by adjusting the

relative value of the oscillator potentials on the anode and oscillator grid. With a screen-grid valve, however, the capacity ratio may be as high as 10,000 to 1, and it is obviously

THE use of the pentode as a single-valve frequency changer of equal efficiency to that of the conventional two-valve arrangement is here described for the first time.

impossible to maintain the balanced potentials in this case. It would, of course, be possible artificially to increase the control grid-anode capacity, but this would give an adjustment difficult to carry out correctly in practice.

Having thus accounted for the freedom from circuit interaction found with the bi-grid, the next step was to find some means

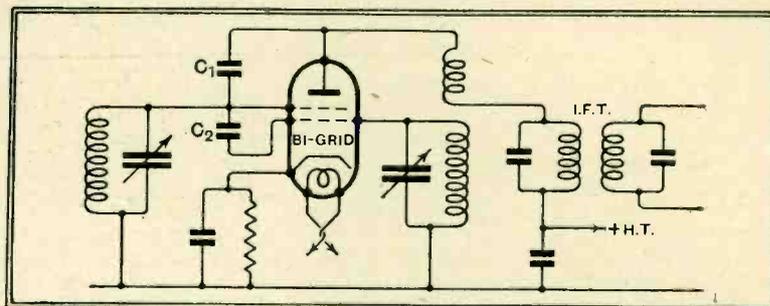


Fig. 6.—The bi-grid circuit re-drawn to show the valve capacities which account for the freedom from interaction.

of improving its efficiency, for this is very considerably inferior to that of a good screen-grid circuit. To be completely satisfactory, the frequency changer would have to combine the circuit isolation of the bi-grid with the efficiency of the American screen-grid circuit.

Now, from what has been said in this article, it will be obvious that the results depend very largely upon the type of valve adopted, and we are now in a position to postulate the characteristics of the ideal valve. A high mutual conductance between the control grid and anode circuits is the first requisite for efficiency, while approximately equal control grid-anode and control grid-oscillator grid inter-electrode capacities are necessary to secure freedom from interaction. The actual ratio of the valve capacities theoretically required, of course, will depend to some extent upon the mutual conductance between the oscillator grid and anode, and, within limits, the lower this mutual conductance the larger will be the reaction coil required, and the more nearly equal will be the oscillator potential changes on the anode and oscillator grid, and the more nearly equal should be the valve capacities.

The Pentode.

The bi-grid is ruled out of count because of its low mutual conductance between the control grid and anode, and the screen-grid valve because of the large disparity in its inter-electrode capacities. A valve with four or more electrodes is essential, and so the only remaining standard type is the pentode, which may be considered as a four-electrode

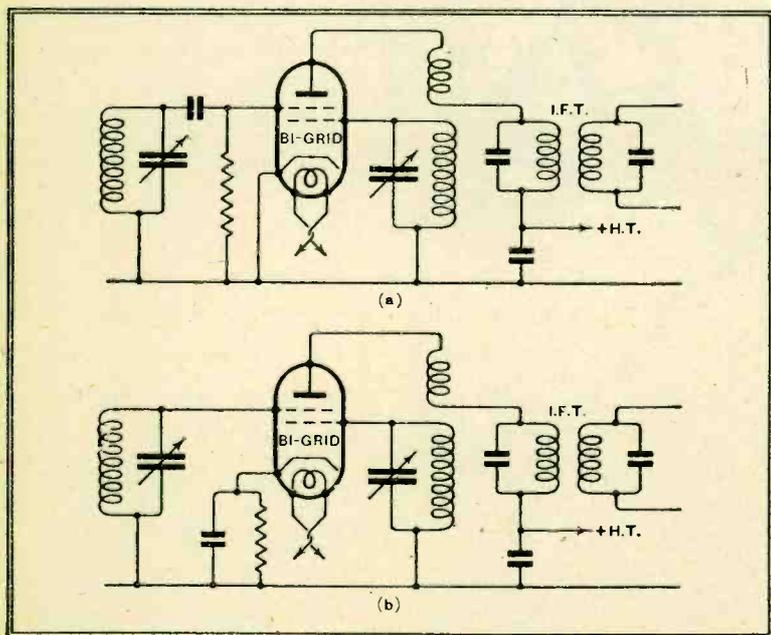


Fig. 5.—The commonly employed bi-grid circuit is shown at (a) and a more efficient arrangement at (b). Circuit interaction is negligible, but the efficiency is low.

Having thus found an arrangement which is free from the evil effects of circuit interaction, the reason for this freedom requires explanation, for it is obvious that the valve

Single-valve Frequency Changers.—

valve for our purposes, as the fifth electrode is connected internally, and is not available for external use.

The high mutual conductance of the pentode is well known, so that on this score it should prove satisfactory. Measurement indicated, moreover, that in certain makes of valve the important inter-electrode capacities were sufficiently alike to prove hopeful. A trial of the valve was accordingly made, and it may be said at once that, when suitable operating potentials were found, the results exceeded all expectations.

The circuit finally developed is shown in Fig. 7, and the Mazda AC/Pen. and the Marconi or Osram M.P.T.4 pentodes proved the most suitable; negative bias for the control grid is provided by the 500-ohms resistance in the cathode lead. The tuned-oscillator coil is connected to the anode circuit by a shunt-feed arrangement, with the I.F. transformer acting as an H.F. choke and feed condenser. The steady anode potential is 200 volts, and the space charge grid, which is used for reaction purposes, is fed from the same 200 volts supply through a 250,000-ohms resistance, so that its actual operating potential is quite small.

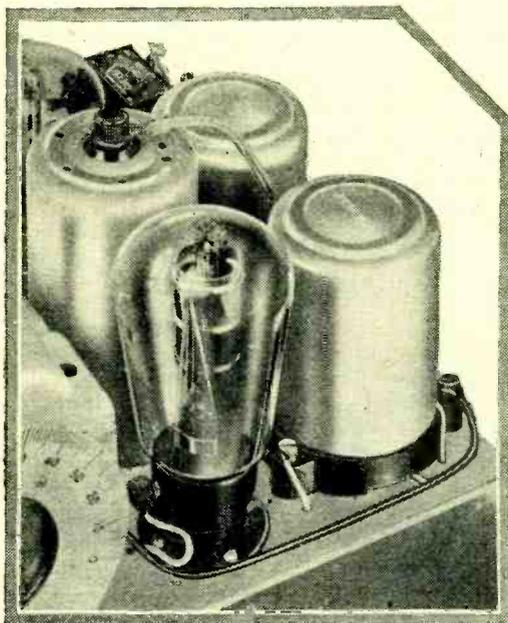
Reaction Coil Resonance.

The coil construction is important, owing to the low mutual conductance of the oscillator grid and anode. A very tight reaction coupling is needed to maintain oscillation, but this must not be provided by a large number of turns loosely coupled, for then resonance effects in the reaction coil upset the operation. The reaction coil must consist of a minimum of turns coupled tightly to the tuned winding.

When the oscillator coils are correctly proportioned, this self-neutralised pentode frequency changer is free from the effects of circuit interaction and radiation, so far as normal operation and adjustment will show. Theoretically, of course, it would be necessary to adopt special balancing precautions if the neutralising action is to be maintained over the whole tuning range of the receiver; in practice, however, these are quite unnecessary for all ordinary purposes. In respect of its efficiency, the circuit is equally satisfactory, and, indeed, on this point it is comparable with the American S.G. circuit.

Although these factors alone would be sufficient to justify the general adoption of the self-neutralised pentode frequency

types, for it is capable of handling without distortion a much greater signal input. In general, superheterodynes demand that an efficient pre-first-detector volume control be fitted to avoid overloading the frequency changer. The pentode frequency changer, however, requires only a moderate amount of signal-input volume control, even on a



An experimental superheterodyne receiver in which a single-valve pentode frequency changer can be seen in the foreground.

powerful local. This point alone is of considerable importance, for volume control has always presented a difficult problem to the designer of a superheterodyne, and this has been particularly so in cases where no pre-detector H.F. stage is to be used.

At this stage of the development it was realised that a single-valve frequency changer had been found which performed as satisfactorily as the more normal two-valve circuit, and that it was cheaper than the two-valve circuit. The design of a four-valve superheterodyne, therefore, which should be comparable in cost with, and give a generally more satisfactory performance than, the popular straight three-valve set had been brought within the limits of possibility.

The development of this was proceeded with, therefore, and it may be said that the resulting receiver was found to give a sensitivity rather better than that of a straight three-valve arrangement, while the quality was equally good. The selectivity, naturally,

was incomparably better, since it proved possible in the North of London, quite close to Brookmans Park, to receive weak Continental stations working with frequencies separated from those of the powerful locals by no more than 18 kc.

Although the results with such a four-valve superheterodyne are of an exceptionally high order, naturally they do not quite reach the high standard set by the very ambitious type of superheterodyne with a greater num-

ber of valves, such as the Monodial A.C. Super. Nevertheless, where neither the maximum of selectivity nor the highest sensitivity are necessary, the four-valve superheterodyne will give a highly satisfactory performance.

The receiver which has been developed is for A.C. operation, and includes ganged tuning, pentode output, and built-in moving-coil loud speaker; it will be described in the near future.

TRANSMITTERS' NOTES AND QUERIES.

Madrid Conference.

SO many matters will probably come up for discussion at the Madrid Conference, which we understand will open on September 3rd, that amateur transmitters are somewhat anxious lest their own interests may be overlooked.

We understand that Mr. Gerald Marcuse and Mr. A. E. Watts have been in constant touch with the Post Office authorities on behalf of the R.S.G.B., and that the G.P.O. will welcome the presence of a representative of the R.S.G.B. at Madrid to advise them on matters affecting amateur radio. Mr. Watts, and possibly Mr. Marcuse, will, therefore, journey to Madrid at some period during the Conference when important amateur matters come up for discussion, but as the meeting will last for about three months it is not practicable for them to be in attendance all the time. Mr. K. B. Warner, the secretary of the A.R.R.L., and two other delegates, will, however, be at Madrid during the whole of the Conference, and will keep a watchful eye over the interests of amateur transmitters from all parts of the world.

The American delegates will endeavour to secure for amateurs the exclusive use of the wavebands made available for them under the Washington Convention, and the Canadian amateurs wish for an extension of the present use of the 7 m.c. band, but there are so many interests to consider that it will be necessary for them to bring forward strong arguments in support of their claims.

The New Call Book.

THE summer issue of the Radio Amateur Call Book is now available, and copies may be obtained from Mr. F. T. Carter, Flat A, Gleneagle Mansions Streatham, for 5s. 6d., post free. The list of amateur transmitting stations in all countries of the world now exceeds 30,000 names and addresses, while the very useful list of short-wave commercial stations has been increased to twenty-eight columns.

Olympic Games.

WE understand that the call-sign W6USA, which, as stated in our issue of June 29th, will be operated by Mr. W. A. Lippmann, Jr., for the benefit of athletes at the Olympic Games, in Los Angeles, was licensed too late for inclusion in the summer Call Book. This call will probably be used after August 15th.

CHANGES OF ADDRESS.

- G2CR A. L. Crane, Kenilworth, 29, Kingsland Road, Grove Park, S.E. 12.
- G2KB H. K. Bourne, 63, Shenstone Avenue, Hillmorton Paddock, Rugby.
- G2VR H. B. Old, The Shack, Spring Lane, Lambley, Nottingham.
- G2YI R. C. Horsnell, St. Neots, Wick Drive, Wickford, Essex.
- G5DA G. Gore, 41, Grendon Gardens, Wembley Park, Middlesex.
- G5DI T. Brown, Ashford, West Lane, Forest Hall, Newcastle-on-Tyne.
- G15WD W. S. Davison, 10, Mark Street, Portrush, Co. Antrim.
- G5WT A. S. Wood, Trebor, St. James Road, Forfar.
- G6CW J. J. Curnow, Tregenna, Garrard Road, Banstead, Surrey.

NEW CALL-SIGNS.

- G5CU (ex 2ANS) J. A. Cuthbertson, Radiohm, Acklam Road, Linthorpe, Middlesbrough, Yorks.
- G6FU (Ex 2BGM) J. H. Cant, 112, Torrison Road, Catford.
- 2AGT R. Walker, 18, Woodville Road, New Barnet, Herts.

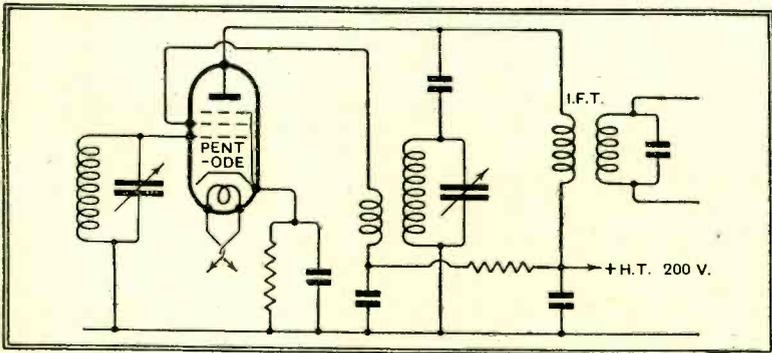


Fig. 7.—The final self-neutralised pentode frequency changer gives negligible circuit interaction, and is as efficient as a screen-grid type. The space-charge grid is operated with a very low positive potential.

changer in inexpensive superheterodynes, it has still another advantage over screen-grid

type of superheterodyne with a greater num-

LABORATORY TESTS

ON NEW RADIO PRODUCTS.

WEARITE Q.V.C. VOLUME CONTROL AND FIXED RESISTANCES.

THE new Wearite volume control, which is made in the form of a potentiometer, is a most cleverly designed component, for, in addition to embodying some quite novel mechanical features, it lends itself admirably to ganging either to a companion component or to a switch, thereby lessening the number of visible controls.

The Q.V.C. model, as it is styled, is enclosed in a moulded bakelite shell fitted with a single hole fixing bush, and incorporates a tapered wire-wound resistance element, the grading being such that the change in resistance follows very closely a square law.

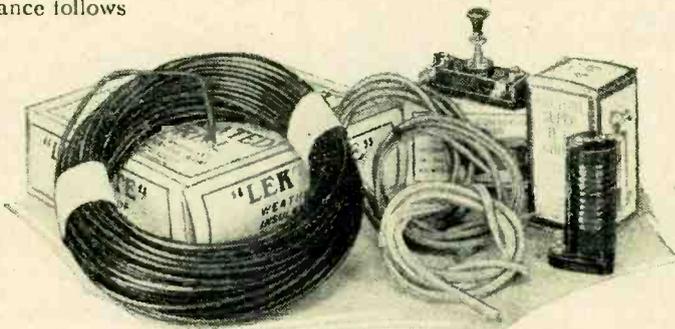
Wire of fine gauge must, of necessity, be used for the higher values so as to relieve the winding of as much mechanical strain as possible. A roller contact is employed carried on the end of a light but well-tensioned spring arm.

The terminals are mounted on three flats formed on the bakelite shell, the material being somewhat thicker here to give additional strength and prevent fracture where the terminals pass through the case.

These resistances are rated at 5 watts and are made in various standard sizes from 600 ohms to 100,000 ohms, the price being 4s. 6d. up to 50,000 ohms, and 5s. 6d. for the higher values. Two-ganged models are obtainable from 9s. 6d., and with the addition of an "on-off" switch from 11s.

Wire-wound resistances of 2- and 4-watt rating form a further addition to the Wearite range of components. These, styled R.D. resistances, are made in sizes of 50 ohms to 25,000 ohms in the 2-watt (A) type, and cost from 1s. to 2s. according to value, while the B type (4-watt rating) extend from 50 ohms to 50,000 ohms, the prices ranging from 1s. 3d. to 2s. 9d.

Both styles are obtainable either with baseboard mountings or with plug fittings for use as interchangeable resistances, the latter being



Selection of Goltone new season's components, also samples of screened sleeving.

poses to which twin sleeving of this type can be put. It is sold in 1-yard lengths, the price being 1s.

For screening mains leads and low voltage A.C. leads Ward and Goldstone, Ltd., have introduced a single and a twin 2 mm. bore tubing enclosed in a tinned iron braided covering. This possesses all the advantages of standard lead-covered wire, but is much easier to handle and, in addition, is very flexible. It costs 9d. for a yard length in single form, and 1s. for the twin tubing.

New components now available comprise a range of compression-type condensers with

maximum capacities of 0.0001 mfd., 0.0003 mfd., 0.001 mfd., and 0.002 mfd. The terminals are mounted on the side so permitting the condenser to be fixed to the underside of the baseboard or to the back of a panel so that only the control knob is visible. Provision is made for baseboard or panel mounting, and the price is 1s. up to 0.001 mfd. and 1s. 3d. for the 0.002 mfd. size.

A Super H.F. choke with an effective range of from 10 to 2,750 metres and listed at 4s. 6d. will meet most present-day requirements. Its high inductance and low D.C. resistance are two very useful features, for the choke is as effective in super-het. I.F. amplifiers of 110 or 126 kc. as in normal straight circuits. Its low self-capacity, about 5 m-mfd., enables it to be used, also, on the very short wavelengths.

Our measurements confirmed the maker's inductance value of 0.35 millihenry; the sample tested however showed a slightly lower D.C. resistance, being 216 ohms as against 225 ohms, as stated. The high inductance and low resistance are obtained by fitting a small laminated iron core and not by increasing the size of the component, for its overall height is but 3 ins., and the base measures 1 7/8 ins. x 1 1/8 ins.

Goltone "Lektrite" insulated aerial wire has the advantage that it is perfectly weatherproof and being well insulated is suitable, also, for indoor use. The seven-stranded copper conductor is enclosed in an impregnated insulated covering impervious both to water and the corrosive effects of coastal and city atmospheres. It is available in cartons containing 50 ft., 75 ft., or 100 ft. of wire, the prices being 1s. 6d., 2s. 3d., and 3s. respectively.

FULL O' POWER DRY CELL. Size 640.

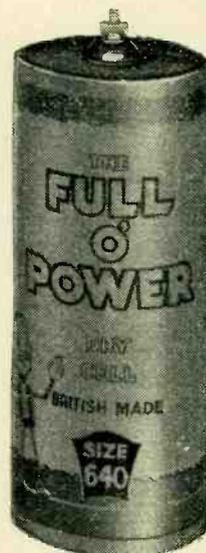
ALTHOUGH the fundamental principles of dry cell construction have changed little for many years, it is only by careful attention

to small details that cells of this type can be produced capable of a long life and possessing the ability to store without deterioration. Few better examples of this can be found than the new models introduced by Siemens Electric Lamps and Supplies, Ltd., 38-39, Upper Thames Street, London, E.C.4. They embody a patented device which hermetically seals the active material, but at the same time permits free exit for the gases given off during the operation of the cell.

When the gas pressure inside the depolariser increases sufficiently it forces some of the compound up through holes in the sealing cover, and when the pressure becomes great enough the small bubbles burst and allow the gases to escape into an air chamber in the top of the container. This chamber connects with small vent holes drilled longitudinally in the centre carbon, so giving access to the air. On collapse of the bubbles the depolarising compound again automatically seals the cell.

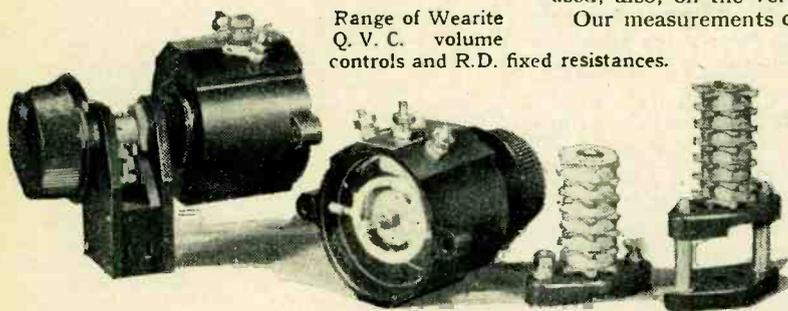
The vent holes in the carbon rod extend to the base of the container and so provide a means of exit for gases generated within the active depolarising material in the lower part of the cell.

It is an interesting fact that the size 640 cell delivers on short circuit a current of approximately 50 amperes, but it is the long life in normal service that the superior qualities of this cell are claimed to be most manifest.



Siemens' Full O'Power dry cell, size 640.

Range of Wearite Q. V. C. volume controls and R.D. fixed resistances.

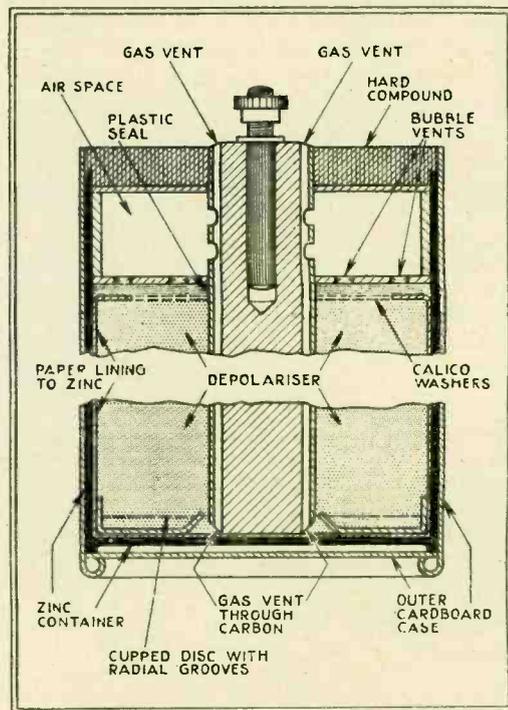


very useful for experimental work. The small, fixed base portion costs 3d.

GOLTONE COMPONENTS AND SCREENED TUBING.

OF the many recent additions to the range of Goltone components and accessories made by Ward and Goldstone, Ltd., Frederick Road (Pendleton), Manchester, especially interesting are the additional types of screened sleeving now available, as this material is used extensively in modern receivers.

In addition to the single screened tubing, there is available now twin insulated sleeving of 2 mm. bore enclosed in a common tinned copper-braided covering for use where two leads associated with the same circuit, but at different H.F. potentials, pass from one screened component to another. There are various other pur-



Sectional drawing showing construction of Siemens' size 640 dry cell.

The size 640 weighs 2 lb. 6 ozs., and measures 2 1/2 in. x 6 1/2 in. high, the price being 2s. In addition to being particularly well suited for operating electric bells, there are many opportunities for using cells of this type in the experimenter's workshop.

BROADCAST BREVITIES

By Our Special
Correspondent.

Music v. Vaudeville.

A BATTLE royal threatens to develop at Broadcasting House between the Music and Vaudeville departments on the question of who shall use the large concert studio.

The fun started when the vaudeville people found that the studio was just as good as the Waterloo warehouse for programmes of the "music-hall" type. Almost at once the music people made another effort to find space in the concert hall for the entire National Symphony Orchestra.

The Cramped Conductor.

The test was carried out on July 18th. The whole orchestra was accommodated, not without difficulty, and although the conductor's style was cramped, the results seemed to satisfy the engineers. Incidentally, the interesting discovery was made that the orchestra, "playing its damndest," could only just be heard in the basement studios beneath, and even then made no impression on the other microphone circuits.

Reluctant Decision.

Realising that a cramped orchestra can never do its best, the Music Department have reluctantly confirmed their original decision not to attempt performances in the concert hall by the entire orchestra; they still feel, however, that the hall is peculiarly their own and that vaudeville and other hilarious programmes should not be permitted in such a holy of holies.

The vaudeville people think differently, hence the squabble.

Why Not?

The best way out of the difficulty, I imagine, would be to permit vaudeville in the large studio at times when it is not required for more serious purposes. The dog-in-the-manger attitude is uncalled for. Some of the German stations manage quite successfully with only one studio for all performances.

Busmen's Holidays.

THE sight of Henry Hall enjoying a song and dance turn at the Palladium the other evening did not surprise me. The B.B.C. staff spend half their leisure in taking busmen's holidays.

Val Gielgud, the B.B.C. dramatic chief, haunts the theatres, while Gerald Cock, who organises outside broadcasts, is for ever on the prowl for suitable material.

Sleuths.

There are, of course, the recognised programme sleuths, whose work it is to tour London and provincial music-halls, cabarets, and dance halls for likely talent; but I am thinking of the staff people who spend their leisure in the public service, and are always ready to pass on their experiences to the ordinary listener. Louis Armstrong, last week's "hot" trumpet player, was "discovered" by a B.B.C. man who was taking a night off.

Good Fellows.

A "holiday" for a B.B.C. engineer more often than not means a journey to the Continent or to America to rub shoulders with foreign technicians and to exchange ideas.

Even if we do occasionally criticise the British Broadcasting Corporation, let us recognise the staff as a band of workers with a splendid *esprit de corps* and an unselfish desire to maintain the popularity of broadcasting.

Motor Race Thrills for Listeners.

THE Royal Automobile Club's International Tourist Trophy Motor Race takes place over the Ards Circuit on August 20th, and a running commentary will be relayed to National and Belfast listeners during the day. The course is nearly fourteen miles, runs through two small towns, and includes a long straight stretch where very high speeds are attained. There are thirty laps, and the full distance of the course is 410 miles. This year's race is particularly interesting, for two of the



A POPULAR VOICE. Miss Francine Lemaître, the young "annoncatrice" at Radio-Normandie (Fécamp), who is well known to English listeners.

greatest British racing drivers, Earl Howe and Sir Henry Birkin, are to drive Italian cars which are challenging the British entries. In all thirty-five cars will take part. The record is at present held by Borzacchini, who lapped, last year, at the amazing speed of over eighty-one miles an hour.

Impromptu Proms.

THE impromptu nature of the "Proms" is one of the surprising features of these popular concerts. Although most of the works performed are old and familiar, it is remarkable that the general standard of playing is so high.

The first rehearsals—for the strings alone—did not begin until Tuesday last, August 2nd, and yet, by to-morrow evening, Sir Henry Wood will have drilled his little army into an efficient machine.

From to-morrow onwards the Orchestra will lead the sort of hand to mouth existence which becomes inevitable when pieces can be rehearsed only on the day of their performance.

Television at Broadcasting House.

UNFORESEEN hitches have caused a delay in the inauguration of television transmissions from Broadcasting House, but I understand that we may rely on a start being made within the next few days.

By the way, my recent suggestion that the ultra-short wave transmitter might be used for television purposes has given birth to the most extravagant rumours. It has even been announced in one quarter that television will be restricted to the ultra-high frequencies. This is quite untrue.

The initial tests will follow the scheme outlined in these columns on July 15th, i.e., Midland Regional will transmit sound on 398.9 metres while London National supplies the images on 261.3 metres.

Awa' North.

ABERDONIANS are now accustoming themselves to transmissions on 214.3 metres, the new wavelength which becomes necessary with the opening of Scottish National on Aberdeen's original wavelength of 288.3 metres.

The "Q" transmitter which the B.B.C. are now using has been heard quite comfortably at 4 miles on a two-valve receiver using an indoor aerial. The same set gave satisfactory results with an outdoor aerial at 12 miles, at which distance the signal strength is 1.7 millivolts per metre.

Cats.

LISTENERS must not get the impression that the B.B.C. is broadcasting soprano auditions during the late evenings. Some of the high notes may be coming from the nether regions of Broadcasting House, where a number of stray cats have taken up residence and refuse to budge.

The intruders, who were first discovered by compassionate workmen when the foundations were being dug, were allowed to remain on the understanding that it would be a case of "Time, Gents!" when the Governors and staff arrived.

Unsporting.

Now that the Governors and the staff have fulfilled their part of the contract by duly arriving, the cats have adopted an unsportsmanlike attitude. They conceal themselves all day beneath boilers and in awkward corners beyond the reach of man, remaining there until the late dance music. Then, in families, they roam the deserted building.

It is said that there are already three generations.

A Summertime Quandary.

HERE is a poser which came in a letter to the B.B.C. Technical Correspondence Department last week:—

"having A portable set and not having nothing on Since 12 of June I would be very much oblige if you could inform Me how to Act or What to do . . ."

READERS' PROBLEMS.

THESE columns are reserved for the publication of matter of general interest arising out of problems submitted by our readers. Readers requiring an individual reply to their technical questions by post are referred to "The Wireless World" Information Bureau, of which particulars, with the fee charged, are to be found below.

Under-loaded Output Valve.

THE designer of a modern set generally tries to arrange matters so that the rectified output from the detector valve is just sufficient to load up the succeeding output valve. It is usual to allow a fair margin of safety, but to legislate for a large surplus would not be economical.

Consequently, readers should think twice before introducing sweeping modifications in the post-detector portion of sets described in this journal. For example, the detector of the "Modern Straight Five" delivers ample energy for the output valve specified, but not enough to load, say, a pair of high-power push-pull output valves linked by a transformer of normal step-up ratio. To make this modification, it would become necessary either to interpose an intermediate stage of L.F. magnification, or, alternatively, to use a transformer of abnormally high step-up ratio. Either course is likely to introduce complications.

Extra Smoothing.

WHEN extra smoothing over and above that provided by a loud speaker field is found to be necessary it is almost invariably correct to insert the additional choke between the rectifier output and the field winding, in the manner indicated in Fig. 1.

A querist who has inserted an extra choke in the alternative position—between the field winding and the receiver—finds that there is still a residue of hum; a series of stage-by-stage tests (which he describes) would indicate that the trouble is at any rate partly due to the loud speaker itself, and we think that the method of connection explained above will put matters right. The extra smoothing condenser

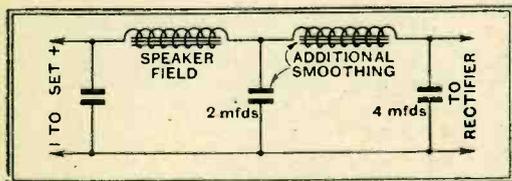


Fig. 1.—Normal position of an extra smoothing choke, connected in series with a loud speaker field winding.

is shown in the diagram as having a capacity of 2 mfd.; occasionally this value may be doubled with advantage.

L.T. Transformer Voltage.

WHEN a commercially made power transformer is fitted in a receiver it seldom happens that the loads imposed on the various secondary windings correspond exactly with the manufacturer's rating. But it should be emphasised that this should be a matter of no importance; provided that the transformer is designed on reasonably generous lines, its voltage regulation should be good enough to cope with small discrepancies. In other words, voltage should not rise by more than a

few per cent. when the load is well below the normal rating; similarly, it should be maintained at sensibly the full value when maximum current—or even a little more—is taken from the windings.

Several questions dealing with this subject have lately been received, and one correspondent appears to be doubtful whether it would be safe to wire two indirectly heated A.C. valves (consuming a total of 2 amperes) across a winding rated at 3 amperes. In this case, the transformer secondary will be delivering two-thirds of the full rated current, and even a badly regulated component should do this without an appreciable voltage rise.

Testing Mains Transformers.

HAVING obtained the loan of a highly accurate A.C. meter, a reader wishes to test his power transformer under working conditions, and asks for information as to how to calculate the value of the artificial loads which will be connected across the L.T. secondaries.

Although this is quite a simple matter in theory, we are inclined to suggest that our querist would do better to take the measurements with a natural load, i.e., that of the valve heaters, etc., which will ultimately be connected across the various transformer windings. The reason is that we doubt if he will have access to fixed resistors of suitably low value combined with adequate current-carrying capacity.

The calculation in question is easily made by dividing "rated voltage" by "current to be consumed" (in amps.). For example, a 4-volt secondary, which will be required to give 2 amperes, should be shunted by a resistance of 2 ohms. The measured R.M.S. voltage across the winding should then be 4 volts.

It may be added that, strictly speaking, measurement should only be made when all the secondary windings are delivering their normal outputs, as a reduction in the total load imposed on the transformer will introduce a rise of voltage even across those secondary windings that are fully loaded. The extent of this change will depend on the design of the transformer.

Yet Another Bias Scheme.

WE are asked whether it is permissible to bias an indirectly heated S.G. valve by inserting the necessary number of dry cells directly in the cathode lead. Our correspondent is using a ganged tuning condenser in the construction of an experimental receiver; he does not wish to go to the expense of fitting an automatic bias arrangement for this temporary set, and thinks, if it will work, that the proposed method of biasing offers the simplest solution of the problem. As the condenser rotors are earthed, the conventional way of applying battery bias is impracticable.

This method is quite practicable, but the diagram which our reader submits with his letter is incorrect, in that it shows the positive terminal of the bias battery as being connected to the earth line. Although this is the correct

method of connection in conventional battery bias circuits, it is wrong in this case. The normal procedure must be reversed, the positive pole of the battery being joined direct to the cathode terminal of the valve holder, and the negative pole to the earth line. The cathode will then be positive with respect to the grid, and so it follows that the grid will be negative with respect to the cathode—the correct operating condition for an amplifying valve.

Although we do not think that this method of biasing has any great practical utility, it may be useful to remember that it is practicable, especially in cases where the correct value of automatic bias resistor is not available at the moment.

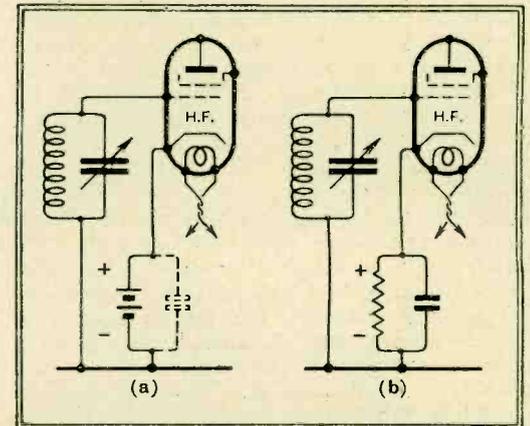


Fig. 2.—A bias battery, connected in the cathode lead, as shown in diagram (a), serves the same purpose as the usual bias resistance (diagram (b)).

The accompanying diagram (Fig. 2) shows that the polarity of a bias battery connected in the manner under discussion corresponds with the polarity of the voltage developed across the conventional bias resistor which it may replace.

Practical Wiring Detail.

REFERRING to a recently published "Readers' Problem," in which we gave some advice on the subject of charging an L.T. cell from a motor car battery, a correspondent asks the reason for showing the current-limiting resistance as connected in the positive lead of the charging battery.

This is a matter of very small importance, and, of course, from the theoretical aspect, it is quite immaterial whether the limiting resistance be inserted in the positive or negative leads. But, as the negative pole of the grid battery will probably be permanently "earthed" to the frame, the risk of damage to the car battery, due to an accidental short-circuit from the charging leads, etc., to any earthed metal work will be slightly reduced by adopting the method of connection shown in our diagram.

The Wireless World

INFORMATION BUREAU.

Conditions of the Service.

THE service is intended primarily for readers meeting with difficulties in the construction, adjustment, operation, or maintenance of wireless receivers described in *The Wireless World*, or those of commercial design which from time to time are reviewed in the pages of *The Wireless World*. Every endeavour will be made to deal with queries on all wireless matters, provided that they are of such a nature that they can be dealt with satisfactorily in a letter.

Communications should be addressed to *The Wireless World* Information Bureau, Dorset House, Tudor Street, E.C.4, and must be accompanied by a remittance of 5s. to cover the cost of the service. The enquirer's name and address should be written in block letters at the top of all communications

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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.

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EDITORIAL COMMENT.

Olympia 1932.

WITH August the 19th only a week ahead of us we have an excuse for allowing our thoughts to run to the Olympia Radio Show which this year promises to be of outstanding interest.

It is not proposed to touch here upon the apparatus which will be exhibited, for this will be fully dealt with in next week's issue and the two following numbers of *The Wireless World*, which together comprise our exhibition "specials." Next week's issue will be a Guide to the Show, drawing attention to items of special interest and generally providing the visitor to Olympia with an indication of "what to see." The second exhibition number, August 26th, will contain a detailed stand-to-stand report on the exhibits, prepared by the technical staff of *The Wireless World* after the opening of the Show. Our third number, appearing on September 2nd, will review the outstanding tendencies in design and the principal improvements observed from a close study of the exhibits as a whole.

1932 — The Best Show.

All the information which we have had up to the present goes to show that the organisers, the Radio Manufacturers' Association, are sparing no efforts to make the wireless show 1932 far ahead of any previous wireless exhibition. The main hall at Olympia is to house the Show and is being decorated and fitted up on entirely new lines.

There are certain points of detail in connection with the Exhibition to which we would like to draw attention. In our opinion, every wireless receiver sold should carry with it a carefully prepared book of instructions and a description giving all essential relative information

including the circuit, wiring diagrams and other details. Manufacturers in this country, with one or two outstanding exceptions, seem to be extraordinarily unappreciative of the importance of this detail of their job, for we believe that not only would the supply of information of this nature, carefully and attractively prepared, give confidence to the purchaser of a set, but it would, no doubt, overcome quite a substantial percentage of the trivial servicing which is at present necessary in connection with many receivers, largely, we suggest, on account of the inadequate information supplied to the purchaser. No manufacturer in America would think of putting out a set without full explanatory literature concerning it, and his booklet would, in all probability, contain, in addition, a large amount of useful general information on the erection of an aerial and general points on the maintenance of the set and tracing faults.

Descriptive Literature.

The mention of literature and the Show reminds us of another point on which we would like to touch. Leaflets and other matter concerning the exhibits should certainly be available, but in past years it has seemed to us that more of these leaflets are scattered about on the floor than are actually taken home by the visitors. Literature should not be forced on to visitors by the stand attendants, only to be dropped on the ground a yard or two farther on. And those paper bags! They may be good publicity for individual firms, but they encourage the idea of collecting leaflets, and we notice that the tendency is for the size of the paper bags to grow, apparently with the idea that the bag bearing a firm's name should be big enough to contain the bags of any rivals indulging in the same form of publicity!

AUTOMATIC VOLUME CONTROL— — IS IT WORTH WHILE ?

The Various Methods Employed.

By W. T. COCKING.

LITTLE published data has appeared in this country on the subject of automatic volume control, and at the time of writing it is believed that no British set includes this refinement. Such controls are quite common in America, but their absence in British sets does not indicate any inability on the part of their designers to include them, but rather a doubt as to whether, in actual fact, they are a desirable feature. This is by no means a technical matter; it is more a psychological point upon which both the technical and the non-technical are equally competent to judge. It is in an endeavour to obtain opinions as to the desirability of automatic volume control that this article has been written, for it is obvious that a fair judgment cannot be formed without knowing at least the audible effects of such a control, and preferably also having at least some idea of the methods by which it may be achieved.

The object of an automatic volume control is to adjust the sensitivity of a receiver in such a manner that, whatever the actual strength of the signal tuned in, the audible sound output from the loud speaker remains at a constant value. As the tuning dial of the receiver is rotated, therefore, all stations should come in at the same volume, and it should prove impossible to distinguish distant stations from the local merely by their strength. It must not be assumed, however, that the control smooths out the light and shade, the loud and soft, passages of musical reproduction. It does not, for it is operated by the carrier of the incoming signal, and not by its modulation, upon which the reproduction depends.

It will be obvious that the automatic volume control must be operated by the voltage developed by the carrier of the incoming signal after it has been amplified, and that, furthermore, it must act to reduce the amplification given by the H.F. stages. It is normally impracticable to make this voltage operate any potentiometer device for the control of volume, and the usual procedure, therefore, is for the rectified carrier voltage to be applied to the grid or screen grids of the H.F. valves in such a way as to reduce their mutual conductance.

Separate Valve A.V.C.

One of the commonest circuits for the attainment of this is shown in Fig. 1; in this particular example a variable-mu H.F. stage is transformer-coupled to an anode-bend detector, but this does not directly affect the control, and other methods could be employed. Under conditions of no input signal

the H.F. valve has its minimum negative bias due to the voltage drop along its bias resistance R_1 , while the detector is also self-biased by the resistance R_2 . The A.V.C. valve has its grid negatively biased to the point at which the anode current is zero by the voltage developed between the points "A-B" on the voltage divider across the H.T. supply. The grid of the H.F. valve is returned to the voltage source through the decoupling resistance R_3 and through the

valve just as in an ordinary anode-bend detector, and a current flows through R_4 . This current sets up a voltage across the resistance which is applied through R_3 as additional bias to the H.F. valve, and so reduces its amplification. As the amplification is reduced the voltage applied to the detector and the control valve is also reduced, and a balance point is reached at which the system is stable.

It is obvious that the greater the signal voltage applied to the detector the greater will be the H.F.-valve bias voltage and the lower the amplification. It is obvious, further, that for a strong input signal the detector input must be greater, in order to provide the higher bias voltage, than for a weak signal. It is thus impossible for the control completely to fulfil its function of maintaining the detector input at a constant level. The real action of the control, therefore, is to keep the detector input more nearly constant than it would be in the absence of any such automatic volume control, and this may be achieved to such an extent that variations in volume are aurally negligible.

The merit of this particular method of obtaining control is that a wide range of control is possible, and that it permits the receiver design to be more or less normal. It suffers from several practical disadvantages, however, for it has been found that in certain cases the A.V.C. valve must be a picked specimen, and that there is also a possibility of distortion being introduced.

Furthermore, the A.V.C. valve requires a positive anode potential which must be added to that required by the H.F. valves, so that the total H.T. voltage is increased. If all the valves be heated from the same winding on the mains transformer, this A.V.C. anode voltage appears as a potential difference between the heaters and cathodes of the H.F. valves, where it might have a detrimental effect upon valve life.

Diode A.V.C.

Although this circuit is very widely used, therefore, it is open to certain objections which are not present in another type of control which is shown in Fig. 2. This control is considerably simpler than the one just described, and it does not necessarily

WILL automatic volume control become popular in this country? Such controls are to be found in a large number of receivers in America, but in spite of obvious advantages there are certain shortcomings which are difficult to obviate. The article affords a valuable topic for discussion and explains the underlying principles of automatic volume control.

automatic control bias resistance R_4 . With no signal there is no current flow through R_4 , and so the bias on the H.F. valve is only that due to its own self-bias resistance.

When a small signal is applied the conditions are substantially the same, and the

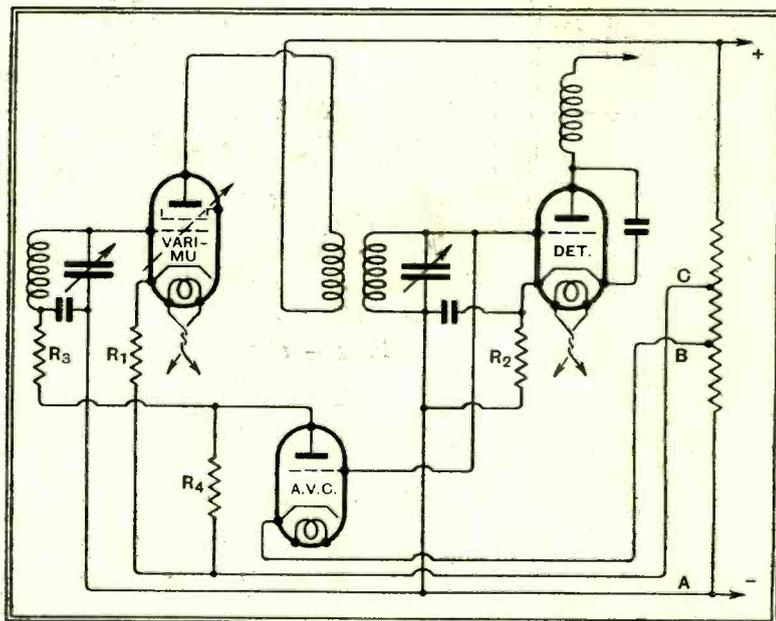


Fig. 1.—A popular American A.V.C. circuit in which an extra valve is used purely for control purposes.

control valve has little or no action. The circuit functions as any other, therefore, until the signal voltage applied to the detector is sufficient to actuate the control valve. When this occurs there is rectification in the control

Automatic Volume Control—Is It Worth While?—entail the use of an extra valve. It will be seen that a diode detector is used, and that the automatic bias potentials are obtained directly from this. The H.F. valve is self-biased in the usual way by the resistance R_1 , and this bias is applied to its grid through the decoupling resistance R_2 and the detector resistance R_3 , through which there is no current flow in the absence of a signal.

When a signal is applied to the diode there is a direct-current flow through the resistance R_3 , with the result that the anode is maintained at a potential negative with respect to its cathode. There is no current flow through R_2 , however, so that the grid of the H.F. valve is at the same D.C. potential as the diode anode, and negative with respect to the diode cathode. The diode cathode, however, is negative with respect to the H.F. cathode on account of the bias resistance of this valve, so that it will be seen that the rectified carrier voltage appearing across R_3 is wholly applied to the H.F. valve as negative grid bias.

The application of the signal to the diode also causes a modulation-frequency current to flow through R_3 , and hence a modulation-frequency voltage to be set up across it, and this is communicated to the L.F. valve through the usual coupling condenser C and grid leak R_4 . This L.F. voltage, however, must not be allowed to reach the first valve, so that the decoupling resistance R_2 and condenser C , are essential features of the circuit.

If the resistance R_3 be high compared with the internal resistance of the diode, we may assume roughly that rectification is 100 per cent. efficient, so that if we choose a value of 1 meg. for R_3 we shall obtain 1 volt of bias for every signal volt applied to the diode. The maximum signal input to the diode, therefore, must obviously depend upon the maximum bias voltage required for the H.F. valves, and if conditions were such that 50 volts bias were required, then we should have to operate the diode with a signal input of this same figure. In the diode itself this does not necessarily lead to any difficulty, but it may complicate the design of the preceding H.F. stage.

In practice it would probably be rarely necessary to work with such a high input voltage, and it should be generally satisfactory to legislate for a voltage of about 20 only, at which figure no particular difficulty should be met with. This method of volume control has the advantage that the same valve is used both for volume control and for detection; at first sight, therefore, no additional valve is needed. This is only true, however, when the receiver with which it is being compared is also fitted with a diode detector, for if a comparison be made with an ordinary set fitted with grid or anode-bend detection, then an additional stage of amplification is necessary to make up for the loss due to the use of a diode.

Such additional amplification can take the

form of extra H.F. amplification, but more usually a further stage of L.F. amplification is employed. On the score of cost, therefore, there is little to choose between the two methods of automatic volume control. The diode, however, has the advantage of being simpler, of giving rise to no abnormal potential difference between heaters and cathodes, of requiring no extra H.T. supply, and of giving less risk of distortion.

The Wunderlich Valve.

Although of little practical interest at the moment in this country, it is important that the newest method of all should not be omitted from this discussion. Within the last few months, a new type of valve has been developed in America expressly for the purpose of simplifying automatic-volume control circuits, and it is an extension of the diode method just described. The circuit is given in Fig. 3, and the special valve, which is known as the Wunderlich, contains, in addition to the usual heater, cathode, and anode, two identical grids. These grids are connected in a push-pull

are thus effectively in parallel. These potentials then affect the anode current, and the L.F. signal appears amplified in the anode circuit in the usual way. The H.F. input voltages, however, although they are applied to the grids in equal proportions, are applied in exactly opposite phase, so that they do not affect the anode current, and signal frequency

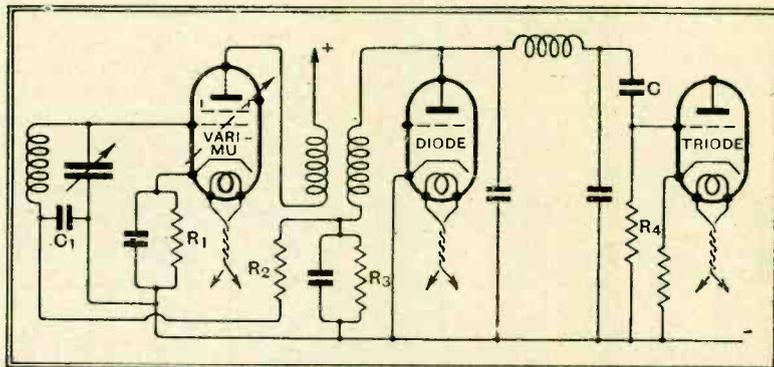


Fig. 2.—A circuit employing a diode for both detection and automatic volume control; an additional valve is usually needed as an amplifier to compensate for the low efficiency of the diode.

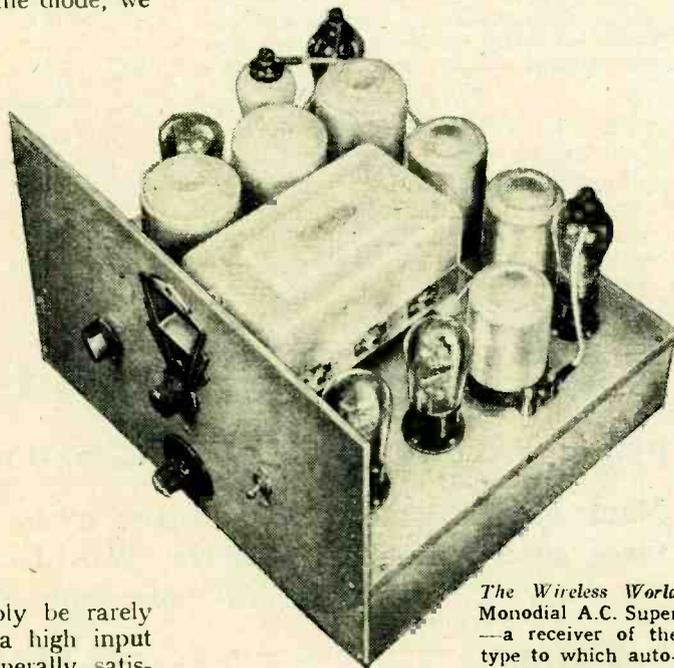
H.F. currents are not found in the anode circuit.

In its action as a volume control valve the Wunderlich valve is the same as that of the diode circuits previously discussed. The novelty lies chiefly in the special type of valve, which is enabled to act both as a diode and as an L.F. amplifier. The use of automatic volume control with this valve, therefore, does not necessitate the use of an extra stage of amplification.

A.V.C. in Practice.

Now that we understand some of the methods by which automatic volume control may be obtained, and we realize that it is a perfectly practical proposition, it is fitting to enquire what effect it will have upon the operation of a set. In the first place, if the desired signal be so weak that the receiver must be working at full sensitivity for its reception, the control will have no effect, and the action of the set will be no different from that of any ordinary type. It is only on the reception of stations for which the volume control of an ordinary set would have to be reduced that the automatic control comes into action.

Over the range of the control, all stations, whatever their actual strength, will deliver the same volume from the loud speaker, provided that they are all modulated to the same extent. The volume variation of fading, therefore, is counteracted, and this is perhaps the most important advantage of automatic volume control, particularly in short-wave receivers. When a station is fading, however, the general mush level caused by atmospheric and extraneous noises does not usually fade as well. The result of a controlled receiver, therefore, on a fading signal is to give the curious effect of a constant signal with a fading background. A signal which is fading, moreover, is usually distorted at times, due to the fading effect being different for the carrier and sidebands; although automatic volume control will hold the volume level constant, it will do nothing to counteract the distortion introduced by fading. It is



The Wireless World Monodial A.C. Super—a receiver of the type to which automatic volume control could be applied.

manner to the tuned input circuit, from the centre tap of which a resistance R_3 , shunted by a condenser, is connected to the cathode.

Full-wave rectification of the signal is obtained, therefore, and the rectified D.C. and signal currents flow through R_3 , across which they set up potential differences. The D.C. voltage is applied as automatic bias to the H.F. valve through the decoupling resistance R_2 , and the usual minimum bias is obtained through the use of R_1 . The modulation-frequency voltages across R_3 , however, are applied simultaneously, and in the same phase to both the grids of the detector, which

Automatic Volume Control—Is It Worth While?—quite possible, therefore, for the full volume distortion and fading mush level of an automatically controlled set to prove more unpleasant than the normal signal fading of an uncontrolled receiver.

Visual Tuning.

Since the automatic control holds the output constant, irrespective of the signal input, within limits, it is almost impossible to tune in a station by ear in the usual manner, for no optimum setting of the tuning dial can be found. It is essential, therefore, for receivers to have some form of visual tuning indicator, which may take the form of a neon tube, or more usually a milliammeter operated either directly or indirectly by the H.F. valve bias voltage. With such an indicator, of course, no tuning difficulty is met with, and it is in fact easier than the normal tuning by ear. The cost of the indicator, however, must not be overlooked when computing the extra expense of an automatic volume control.

A further point in the operation of a controlled set which may prove disadvantageous is that as the tuning dial is rotated the sensitivity of the set is continually varying in accordance with the variations in the signal inputs. As the set is mis-tuned from a station the sensitivity rises until it is at its maximum when the set is tuned midway between two stations. At this point, therefore, the full output of the set will be obtained on mush, local interference, and frequency modulation interference. Instead of obtaining silent points between stations, therefore, we should normally obtain strong mush points.

Volume Control.

Since the automatic volume control is really a control only over the sensitivity of the set, and is intended to keep the detector input constant, it is necessary to fit in addition a

normal type hand-operated volume control in the L.F. circuits, so that the loud speaker volume can be regulated to the desired level. This control, of course, requires only occasional adjustment when a change in the speaker volume is needed, and not for every station tuned in. By reducing the setting of this control when tuning, however, the disadvantage of the automatic control in giving a high mush level between stations can be overcome, so that this effect alone need be no great deterrent to its use.

An effect which is often stressed as a great advantage of automatic control lies in the elimination of the terrific bursts of volume

for instance, it may be made to overload when the input exceeds a certain value and excessive volume is then avoided without the use of additional apparatus. This course has been adopted in the more sensitive receivers described in *The Wireless World*, notably in the Monodial A.C. Super and the Modern Straight Five, and has proved very satisfactory in practice.

It will be seen, therefore, that the advantages of an automatic volume control are the elimination of overloading when tuning through a local, the reception of all stations at approximately the same volume level, and the avoidance of the volume variations of fading. The disadvantages are a high level of background noise between stations, a variable mush level on a fading signal, and the reproduction of fading distortion at full volume, and, of course, the additional apparatus.

It will be obvious that the control is unsuitable for inclusion in the less sensitive types of receiver, and it would only prove useful in superheterodynes and multi-H.F. straight sets. Moreover, the control cannot normally be added to an existing receiver, for the whole apparatus must be designed from the start for working with automatic volume control.

In the writer's opinion, the advantages and disadvantages of automatic volume control are rather evenly balanced, with the result that it is difficult to form an opinion as to whether its use is justified in high quality receivers. This article has been written, therefore, not with the idea of either advocating or condemning the system, but rather with the hope of stimulating interest in the subject. Opinions will naturally differ as to the relative values to be assigned to the merits and demerits, and it is hoped that as a result of this article some conclusion may be reached as to the way in which automatic volume control would be regarded. Should there be a definite consensus of opinion in its favour, then it will undoubtedly be included in some future receiver design.

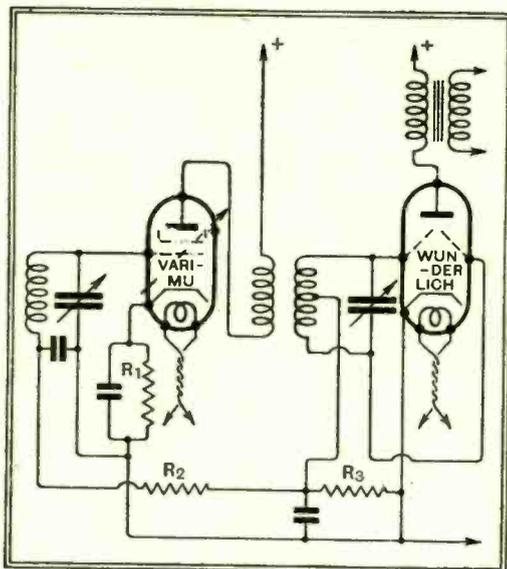


Fig. 3.—A circuit employing the new American Wunderlich valve, which acts as a full-wave diode detector, an L.F. triode amplifier, and a volume control.

sometimes found when inadvertently tuning through the local station. This is undoubtedly true, but it is not necessarily a great point in favour of the control, for it may be obtained more simply by other means. If the detector operating conditions be correctly adjusted,

OLYMPIA RADIO SHOW

FRIDAY, AUGUST 19th, to SATURDAY, AUGUST 27th, INCLUSIVE

AUG. 19

GUIDE TO THE SHOW

A complete guide to "What to See" at Olympia, giving first details of new apparatus and components. The issue will also contain information on how to build a new four-valve superheterodyne receiver, self-contained, with loud speaker: "The Wireless World BABY SUPERHET."

Next week's issue, dated August 19th, will be the first of three special numbers of **THE WIRELESS WORLD** dealing with the Olympia Radio Show.

AUG. 26

STAND-TO-STAND REPORT

A detailed, fully illustrated record of the Olympia Show, entirely compiled by the technical staff of THE WIRELESS WORLD from first-hand information collected after the opening of the Show.

SEPT. 2

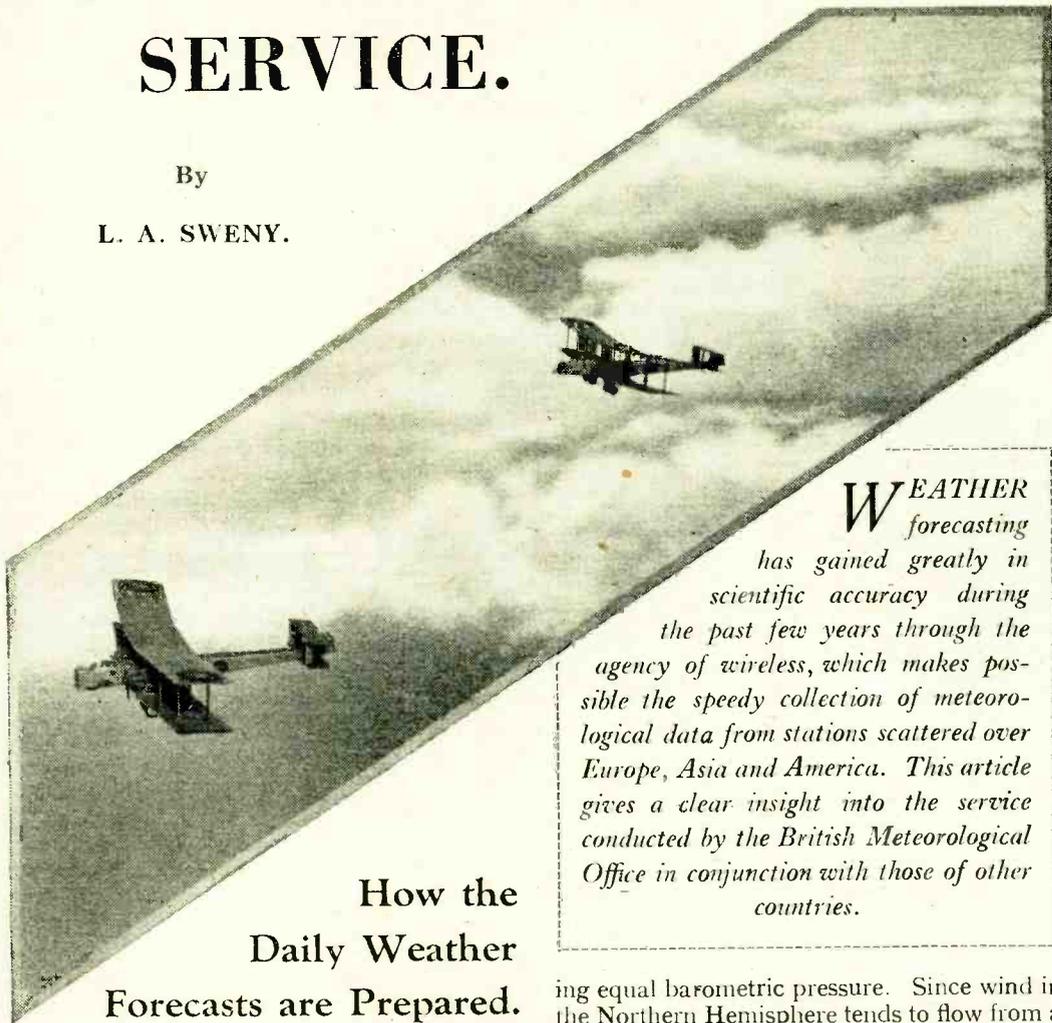
SHOW REVIEW

An issue which will record the progress of the year as revealed by the new products at Olympia, giving detailed information on many of the new products. Fully illustrated.

RADIO AND THE METEOROLOGICAL SERVICE.

By

L. A. SWENY.



W EATHER forecasting has gained greatly in scientific accuracy during the past few years through the agency of wireless, which makes possible the speedy collection of meteorological data from stations scattered over Europe, Asia and America. This article gives a clear insight into the service conducted by the British Meteorological Office in conjunction with those of other countries.

How the Daily Weather Forecasts are Prepared.

OF recent years the daily forecast has only excited comment from the general public when its prophecies have not been fulfilled—sure proof that it is an essential to be regarded in almost the same light as other utility services which, while receiving criticism for their shortcomings, rarely get credit for their part in easing the burden of present-day civilisation.

Accurate weather forecasts depend entirely upon the study of all aspects of the meteorological situation over a large area, and only by the frequent inspection of the fluctuations of pressure, the changes in wind-direction and speed, and the state of the sky can deductions be drawn by the forecaster. A gradual fall in the atmospheric pressure in Southern England, accompanied by a high cloud-sheet and a freshening south-easterly wind, will always precede the issue of a weather forecast from our broadcasting stations announcing rain. The phenomena mentioned above are the outward and visible signs of facts that the meteorologist, by the study of his weather maps, had embodied in the previous evening's "further outlook."

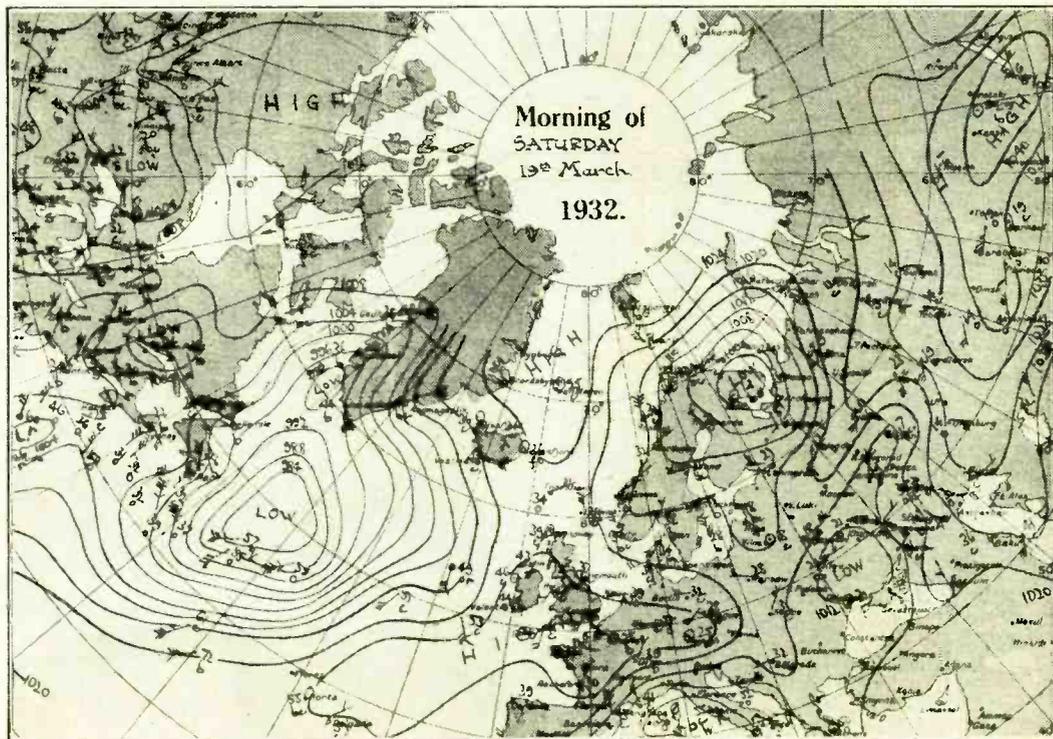
The collection of weather data, i.e., pressure and temperature changes, wind, state of sky and sea, are used by the meteorologist to compile such a map as that illustrated, which is reproduced by courtesy of H.M. Stationery Office. As each report is received, the meteorologist marks the information against the place from which it emanates and gradually joins up by lines those places show-

ing equal barometric pressure. Since wind in the Northern Hemisphere tends to flow from a high-pressure area to a "low," or depression, in a direction approximately parallel to the lines of equal barometric pressure (or isobars), he has a further clue to the position and

identity of the depression, which is again aided by the distribution of general weather, cloud, and temperature. By the study of the sequence of events as disclosed by successive weather maps, depressions are tracked down, their behaviour watched, their direction of travel noted, and their bearing on the prospect of, say, an "outdoor" week-end or a seasonable Christmas deduced. Although we have become accustomed to hearing our loud speakers advertising Iceland as the spiritual home of depressions which always seem to be antagonistic to the anticyclone that dwells near the Azores, it is a fact that although the weather maps now prepared four times a day would, if numbered consecutively from their commencement, exceed 60,000, no two maps exhibit identical features, although there may be general resemblances amongst them. This being the case, the meteorologist is ever striving for more information from more sources in order that he may examine to a greater depth the infinite variety of meteorological expression, and so improve the scope and accuracy of his forecasts.

Twelve Years' Development.

All forms of electrical communication are used in the collection of the data from which the forecasts are compiled, but radiotelegraphy is by far the most important factor in the rapid collection of reports from places many miles apart, and its development in the last twelve years has enabled the meteorological services to obtain information from an increasing number of stations in Europe, Asia, and North America. It is therefore playing no mean part in assisting the meteorologist to forecast more accurately, since the more complete his knowledge of weather changes taking place within a large radius of



A portion of a typical weather chart of the Northern Hemisphere, rapidly prepared in the Meteorological Office at the Air Ministry, London, from wireless and other messages received from observation stations dotted all over Europe and North America. The lines join up those points showing equal barometric pressure.

Radio and the Meteorological Service.

his headquarters the greater are his chances of foretelling the conditions in his own immediate vicinity.

The assistance to be obtained from electrical communication was recognised in 1860, for in that year the Meteorological Department of the Board of Trade commented the daily collection by telegraphy of weather reports from fifteen stations in the United Kingdom as well as from certain places on the Continent.



A wireless operator at the Air Ministry whose duty it is to tune in some forty British and foreign stations each day for the latest weather news. He "tours" the Northern Hemisphere with the aid of the map shown above his instrument.

From 1905 to 1914 the increasing use of radiotelegraphy enabled the meteorologist to cast his net wider, and a daily broadcast was commenced from the Eiffel Tower of the weather conditions at many places on the European Continent. In addition, arrangements were made for weather reports to be transmitted by radiotelegraphy from H.M. ships at sea and Atlantic liners.

A Day-and-Night Task.

Since 1919 the British meteorological radio services have been centred at the Air Ministry, Kingsway, where the Meteorological Office has its headquarters, and here operators are employed all day and night in the collection of reports from meteorological centres in Europe, the Mediterranean, North America, and the U.S.S.R. Transmissions of reports from places in the United Kingdom, Ireland, and Scandinavia are made at various times of the day from this station, which also broadcasts aviation weather forecasts and international collective weather messages.

In order that the meteorologist can frequently obtain as complete a picture as possible of the weather distribution over large portions of the earth's surface, arrangements have been made internationally for observations to be made simultaneously at a great number of stations in the Northern Hemisphere. Each country in the Northern Hemisphere collects simultaneous observations from its own network of stations, and broadcasts them from one or more stations of such power that the transmissions can be received by other countries interested. These are known as the National Synoptic Issues, and it is from the information contained in these transmissions that the weather maps are drawn and forecasts for large areas deduced.

The collection of these reports demands the

employment of a special staff of operators, and at the Air Ministry upwards of fifty transmissions, containing reports from over 500 stations, are received daily from European and adjacent countries. At the busiest hours as many as five receivers are employed simultaneously. In addition to the national synoptic reports, weather messages are taken from America. Reports from places in

Canada, the United States, and the Gulf of Mexico, combined with those transmitted by certain ships in the Atlantic Ocean, are of great importance to the British Meteorological Office, as they indicate the conditions that are likely to spread eastward and eventually affect the United Kingdom.

All the weather information, as it is received, is passed to the Meteorological Office, and from it charts are constructed showing the distribution of atmospheric pressure, temperature, wind direction and speed, and the general weather conditions. By the comparison of a chart with an earlier one the trend of the weather is established and the forecast drawn up.

The weather transmissions made by the Air Ministry consist of:—

(1) The National Synoptic reports which are broadcast by radiotelegraphy on 73.2 kcs. (4,098 metres) eight times a day, and contain observations taken by some seventy-three stations in the United Kingdom, the Faroes, Iceland, Portugal, and ships

at sea, at 0100, 0500, 0700, 1000, 1300, 1600, and 1800 hours G.M.T. The information from which these messages are compiled is received at Headquarters by telegraph, telephone, and radio.

(2) The International Collective Messages sent out four times a day, twice from the Air Ministry on 73.2 kcs. (4,098 metres) and 9,295 kcs. (32.8 metres) simultaneously, and twice from Rugby on 16.01 kcs. (18,740 metres), 19,640 kcs. (15,275 metres), and 9,220 kcs. (32.54 metres) simultaneously.

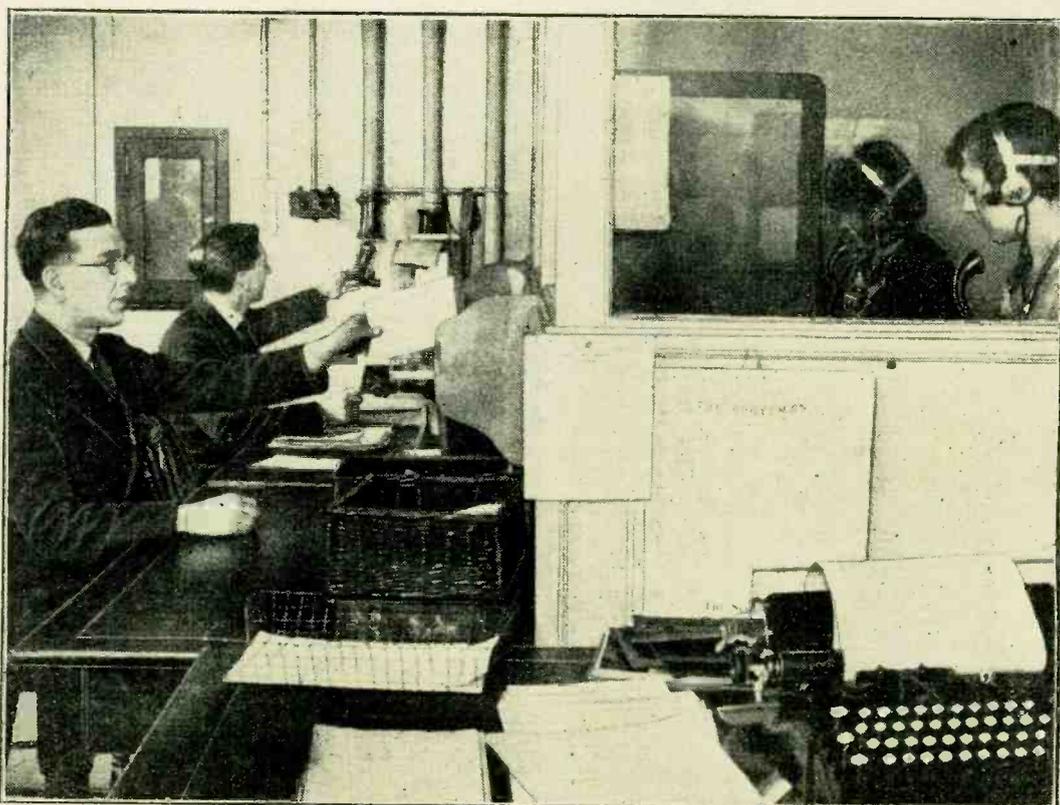
(3) The General Inference, "Weather Shipping," and Forecast messages which are transmitted by Rugby at 0910 and 2118 hours G.M.T. daily on 16.01 kcs. (18,740 metres). These messages contain a plain language statement of the main features of the weather situation in the seas adjacent to the British Isles, and forecasts of wind and visibility for twelve hours for the various areas round the coast of Great Britain. Reports in code from coastal stations are also included.

(4) Aviation weather forecasts for Great Britain and Northern Ireland broadcast in code four times a day. Two forecasts for daylight flying are transmitted at 0615 (0825 hours when Summer Time is not in force) and 1200 hours G.M.T., followed by the prospects for night-flying issued at 1530 hours G.M.T. and the transmission of a forecast for the next day at 1600 hours G.M.T. These messages are sent out on 73.2 kcs. (4,098 metres) by the Air Ministry.

All these messages are prepared for transmission at the Air Ministry W/T Station, being punched on a tape with a Creed machine. The tape is fed through circuits which are connected as requisite by land-line to Rugby or the Air Ministry's own remote high-power transmitters.

Weather News for Ships.

Most of the information contained in the shipping messages broadcast by Rugby is, of course, repeated by Daventry (5XX) for the benefit of fishing and other small vessels which are not provided with the skilled personnel or the necessary apparatus for receiving direct from Rugby. In addition, the shipping messages are also transmitted twice a day by the coast stations at Valentia, Sea-



The Meteorological Office not only receives weather bulletins but transmits them, thus co-operating in an elaborate exchange system. Air Ministry clerks are here seen compiling reports received by telephone from British stations and arranging for their retransmission by wireless for the benefit of observers abroad.

Radio and the Meteorological Service.

forth, Niton and Cullercoats on 500 kcs. (600 metres), special information being added to show the state of the weather at various places within the area served by each station. This service, combined with the issue of gale warnings—which are transmitted in plain language—from the coast stations at Wick, Humber, Niton, Fishguard, Valentia, and Malin Head, provides shipping with the means of obtaining all the meteorological data necessary for safe navigation. Liners from America, South Africa, and India commence to receive the weather shipping messages from Rugby whilst still on the high seas, whilst the trawler man out in the North Sea listens to the same message broadcast from Davenry (5XX).

A New Radio Plan.

It has been said that the accurate preparation of all this information depends upon the reception at the Air Ministry of a large number of weather reports from stations in various parts of the world. In order to reduce the amount of reception necessary to obtain the data for the weather map, a plan is in process of execution for the meteorological reports of the most important meteorological observation posts in the Northern Hemisphere to be transmitted by five high-power radio stations, each being responsible for the broadcasting of weather reports from stations in the area served by it. These radio stations have been so chosen that by the reception of a few transmissions the European meteorological centres can obtain complete weather information from America, the Atlantic Ocean, Europe, Siberia, and North Africa. Similarly, the American weather bureaux obtain reports from ships in the Atlantic and stations in Europe and Siberia. At present, five stations are employed in the network, Eiffel Tower, transmitting on both long and short waves, issues reports of West and North-West European, North African, and Eastern Atlantic conditions three times daily; while Königswüsterhausen and Hamburg, transmitting simultaneously six times daily on long and short waves respectively, broadcast information received from meteorological stations in Northern, Central, and South-East Europe. Moscow is responsible for the issue of Russian and Siberian reports, and the American and Western Atlantic data is broadcast by Annapolis. Rugby is responsible for the transmission of the European and Eastern Atlantic conditions to America. Later, another high-power radio station situated in South-Eastern Europe will be brought into the organisation.

The Continental air services from this country have their own meteorological centre at Croydon. To the data received at the Air Ministry station is added information from the aviation weather centres in France, Belgium, Holland, and Germany. A special organisation exists at Croydon for the radio reception of reports at half-hourly intervals during flying periods from these countries. Similarly the weather conditions in South-Eastern England are broadcast by Croydon at five and thirty-five minutes past each hour. The reports as received are distributed to the control tower, and so complete and up-to-date information about the weather on the air routes from England to the adjacent Continental centres is always available to pilots.

IN NEXT WEEK'S ISSUE

**Wireless World
Baby Superhet.**



Showing the four controls and speaker grille.

A SELF-CONTAINED four-valve superheterodyne with built-in moving-coil loud speaker, metal rectifier for H.T. supply from A.C. mains, and electrolytic smoothing condenser to ensure hum-free operation with a minimum of equipment. An input band-pass filter precedes the new self-neutralised pentode single-valve frequency changer, and its tuning condensers are ganged to that controlling the oscillator circuit, giving single control operation over both wavebands. A total of four tuned

**An Inexpensive 4-Valve
Superheterodyne of
Exceptional Performance.**

circuits is employed in the intermediate frequency amplifier, in which a variable-mu valve is used, and as the band-pass principle is partially adopted high selectivity is obtained with moderate sideband cutting. The grid detector is arranged to permit the connection of a gramophone pickup, and is transformer-coupled to a pentode output valve delivering some 1,500 milliwatts to the loud speaker.

Tone Correction.

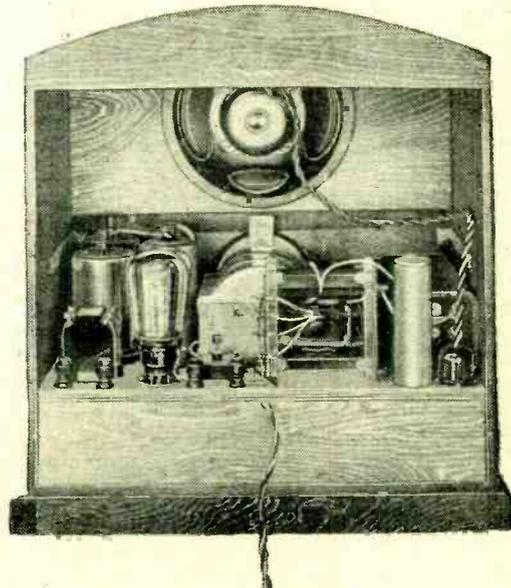
Automatic tone correction to compensate for the sideband cutting of the intermediate frequency circuits is secured in the output stage, and a high standard of quality is ensured without a sacrifice of selectivity. The sensitivity is adequate for the reception of the majority of worth-while Continental transmissions, and the number of controls has been reduced to four—the tuning control, the wave-change switch, the radio-gramophone switch, and the combined volume control and mains on-off switch.

LIST OF PARTS.

After the particular make of component used in the original model, suitable alternative products are given in some instances.

- 1 Three-gang superhet condenser (Polar "Star")
- 1 Dial (Cydon "Sector Vision" type V.D.)
- 1 Set of Coils (Colvern Type K.B.L.C. ganged, for under baseboard mounting, with 1 Type K.53.)
- 2 I.F. Transformers, 110 kc. (Wearite Type W.W.I.F.)
- 1 Wire-wound volume control, 15,000 ohms and mains switch (Wearite Type Q.V.C. and C.40)
- 1 Switch (Wearite C.40)
- 1 Mains transformer for H.T.9 rectifier with 4 volts 4 amps. C.T. secondary, and primary 200-250 volts (Junit Type W.H.T.9S)
- 1 H.T.9 rectifier (Westinghouse)
- 5 5-pin valve holders, sub-base type with terminals (Clx) (Eddystone.)
- 1 Electrolytic condenser, 8 mfd. (T.C.C. Type 802)
- 2 Fixed condensers, 4 mfd., 800-volt D.C. test (T.C.C. Type 80)
- 3 Fixed condensers, 1 mfd., 500-volt D.C. test (T.C.C. Type 65)
- 4 Fixed condenser, 2 mfd., 500-volt D.C. test (T.C.C. Type 65)
- 1 Fixed condenser, 1 mfd., 400-volt D.C. test (T.C.C. Type 50)
- 4 Fixed condensers, 0.1 mfd., 400-volt D.C. test (T.C.C. Type 50)
- 1 Fixed condenser, 0.0001 mfd. mica (T.C.C. Type 34)
- 1 Fixed condenser, 0.005 mfd. mica (T.C.C. Type 34)
- 1 Semi-fixed condenser, 0.0001/0.00001 mfd. (R.I. "Varicap No. 2")
- 1 Semi-fixed condenser, 0.002/0.0005 mfd. (R.I. "Varicap No. 8")
- 4 Ebonite Shrouded terminals, Aerial, Earth, and two Pick-up (Belling-Lee Type "B")
- 2 Metallised resistances, 1 watt, 250,000 ohms (Dubilier)
- 1 Metallised resistance, 1 watt, 50,000 ohms (Dubilier)
- 3 Metallised resistances, 1 watt, 20,000 ohms (Dubilier)
- 1 Metallised resistance, 1 watt, 15,000 ohms (Dubilier)
- 1 Metallised resistance, 1 watt, 1,000 ohms (Dubilier)
- 1 Metallised resistance, 1 watt, 500 ohms (Dubilier)
- 2 Metallised resistances, 1 watt, 250 ohms (Dubilier)
- 1 Metallised resistance, 3 watts, 25,000 ohms (Dubilier) (Claude Lyons, Ltd.)
- 1 L.F. transformer, 5:1 ratio (Varley "Nictet" D.P.22)
- 1 Valve screen, open top type (Colvern)
- 1 5-pin plug (Bulgin P.3)
- Screened sleeving (Goltone)
- (Lewcos, Harbros.)
- 1 Loud speaker, 2,500-ohm field, Pentode transformer and hum-bucking coil (Rola F.P. 2,500)
- (Magnavox Model 142.)

- 1 Cabinet (Camco "Empire")
- 1 Plymax base, 15 1/4 in. x 10 in. x 3 in.; 2 Pieces 3 in. ply wood, 9 1/4 in. x 3 in.; 1 Piece 3 in. ply wood 15 1/4 in. x 3 in.; 1 Piece 16 gauge aluminium 15 1/4 in. x 3 in. (Peto-Scott)
- Flex, tinned copper wire, screws, systollex, etc.
- Valves
- 2 Mazda AC/Pen, 1 Marconi VMS4, 1 Mullard 354V. (2 Marconi MPT4 or Osram MPT4, Osram VM84 or Mazda AC/S1VM, Mazda AC/HL or Marconi MH4 or Osram MH4.)



Rear view of the Baby Superhet. On the right can be seen the electrolytic condenser which greatly assists in smoothing.

THE DESIGN OF SINGLE-LAYER COILS.

Simplified Calculations for Close-wound Inductances.

By R. T. BEATTY, M.A., B.E., D.Sc.

LET us suppose that we have a paxolin tube of 2 inches diameter and some 28-gauge wire, double cotton covered, and that we wish to make a coil of 200 microhenrys inductance for a high-frequency tuned circuit. How many turns are required? The answer depends on the length of the coil.

If we decide on a coil one inch long, then we find from Radio Data Charts, abac 17, that 62 turns are needed. But since, even with close winding, only 40.2 turns of this particular wire can be wound in a length of one inch (see Table A), no such coil can be wound.

Let us therefore try again, making the coil 3 inches long. We now find from the abac that 87 turns are required. Hence, in order to get the length right, the turns must be spaced, for close winding would give $40.2 \times 3 = 121$ turns.

Making the Chart.

By repeated trials we could, of course, find the turns and corresponding length so that close winding would give the correct result. But it is preferable to have a chart which gives the answer directly, and such a chart is given in this article.

The basic formula from which the chart has been constructed is $L = SD^2n^2$, where $L =$ microhenrys,

$D =$ diameter of coil in inches,*

$n =$ turns per inch,

$S =$ shape factor depending on ratio of length to diameter of coil.

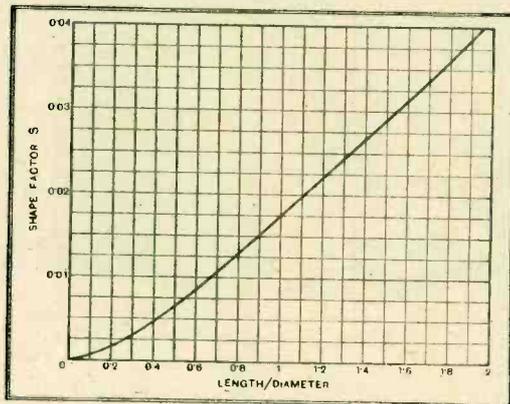
The first operation, as shown in the

TABLE A.

Standard Wire Gauge.	Turns per inch.			
	Enamel.	Double Cotton.	Single Silk.	Double Silk.
20	26.1	21.7	26.3	25.3
21	29.4	23.8	29.4	28.2
22	33.3	26.3	33.3	31.8
23	38.8	29.4	38.5	36.4
24	42.1	31.3	42.1	40.0
25	46.0	33.3	46.0	43.5
26	50.6	35.7	50.6	47.6
27	55.9	37.9	55.1	51.6
28	61.4	40.2	60.4	56.2
29	66.2	42.4	65.2	60.2
30	73.3	44.7	72.0	67.1
31	77.8	46.3	76.3	70.9
32	83.0	50.5	81.3	75.2
33	88.9	52.6	87.0	80.0
34	98.0	54.9	93.4	85.5
35	106	61.0	101	91.8
36	116	64.1	110	102
37	128	67.6	121	110
38	143	71.4	133	121
39	168	75.8	149	134
40	180	78.1	159	142

* Diameter of coil = diameter of former + diameter of wire.

skeleton inset, divides L by D^2 . Then on returning from right to left we divide by n^2 , thus obtaining the shape factor S . Actually no scale of S appears on the chart, but it was placed there temporarily when the chart was being constructed, and by joining corresponding values of S and



Curve giving length/diameter of coil and shape factor S . This assists in the construction of the abac shown on the next page.

length/diameter a set of lines was obtained from which a curve was drawn to touch all the lines. Accordingly the third operation is to draw a line touching this curve and

TABLE B.

Standard Wire Gauge.	Diameter in thousandths of an inch.			
	Enamel.	Double Cotton.	Single Silk.	Double Silk.
20	38	46	38	39
21	34	42	34	35
22	30	38	30	31
23	26	34	26	27
24	24	32	24	25
25	22	30	22	23
26	20	28	20	21
27	18	26	18	19
28	16	25	17	18
29	15	24	15	17
30	14	22	14	15
31	13	22	13	14
32	12	20	12	13
33	11	19	11	12
34	10	18	11	12
35	9	16	10	11
36	9	16	9	10
37	8	15	8	9
38	7	14	7	8
39	6	13	7	7
40	6	13	6	7

giving the required value of length/diameter. Then total turns = length/diameter \times diameter \times turns per inch.

Example.

A zin. former of circular section is available, and a reel of 30-gauge enamelled wire. How many turns are required to produce a coil of inductance 755 microhenrys?

Table B shows that the diameter of this wire is 0.014 inch, while Table A gives 73.3 turns per inch corresponding to close winding. Hence

Inductance = 755 microhenrys,

Coil diameter = 2.014 inches,

Turns/inch = 73.3.

Accordingly we find from the chart that length/diameter = 0.99.

Hence total turns = $0.99 \times 2.014 \times 73.3 = 146$.

NEW "ETA" S.G. VALVE

THE range of "ETA" valves, distributed by the Electrical Trading Association, Ltd., Aldwych House, Aldwych, London, W.C.2, has been augmented recently by the addition of a new indirectly heated screen-grid valve for A.C. operation, and styled the D.W.7. Its nominal characteristics are:—

A.C. resistance 200,000 ohms,

Amplification factor 600,

Mutual conductance 3 mA/V,

when measured with 100 volts on the anode, 75 volts on the screen and zero grid bias.

The heater requires 4 volts at 1 amp., and under normal conditions it operates with 200 volts on the anode, 80 volts on the screen, and a grid bias of between -1.5 and -3 volts; the average anode current being of the order of 5 mA.

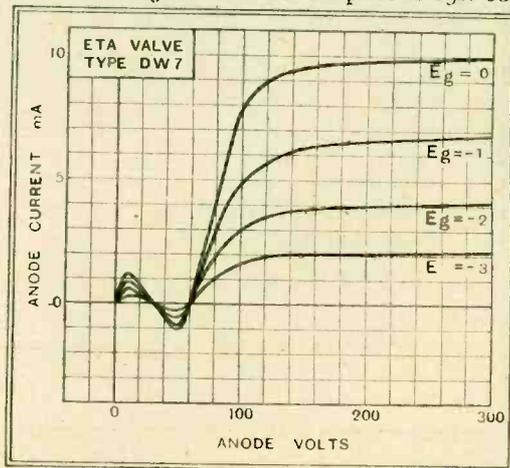
Tested in a typical three-valve receiver fitted with one H.F. stage and a tuned-grid circuit the valve gave exceptionally good results, and in view of its high amplification the precaution was taken of enclosing it in a metal screen.

A slight reduction of the screen voltage may be necessary in certain cases to obtain perfect stability at the lower end of the medium wave-band, and if a potentiometer is used for this purpose it will serve, also, as a volume control. Incidentally, volume can be controlled satisfactorily by over-biasing the valve, using a variable resistance in series with a 500-ohm fixed resistance to provide the optimum grid bias when the control is set to the position for maximum volume.

The anode-to-grid capacity of the valve is given as 0.005 mmfd. and the price is 15s. 6d.

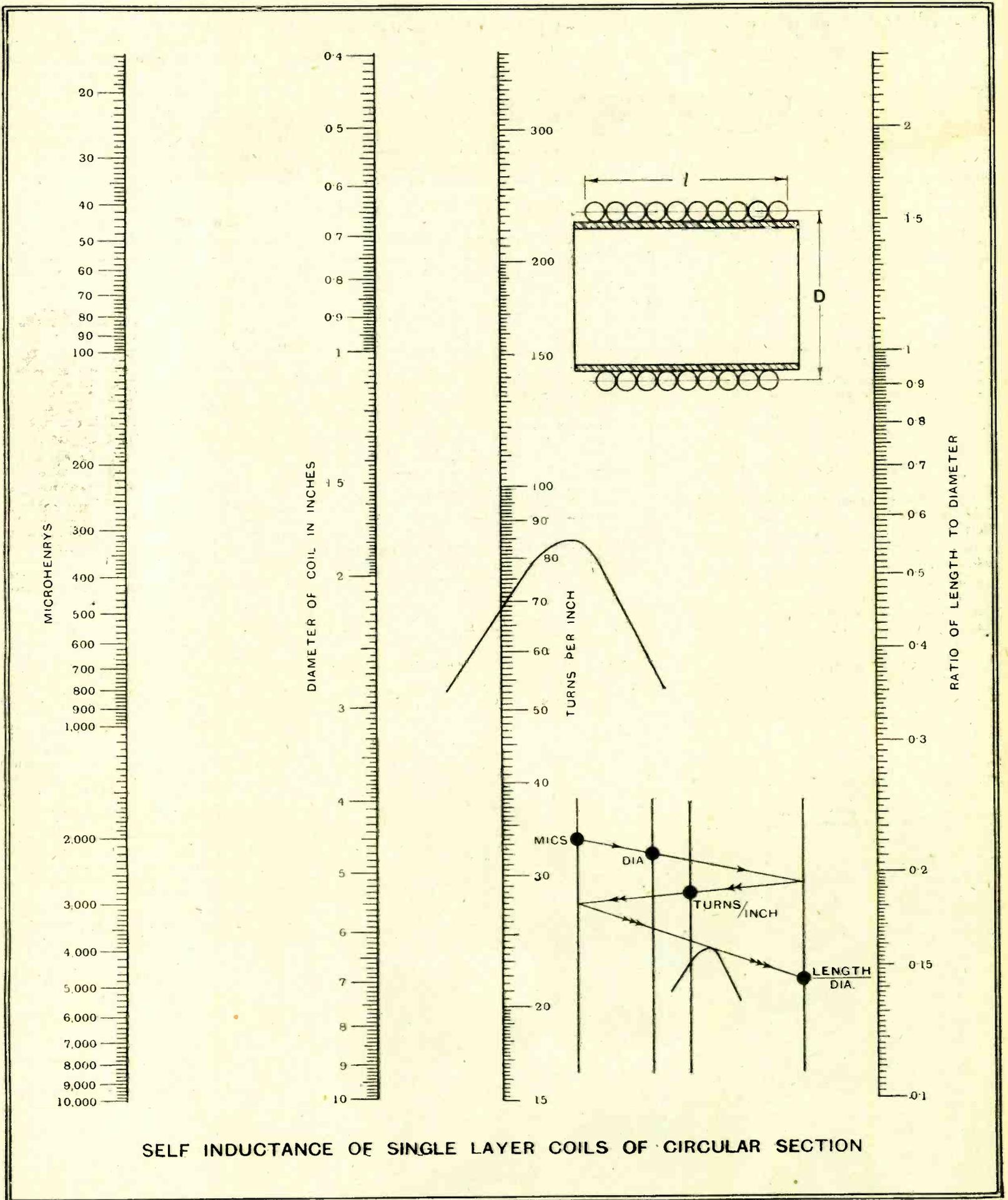


New "ETA" indirectly heated screen grid valve, Type D.W.7.



Anode current-anode voltage curves of "ETA" D.W.7 indirectly heated screen-grid valve.

CHART FOR CLOSE-WOUND TUNING COILS



SELF INDUCTANCE OF SINGLE LAYER COILS OF CIRCULAR SECTION

This time-saving abac gives the necessary data for winding tuning coils of any inductance and diameter having turns touching.

THE VARLEY SQUARE PEAK 3.

A Three-Valve A.C. Transportable.



A WIRELESS receiver is no longer accepted solely upon the grounds of its electrical performance, for it has come to be regarded, if not as an article of furniture, at least as an object whose appearance must harmonise with the furnishing of the room in which it is to be used. Where so many sets of good performance, and of an approximately equal price, are available, therefore, the final choice often rests largely upon their appearance.

The designers of the Varley Square Peak 3 are to be congratulated in having secured a high electrical efficiency with a most pleasing appearance for the complete apparatus. The cabinet work is of good quality and exceptionally well finished, and the walnut shade adopted tones well with almost any furnishing scheme. The overall dimensions, moreover, are small enough to allow of the set being unobtrusive in even the smallest of modern rooms. The receiver is completely self-contained, and requires only an aerial, earth, and a mains point for its operation; it is readily transportable, for it is fitted with a disappearing carrying handle, and so can be moved from room to room at a moment's notice.

An examination of the receiver reveals the closest attention to detail throughout the design. Not only is there a disappearing carrying handle, but fitted to the rear of the cabinet are clips over which the mains flex can be wound when the set is not in use. An unusual point is also to be found in the means for connecting an external loud speaker, for this is not arranged merely for use as well as the internal speaker, but can be employed as a true alternative if desired. Thus either the internal or the external speaker may be used alone, or both together, for the internal speaker circuit can be broken by the movement of a switch.

The Circuit.

The circuit diagram shows that the three receiving valves are employed in the popular combination of a screen-grid H.F. amplifier, a power-grid detector, and a pentode output stage, while a fourth valve is used to rectify the alternating mains current for the H.T. supply. Every circuit is thoroughly decoupled, and the field winding of the

moving-coil speaker acts as a smoothing choke, and thereby derives its energisation. In all cases the grid bias is obtained by the well-tried method of including resistances in the valve cathode leads, and the screen voltage of the H.F. valve is obtained from a potentiometer, which serves also to maintain a load on the mains equipment while the valves are warming up.

The H.F. valve is preceded by two tuned circuits dual-capacity coupled to form a constant peak separation band-pass filter; this dual-capacity coupling, of course, takes the form of a common high-capacity condenser

The detector is transformer-coupled to the pentode output valve, which is, in turn, transformer-coupled to the moving-coil loud speaker, and is provided with the usual compensating circuit. The mains equipment follows standard practice, and the speaker field is used as a smoothing choke in conjunction with high-capacity electrolytic condensers. Fuses are provided in the mains circuits.

Results.

On test, the sensitivity proved adequate for all normal purposes, and good reception of Langenberg was possible in daylight without unduly forcing reaction. The sensitivity, moreover, was well maintained over the whole of both wavebands. At a distance of nine miles from Brookmans Park the selectivity was sufficient to allow of interference-free reception of stations on wavelengths higher than that of the Midland Regional, and lower than that of Fécamp. Between these two points the London transmitters were inclined to blanket the weaker foreign stations, but no trace of mutual interference between the London stations themselves could be found. On the long waveband practically every station was available with the exception of Königs-wusterhausen, which is in the unfortunate position of being sandwiched between Daventry National and Radio Paris.

The quality of reproduction is well balanced, and the bass is well reproduced considering the small baffle area of the cabinet. Excellent volume is obtainable, and the speaker fitted is evidently of a sensitive type. Mains hum can be heard during intervals in the transmission, but is not noticeable during modulation.

FEATURES.

General.—Self-contained three-valve set with built-in moving-coil loud speaker, and provision for additional or alternative use of external speaker. For 200 to 250 volts A.C. mains.

Circuit.—Screen-grid H.F. stage preceded by constant peak separation band-pass filter, and tuned grid coupling to power-grid detector with reaction. Provision for gramophone pick-up to be connected to the detector, which is transformer coupled to the pentode output valve delivering some 2,000 milliwatts to the speaker. H.T. supply by valve rectifier with speaker field acting as smoothing choke.

Controls.—(1) Single-knob tuning with station calibrated and illuminated scale. (2) Wave-range switch. (3) Reaction. (4) Volume control by variable resistance between aerial and earth. (5) Mains on-off switch. (6) Switch for breaking internal speaker circuit.

Price.—17 guineas.

Makers.—Varley Ltd., Kingsway House, Kingsway, W.C.2.

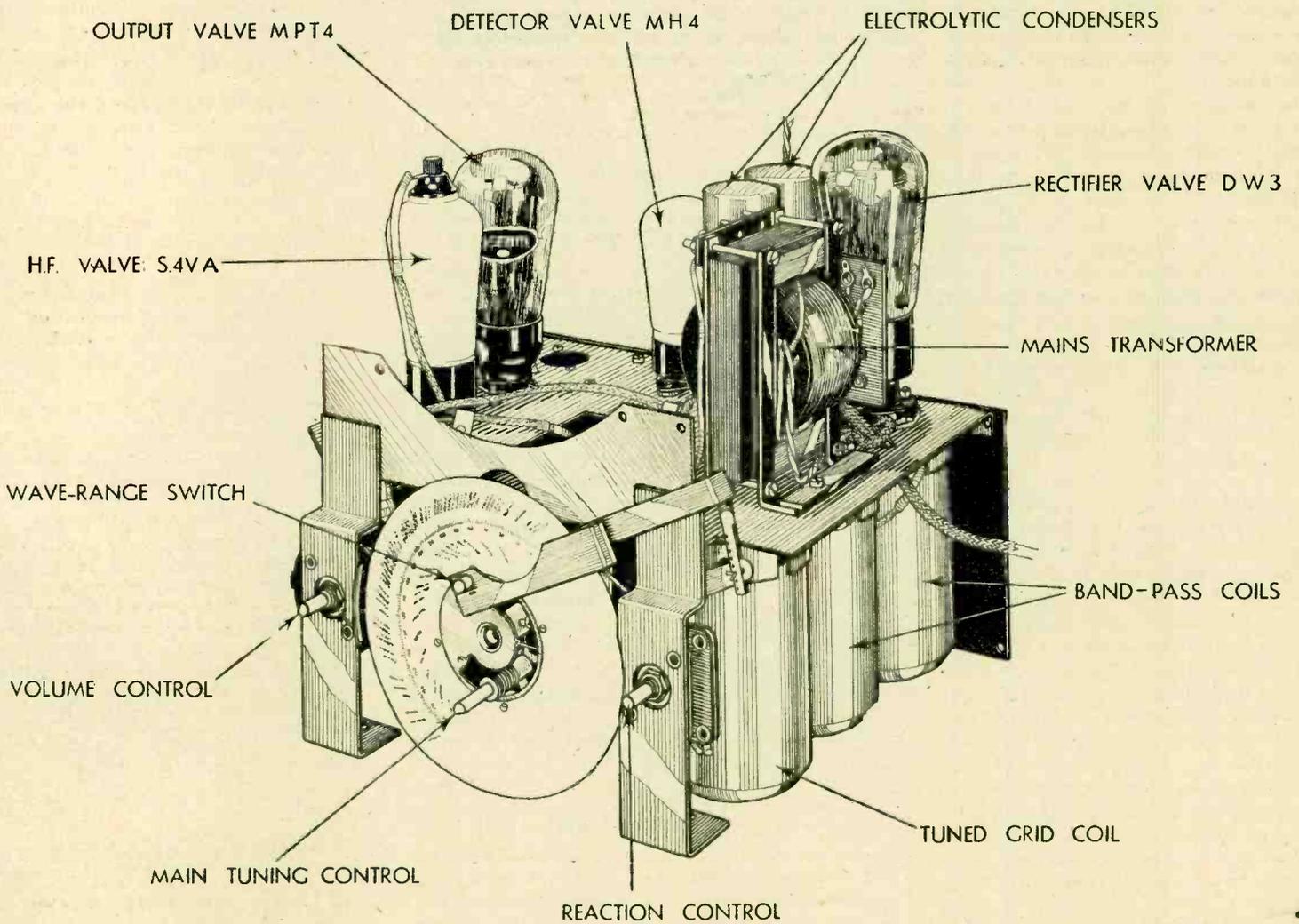
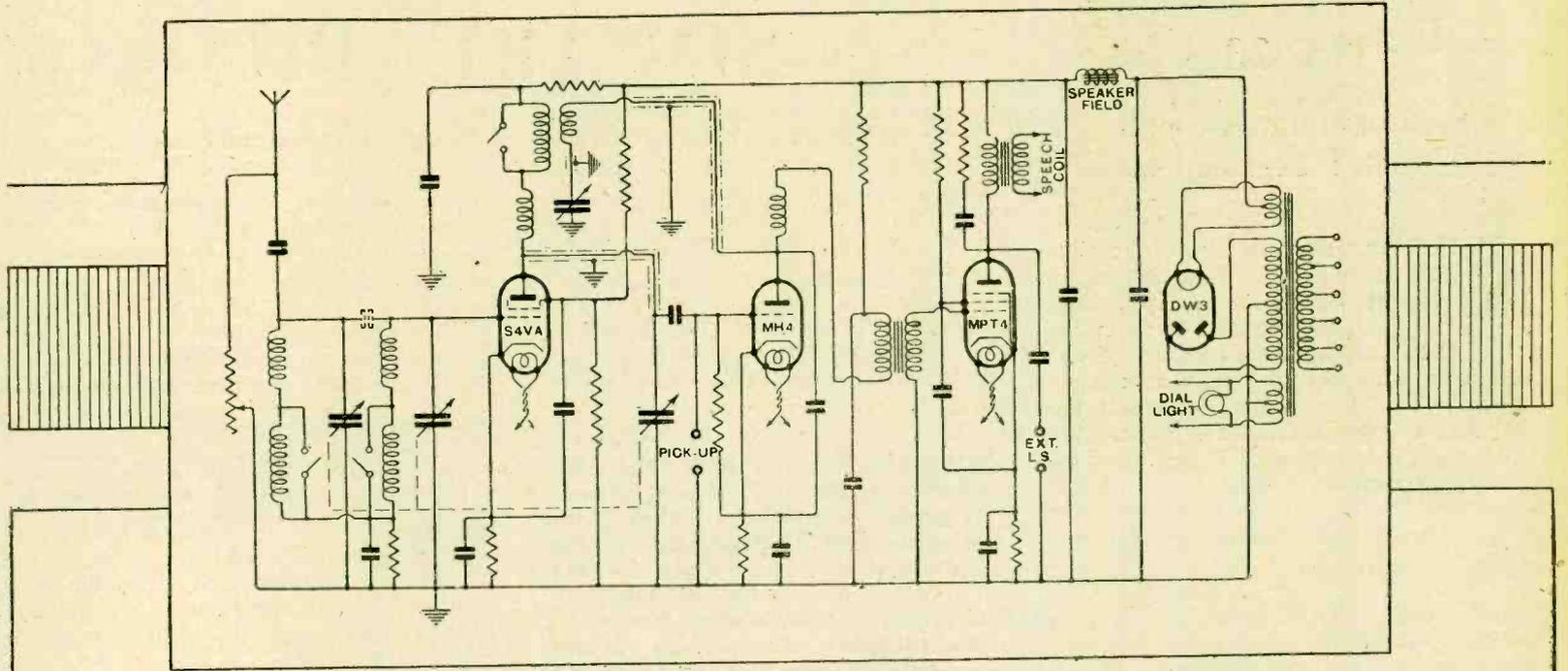
at the low-potential ends of the circuits, and a very small coupling capacity at the high-potential ends. The aerial is coupled to the primary filter coil through a small-capacity condenser, and a variable resistance connected between the aerial and earth terminals acts as a pre-H.F. volume control to avoid overloading and distortion on strong signals.

These circuits are tuned by two sections of the three-gang condenser, the third of which tunes the tuned-grid intervalve coupling. Reaction is provided from the anode circuit of the detector, and it is interesting to note that straight reaction is preferred to differential. Each tuned circuit is individually screened with built-in wave-range switches which are linked together and operated by an ingenious series of levers by the movement of the tuning-dial escutcheon. This is a most unusual method, and one which has much to commend it. The escutcheon slides vertically and operates the wave-change switch; at the same time, however, different surfaces on the illuminated wavelength scale are exposed for the two wavebands. There is thus no possibility of error arising as to the waveband actually in use.



Showing the compactness and clean layout of the receiver.

CIRCUIT AND CHASSIS DETAILS OF THE VARLEY SQUARE PEAK THREE.



The complete receiver chassis, showing the principal components.

WIRELESS ENCYCLOPEDIA

No. 23

Brief Definitions with Expanded Explanations.

KIRCHHOFF'S two laws of the electric circuit come next in importance to Ohm's law; in fact, taken together, they amount to an extension of Ohm's law to more complicated circuits with branches and internal electromotive forces. Ohm's law states that the current in a simple resistance is proportional to the applied or impressed E.M.F., and inversely proportional to the value of the resistance. If E is the electromotive force in volts applied to a resistance of R ohms, the current is given by $I = \frac{E}{R}$ amperes.

Now, when a circuit is divided up into branches and closed loops, themselves containing internal electromotive forces, Ohm's law is not sufficient to enable the circuit to be solved—that is, to enable the currents in the various parts to be calculated. In the first place, it is essential to know the conditions existing at a point where currents divide and meet at a junction of wires or conductors in a circuit. This information is given by Kirchhoff's first law, which states that the algebraic sum of all currents meeting at a point is zero. This means that, taking currents approaching the junction as positive and those leaving as negative, the total sum is zero; in other words, the sum of all currents approaching the junction is equal to the sum of the currents leaving.

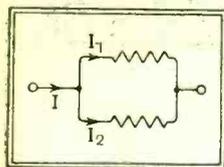


Fig. 1.—Application of Kirchhoff's first law to a simple divided circuit. $I - I_1 - I_2 = 0$ or $I = I_1 + I_2$.

The simplest example is that in which a circuit divides into two branches, as in Fig. 1. If I is the total current flowing to and from the circuit, and I_1 and I_2 are the currents in the branches, then $I - I_1 - I_2 = 0$, or $I = I_1 + I_2$. This rule is so simple that it is usually taken for granted, and applied without question of its verity.

The second law relates to any closed loop in a circuit where currents are flowing and where electromotive forces are acting within the loop itself. The second of Kirchhoff's laws is not quite so simple as the first either in its wording or its application. But it applies equally well to the case where the loop concerned comprises the whole circuit as to the more general case where the loop forms one part of a more complex circuit. So, in explanation, the simplest possible single loop circuit will be taken as a first example, the circuit referred to consisting merely of a resistance R ohms connected across a battery whose electromotive force is E volts and whose internal resistance is r ohms, as shown in Fig. 2(a).

In this case there is only one E.M.F.

acting round the loop, and there are no branch circuits. If I is the current, then, according to the second law, the E.M.F. is equal to the sum of the products of current and resistance in each part of the circuit, namely $E = IR + Ir$. Since the circuit is a simple one without branches, Ohm's law can be applied in the ordinary way, namely, $I = \frac{E}{R+r}$ amps, where $R+r$ is the total resistance of the loop. It will be seen that this equation is the same as the previous one, being merely transposed into a different form.

KIRCHHOFF'S LAWS (of the electric circuit). Two laws of fundamental importance relating to currents and electromotive forces in an electric circuit. They are: (1) The algebraic sum of all currents meeting at a junction of a number of conductors is zero; (2) In any closed loop forming the whole or part of a circuit, the algebraic sum of all the electromotive forces acting round that loop is equal to the algebraic sum of the products of current and resistance in each part of the loop.

Now let us consider another single loop, but this time containing more than one E.M.F., as in Fig. 2 (b). Electromotive forces acting in a clockwise direction round the loop are taken as positive, whereas those in the reverse direction must be considered negative (or vice versa). So in this case the resultant clockwise E.M.F. is $E_1 - E_2 + E_3$. If R_1 and R_2 are the only two resistances in the loop and I is the current, we have, according to Kirchhoff's second law:

$$E_1 - E_2 + E_3 = IR_1 + IR_2$$

Each term on the left is an electromotive force or electrical driving force, whereas each term on the right is a potential drop due to resistance.

Two Laws.

In a circuit of a more general character, having branches and internal loops, it is necessary to use both the first and second of Kirchhoff's two laws. The first is involved

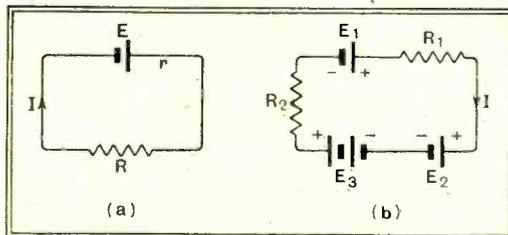


Fig. 2.—Two single loop circuits in which the current can be found by Kirchhoff's second law. In each case the resultant E.M.F. acting round the circuit is equal to the total "resistance drop."

at each junction of three or more conductors, and the second can be applied to every closed loop in the circuit. For instance, in the circuit of Fig. 3, if I_1 , I_2 , and I_3 are the

current values in the various parts as shown, we know from the first law that $I_1 = I_2 + I_3$ amperes; and, applying the second law to the two loop circuits A and B, one obtains the equations $E_1 = I_1 R_1 + I_3 R_3$, and $E_2 = I_2 R_2 - I_3 R_3$ respectively, taking the clockwise-direction as positive in each case. By writing in the numerical values of the resistances and E.M.F.s, and combining the three last equations, the numerical values of I_1 ,

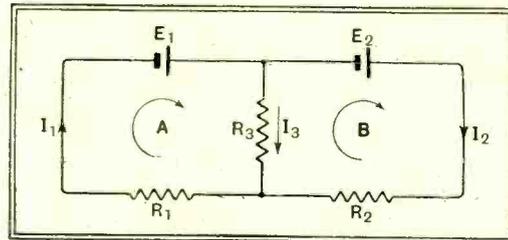


Fig. 3.—A more complex circuit the solution of which involves both the first and second laws. The circular arrows indicate directions taken as positive.

I_2 , and I_3 can be found. If I_3 is found to be negative, it simply means that the direction of I_3 is opposite to that initially assumed.

It should be realised that in a circuit like that of Fig. 3 Ohm's law cannot be applied to find the currents in loops A and B because the resistance R_3 is common to both loops.

The Wireless World INFORMATION BUREAU.

Conditions of the Service.

(1) THE service is intended primarily for readers meeting with difficulties in the construction, adjustment, operation, or maintenance of wireless receivers described in *The Wireless World*, or those of commercial design which from time to time are reviewed in the pages of *The Wireless World*. Every endeavour will be made to deal with queries on all wireless matters, provided that they are of such a nature that they can be dealt with satisfactorily in a letter.

(2) Communications should be addressed to *The Wireless World* Information Bureau, Dorset House, Tudor Street, E.C.4, and must be accompanied by a remittance of 5s. to cover the cost of the service. The enquirer's name and address should be written in block letters at the top of all communications.

(3) The fee of 5s. covers the reply to any wireless technical difficulty, but in special cases, where the enquiry may involve a considerable amount of investigation, an increased fee may be necessary. In such cases a special quotation will be made.

(4) Questions should be clearly written and concisely worded in order to avoid delay. Where enquiries relate to trouble experienced in receivers built to specifications in *The Wireless World* a complete account should be given of the trouble, and especially the symptoms.

(5) Where reference is made to published articles or descriptions of apparatus, the title of the article, the date of publication in *The Wireless World*, and the page reference number should be given, in order to facilitate reply.

(6) Full circuit diagrams, constructional details of apparatus, or values of components for home-designed receivers cannot normally be supplied, but circuit diagrams sent in with queries will be checked and criticised.

(7) Particular makes of components cannot, in general, be recommended, but advice will be given as to the suitability of an individual component for a particular purpose specified by the enquirer.

Practical HINTS and TIPS.

TO make a neat joint in a telephone cord or loud speaker lead is not an easy matter. The best cords frequently have copper tinsel for the conducting strands, sometimes interwoven with cotton or silk threads, and soldering is quite unsuitable in such cases. The following method has been found to make a neat and permanent joint which is adequate both electrically

**Jointing
Tinsel
Leads.**

and mechanically. The braided outer covering is first slid back and the twin leads freed for two or three inches. One of each pair is then shortened by about an inch and a half. About half an inch of each lead is then bared down to the copper wires or tinsel. This stage is shown in Fig. 1 (a). The bared conductors are then bound to each other and to the adjacent leads as shown in diagram (b). A thin bare copper wire should be used for this purpose—about No. 40, for instance. If this is not available, a single copper strand from a piece of ordinary flex is quite suitable. When each connection has been bound in this way, the braided outer cover can be slid back over the joins as in Fig. 1 (c). Finally, a single-layer binding can be made, covering the cord to about half an inch beyond each join (diagram (d)). This binding can be made with a stout linen or silk thread—or the braided covering from a piece of flex is also very suitable and takes less time to put on.

Incidentally, the following is a simple method of making a very neat self-locking binding of this kind. The binding material is looped back along the object to be bound, and the binding is then made with the free end. This end is threaded through the loop

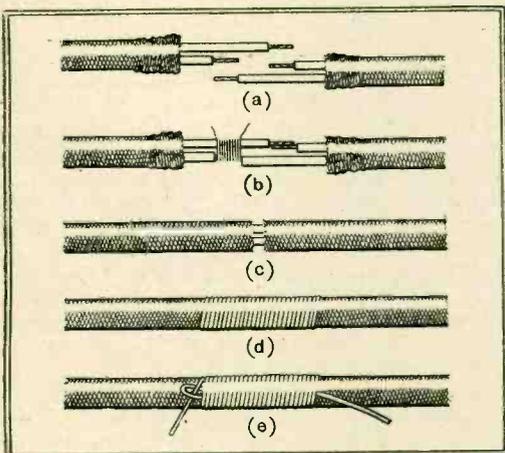


Fig. 1.—Repairing telephone or loud speaker leads; these usually embody tinsel conductors, which cannot be joined satisfactorily by soldering.

as in diagram (e). A pull on the other end of the binding thread will now close up the loop. It is usually advisable to pull the loop, with the free end caught in it, under the last few turns of the binding. Finally, both ends of the thread can be cut off close to the binding, which is now securely locked.

AIDS TO BETTER RECEPTION.

EVEN the beginner nowadays is apt to consider, rightly enough, that the construction of an all-mains set is by no means beyond his legitimate scope. These sets are now just as easy to get into a state of satisfactory operation as are battery receivers, and all that the constructor need remember is that he will probably be dealing with fairly high voltages, which

**Don't
Earth the
Mains.**

should be treated with a certain amount of respect. Further, it should perhaps be emphasised that he is under an obligation to the Supply Company (and, in a roundabout way, to other wireless users) to take care that neither of the mains leads shall be earthed, either directly or even through a resistance of high value. In certain circumstances, quite a small leakage is apt to be embarrassing to the Company's engineers, and if the number of such leakages reaches considerable proportions restrictive rules, regulations, and even legislation, are bound to follow.

Care should be taken that the fixed condenser commonly inserted in the earth lead of a D.C. receiver is beyond suspicion; it should preferably be rated to work at twice the mains voltage. Special care should also be taken to see that the general insulation between mains and earth is of a high order.

AT this time of year quite a number of portables—and many of them, it is feared, of out-of-date design—are again put into commission on the occasion of their owners' holidays. Not a few of these sets are incapable of covering the present broadcast wave-band, and some of them are incapable of being tuned in stations operating in the region of 250 metres.

**The
Holiday
Set.**

It is the purpose of this note to point out that the lower limit of the tuning range may often be extended in a very satisfactory manner, without the need for disconnecting any wires internally, simply by wiring a tuning coil across the frame aerial winding. By this procedure, the inductance of the built-in frame is reduced, as two inductances in parallel must always have a lower value than either used singly.

Any commercial coil of suitable inductance will do well for a shunt; one of the plug-in variety with from 75 to 100 turns will generally meet the case, and is convenient to use, as it may be withdrawn in a moment when not required.

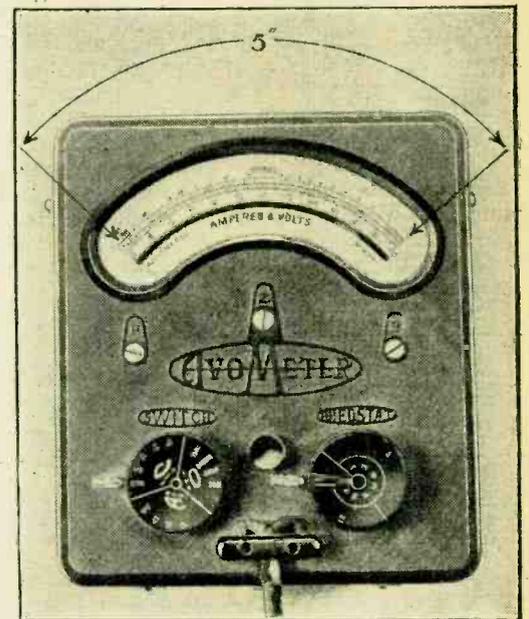
All this applies particularly to sets with aperiodic H.F. amplifiers, and it may be added that, by reducing the effective inductance of the frame, apparent selectivity is sometimes increased at low wavelengths.

EVERYONE knows that it would be ridiculous to choose, say, a meter rated at 0.100 milliamps. when it is anticipated that the current to be measured will be in the order of 1 or 2 milliamps. When extreme accuracy is needed, one takes a meter of which the maximum scale reading is only slightly in excess of the current—or voltage, for that matter—to be

**Meter
Sensitivity.**

measured. Without a veritable array of meters, this ideal can seldom be realised.

Although the need for extreme quantitative accuracy seldom arises in ordinary wireless work, the ability to appreciate small



The scale length of a measuring instrument has an important bearing on the accuracy with which readings may be taken.

changes is often valuable. This applies particularly to a detector anode current meter, which is certainly one of the most valuable instruments the experimenter can possess. Here changes in current are particularly informative, and precise quantitative measurements are seldom important.

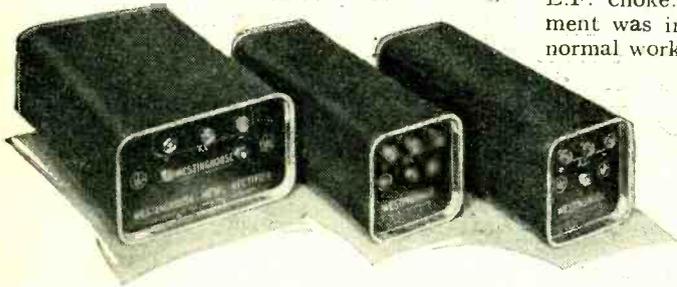
It is not always appreciated that, from the point of view of sensitivity, the length of a meter scale is just as important as its range. Put another way, it should be remembered that accurate readings can be made, and that small changes can be appreciated, equally well with a meter having a short scale and a limited range, as with one having a greater range and a longer scale.

As an example of this, we may take the combination instrument shown in the accompanying illustration; its lowest current range is 0.12 milliamps., but the scale is approximately 5 in. long; consequently, all other things being equal, current readings may be taken just as accurately as with a milliammeter having twice the sensitivity (0.6 milliamps.) but with a 2½ in. scale.

LABORATORY TESTS

NEW WESTINGHOUSE H.T. RECTIFIERS.

THE Westinghouse Brake and Saxby Signal Co., Ltd., 82, York Road, King's Cross, London, N.1, have now extended their range of H.T. rectifiers by the addition of three new models styled the H.T.9, H.T.10, and H.T.11, respectively. These are intended to be operated in a voltage-doubling circuit, which arrangement gives full-wave rectification with a single secondary winding on the mains transformer. The A.C. voltage supplied by this winding is



The new Westinghouse rectifiers, models H.T.9, H.T.10, and H.T.11.

a little more than half that of the rectified output from the rectifier, and so precludes the need for mains transformers giving very high secondary voltages.

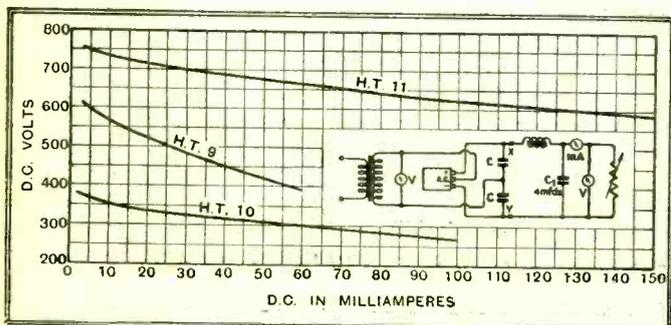
The H.T.9 model is rated to give a D.C. output after smoothing of 300 volts at the maximum load of 60 mA., with an A.C. input of 240 volts. The reservoir condensers, marked C in the diagram, each have a capacity of 4 mfd.

NEW WESTINGHOUSE H.T. RECTIFIERS.

Model.	A.C. Input.	Rated D.C. Output. (Smoothed).		Reservoir Condensers (C)		Working D.C. Voltage Filter Condenser (C ₁).
		Volts.	mA.	Cap. mfd.	Working A.C. Voltage.	
H.T.9	240 volts (200 mA.)	300	60	4	250	500
H.T.10	150 volts (550 mA.)	200	100	8	200	400
H.T.11	300 volts (550 mA.)	500	150	8	400	800

The H.T.10 rectifier, however, operates with a lower input, requiring 150 volts A.C. only, but it will give 100 mA. of D.C. on full load at about 200 volts after smoothing. In this case the reservoir condensers must have a capacity of 8 mfd. each.

Hitherto the only Westinghouse rectifier capable of giving a high output voltage at a relatively heavy load was the model H.T.2. This was bridge-connected and somewhat bulky, but otherwise a most satisfactory unit. The new model H.T.11 now replaces this unit, for it has a rated output of about 500 volts at 150 mA. and operates in a voltage-doubling circuit using two 8 mfd. reservoir condensers. The A.C. input is 300 volts.



Regulation curves of new Westinghouse rectifiers, models H.T.9, H.T.10 and H.T.11, with constant input voltage and measured before smoothing.

ON NEW RADIO PRODUCTS.

For easy reference the essential data relating to these three new models is given in tabulated form.

Tests made with specimens of each new rectifier show that the makers rating is very conservative in every case, even though allowance be made for the voltage dropped in the L.F. choke. Although the smoothing equipment was included in the circuit to simulate normal working conditions the curves show the unsmoothed D.C. voltage across X and Y, correction having been made for the volts lost in the choke.

It was felt that this information would prove the more useful, for there are so many suitable smoothing chokes on the market and their D.C. resistance varies between quite wide limits. Knowing the D.C. resistance of the choke to be used correction

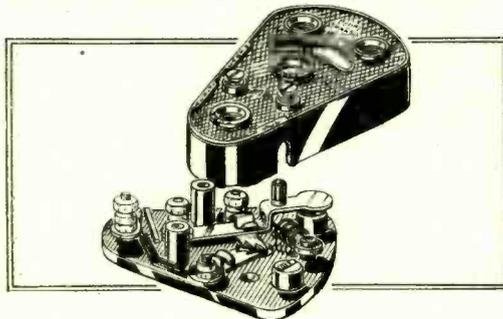
can easily be made to the output figures.

In each case the A.C. voltage was maintained at the correct value for the particular rectifier, thus these curves show the true characteristics of the unit and not the combined regulation of rectifier and transformer. A well-made mains transformer has a good regulation and the full load output should not be more than 5 or 7 per cent. lower than the initial voltage on light load.

With these additions, the Westinghouse range of metal rectifiers now includes a model suitable for every requirement, and the prices are very reasonable, being 21s. for H.T.9 and H.T.10, and 35s. for the H.T.11.

BULGIN LIGHTNING SWITCH.

IN these latitudes we are not often visited by severe electrical storms, nevertheless it is hardly wise to ignore their potential dangers



Bulgin lightning switch, incorporating safety fuse and spark gap.

when an outdoor aerial is used, especially when adequate protection can be provided by fitting an inexpensive device for safeguarding the radio receiver and avoiding possibly more serious consequences.

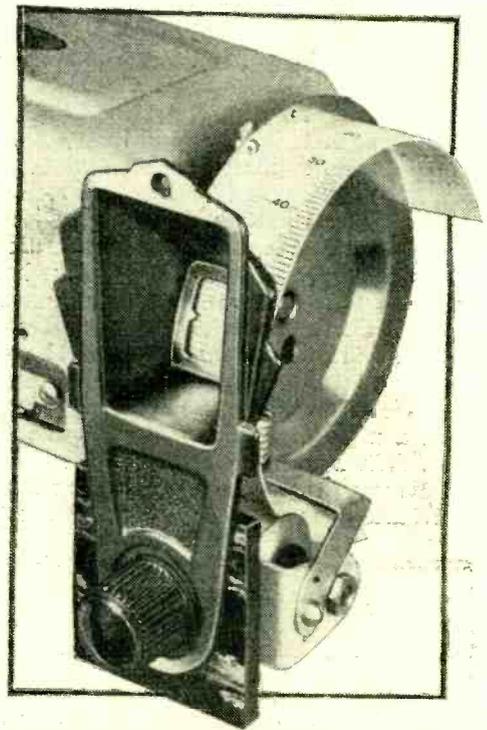
Of the many protective devices now available few are so compact, or embody so many distinctive features, as the new Bulgin lightning switch. So far as we are aware, this model is the only one of its kind having a quick make-and-break action and, in addition, incorporating a safety fuse as well as a spark gap.

The switch arm, which is spring loaded, moves from the "on" to the "off" position

with a reassuring snap action and is held securely in either position by the tension of the spring.

A useful feature is the rather novel method of indicating whether the aerial is to earth or joined through to the receiver. The moving arm of the switch is made slightly longer than really necessary and the free end, which is in the shape of a disc, discloses the engraving "on" or "off" as the case may be. "On" indicates the aerial is free, while the "off" serves as a reminder that the aerial is earthed.

The switch mechanism is totally enclosed in a



British Radiophone slow-motion drum dial fitted to a three-gang condenser.

bakelite case provided with apertures through which protrude the knob and for examining the spark gap, fuse and indicators.

Made by A. F. Bulgin and Co., Ltd., Abbey Road, Barking, Essex, this most useful accessory costs a modest 2s. 6d.

BRITISH RADIOPHONE DRUM DRIVE.

MADE by British Radiophone, Ltd., Aldwych House, Aldwych, London, W.C.2, this slow-motion drum drive has been designed especially for use with the gang condensers made by this firm. It is exceptionally robust and well made, and will drive the four-gang model without the slightest trace of slip.

The reduction ratio, which is 16:1, is happily chosen, for it affords perfect control even of superheterodyne receivers, where accurate adjustment is essential, but it is not too tedious to operate when exploring the ether for distant stations.

A translucent ivorine scale, divided into 100 divisions, is fitted, and a small lamp bracket is provided for illuminating the dial.

Escutcheon plates finished either in oxidised silver or in Florentine bronze, with black or brown knobs to match are available, and the aperture is so designed that it affords perfect vision of the illuminated scale from various angles.

The dial is quite easy to fit, provided the various parts are assembled in the correct sequence, but no difficulty will be experienced if the instructions given in the accompanying leaflet are followed. The price of this dial is 8s. 6d.

BROADCAST

By Our Special Correspondent.

BREVITIES

The New "Empire Department."

FOR two reasons the appointment of Mr. C. G. Graves as director of the "Empire Department" of the B.B.C. is of special interest. In the first place Mr. Graves' translation from the post of Assistant Director of Programmes will involve a little earthquake among the B.B.C. staff, leading to some well-deserved promotions. For instance, when the smoke clears we shall probably behold Adrian Boult as an Assistant Controller, the musical side of programme building having at last come into its own.

Several hard workers in the provinces will also obtain recognition long overdue.

An Experienced Chief.

Secondly, the new move establishes Empire broadcasting on a firm basis. In Mr. Graves the listeners of the Dominions and Colonies will find a keen and sympathetic guardian of their interests with experience in practical programme building. For more than five years he has been Mr. Roger Eckersley's right-hand man. He is a nephew of Viscount Grey of Falloden.

Operatic Developments at Broadcasting House.

ONE of the more important staff changes at Broadcasting House will be the transfer of a leading member from the Vaudeville to the Music Department for the production of studio opera.

It is a surprisingly long time since the B.B.C. gave us a series of operas specially adapted for broadcasting. The reason is not far to seek. In its original state the average opera is as unwieldy an art form as could well be imagined. The work of whittling it down and eliminating absurdities in the libretto which pass muster on the stage but never in the studio calls for the patience of Job and the energy of a Titan.

A German Offer.

For some time the German broadcasting authorities have been concentrating on the task and have now produced a library of nearly seventy operas in specially shortened versions suitable for the microphone. I understand that

the whole collection has been generously placed at the disposal of the B.B.C., with the result that next winter British listeners will be able to enjoy a season of fireside opera on a scale never attempted before.

Each opera will occupy from an hour to an hour and a half.

Scottish National Tests.

BY the time that the Edinburgh Radio Show is opened, i.e., October 12th, both B.B.C. transmitters at Falkirk should be giving a full-time service. Scottish National will probably begin the first public tests on August 22nd.

A One-Armed Pianist.

A POIGNANT item in the Promenade Concert on Tuesday next, August 16th, to be broadcast Regionally, is Ravel's Pianoforte Concerto for the left hand, written expressly for the soloist, Paul Wittgenstein, the distinguished pianist who lost his right arm in the War. With only five fingers, Wittgenstein performs in such an amazing way that Ravel is only one of the composers who have written music specially for him. Richard Strauss wrote his "Parergon" for Wittgenstein, while Korngold and Prokofiev have also ensured that the one-armed pianist's art shall not be wasted for lack of suitable compositions.

Broadcasters "On the Air."

MEMBERS of the Theatrical and Film "professions," according to a leaflet issued by Mr. James Raglan and Mr. Rivers Oldmeadow, joint honorary secretaries, have formed a Stage and Aero Club, with the primary object of bringing aviation within the reach of its members under ideal conditions. The club is to be open also to "persons engaged in broadcasting."

"Obsession."

ONE of the outstanding play successes of the year 1930, "Obsession," is at last to be repeated on August 24 (Regional) and August 25 (National), thus complying with the demands of a host of listeners received after the broadcast two years ago. "Obsession" is an original play by Dulcima Glasby, one of the B.B.C.'s "play-doctors" — those important people who can seize upon a wholly unsuitable stage play and, by condensation and interpolation, make it endurable to the man at the loud speaker.

Miss Glasby has a flair for microphone technique, and has incorporated a good deal of her knowledge in her original work, which is to be produced by Howard Rose. "Obsession" is a play worth listening to.

Can You Beat it?

THE day of broadcast stunts evidently is not yet over, for the American Columbia Broadcasting System has just broadcast the voice of Gertrude Ederle as she skimmed along the Hudson River at 40 miles per hour behind a speedboat piloted by Mrs. Guy Lombardo.



Miss Ederle will be remembered as the first woman to swim the English Channel, nearly six years ago.

As an aquaplane is nothing more than a flat board six feet in length, towed approximately 35 feet behind the speedboat, Miss Ederle had a difficult feat to accomplish, for her microphone had to be guarded from water. Although a spray-proof and wind-proof microphone

of the small hand variety was constructed specially for this broadcast, it could not stand complete immersion, so one of the new lapel types was employed.

Transmitter in Speed Boat.

A short-wave receiver was installed on the balcony of the Hudson River Yacht Club at 92nd Street, and the Hudson River, New York, a one-watt transmitter being placed in the seating compartment in the stern of Mrs. Lombardo's speedboat. A waterproof cable, attached to the tow-line of the aquaplane, carried the microphone circuit to Miss Ederle.

Another one-watt transmitter was installed on the clubhouse docks. Through the use of earphones, Miss Ederle was able to conduct a two-way conversation with officials on shore during a portion of the actual broadcast.

Opera on the Piano.

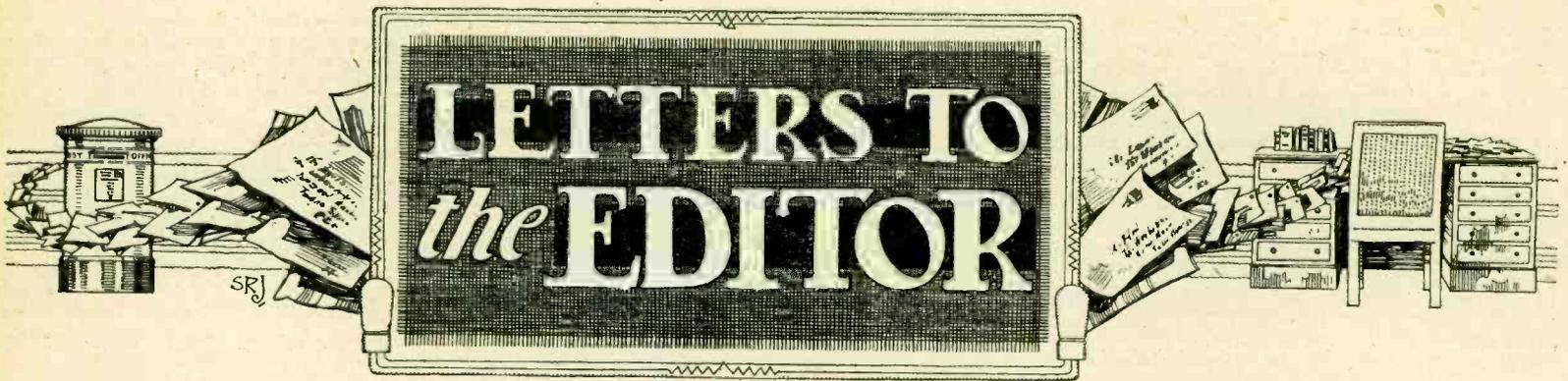
A RECITAL by George Mantle-Childe of some of Liszt's transcriptions of operatic music will be given for Midland Regional listeners on August 14th. The task is a difficult one for so young a player, as Liszt's music offers great technical difficulties. In his transcriptions the composer cleverly caught the inner spirit of the original music and managed to suggest orchestral effects on the piano with great skill.

He Said It.

WHILE Mr. Bernard Shaw and his colleagues on the B.B.C. pronunciation Advisory Committee have been discussing how to pronounce "beret," Mr. C. Drummond, an announcer at 2YA, Sydney, has single-handed had to decide how to say "Taumatwahakatangihakoauauaatanenuiaringikitanehau." It is the name of the Maori locality which, as you know, is twenty-six miles from Dannevirke.



B.B.C. DRAMA. Our artist has sent us this exclusive portrait of Miss Ella Van Noÿs, whose presence makes (or mars) a radio play. This celebrated star can imitate all sounds from the squeaking of a new shoe to the crash of a naval engagement. In the "atmosphere" thus created, the lesser stars are often quite befogged.



The Editor does not hold himself responsible for the opinions of his correspondents.

Correspondence should be addressed to the Editor, "The Wireless World," Dorset House, Tudor Street, E.C.4, and must be accompanied by the writer's name and address.

The Quality of B.B.C. Transmissions.

FROM the many illustrations that are published from time to time showing the working of the B.B.C. organisation, it would appear that the control engineers manipulate their controls largely as the result of what they hear from earphones. The limitations of earphones, especially in the bass register, are, of course, well known, and it would therefore be very interesting to have some concise information as to the use of earphones for the purpose in question. Is any other and more satisfactory means of control actually used at the same time?

J. BAGGS.

New Moston, Manchester.

100 Divisions or 180-degree Scale?

I HOPE that some of our manufacturers of wireless apparatus will see and read that excellent letter by W. A. B., Edgware, published in your number of July 29th.

I am sure that many wireless enthusiasts will agree with me in saying that the great majority of sets made in this country leave much to be desired in matter of tuning controls and dials, though in respect of their electrical efficiency and compactness of chassis they are all that we could wish for.

Ease and accuracy of reading are unfortunately sacrificed too frequently for the sake of appearance, and one sometimes regrets the passing of the 1925 types of set with their convenient sloping panels and large, well-made and graduated dials, whose sole defect was their multiplicity.

Many sets are fitted with control knobs which are too small, badly made, and often eccentric, and some manufacturers even copy the dreadful American practice of fitting knobs which look like the door handles of a doll's house.

I dare say that many engineers feel, as the writer does, a strong aversion for all types of friction gearing, and certainly some of those fitted to wireless sets can cause a whole heap of trouble. I note that W. A. B. suggests a toothed gear 2:1 drive to increase the drum dial surface available for graduation, and this would seem to be a very sound scheme, and one that might well be adopted. Also, why do we never find a set fitted with the highly efficient and convenient worm drive of which a beautifully made foreign example was on sale in London last summer at about 4s.?

As regards ease of reading, in the case of many sets, one of which is unfortunately in the writer's possession, it is necessary to:—

- (1) Fetch a pocket torch,
- (2) Go down on one's knees,
- (3) Use a magnifying glass

in order to obtain an accurate reading of any setting.

Of the practice of graduating dials in two-degree spaces, or with the names of stations only, the less said the better.

I heartily agree with W. A. B. that every

tuning dial should carry a scale graduated in degrees, whatever other scale may be engraved on it, and it is very satisfactory to note that one famous firm have just put on the market a set fitted with a vernier reading dial for degrees of arc, which should prove a boon to all lovers of mathematical accuracy which is a necessary adjunct to satisfactory reception in these days. Let us hope that other manufacturers will copy this scheme.

May I take this opportunity of expressing appreciation of the recent additions to your journal, and also of the most interesting articles on trade sets which you have been publishing for some years past. May I say that the perspective sketches of apparatus attached to these articles are works of art.

G. G.

Bournemouth.

Empire Broadcasting.

MR. MANN, in his article which appeared in your issue of June 22nd, treated us to an outspoken criticism on the futile efforts of G5SW to reach out to the various countries which constitute our far-flung Empire, when many foreign stations succeed as a matter of course.

Like Mr. Mann, I, too, am situated in an outpost of Empire, close to the North-East Frontier of India to be concise, and the results I have obtained in the past three years are precisely the same as are apparently obtained in Kenya, 4,000 miles away. This statement only strengthens the opinion that Mr. Mann's diagnostics are unfortunately only too true.

As the criticism on broadcasting has already been very ably put, I would bring up yet another subject which calls for a frank expression of opinion, and that is the general apathy shown by British manufacturers in capturing Empire markets. With a very few exceptions, it is patent to anybody out here that no attempt is being made by British manufacturers to study the various conditions and requirements obtaining in various parts of the Empire. This remark is amply illustrated by a perusal of manufacturers' advertisements in *The Wireless World*. The various types of receiving sets advertised very seldom incorporate the short-wave band (an essential feature in this country of artillery-barrage atmospherics), and in practically all cases are entirely operated by A.C. or D.C. mains. The first point will be easily understood by those with even the most meagre knowledge of radio technology, but the second, I think, needs a word of explanation. It must be remembered that a great proportion of radio enthusiasts in the Empire live many miles from a town, where such things as A.C. or D.C. mains are unknown, but who nevertheless look for their sole contact with the outer world on their radio receiver. For these many thousands, therefore, dry batteries are the only source of electrical energy available. The suggestion

occurs, then, "Could not the British manufacturers reach out to this latent market by duplicating their well-known models in battery-operated form?"

What the British leaves undone the American does for them, and that accounts for the popularity of the American receivers out here. The clarion cry of "Buy British" is heard even in this land, and those of us with American receivers can only answer, "Let England remember us, and we will readily respond to the call."

My remarks apply to the industry as a whole, and not to the select few who are showing signs of really studying Empire conditions.

M. W. P. LAWS.

Power-handling Capacity of Loud Speakers.

MR. HARTLEY very refreshingly points out that "with a moving-coil loud speaker having a 7in. cone, with a flux density of 10,000 lines per sq. cm., a free movement of the cone and coil of approximately three-quarters of an inch at 50 cycles with 5 watts input is required." May I be permitted to transpose and give the further information that "With the engine of the Royal Scot having a boiler painted blue, with 50 tons of coal on the tender, wheels one mile in diameter would be required to use up all the water"?

It is difficult to see why the Gramophone Company and Mr. Hartley feel it necessary to interest themselves in an effusion which I would hardly have expected from one of the columnists "Free Grid" so soundly berates, if his aural appendages are so equipped by nature that they respond to watts input rather than the more usual acoustic output, leave him in his misery.

In gratitude for all his valuable information I will reciprocate and give "Free Grid" a tip how to double the power-handling capacity of his loud speaker—leave the field coil open.

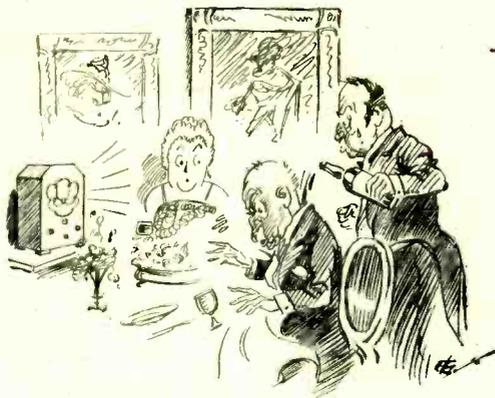
Hendon, N.W.4. L. W. MURKHAM.

A Defect in Transmissions.

THE article in *The Wireless World* of July 22nd entitled "A Defect in Transmissions" brings to light a type of interference which is likely to become increasingly troublesome. This interference is undoubtedly due to the effects of over-modulation, but I doubt whether it can fairly be described as "frequency modulation," since there is no relation between this deformation of the carrier and the form of the amplitude modulation which is being applied. The radiation during the peaks of the over-modulation is a series of pulses of very complex form, analogous to the output of a primitive spark transmitter, which they resemble very closely in their audio-frequency effect. Owing to the complex nature of the pulses, corresponding to components of many different frequencies, selectivity is of

UNBIASED

By FREE GRID.



Hollywood's missed opportunity.

Shocks and Stares.

I WAS filled with righteous indignation a little while ago when the B.B.C. peremptorily discontinued its broadcasts of the Stock Exchange reports, thereby robbing me of the opportunity of making a cool million or two from my armchair, apart from depriving me of one of the brightest features of the evening programme.

It appears that I am by no means the only one who enjoys hearing about the merry gambols of the bulls and bears in Throgmorton Street, for prior to the news being received that the feature was to be resumed, many people sent stern letters of protest to several of the "dailies." There was one particular letter from an indignant female which compelled my attention, and I simply cannot refrain from quoting part of it herewith. " . . . It was an event of the day to hear how things were going in the city, not only to my family, but to my servants, who are of many years' standing, and all have their small investments. . . . Shades of William Q. Shakespeare, the great scenario writer! What an opportunity Hollywood has missed in not giving us a close-up of an English butler trying, while doling out the port, to preserve perfect *sang-froid* as the loud speaker bellows forth news of the complete wipe-out of his capital.

But stay, surely this is the very thing which should provide material for one of the radio playwrights. Imagine listening to the heartrending sobs of the scullery maid as she learns that the bottom has fallen out of silk, taking half of her last week's wages with it!

A Literary Discovery.

ONE reads in the newspapers the complaints of M.P.s that at times when certain controversial bills are before Parliament their post-bags are filled to bursting point by a noisy but well-organised minority. It appears that M.P.s may receive thousands of letters all couched in similar terms, and are thus apt mistakenly to assume that the whole country is speaking as one man.

I have always been inclined to doubt that this sort of thing did go on, but a recent experience has opened my eyes. A few days ago I read in one of our best-known weekly reviews a letter to the Editor in which the writer, after referring to the forthcoming Olympia Exhibition, demanded that it should include, among other things, a section, to quote his own words, "Showing new radio users how to tune in without oscillating neighbours' sets." I sadly shook my head at this despoiling of the King's English, and

after wondering for a while what on earth he meant by "oscillating neighbours' sets," I dismissed the matter from my mind.

Later that day I happened to board a tram-car, and, having nothing to read, picked up a paper, which, judging from its appearance, had been used by a day excursionist from Birmingham to wrap up his lunch. You can judge of my amazement when, on turning to the Correspondence Pages, I found the identical letter, word for word the same, and signed by the same man.

Hastily leaping off the tram I dived into a nearby public library. Reaching the Reading Room I dislodged an ardent student of form at the nearest reading desk and turned to the Correspondence Columns. To my delight I found the same letter again, and quickly elbowing my way from desk to desk, leaving a trail of indignant readers in my wake, I found the same letter in practically every other journal.

Very Obliging.

Having revealed this rather surprising state of affairs I must express my astonishment and admiration at the willingness shown by the organisers of the Wireless Exhibition to accept suggestions from the public, for the very next day there appeared a letter from the Lord Chief Organiser himself, stating that all the things suggested by the previous day's correspondent were already provided for, even to the extent of having demonstrations to show people how to tune in "without oscillating neighbours' sets."

My curiosity is thoroughly piqued, and I have already resolved to attend a demonstration in order that I may avoid committing this dreadful crime against my neighbour. I fear, however, that I shall have to hang my head and confess shamefacedly that I do not know how to "oscillate my neighbour's set," and shall have to take the



Oscillating a neighbour's set.

humblest position in the beginners' class to learn how to perform this wonder before I am in a fit state to learn how to refrain from doing it. Needless to say, I shall first have to take a preliminary course in English in order to find out what the expression really means.

Selling "Time on the Ozone."

I HAD occasion a little while back to refer to an unhappy wireless experience which befell me when spending a few days' well-earned rest by the sad sea waves, but lest it be thought that my experiences in this direction were entirely unfortunate, I would hasten to say that during my sojourn I was privileged to hear finer quality of reproduction than I have heard for many a long day.

The local Municipality had resolved that visitors to their resort should be put on a level with the young lady in the celebrated nursery rhyme, and have music wherever they went. Realising the expense of providing about a dozen orchestras distributed about the cliffs, they had equipped each promenade shelter with a first-class loud speaker. In addition, deck chairs were arranged at certain spots where normally one might expect to find a bandstand, and here, also, excellent loud speakers with truly prodigious baffles were provided.



Agreed it was undesirable.

Needless to say, all these loud speakers were connected up to a central point where a band was actually performing.

A microphone was also provided for announcing the items on the programme, but the whole scheme was rather spoilt, in my estimation, by annoying interruptions from the town publicity merchant, who interspersed the musical items with exhortations not to miss the fat woman on the pier, and other attractions which the town had provided for its visitors.

A resident agreed with me that this was very undesirable, and informed me that still more regrettable features were being mooted, as the City Fathers were considering the question of selling time on the air to local motor coach proprietors and other traders, so that they could advertise their wretched services.

Of course, as this publicity matter would be distributed to various parts of the town solely by private land lines erected by the Council, the P.M.G. could have no say in the matter, but I do hope that common sense will prevail, and that if other resorts adopt this method of providing music cheaply for the benefit of visitors they will profit by experience and omit less desirable features.

NUTS TO CRACK.

THE present series has been started by *The Wireless World* for the benefit of readers who like to work out little problems for themselves and be sure that the results they obtain are correct. At frequent intervals wireless problems are presented, and in the following instalment the answers are given with the methods of working them out, and hints on possible points of difficulty. Problems 59, 60, and 61 have already been given, and below the answers appear, whilst another set of problems is included this week for treatment in the next instalment.

QUESTION 59.—If 10 kilocycles be taken as the necessary frequency "spread" of a broadcasting station, how many stations could be operated on wavelengths between (a) 100 and 600 metres; (b) 3 and 8 metres?

Answer—(a) 250; (b) 6,250.

All that is needful here is to express the various specified wavelengths as frequencies. The frequency corresponding to a wavelength of λ metres is given by $3 \times 10^8 / \lambda$ cycles per second, or $3 \times 10^6 / \lambda$ kilocycles per second. The first band of broadcast stations will thus have frequencies between 3,000 and 500 kilocycles. This range occupies a band of 2,500 kc., so that it could accommodate $2,500/10$, or 250 stations.

The second group of stations will occupy that part of the frequency "spectrum" between 100,000 and 37,500 kc., i.e., a band of 62,500 kc. It will thus provide room for no fewer than 6,250 stations.

It is interesting to note that the second group could contain 25 times the number of stations in the first; in other words, it has provision for exactly 6,000 more stations! This illustrates in a very striking manner the possibilities offered by the very short waves in overcoming the congested state of the ether in present-day broadcasting. With the growing improvement in short-wave technique, the vexed problems of quality and interference may ultimately be solved along these lines.

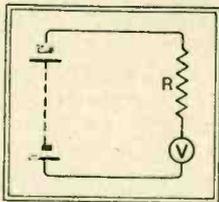
QUESTION 60.—In order to measure the resistance of a grid leak, a 200-volt meter of 980 ohms per volt resistance is employed in conjunction with a dry battery. The direct voltage reading of the battery is 144 volts, but if the grid leak be included in the circuit the reading drops to 24 volts. What is the value of the leak?

Answer—980,000 ohms.

This is quite a good method of ascertaining the approximate value of a grid leak or similar large resistance if a reliable high-resistance voltmeter is available. The meter resistance in ohms per volt is usually quoted by the maker, but, if not, it can be readily calculated by the simple expedient of measuring the current taken by it in order to produce a given deflection and applying Ohm's Law. In the present case, since the meter is scaled for 200 volts, its resistance will be 200×980 , or 196,000 ohms.

Let us denote the unknown value of the grid leak by R ohms. Then, when the volt-

meter is connected to the battery through R, the circuit will appear as in the figure. Now, since the battery resistance may be assumed negligible in comparison with the other resistances in the circuit, we may regard the P.D. of the battery when measured directly by the meter as equivalent to the



Measuring an unknown value of resistance: when it is included in the circuit, the voltmeter reading falls to a value much below the E.M.F. of the battery.

E.M.F. in the circuit illustrated. The current flowing will therefore be:

$$I = E / \text{Total Resistance} = 144 / (196,000 + R) \text{ amperes.}$$

Now we know that this current, flowing through the voltmeter, causes it to register a deflection of 24 volts, which is thus the IR drop across its terminals. But this IR drop is also given by the product of the current flowing and the meter resistance, so that we may write:

$$\left(\frac{144}{196,000 + R} \right) \times 196,000 = 24.$$

Solving this equation for R, we have $24 \times (196,000 + R) = 144 \times 196,000$; $\therefore 24R = 120 \times 196,000$; $\therefore R = 980,000$ ohms.

QUESTION 61.—A transformer-coupled stage of L.F. amplification incorporates a device for tone-control by the use of which the effective amplification of the stage may be varied between 3 times and 0.15 times the magnification factor of the valve. What is the amplification range of the tone-control in decibels?

Answer—26.02 decibels.

Perhaps the simplest way of looking at the decibel is to regard it as the unit in terms of which the difference between two power levels may be measured. If we take the symbols P_1 and P_2 to represent two power values, then the difference, D decibels, in their power levels is given by

$$D = 10 \times (\log P_1 - \log P_2) \\ = 10 \log \frac{P_1}{P_2} \dots (1).$$

The difference in power level thus depends on the ratio between the two powers.

Since the decibel is defined in terms of a ratio between powers, we must be wary in applying it to measure ratios between other quantities such as voltages and currents. In cases where it is wished to express a ratio between voltages in decibels, we must first translate the voltage ratio into an equivalent power ratio. This we can do by making a convention, viz., that

Instructive Problems and their Solution.

the two voltages are imagined to operate across the same resistance, R ohms, so that the resulting power expenditures may be compared. Thus, if the difference between V_1 and V_2 volts is to be expressed in decibels, we assume each to operate across a resistance R ohms. The

two powers are then $\frac{V_1^2}{R}$ and $\frac{V_2^2}{R}$ watts, and

the power ratio is $\frac{V_1^2}{V_2^2}$. We can now substitute this for the ratio $\frac{P_1}{P_2}$ in equation (1),

obtaining

$$D = 10 \log \frac{V_1^2}{V_2^2}, \text{ i.e., } D = 20 \log \frac{V_1}{V_2} \dots (2).$$

In the example, we are dealing with voltage amplification, which, of course, is quite a different thing from power amplification. Equation (2) will therefore apply, V_1 being

$$3 \times \mu, \text{ while } V_2 \text{ is } 0.15 \times \mu. \frac{V_1}{V_2} \text{ is thus } \frac{3}{0.15}$$

$$= 20. \text{ Whence, } D = 20 \times \log 20 = 20 \times 1.301 = 26.02 \text{ decibels.}$$

NEXT SERIES OF PROBLEMS.

QUESTION 62.—An electric lamp is marked 40-watt 220-volt. What current will it take from 220-volt D.C. mains, and what resistance will it have at that voltage? What further specification would be required before employing such a lamp in a D.C. mains receiver?

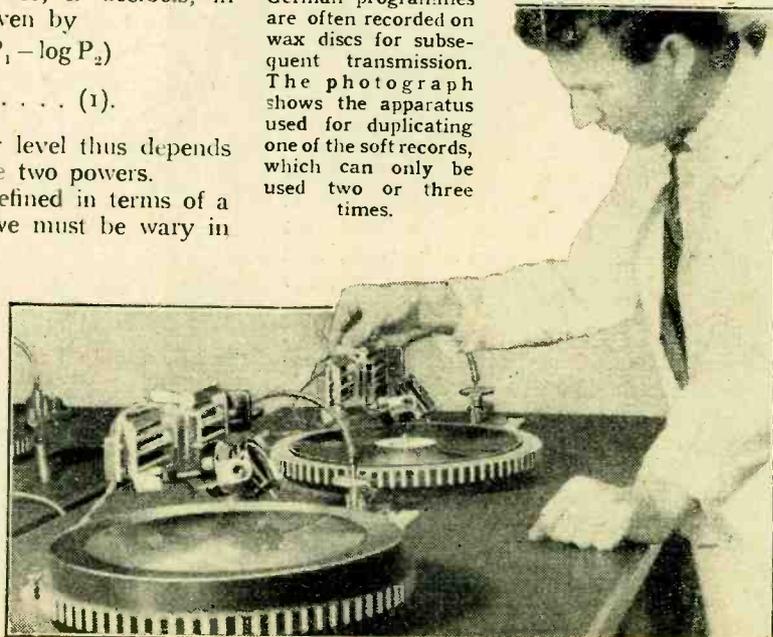
QUESTION 63.—For a certain double-range voltmeter, a current of 2 mA. gives a full-scale deflection on both the 6-volt and 250-volt ranges. What is the rated resistance in ohms per volt for the two cases?

QUESTION 64.—The H.F. current at 300 kc. in a certain reaction primary coil is known to contain a 15 per cent. third harmonic. If the fundamental frequency E.M.F. induced in the coupled coil has an amplitude of 12 mV., what will be the induced E.M.F. of the third harmonic?

NUTCRACKER.

RECORDING FOR REBROADCAST

German programmes are often recorded on wax discs for subsequent transmission. The photograph shows the apparatus used for duplicating one of the soft records, which can only be used two or three times.



little use. Moreover, these pulses affect a receiver mainly by exciting the natural oscillations of the tuned circuits, so that any attempt to increase selectivity by reducing the decrement of the tuned circuits will increase the response of the receiver to this type of interference.
D. A. BELL.

Berkhamsted, Herts.

Points for Manufacturers.

I HAVE recently noticed several instances in which manufacturers of transformers and chokes have given values which are exceedingly high and do not obtain in actual practice.

As the permeability varies over very wide limits with different values of magnetising force, it follows that as the inductance is a direct function of the permeability, the inductance which obtains in practice is dependent upon the operating conditions.

Reference to characteristic curves of representative alloys shows that the permeability is more than doubled between a field strength of perhaps 0.05 gauss and 0.4 gauss. When the transformer is subjected to a steady polarising field, the effective permeability is then very much the same irrespective of the A.C. field after a value of perhaps 0.5 D.C. gauss, the lowest value obtaining.

Obviously for inductance values to have any meaning at all, the conditions under which they are measured must definitely be stated. Values such as the mutual conductance of a valve are always given at specified working voltages. Why, therefore, should manufacturers fail to specify the conditions under which they measure their inductances, when the inductance value varies more than the parameters of a thermionic valve.

Many figures are to my mind quite misleading and I think that the trade as a whole would do well to demand greater detail in this direction. I am not for one moment suggesting that manufacturers' published figures are inaccurate, but it is just as feasible to say that a transformer has an inductance of perhaps 60 henrys as it is to state that a 7 h.p. motor car will attain a speed of 200 miles per hour. In the latter case it is a perfectly true statement providing that it is very much "down hill with the wind behind," but this is a condition which does not generally obtain.

Similarly, 60 henrys would not be obtained under radio set operating conditions, with the type of transformer which I have in mind.

PAUL D. TYERS.

Watford.

IT was only in January last year that valve manufacturers at last let D.C. users enjoy privileges which those who could boast an A.C. supply could long enjoy. But our triumph was short-lived. The variable-mu, A.C. and battery, came to put us behind once more. I expect that we shall have to wait as long for an indirectly heated D.C. valve to be advertised and then half a year more before we can obtain one! Meanwhile, the A.C. user will go from strength to strength.

Harrow.

R. M. C. KITTOE.

Quality and the Transmitter.

IT would indeed be delightful if the side-bands in a broadcast transmission could be eliminated without spoiling the reproduction, as Mr. Maugham suggests in his letter to *The Wireless World* of June 15th. Especially do we realise this here in Cambridge, where the field strengths of interfering stations may rise to as much as a fifth of those of Brookmans Park or Midland Regional.

I am afraid, however, that if Mr. Maugham will work it out in detail he will find that the association between the side-bands and the amplitude modulation is not a matter of accident,

nor yet of a physical law, but of a mathematical identity depending upon the relation:

$$(1 + a \cdot \sin pt) \cdot \sin qt$$

$$= \sin qt + \frac{a}{2} \cdot \sin (q - p) t - \frac{a}{2} \sin (q + p) t,$$

where the left-hand side represents a modulated sine wave, and the right-hand side a carrier wave and two side-bands. Thus the amplitude modulation and side-bands are not concomitants, but are different ways of expressing the same thing. Even the "Monodial Super" could not give us the high notes if its tuned circuits entirely cut out the corresponding side-bands. This, of course, they do not do. It might seem at first sight as though the use of true frequency modulation, and a detuned receiving circuit, would solve the difficulty, since with this system the whole range of sounds could be reproduced with as small a frequency variation of the carrier wave as we please; but a little consideration will show that we could not use a circuit with a smaller decrement than those in use without cutting the high notes, so that intelligible interference would be as bad as ever. There would be no need for heterodyning, however, and something might be done with tone-correction. There would be some difficulty connected with the introduction of harmonics by the tuned circuits, but this should not be insuperable.

This system is not likely to come into use just yet, however, and a more practical method of getting rid of heterodyne interference at

separately from the band-pass filter which one might incorporate after the first valve, but this is not a matter of immense importance.

Cambridge. P. S. H. HENRY, Ph.D.

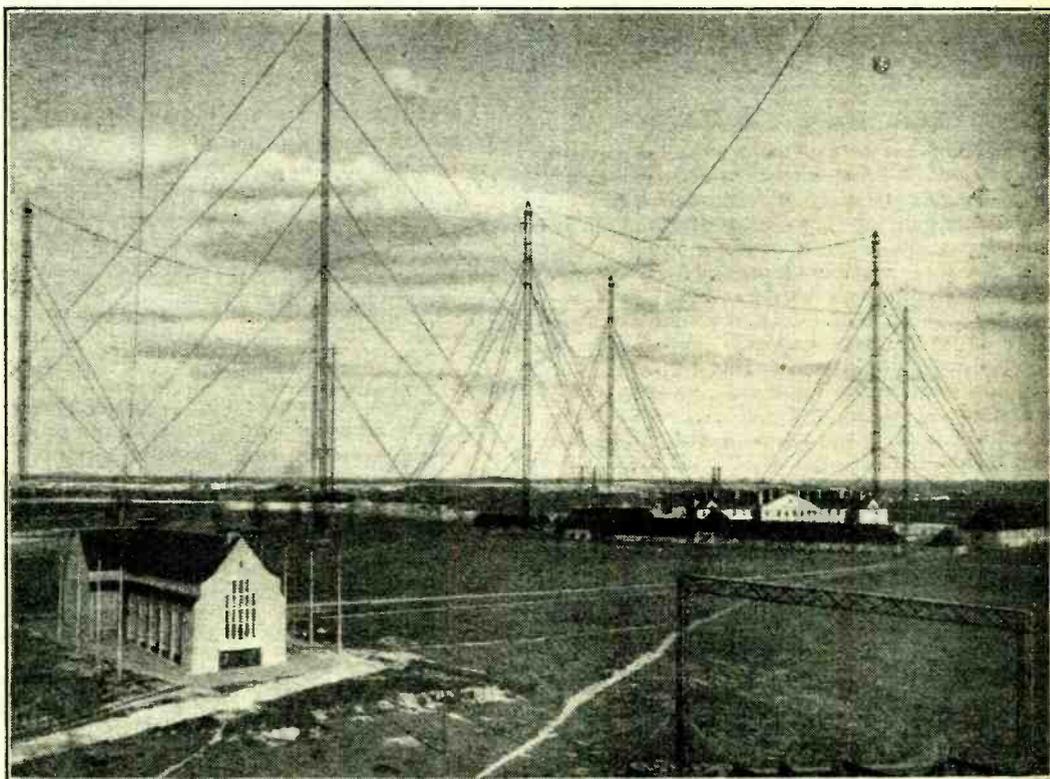
Accentuating Upper Frequencies at the Transmitter.

I DO not think that the plan of raising the upper end of the transmitter-frequency characteristic mentioned by your correspondent, Mr. P. W. Willans, can be dismissed as easily as, perhaps, Mr. Finlay would wish; anyhow, the B.B.C. has apparently been doing this in its somewhat secretive manner.

It is an old principle in talking-film work that the recording level at above, say, 4,500 cycles may be increased relative to the rest of the range, as the harmonics produced by the overloading of the sound track with an occasional very loud note above this frequency are not reproduced by the reproducing amplifier system, being above 9,000 cycles.

Thus, given a transmitting amplifier which overloads at audio-frequency just before overloading the carrier (and thus avoiding frequency modulation), it is possible to make the selectivity of the receiver as good as the present band-pass and yet get a distinctly longer overall response.

The fact that another station on an adjacent channel was doing the same thing would make very little difference, as one cannot modulate



A GERMAN BROADCASTING CENTRE.—Zeesen, situated near Berlin, is the site of the famous Konigs Wusterhausen broadcasting station. The photograph shows the masts of the long- and short-wave transmitters.

present is one which seems to have fallen into neglect. I refer to the use of a directional aerial having a sharp minimum (though even here one is stumped when the stations to be separated are in the same straight line with the receiver!). Now that variable-mu valves and high-frequency pentodes have got rid of the necessity of introducing the main selective circuit before the first valve, such an aerial has considerable possibilities in eliminating interference. With a little care, a frame aerial can be made to show a much better minimum than those usually fitted to portable sets, and if made large, can be much more efficient. True, the aerial would probably have to be tuned

a 50-kilowatt carrier at more than 100% even at 8,000 cycles.

This brings us to the arguments against either a steadily rising or steadily falling characteristic which nobody wants, anyway. The real reason against such an arrangement is its inefficiency, as at a normal frequency of, say, 800 cycles only a very small proportion of the carrier could be modulated.

May I finally heartily endorse your plea for a multi-frequency test from the B.B.C. occasionally so that, with the help of a simple valve voltmeter or metal rectifier moving-coil meter, we could tell what quality we are getting.

Orpington, Kent. B. T. WEDMORE,

READERS' PROBLEMS.

THESE columns are reserved for the publication of matter of general interest arising out of problems submitted by our readers. Readers requiring an individual reply to their technical questions by post are referred to "The Wireless World" Information Bureau, of which particulars, with the fee charged, are to be found on page 128.

Resistance Combinations.

IT is obvious that manufacturers cannot produce fixed resistances in an infinite number of ratings, and so it often happens that a particular value of fixed resistor—required, say, for experimental work—is not available commercially. This is inevitable, but fortunately the range of values produced is so large that ordinary needs are well catered for.

Querists who write to us on this subject seem often to ignore the possibilities of connecting a number of resistances in series, in parallel, or in series-parallel, so that the desired value may be attained. For the benefit of these readers, they may be reminded that the value of a number of resistances in series is equal to the sum of their individual resistances. The effect of connecting two resistors in parallel is most easily ascertained by multiplying together their individual values; the result is then divided by the sum of the individual values.

Eliminating a Circuit.

A READER who has just constructed a det-2 L.F. radio-gramophone, which, so far as the radio side is concerned, is intended to give only reception of the local station, is in difficulty with his tuning system. It is stated that the reproduction of gramophone records is excellent, but no wireless signals are receivable. A diagram of the two-circuit input tuner is submitted, and our correspondent, who logically concludes that this part of the set is almost certainly at fault, asks us to criticise it and to say where the defect is most likely to be. It is stated that all components have been tested.

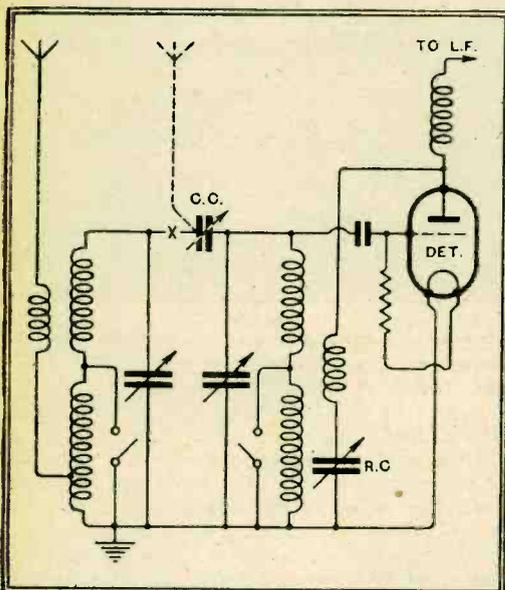


Fig. 1.—Stage-by-stage filter tests: the primary circuit is temporarily eliminated by interrupting the inter-circuit coupling at point X and transferring the aerial to the coupling condenser C.C.

As the arrangement shown is entirely conventional, and moreover is extremely simple, any derangement should be revealed by

straightforward tests. We are inclined to think that in all probability there is no fault at all; as the set is being used at something approaching the limit of its range, failure to receive signals is probably due to the user's lack of familiarity with this type of tuner. It seems probable that, without an exceptionally good aerial-earth system, nothing whatever would be heard until the two circuits are brought approximately into resonance.

The right procedure in such cases is temporarily to concentrate one's efforts on the secondary circuit; any fault that may exist in it should then be traceable quite easily, as the factor of uncertainty is largely eliminated. As capacity coupling is employed in the case with which we are dealing, it should be particularly easy to eliminate the primary circuit by employing the existing coupling capacity as an aerial feed condenser. This point is illustrated in Fig. 1.

Voltages for Variable-mu Valves.

VARIOUS methods have been suggested for ensuring the application of sensibly constant anode and screening grid voltages to variable-mu H.F. valves under changing conditions of grid bias. But it should be made clear that these schemes are always based on the assumption of a fixed voltage supply from the source from which the valves are fed. Moreover, it is necessary that the voltage of this source should not be very greatly in excess of that at which the valves are to work.

For example, it would be impossible to devise a fixed resistance feed for a variable-mu valve that would give reasonably constant anode and screen voltages from a 500-volt supply. At any rate, to do so would involve the use of a potentiometer of such a low resistance that the current consumed by it might well be excessive from the point of view of economy.

This is the difficulty of a reader who wishes to add a variable-mu H.F. valve to a high-power local-station set, of which he does not give full details, but where we suspect that a sufficiently large surplus output is not available.

We can only suggest that he attempts to adapt the voltage distribution system of an up-to-date receiver like the "Modern Straight Five" to his own particular needs. A simplified diagram of this system appeared in the "Hints and Tips" section of our issue for July 15th.

Field Current.

IT is admittedly something of a problem to know how to obtain rectified current for the field winding of a loud speaker, originally designed for connection to a D.C. mains, when one's supply system is changed over to alternating current.

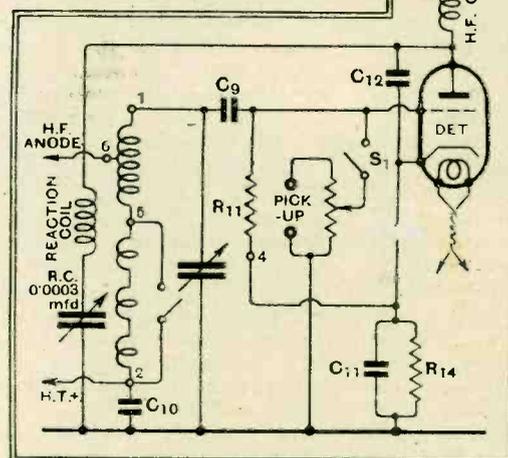
To a reader who finds himself in this predicament, and who asks for our advice, we can only suggest that he should first ascertain the ohmic resistance of the winding, and also the minimum current necessary for energising the field. With this information it will not be difficult to choose a high-voltage rectifier capable of supplying the necessary current at the correct voltage.

There is also the possibility that the instrument could be used as a smoothing choke in the manner which is now so popular in A.C. sets. Further, it may be that the field coil could be rewound to a resistance that might suit our correspondent's set better than the present winding. But it must not be forgotten, if this latter suggestion is followed up, that the field ampere-turns must not be sensibly less than at present. At any rate, if they are, there is a risk that the field will not be sufficiently intense for good results.

Adding Reaction.

IT is asked whether reaction can be added to the "Modern Straight Five" (*The Wireless World*, June 22nd and June 29th), and, if so, how this addition should be carried out.

Fig. 2.—A suitable reaction control circuit for the "Modern Straight Five." Component references correspond with those of the original constructional article.



As this set has two H.F. stages, and a total of four tuned circuits, the additional complication of reaction should hardly be necessary, either as an aid to sensitivity or selectivity. Its use might, in exceptionally difficult receiving conditions, confer a slight benefit, but would tend to upset the overall frequency characteristics.

However, done with care and used in moderation, the addition of reaction may be regarded as permissible, and the normal method of connection, as shown in Fig. 2, is applicable to the receiver in question. In dealing with any "2-H.F." set, the possibility of introducing instability through the extra wiring must be envisaged, and it would probably be wise to screen some, at least, of the reaction leads.

FOREIGN BROADCAST GUIDE.

BARI (Italy).

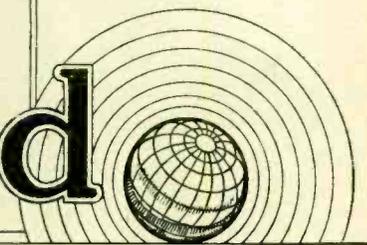
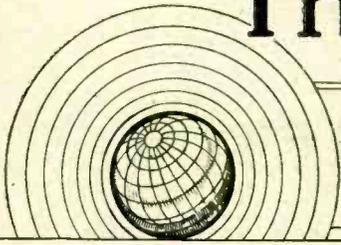
Geographical position: 41° 9' N.; 16° 51' E.
Approximate air line from London: 1,020 miles.
Wavelength (Temporary): 269.3 m. Frequency: 1,115 kcs. Power: 20 kw.
Time: Central European (coincides with B.S.T.).

Standard Daily Transmissions.

20.00 B.S.T.: gramophone records, time signal, news;
20.45, main evening programme; 22.55, final news bulletin.
Mainly broadcasts from own studio but, later, will link up with Rome and Naples, with which studio programmes will be exchanged.
Opening signal: Carillon (gramophone record).
Woman announcer.
Call: E.I.A.R. (phon: *Eh-yah*: Radio Bari).
Closes down with the words: *Signori, Buona Notte*, followed by Fascist hymn and Italian Royal Anthem.

The Wireless World

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22nd Year of Publication



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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.

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POINTS FROM OUR GUIDE.

ITEMS OF SPECIAL NOTE.

OLYMPIA, 1932, is an extraordinarily comprehensive Show; there is something for everyone, and no single field of wireless interest has been neglected (p. 156).

The listener without a mains supply had a real grievance last year, but this year he is to have a wide choice of up-to-date battery sets with modern features (p. 156).

The variable- μ valve appears to have entirely superseded the screen-grid valve (p. 168).

Any one of twelve pre-determined stations can be selected at will by the operation of a single knob. The name of the station selected is shown on an illuminated indicator (p. 160).

A set operated by a push-button system, pre-tuned to the wavelengths of nine stations. This receiver embodies automatic volume control (p. 160).

There is good news for the D.C. user, who can now take his choice from a number of H.F. detector and small output valves, equal in efficiency to the A.C. types (p. 168).

In the D.C. range of valves there is a new H.F. variable- μ type (p. 168).

Totally screened and semi-screened ganged condensers will dominate the stands of those firms specialising in components of this class (p. 163).

Amongst coils, the outstanding feature this year will be the many varieties of special superheterodyne coils (p. 164).

Formo will show coils with the novel and useful feature of including at the top of each coil former a circuit diagram giving connections for each winding (p. 164).

The superheterodyne principle has gained ground, as it was bound to do, and in many cases is combined with tone correction (p. 156).

Speaking generally, a set without a built-in loud speaker is now a rarity, as is also one of the multi-circuit type without ganged tuning (p. 156).

The unusual centring spider in the new mains and permanent magnet loud speaker models of Sonochorde Reproducers, Ltd., will repay examination (p. 162).

A loud speaker with no resonance in the region of 2,500-3,500 cycles, which is a frequent source of strident high-note response, and with an output stated to be well maintained up to 10,000 cycles (p. 162).

Large loud speakers for public address and cinema work will be seen on the stands of Partridge and Mee, Baker's "Selhurst" Radio, Tannoy Products, and Epoch (p. 162).

From the technical aspect, the new Pye Model G is likely to prove one of the most interesting three-valve sets for A.C. mains operation (p. 158).

Some of the new two-valve receivers are fitted with high-power output valves; the Cossor Model 222, for instance, supplies two watts of energy to a built-in moving coil loud speaker (p. 159).

Interest in portable sets will inevitably centre round the new portable superheterodynes, of which there are several examples (p. 159).

One of the most interesting moving iron movements will be shown by Shapland and Petter (p. 162).

Dual-unit moving-coil loud speakers will probably make a last-minute appearance on many stands, and they will be the principal exhibit by Magnavox (G. B.), Ltd. (p. 162).

The superheterodyne forms one of the most interesting classes of receiver this year, and its rise to popularity has been so rapid that there are now few firms who are not showing at least one model (p. 156).

A G.E.C. mains superheterodyne has seven tuned circuits, and a band-pass principle is employed in both the signal frequency and the intermediate circuits (p. 157).

Nine valves, including the rectifier, are used in the Murphy Radio superheterodyne. Three tuned circuits operate at signal frequency. Two I.F. stages are followed by a duo-diode second detector, from which automatic volume control is obtained (p. 157).

An A.C. mains set with two H.F. stages, with the unusual feature of four tuned circuits arranged as two band-pass filters.

Progress has been made in the development of the electrolytic type of condenser, of which examples will be found on the stands of both Dubilier and T.C.C. (p. 164).

A rapid and accurate method of obtaining pick-up characteristics will be shown by H.M.V. (p. 167).

The news that the Garrard Engineering Co. have produced a record changer of simple and original design should ensure a good attendance at their stand (p. 167).



The Wireless World

Baby Superhet.

Part I.

Circuit Details of a 4-Valve Receiver of Exceptional Performance.

By W. T. COCKING.

THE rapid rise to popularity of the superheterodyne is to be accounted for by the ever-increasing congestion of the broadcasting ether, and there can be but few who doubt that it is the ideal type of receiver when something more than local reception is required. In the past, however, superheterodynes have usually been rather high in their total cost because of the large number of valves which have been necessary for satisfactory results. The development of an efficient single-valve frequency changer, however, has changed all this, and has permitted the design of a superheterodyne employing a total of no more than four valves.

The performance of such a receiver, of course, is not equal to that given by seven- and eight-valve superheterodynes of first-class design, just in the same way as a straight three-valve set gives poorer results than the straight four- or five-valve receiver. The four-valve superheterodyne, however, will give a sensitivity rather better than that of the best three-valve straight set, quality of reproduction of a similar order, a degree of selectivity which is infinitely superior, and be of a strictly comparable total cost. Its superiority to the straight three-valve set is thus chiefly in the matter of selectivity.

The Pentode Voltages.

The principles of the new single-valve frequency changer which have permitted the development of such a receiver have been fully described in two recent issues of this journal, and it is consequently unnecessary to go into them here, and we can pass on to a consideration of the receiver as a whole. The complete circuit diagram is shown in Fig. 1, and it will be seen that the frequency changer is preceded by the usual inductively coupled two-stage band-pass filter, the inductive coupling being provided by means of a link circuit. The aerial is connected on to the primary of this filter through the 0.0001 mfd. compression-type condenser C_1 , which is used also for the adjustment of the ganging. The coils are individually and completely screened to

avoid the direct pick-up of signals, and the waveband switches are built into their bases.

The first valve is a pentode of the AC/Pen type, and its control grid is connected to the secondary of the input filter, so that the incoming signal is applied to it. Grid bias is obtained by the usual method of inserting a resistance in the cathode lead; optimum signal strength results when this resistance R_2 has a value of 500 ohms and is shunted by a 0.1 mfd. condenser C_5 . Oscillation takes place between the anode and space charge grid circuits, and it will be seen that the reaction coil is connected in the latter circuit with the tuned oscillator winding in the anode. The space charge grid requires a potential of about 30 volts only, and as

as the normal trimmer on the I.F. transformer, and is adjusted as such, its other function of feeding the oscillator circuit having no effect upon it.

The Tuning System.

The two pre-selector circuits are tuned by two similar sections C_2 and C_3 of the special three-gang condenser, the third C_4 of which has vanes so shaped that correct ganging is automatically obtained on the medium waveband without the necessity for using padding condensers. On the long waveband, however, a padding condenser is still necessary, and this takes the form of a compression-type condenser C_7 with a maximum capacity of 0.002 mfd. As there is no direct-current flow through the tuned-oscillator circuit, this condenser can be connected directly in series with the long-wave oscillator coil, and a single switch used for the waveband change.

The secondary of the first I.F. transformer, which is, of course, tuned to 110 kc., is of normal type and feeds the variable- μ I.F. valve. This valve is coupled to the grid detector by another similar transformer, so that a total of four tuned circuits is employed in the intermediate-frequency amplifier. Being used in two pairs of coupled coils, these circuits naturally form two band-pass filters with adjustable coupling, so that the optimum compromise between the conflicting factors of selectivity and quality is readily reached.

The anode of the I.F. valve is fed from the 200 volts line, while the screen grid is fed from the potentiometer comprising R_6 and R_5 of 20,000 ohms and 15,000 ohms respectively, and is maintained at earth potential to I.F. currents by the 0.1 mfd. condenser C_{11} . The fixed minimum bias is provided by the 250 ohms resistance R_{11} , which is by-passed to earth by another 0.1 mfd. condenser C_{10} . Volume control with a variable- μ valve is naturally by the variation of its grid bias, and a 15,000 ohms potentiometer R_1 is so connected that it acts as a variable resistance in the cathode circuit. The free end of the resistance element, however, is connected to the aerial, so that it also acts as a resistance shunt across the aerial and earth, and so reduces the aerial input to the set at low volume settings and prevents overloading of the first detector.

FEATURES.

Four-valve self-contained A.C. superheterodyne with new self-neutralising single-valve pentode frequency changer. Band-pass pre-selector and single-dial tuning with completely screened coils. Variable condenser with shaped plates to maintain correct oscillator tracking. Four tuned circuits are used in the I.F. circuits and form two narrow-width band-pass filters.

The second detector (grid rectification) is transformer-coupled to a pentode output valve which delivers some 1,500 milliwatts to the moving-coil loud speaker, the field winding of which acts as a smoothing choke for the H.T. current.

Automatic tone correction is derived from the pentode and permits high-quality reproduction being obtained in a simple manner with a maximum of selectivity. The controls are four in number, namely: tuning control, radio-gramophone switch, wave-range switch, and combined volume control and mains on-off switch.

it then passes a current of 0.68 mA. this is provided through the voltage-dropping resistance R_3 of 250,000 ohms. A by-pass condenser C_6 of 0.1 mfd. is provided to give a free path for the oscillations between the space charge grid and the cathode.

The anode circuit of the frequency changer appears more complex than it really is, for the intermediate-frequency transformer and oscillator circuit seem inseparable. Actually, the tuned-oscillator circuit is shunt fed from the pentode anode, with the primary of the I.F. transformer acting as an H.F. choke, and the primary trimming condenser acting as the oscillator feed condenser. The condenser C_8 , therefore, is, in practice, treated

Wireless World Baby Superhet.—

The mains on-off switch S_2 is ganged to this volume control, so that complete rotation of the knob in an anti-clockwise direction switches off the set.

The Detector and L.F. Circuits.

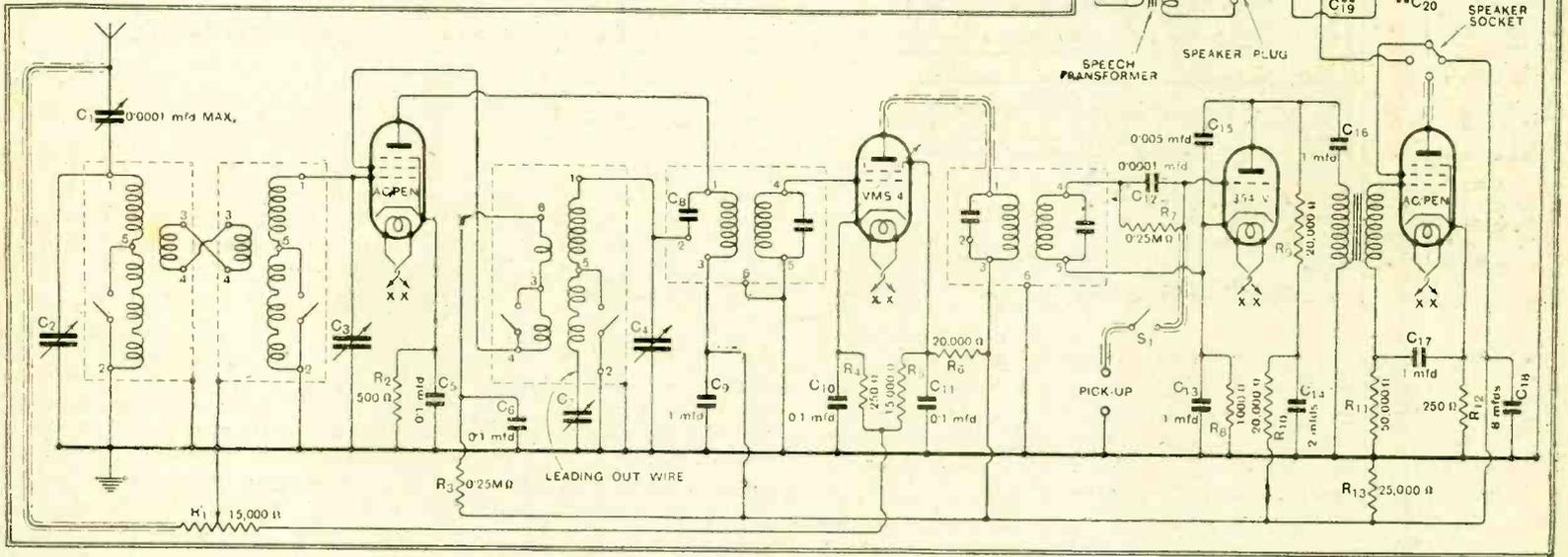
When acting as a detector, the third valve is fed from the I.F. stage, and rectification

amplifier, and bias is then needed. The pick-up, therefore, is connected between the grid of the valve, by means of the switch S_1 , and negative H.T., and the 1,000 ohms resistance R_8 shunted by the 1 mfd. condenser C_{13} , then automatically applies the correct voltage to the grid.

The coupling between the detector and the output valve is by means of a 5-1 ratio transformer, resistance-capacity fed by the

effectively serves its purpose and causes no audible reduction in the high-frequency response. Detector decoupling is obtained by means of the 20,000 ohms resistance R_{10} and the 2 mfd. condenser C_{14} . The standing no-signal current is about 2.5 mA., a

Fig. 1.—The complete circuit diagram. C_{19} and C_{20} are of the 400 volts working type, while C_{18} is an electrolytic condenser for working at 440 volts. Excepting R_{13} , which is of the 3 watts type, the resistances are all rated for 1 watt. The mains switch and the volume control are linked together, and operated by a single control knob.



takes place with the aid of the 0.0001 mfd. grid condenser C_{12} and the 250,000 ohms grid leak R_7 . As no bias is then required, the lower end of the I.F.-transformer secondary is returned directly to the detector cathode. When using a gramophone pick-up, however, this valve must act as an

20,000 ohms resistance R_9 , and the 1 mfd. condenser C_{16} , while the 0.005 mfd. condenser C_{15} serves to prevent the leakage of I.F. currents into the L.F. circuits. This capacity may seem rather high, but is necessary in the absence of any H.F. choke; with the other circuit values chosen, it

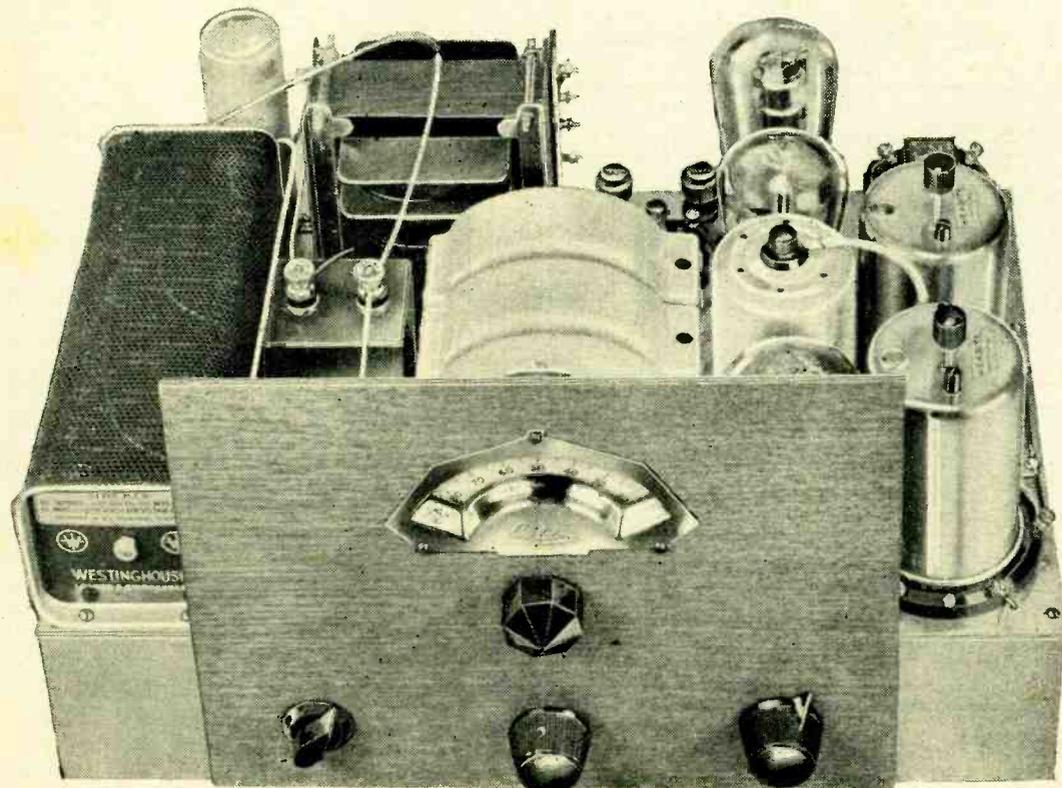
figure which is ample to allow of sufficient L.F. output being obtained from the detector for the complete loading of the output valve, but is not so high that this stage can easily be overloaded.

For the convenience of readers constructing this set, blue prints are available from the publishers at 1/6, post free.

The output valve is a pentode capable of delivering 1,500 and 2,000 milliwatts to the moving-coil loud speaker, to which it is transformer coupled. Its control grid is negatively biased by the 250 ohms resistance R_{12} in the cathode lead, and grid decoupling is provided by the 50,000 ohms resistance R_{11} in conjunction with the 1 mfd. condenser C_{17} . Both the screen grid and the anode are fed directly from the common 200-volts line, from which a 25,000 ohms 3-watts resistance R_{13} is shunted to earth in order to maintain a load on the mains rectifier and prevent a voltage rise during that period after switching on in which the valves are warming up.

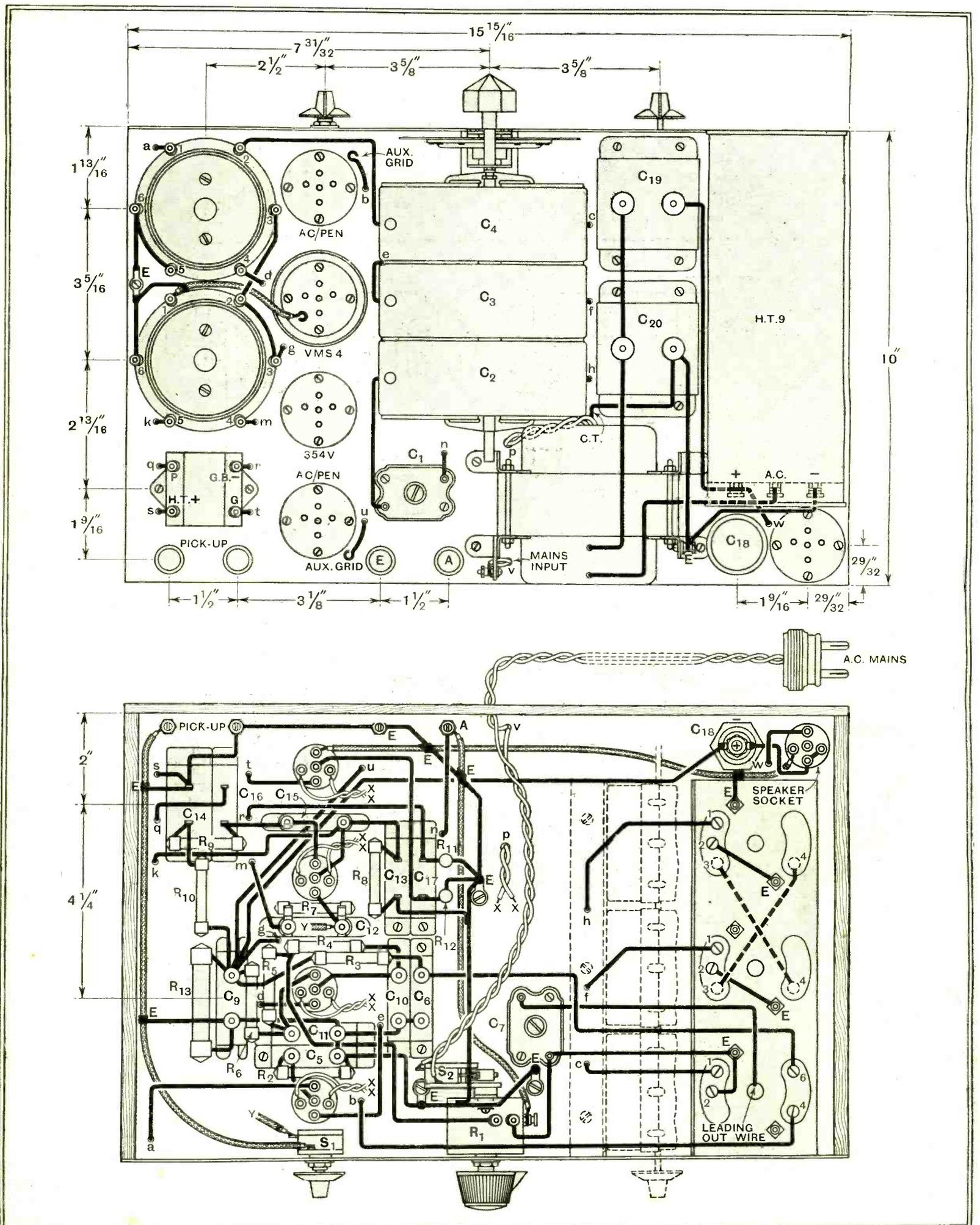
Speaker Field Smoothing.

The mains transformer has one secondary providing 4 volts at 4 amperes for the valve heaters, and another rated at 230 volts 180 mA. for the H.T. supply. This secondary is connected to the H.T. metal rectifier in a voltage-doubling circuit provided by the two 4 mfd. condensers C_{19} and C_{20} , and gives a total output of some 360 volts. The current then flows through the 2,500 ohms field winding of the moving-



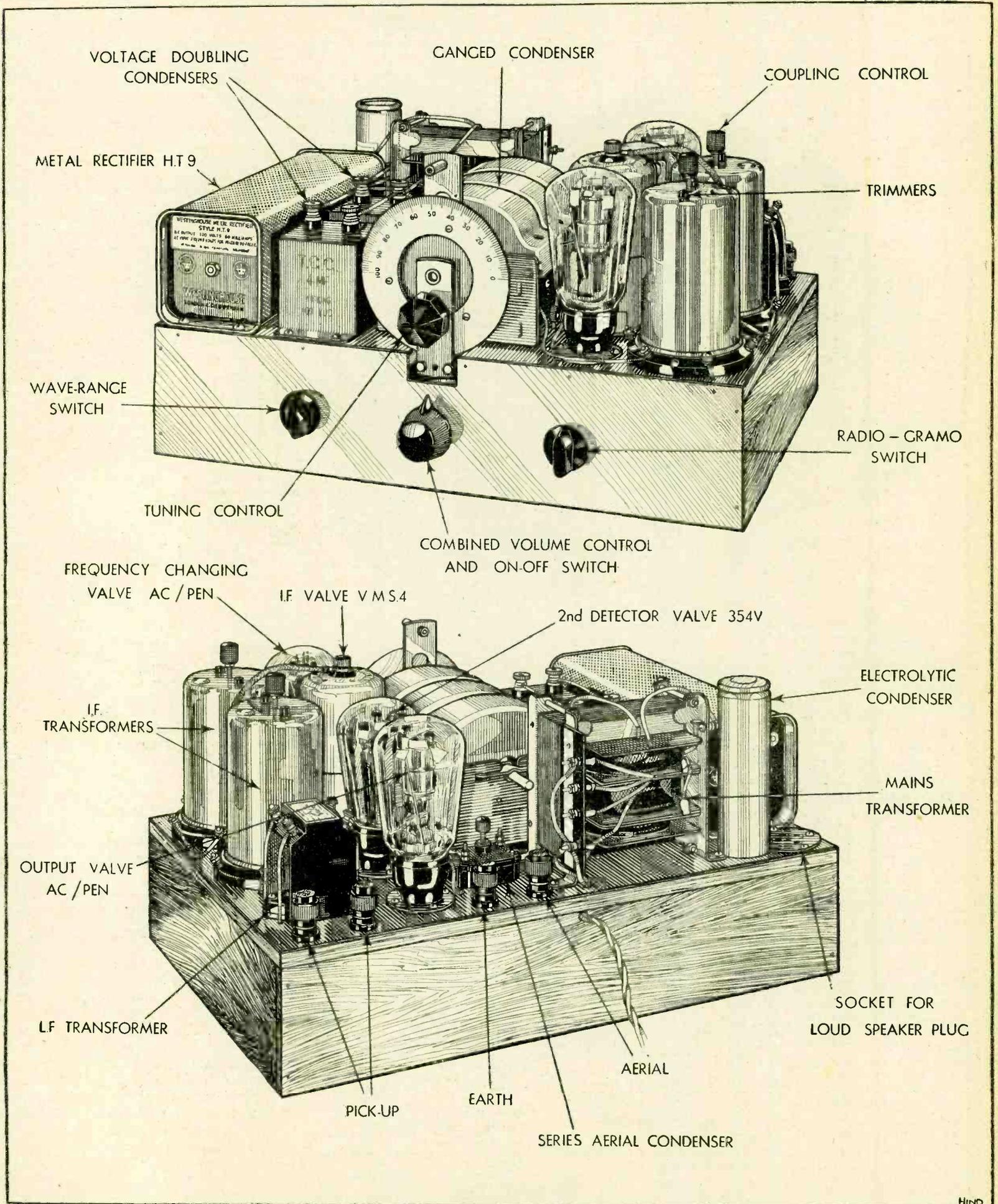
The front of the receiver showing the four controls comprising tuning control, radio-gramophone switch, wave-change switch, and combined volume control and mains on-off switch.

WIRING PLAN AND GENERAL LAYOUT OF COMPONENTS.



The clean layout ensures ease of wiring and the metal-covered baseboard assists in screening.

EFFICIENT FREQUENCY CHANGING WITH SINGLE VALVE.



Two views of the receiver chassis. The signal frequency and oscillator coils are mounted beneath the baseboard.

HIND

Wireless World Baby Superhet.—

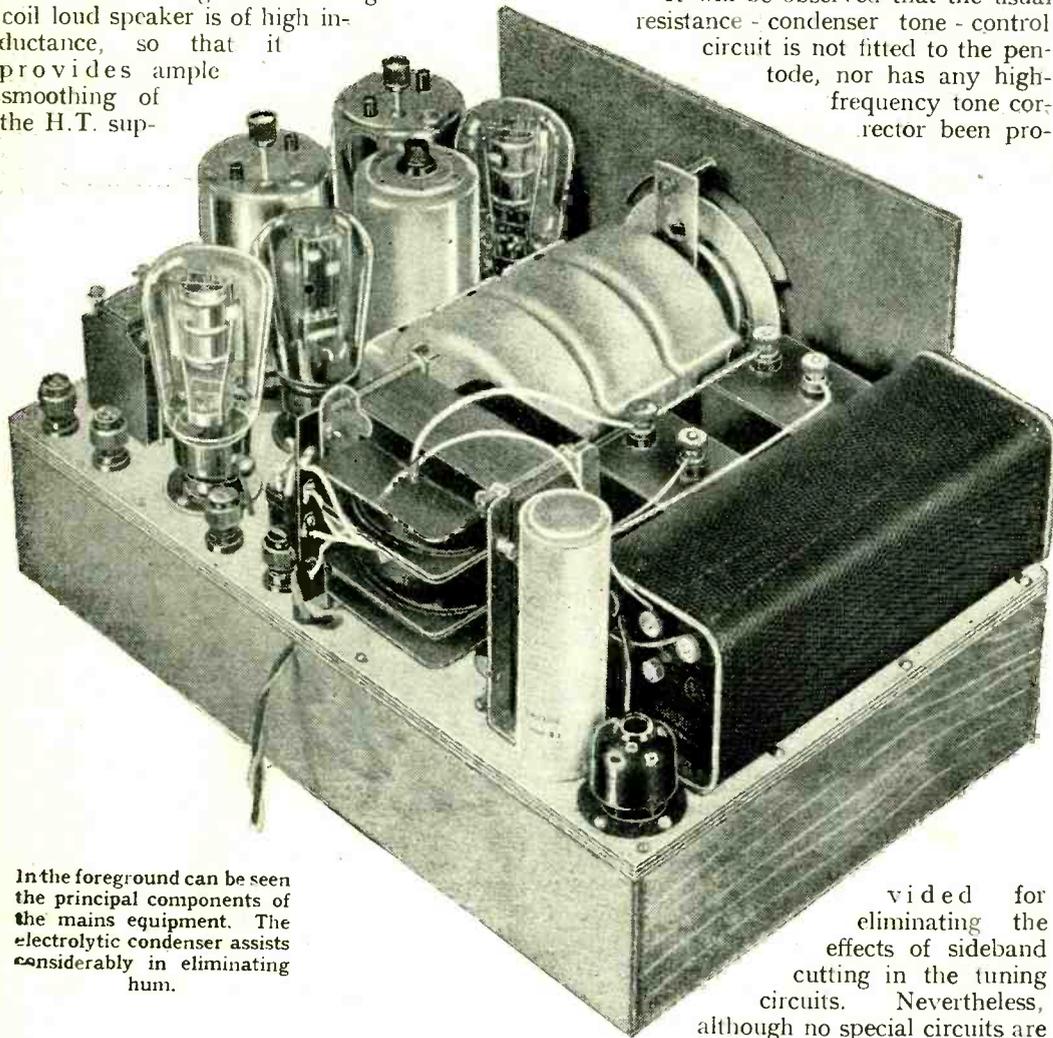
coil speaker, which provides the sole smoothing in conjunction with the 8 mfd. electrolytic condenser C₁₈. The voltage drop along the speaker field is about 125 volts, so that over 6 watts are available for its energisation. The field winding of a moving-coil loud speaker is of high inductance, so that it provides ample smoothing of the H.T. sup-

ply. There is, however, a serious possibility that if much ripple be present on the current fed to the field, hum will be introduced directly into the speech coil. To obviate this possibility, therefore, the speaker is fitted with a hum-bucking coil, which consists of a winding around the field coil which is connected in series with the speech coil, and in such a way that the currents induced

in them from the field are in opposite phase. Provided that this precaution be taken in the speaker, it is a perfectly practical proposition to utilise the speaker field for the sole smoothing equipment of a receiver, and considerable economy results. It will be observed that the usual resistance-condenser tone-control circuit is not fitted to the pentode, nor has any high-frequency tone corrector been pro-

vided for eliminating the effects of sideband cutting in the tuning circuits. Nevertheless, although no special circuits are included, such tone correction is, in fact, employed. A pentode used with any ordinary loud speaker accentuates very considerably the upper audible frequencies, and the purpose of the usual tone-control circuit is to prevent this by reducing the high notes. In this receiver, however, the high notes are already reduced prior to the pentode by sideband cutting, so that any further reduction would result in excessive bass. Looking at the matter from another angle, it can be said that the normal accentuation of the high notes with an uncorrected pentode is just sufficient to correct for the sideband cutting, and so a special tone-correction circuit is unnecessary. True automatic tone correction is thus secured, and with a saving in apparatus, for it is necessary to use neither a special tone corrector nor the usual pentode-compensating circuit.

Notes on constructing and adjusting the receiver will be given in the concluding instalment, appearing on September 2nd.



In the foreground can be seen the principal components of the mains equipment. The electrolytic condenser assists considerably in eliminating hum.

vided for eliminating the effects of sideband cutting in the tuning circuits. Nevertheless,

although no special circuits are included, such tone correction is, in fact, employed. A pentode used with any ordinary loud speaker accentuates very considerably the upper audible frequencies, and the purpose of the usual tone-control circuit is to prevent this by reducing the high notes. In this receiver, however, the high notes are already reduced prior to the pentode by sideband cutting, so that any further reduction would result in

THE POST OFFICE AT OLYMPIA.

NOT the least fascinating stand at Olympia is that of the General Post Office, which is mainly devoted to showing methods of overcoming electrical interference with broadcast reception. On the principle that an ounce of practice is worth a ton of theory, at least where the general public are concerned, experts from the Dollis Hill Research Station are giving working demonstrations showing how noises can be eliminated by the use of suitable chokes. For example, a vacuum cleaner, a street-traffic signal, and various types of medical high-frequency apparatus are set in operation on the stand and their effects noted on a standard radio receiver. An eliminator of a type approved by the Post Office is then switched into circuit, demonstrating that local interference of the most virulent type can be effectively overcome.

Of special interest in the light of recent developments are the ultra-short-wave transmitters and receivers developed at the Post Office Research Station. These sets are being demonstrated on the stand.

Broadcast listeners will be interested in an exhibit showing typical Post Office telephone circuits used for musical transmissions in which the best possible quality is required.

A special Post Office is established at Olympia to enable purchasers of wireless sets to take out their licences forthwith.

THE B.B.C. EXHIBIT.

AT the B.B.C. stand attention will be focused on the scale model of Broadcasting House. The model is on a scale of 1/4 in. to a foot, and is approximately 5ft. long and 3ft. wide. The exterior of the front and the west side are shown, while from the east side visitors can see a cross-section down the centre of the interior.

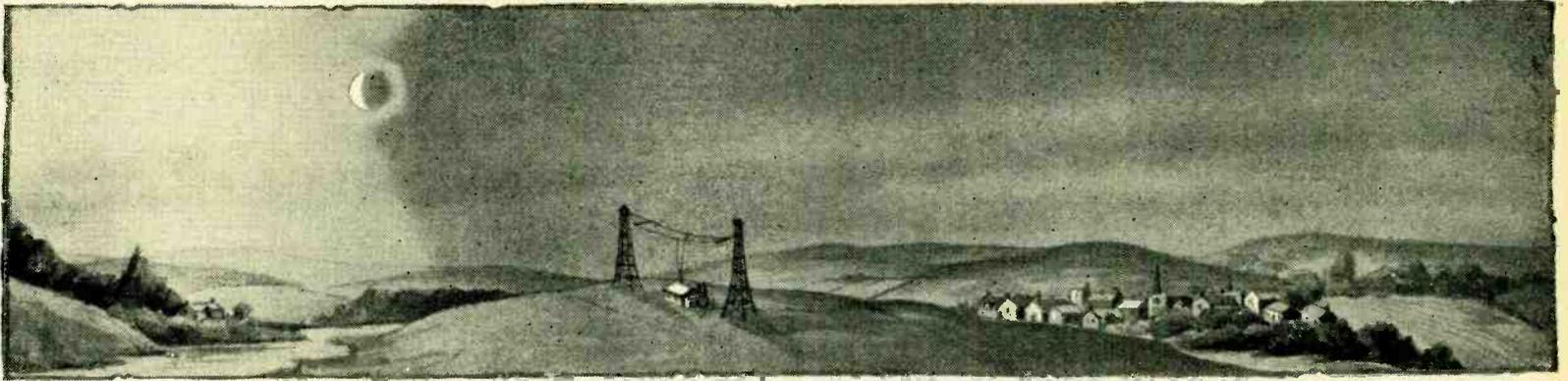
The 1 1/2-kilowatt amplifier supplying speech and music to the exhibition stands is also on view. On the left of the main amplifier unit will be seen a rack on which is mounted the input equipment, comprising five stages of R.C.C. amplification. The output from this rack is fed to the power amplifier, which consists of two stages of push-pull R.C.C. amplification, the high- and low-tension current for which is obtained from a motor-generator set.

LIST OF PARTS.

After the particular make of component used in the original model, suitable alternative products are given in some instances.

- 1 Three-gang superhet condenser (Polar "Star")
- 1 Dial (Cydon "Sector Vision" type V.D.)
- 1 Set of Coils (Colvern Type K.B.L.C. ganged, for under baseboard mounting, with 1 Type K.53.)
- 2 I.F. Transformers, 110 kc. (Wearite Type W.W.I.F.)
- 1 Wire-wound volume control, 15,000 ohms and mains switch (Wearite Type Q.V.C. and G.40)
- 1 Switch (Wearite G.40)
- 1 Mains transformer for H.T.9 rectifier with 4 volts 4 amps. C.T. secondary, and primary 200-250 volts (Junit Type W.H.T.9S)
- 1 H.T.9 rectifier (Westinghouse)
- 5 5-pin valve holders, sub-base type with terminals (Clix) (Eddystone.)
- 1 Electrolytic condenser, 8 mfd. (T.C.C. Type 802)
- 2 Fixed condensers, 4 mfd., 800-volt D.C. test (T.C.C. Type 80)
- 3 Fixed condensers, 1 mfd., 500-volt D.C. test (T.C.C. Type 65)
- 1 Fixed condenser, 2 mfd., 500-volt D.C. test (T.C.C. Type 65)
- 1 Fixed condenser, 1 mfd., 400-volt D.C. test (T.C.C. Type 50)
- 4 Fixed condensers, 0.1 mfd., 400-volt D.C. test (T.C.C. Type 50)
- 1 Fixed condenser, 0.001 mfd., mica (T.C.C. Type 34)
- 1 Fixed condenser, 0.005 mfd., mica (T.C.C. Type 34)
- 1 Semi-fixed condenser, 0.0001/0.0001 mfd. (R.I. "Varicap No. 2")

- 1 Semi-fixed condenser, 0.002/0.0005 mfd. (R.I. "Varicap No. 8")
- 4 Ebonite Shrouded terminals, Aerial, Earth, and two Pick-up (Belling-Lee Type "B")
- 2 Metallised resistances, 1 watt, 250,000 ohms (Dubilier)
- 1 Metallised resistance, 1 watt, 50,000 ohms (Dubilier)
- 3 Metallised resistances, 1 watt, 20,000 ohms (Dubilier)
- 1 Metallised resistance, 1 watt, 15,000 ohms (Dubilier)
- 1 Metallised resistance, 1 watt, 1,000 ohms (Dubilier)
- 1 Metallised resistance, 1 watt, 500 ohms (Dubilier)
- 2 Metallised resistances, 1 watt, 250 ohms (Dubilier)
- 1 Metallised resistance, 3 watts, 25,000 ohms (Dubilier)
- 1 L.F. transformer, 5:1 ratio (Claude Lyons, Ltd.)
- 1 Valve screen, open top type (Varley "Nictet" D.P.22)
- 1 5-pin plug (Colvern)
- Screened sleeving (Bulgin P.3) (Goltone)
- (Lewcos, Harbros.)
- 1 Loud speaker, 2,500-ohm field, Pentode transformer and hum-bucking coil (Rola F.P. 2,500)
- 1 Cabinet (Magnavox Model 142.) (Camco "Empire")
- 1 Plymax base, 15 1/4 in. x 10 in. x 3/4 in.; 2 Pieces 3 in. ply wood, 9 1/4 in. x 3 in.; 1 Piece 3 in. ply wood 15 1/4 in. x 3 in.; 1 Piece 16 gauge aluminium 15 1/4 in. x 3 in. (Peto-Scott)
- Flex, tinned copper wire, screws, systolex, etc.
- Valves
- 2 Mazda AC/Pen, 1 Marconi VMS4, 1 Mullard 354V. (2 Marconi MPT4 or Osram MPT4, Osram VMS4 or Mazda AC/S1VM, Mazda AC/HL or Marconi MH4 or Osram MH4.)



The Wireless Eclipse.

When and Why it Occurs.

THE complete art of wireless—or is it now a science?—borders on and, indeed, overlaps many other branches of knowledge. This is readily seen from mere consideration of the number of other sciences that are concerned with the day-to-day operations of wireless, and even more particularly with the developments that are continually proceeding. The “heavy” electrical engineer comes into his own at the “kilowatts” transmitter; the civil engineer designs its essential masts. The modern valve is the product of engineer, physicist, and chemist alike. The theoretician analyses circuits and circuit-properties, and the mathematician is called in to help him when the calculations become—as they often do—too much for the technician. The stimulus of audio-frequency technique due to the expansion of broadcasting has led to great advances in acoustical knowledge, which, in turn, are used to improve our conditions of reproduction.

The world-wide broadcast nature of wireless propagation has brought it prominently into focus in connection with large-scale cosmic physics. Here, however, it looks as if wireless had almost more to give to the other science than to receive from it.

The Ionised Layers.

Incidentally, it is interesting to recall that a year before Marconi used an elevated aerial to provide an effective radiator for his early transmissions, the very first elevated aerial was erected by Popoff. But Popoff used his aerial for the purpose of receiving at a distance *the effect of thunderstorms*. The first wireless aerial—to say nothing of Benjamin Franklin’s still earlier attempts—was thus one for atmospherics; so that we cannot really complain if these still exercise their priority and give us trouble at times. Since then it has been shown that there is a strong correlation between meteorological conditions and atmospheric sources, and methods have been developed by the Radio Research Board to locate the sources of individual atmospherics. How far this may ultimately be of advantage to routine meteorology and weather forecasting is still a matter for investigation. Possibly it may prove a useful adjunct to the inferences that

JUST as the passage from daylight to night conditions and vice versa have a marked effect on the intensity of received wireless signals, so an eclipse of the sun produces similar results. It is now believed that when corpuscular, as distinct from light, radiations from the sun are intercepted by the moon, the intensity of wireless signals is also affected. The corpuscular and light eclipses will not occur at the same time but will follow one another, due to the difference in their rate of travel from the sun. The present article discusses these effects in connection with an eclipse of the sun, due to take place on August 31st.

are to be drawn from the movement of depressions and anti-cyclones, so that the toad may have “yet a precious jewel in his head.”

The latest application of wireless propagation is to use it for new determinations of the nature of solar radiations.

It is now many years since Heaviside and Kennelly suggested that an ionised layer of the atmosphere—deriving its ionisation from solar activity—was responsible for wireless signals travelling to distances that on previous theory they ought not to have been able to reach. Even now it is quite a few years since classical experiments by Prof. E. V. Appleton proved beyond doubt the existence of such a layer. A little later—somewhere about 1927—he suggested that there were actually two layers; or, perhaps, “regions” should now be regarded as a better description. Since then additional evidence appears to put it beyond dispute that there are two such regions, one about 80 to 100 kilometres high, and the other at about 230 kilometres or more.

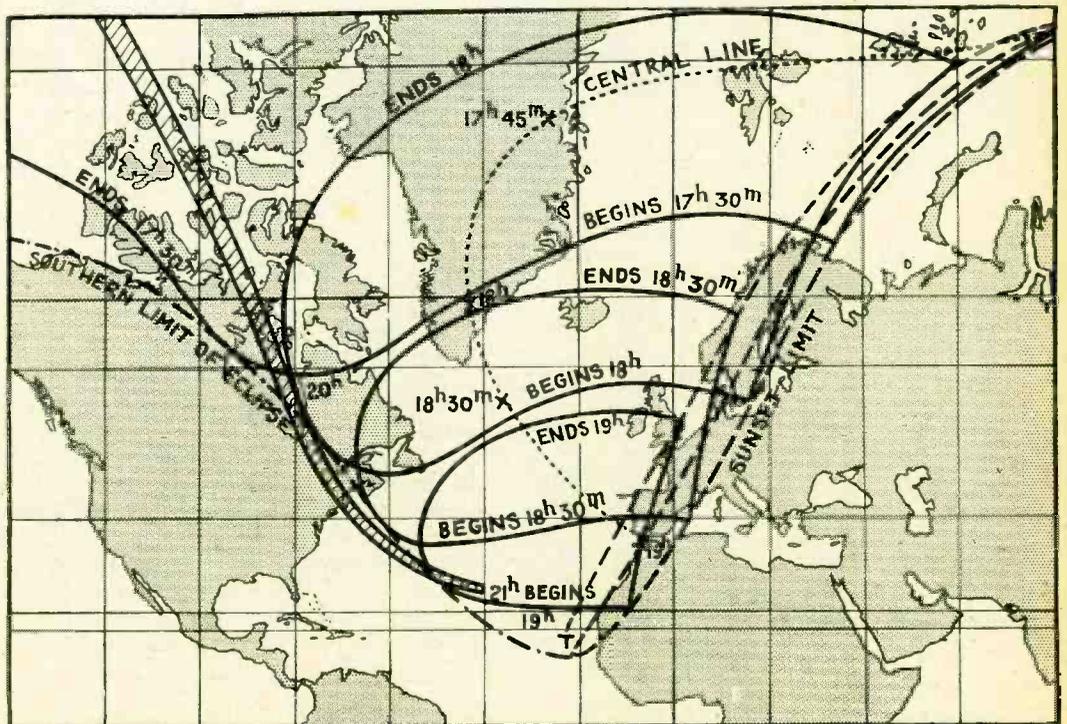


Fig. 1.—The optical shadow (shaded band) and the corpuscular shadows calculated for the solar eclipse of August 31st.

The Wireless Eclipse.—

The question now arises, "What particular types of solar agency are responsible for these two regions?" It appears that wireless signals are likely to be, once again, the method of solution. It is suggested by Prof. S. Chapman, the well-known authority on aurora and terrestrial magnetism, that the upper of these regions derives its ionisation from ultra-violet light, and the lower from corpuscles or particles shot off by the sun.

Corpuscular Eclipse.

Now, it is extremely difficult to devise experiments which in ordinary day-to-day conditions would give measurements that could cast light on this point. But an eclipse of the sun gives a particular type of cut-off of the sun's influence. Light, we know, travels at the rate of 300,000 kilometres per second, whereas the corpuscular particles of the nature suggested by Prof. Chapman are estimated to have a rate more of the order of 1,000 kilometres per second. This means that, to an observer on the earth, the corpuscular supply will be interrupted before the visible and ultra-visible light shadow is cast by the moon's intervention. It is not very difficult to see that a difference in time may be expected between the eclipsing effect of the moon on the two different types of solar emission. The moon is about 240,000 miles from the earth, so that the effect on light, travelling at the rate of 186,000 miles per second, will be experienced at the earth's surface in just over a second, that is, relatively instantaneously. On the other hand, particles travelling at the slower rate already suggested, viz., 1,000 miles per second, will not be cut off at this time. It is not, however, so easy to see why the corpuscular eclipse should actually take place at the earth's surface before the optical eclipse.

An Explanation.

The explanation given by Prof. Chapman is as follows:—

Light is emitted effectively from all the visible disc of the sun, and the eclipsing effect, as seen at the earth's surface, consists of a large *penumbra* or region of partial shielding, and only a relatively small region of *umbra*, or total eclipse, as shown approximately in Fig. 2 (b). The theory of corpuscular emission—which need not be considered here in detail—appears to indicate that this emission only proceeds from a relatively limited and central part of the disc. At great distances from the sun, as, for example, near the earth's surface, the particles form a nearly parallel beam. The particles thus cross the earth's orbit in a direction nearly radial from the sun, so that the moon creates something closely approaching a shadow-cylinder, as shown in Fig. 2 (a), having a cross-section which is, at the earth's surface, nearly equal to the diameter of the moon itself.

Now, when the moon is on that side of the earth nearest to the sun it has a velocity of about 1,075 miles per minute in the direction of the orbital motion of the earth. The particles have an equal and opposite transverse velocity relative to the moon, while their velocity in the radial path from sun

to earth is, as stated, 1,000 miles per second, or 60,000 miles per minute. As a result, the shadow-cylinder carved out by the moon (treating the corpuscles as moving completely parallel to each other) has a backward slope of approximately 1 degree. During the four minutes taken for the particles to travel from the moon to the earth the transverse lag of the particles or of the shadow-cylinder will be $1,075 \times 4 = 4,300$ miles behind the moon. About the time of a solar eclipse the moon is moving with a velocity nearly parallel to that of the earth but less than it by about thirty-five miles per minute, so that the corpuscular shadow-cylinder will strike the earth 4,300/35 or 123 minutes before the axis of the optical shadow-cone reaches the earth.

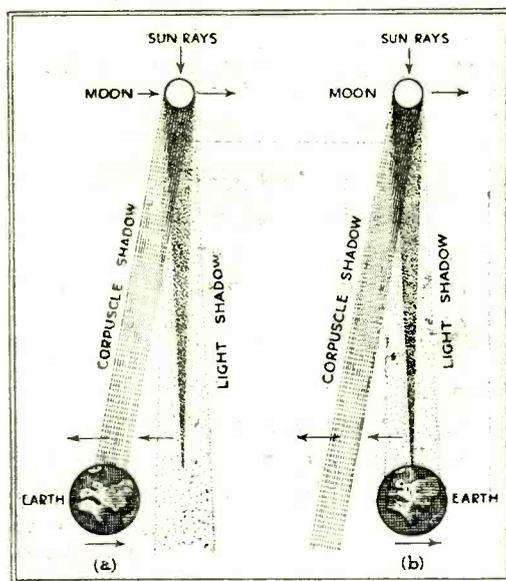


Fig. 2.—Showing the difference between the incidence of corpuscular and optical shadows. (a) The corpuscular eclipse in progress before the light eclipse begins; (b) the light eclipse in progress, the corpuscular eclipse being over.

These successions of shadow regions are shown in Fig. 2, which is not, of course, drawn to scale, the angles and dimensions being altered to emphasise the points mentioned above.

Previous wireless observations during eclipses have certainly revealed that the passage of the moon produced effects comparable to those of sunset, darkness, and sunrise. But experiments have not previously been oriented towards looking for effects so remote from the band of optical totality or even partial optical eclipse, as would appear necessary. This is well illustrated by the map of Fig. 1.

Are you in the Corpuscular Shadow?

On August 31st there will be an eclipse whose band of optical totality will fall chiefly in Canada and Eastern U.S.A., as shown by the shaded area. But, assuming the rate of corpuscular travel already mentioned, the various eclipsed regions in the "corpuscular shadow" have been worked out by the Royal Astronomical Society to be as shown at the other parts of Fig. 1. A considerable part of Northern England and South and Mid Scotland thus fall into a region of pronounced corpuscular eclipse, while the general distribution illustrated in the map shows the wide separation in time and in space that may occur between the

two types of wireless shadow that have already been mentioned. It is a pity that so much uninhabited Atlantic Ocean falls within the "corpuscular shadow"; but, unfortunately, we are not yet able to place eclipses where our wireless scientists would like them.

The August 31st eclipse should, however, even with these limitations, provide opportunity for observing the effect of the two types of shadow on wireless signals. The Canadian Government is arranging for wireless observations on a site in the track of the optical shadow. Other expeditions being made in connection with the Second International Polar Year should be in a position to make observations at places within the corpuscular eclipse, but a wide network of observers within or near this region would be a very welcome addition. Prof. Appleton has pointed out that, in the case of the 1927 eclipse, wireless observations of great scientific value were obtained with apparatus of a modest type, such as a simple galvanometer-record of signal-intensity. Amateurs will be able to devise apparatus for themselves.

Wireless amateurs participating in these observations should communicate with Prof. Appleton at King's College, Strand, London, W.C.2.

The Wireless World INFORMATION BUREAU.

Conditions of the Service.

(1) THE service is intended primarily for readers meeting with difficulties in the construction, adjustment, operation, or maintenance of wireless receivers described in *The Wireless World*, or those of commercial design which from time to time are reviewed in the pages of *The Wireless World*. Every endeavour will be made to deal with queries on all wireless matters, provided that they are of such a nature that they can be dealt with satisfactorily in a letter.

(2) Communications should be addressed to *The Wireless World* Information Bureau, Dorset House, Tudor Street, E.C.4, and must be accompanied by a remittance of 5s. to cover the cost of the service. The enquirer's name and address should be written in block letters at the top of all communications.

(3) The fee of 5s. covers the reply to any wireless technical difficulty, but in special cases, where the enquiry may involve a considerable amount of investigation, an increased fee may be necessary. In such cases a special quotation will be made.

(4) Questions should be clearly written and concisely worded in order to avoid delay. Where enquiries relate to trouble experienced in receivers built to specifications in *The Wireless World* a complete account should be given of the trouble, and especially the symptoms.

(5) Where reference is made to published articles or descriptions of apparatus, the title of the article, the date of publication in *The Wireless World*, and the page reference number should be given, in order to facilitate reply.

(6) Full circuit diagrams, constructional details of apparatus, or values of components for home-designed receivers cannot normally be supplied, but circuit diagrams sent in with queries will be checked and criticised.

(7) Particular makes of components cannot, in general, be recommended, but advice will be given as to the suitability of an individual component for a particular purpose specified by the enquirer.



The Wavelength Problem

Part I.—Frequency Separation and Interference.

DURING the last year and a half there has been an unusual amount of discussion amongst those interested in wireless, not only concerning the wavelengths which are used for broadcasting, but also the whole problem of the necessary channel width for the different types of wireless communication. Many opinions have been expressed and certain suggestions have been made as to the methods of overcoming the difficulties. When viewed from the practical point of view some of these have been perhaps a little wild, to say the least of it, many others have been quite sound technically but never likely to be agreed internationally, while a few have been helpful. However, if we face the true facts it is fairly obvious that there can be no definite and lasting cure to a state of congestion amongst wireless stations which re-establishes itself almost immediately after steps have been taken to remedy the conditions existing for the time being. What happens in practice is that immediately receiving technique is improved more stations are crowded into a given band, with the result that the same state of interference exists after a few months as existed before the new technique was introduced, the only difference being that there are more stations involved.

The Madrid Conference.

This statement does not mean that very great improvements could not be made or that the present system of distribution of the wavebands available for the various services has reached finality; this, in fact, is very far from true, and everyone is looking forward to the Conference in Madrid next September, with the hope that at least some of the more useful suggestions will be in-

By NOEL ASHBRIDGE, B.Sc.,
Chief Engineer, B.B.C.

corporated in future agreements. Again, recently some rather misleading statements have been published concerning discussions which are alleged to have taken place at meetings of the U.I.R. (Union Internationale de Radiodiffusion), which would seem to have arisen from inaccurate infor-

***T**HE Chief Engineer of the B.B.C. here discusses the problem of frequency separation and interference. The curves giving the sideband energy transmitted across the low-frequency spectrum should prove of great interest as they provide an explanation of certain phenomena of sideband heterodyning so often experienced. With a 9-kilocycle separation between stations, it is pointed out that reproduction without interference above some 4,000 cycles cannot be obtained at the limit of the service area.*

mation. It is for all these reasons that I am proposing to set forth the position as I see it to-day, while there is, so to speak, a lull in the storm pending the opening of the Madrid Conference in the autumn.

In this article we must confine ourselves to the question of broadcasting only. I do not wish to trouble readers with a long history of the early agreements which were made in connection with the distribution of the avail-

able wavelengths amongst the various countries. Suffice it to say that the existing agreement known as the Prague Plan was put into force by a large majority of the signatories, but unfortunately not quite all, on June 30th, 1929. So far as the medium wavelengths are concerned, that is to say, the waveband of 200 to 545 metres, there is a general separation between stations of 9 kc/s, except for some of the shorter wave channels between 200 and 214 metres, where there is a separation of 10 kc/s. The first question which naturally arises is, On what grounds was the separation of 9 kc/s chosen, particularly having regard to the fact that the Geneva Plan (which incidentally was not universally applied) was worked out on a basis of 10 kc/s? Again, a separation of 10 kc/s was standard in the United States. Technicians might ask, On what basis had the 9 kc/s been calculated?

Compromise or Chaos?

Unfortunately it has to be admitted that it was not calculated on a technical basis at all, but was merely adopted as the only hope of getting an agreement of any kind; that is to say, the extra number of stations which the smaller separation allowed just gave a chance of getting a measure of agreement which otherwise would have been impossible. Therefore it cannot be said that those responsible for the Prague Plan made a mistake in adopting this separation, because even if it has to be admitted that 9 kc/s separation is perhaps questionable policy on technical grounds, undoubtedly it is better to have something not quite sound technically than something which is obvious chaos.

The next question is whether the separation of 9 kc/s is in fact technically unsound,

The Wavelength Problem.—

and, if not, can it be made sound by the general use of more selective receivers and/or by reducing the band of frequencies emitted by the transmitters. However, before embarking on technical arguments concerning the highly controversial question of the frequency band necessary for a broadcasting station, it might be as well to consider how the plan has worked in practice from the point of view of separation between stations. For the first year it worked very well, apart, of course, from cases of interference which arose from the fact that a few people signed the Plan, or, as it should be called, the Protocol, and did not observe it in practice. Fortunately such people were very much in the minority. It must be remembered, of course, that during the first year there were very few stations in Europe working in the medium waveband with a power of more than about 15 kW. Figures 1 and 2 show at a glance how the European network has developed in the past 12 years. However, so far as Great Britain is concerned trouble started with a vengeance in November, 1930, when for the first time we had a really high-power station next door to one of our medium wavelength channels. The result was immediate and severe jamming after dark on the London Regional programme. This was not unforeseen.

separation of 9 kc/s. The situation was made worse because at the time, nearly two years ago now, receivers were by no means so selective as they are now. Perhaps also the mean level of modulation used at Mühlacker when the station was opened was a little higher than it is now. In the November following my visit we knew the worst, and the worst was pretty bad. Naturally we tried to do everything we could to get rid of the trouble, and so did the German engineers, two of whom came over here early in 1931 and carried out some tests with one of their own receivers. They succeeded in cutting out the interference altogether, but the quality given by the receiver after they had done so was not, in my opinion, acceptable. As is well known, eventually a solution of the difficulty was found by increasing the separation between Mühlacker and London to 11 kc/s. This was fol-

ing that the normal sideband theory, whatever faults some people may consider it has, at least provides a means of visualising what is happening, we can say straight away that a broadcasting station transmits a carrier wave with two families of sideband frequencies which may extend up to, say, 10 kc/s or more on either side of the carrier. But the amplitude of the carrier and most of the sideband frequencies are not, in general, by

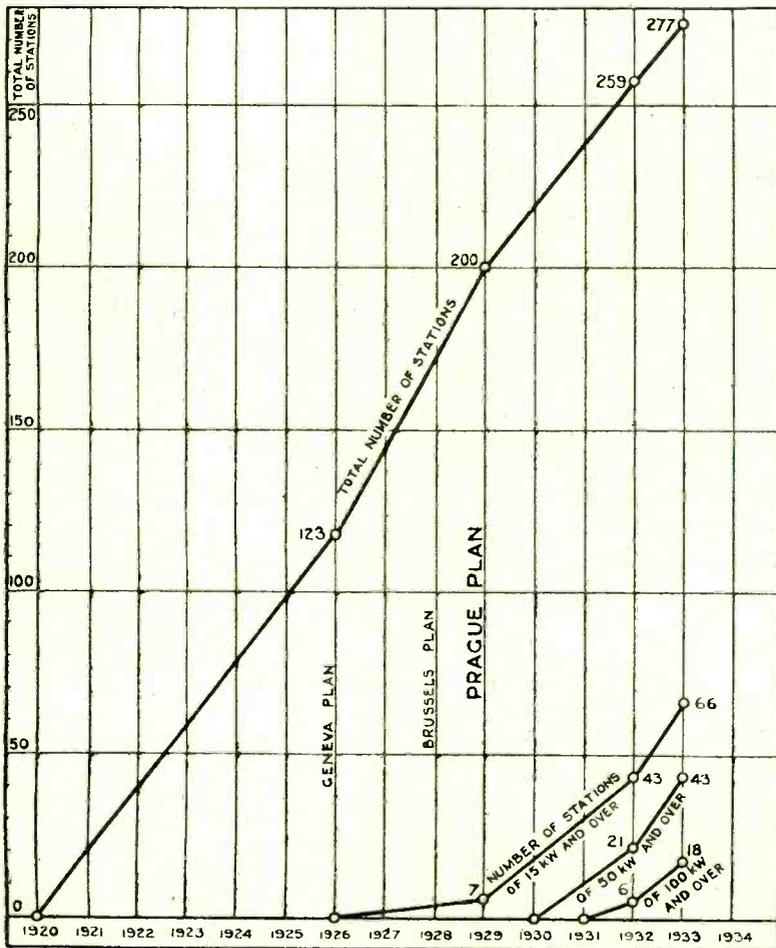


Fig. 1.—How the European network has developed in the past 12 years. The rapid increase in the number of high-power stations since 1930 can clearly be seen.

I had seen Mühlacker in course of construction in the previous August, and on that occasion we discussed with considerable misgiving what would happen when two stations having about 50 kW or more in their aerials were working side by, side with a

Returning to the question of whether 9 kc/s can be looked upon as a sufficient separation between broadcasting stations, it is necessary to reconsider one or two well-known theoretical facts concerning the transmission of telephony. If we start by assum-

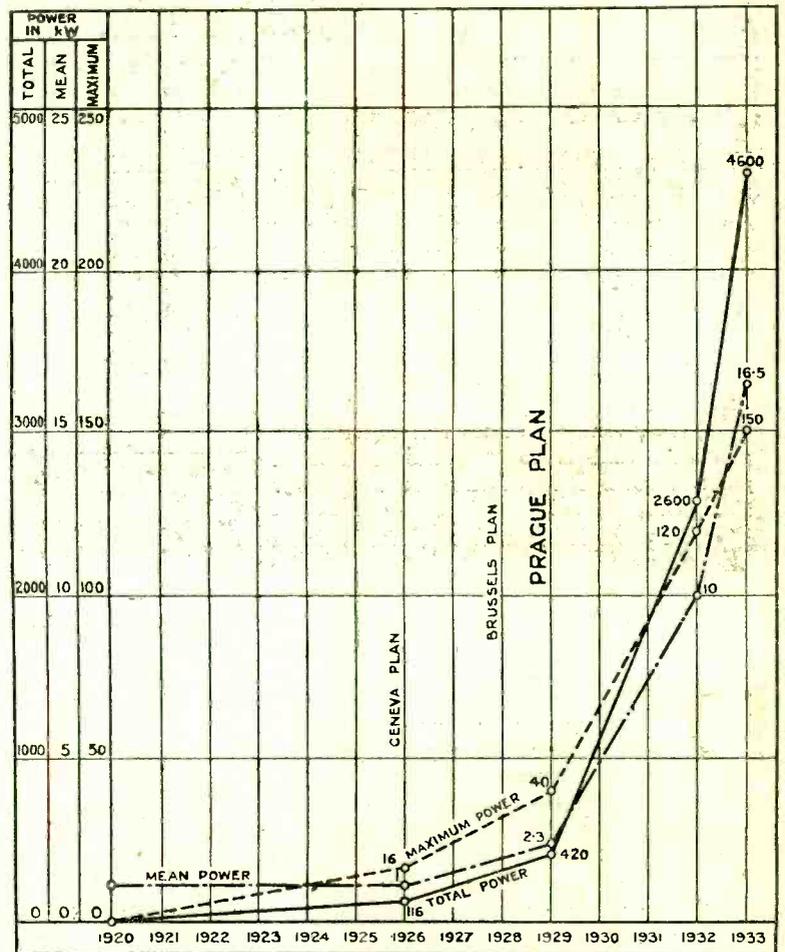


Fig. 2.—Curves showing the increase in power of individual stations and the total power of all European stations from 1920 onwards.

lowed by increasing the separation in several other cases, such as, for example, between Prague, North Regional and Langenberg.

Very briefly, this is how the controversy concerning the need for greater separation between broadcasting channels started, at least for stations in the medium waveband. Later I shall have something to say about the discussions which we have had abroad on this subject and the various different points of view which gradually emerged.

any means equal. As an example, consider a broadcasting station where the modulation is limited strictly to 80 per cent., which incidentally is not by any means always the case. This means that the peak value of any of the modulation frequencies is never greater than 80 per cent. of the peak value of the carrier, but it does not mean that all such frequencies up to, say, 10,000 p.p.s. ever reach a peak value even approaching this value.

Speech and Music Modulation.

Without going closely into an analysis of the average sideband produced by speech, music, etc., one can say as a rough approximation that frequencies from 150 to about 3,000 cycles would probably at times reach the maximum figure, but above 3,000 cycles the amount of modulation falls off very rapidly. Figures 3 and 4 give curves showing approximately how the energy in the sidebands varies with frequency, both for music and speech. These two curves, which are based on the work of Harvey Fletcher, have both been plotted to show the same maximum modulation in order to give an immediate comparison between the energy spectra of speech and music. The sound energy in the studio is, of course, far greater

The Wavelength Problem.—

in the case of most forms of music, moreover, a transmitter is not normally modulated to the maximum for speech. Of course, it will be obvious that if we wish to limit the maximum peak modulation to 80 per cent. of the carrier, the limitation will only apply to the sideband frequencies which are produced at the greatest strength and other frequencies will reach a lower degree of modulation, corresponding, but not strictly proportional, to the strength at which they are produced in the studio.

The Causes of Interference.

What, then, are the causes of interference? When several high-power broadcasting stations are working at 9 kc/s separation and the strength given by each is of the same order, there are four possible causes of interference likely to occur in practice, and these are as follow:—

- (1) An audible heterodyne between the carrier wave of the wanted station and those of its two neighbours.
- (2) The hearing of an intelligible programme, that is to say, the modulated carrier, from each of the two neighbour stations.
- (3) A possible heterodyne effect between one unwanted sideband of each of the neighbour stations and the two sidebands of the wanted station.
- (4) The heterodyne between one sideband of each neighbour station and the wanted carrier.

To explain the above, let us assume that we have two broadcasting stations, each of 50 kW with their carrier waves separated by 9 kc/s, and for the sake of simplicity let us consider that only these two stations are concerned in the problem. Imagine also that we are using a receiver where the selectivity can be easily varied without appreciably affecting the mean volume of the loud speaker output. Let us assume also that the receiver is capable of a considerable measure of response up to 9,000 cycles per second, so far as its low-frequency circuits are concerned, and that we are receiving at a point where the field strength of the wanted

and in this case we may assume that the mean field strength of the unwanted station was half of that of the wanted station.) In these circumstances, if we adjust the receiver to be definitely unselective, that is to say, so that it covers about 18 kc/s on either side of the wanted carrier without much cut down, then we shall, of course, hear most strongly the wanted station, but we shall also hear a heterodyne between the two

extremely selective, then even the sideband heterodyning will disappear, but by the time we have obtained this effect *completely* we shall find that the quality of the transmission from the wanted station is very much lacking in the higher frequencies. We must consider to what extent they are likely to be missing. Some experiments which have been carried out recently have shown that most of this twittering or grasshopper noises,

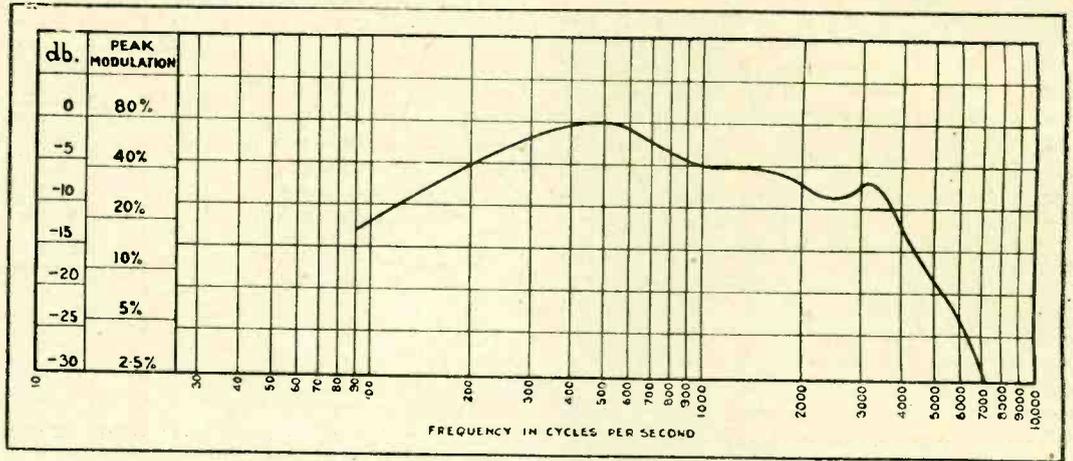


Fig. 4.—With male speech the sideband energy transmitted at the high frequencies is considerably reduced.

carriers, together with the complete programme, that is to say, the modulated carrier, of the unwanted station. Again, we should also hear the heterodyne of one set of unwanted sidebands with the wanted carrier, and would also, theoretically at any rate, hear the heterodyne of one set of unwanted sideband frequencies with one set of wanted sideband frequencies. However, in practice, this last form of jamming does not seem to be troublesome, presumably because the heterodyne effect is weak owing to the fact that the carrier of the wanted station is not involved.

If now we gradually increase the selectivity of the receiver, the strength of the heterodyne between the two carriers and the intelligible type of interference will both decrease noticeably, and in fact both can be made to disappear with a well-designed receiver. However, we shall find that we

as sideband heterodyning is sometimes called, is caused not so much by the upper sideband frequencies of the unwanted station as by the modulation frequencies which contain the most energy, namely, those extending up to, say, 3,000 cycles per second.

Effect of Sideband Energy.

An unwanted sideband with a frequency of 3,000 cycles per second will produce a note with the wanted carrier of 6,000 cycles per second. Therefore, in order to get rid of this effect, we must have practically no response in our receiver at 6,000 cycles per second, which in turn means that we shall not be able to reproduce any audio-frequencies from the wanted station above about 4,500 to 5,000 cycles per second. The higher unwanted sideband frequencies, say those between 6,000 and 7,000 cycles, will make a jamming note of from 3,000 to 2,000 cycles per second, but, as I have already said, the energy normally radiated on such frequencies is small, and in practical cases the heterodyne effect is much less noticeable as compared with interference caused by the lower unwanted sideband frequencies. All this, of course, is not in any way new, but an explanation has been given in order to emphasise two important points which concern respectively transmission and reception:

(a) Comparatively little good would be done by cutting off the upper modulation frequencies above, say, 5,000 cycles per second in every transmitter with a view to preventing interference.

(b) With a 9-kc/s separation one cannot hope for reproduction of frequencies above, roughly, 4,000 cycles per second at the limit of what is usually called the service area, unless one happens to be so placed that the neighbouring stations likely to cause interference are very weak compared with the wanted station.

(To be concluded.)

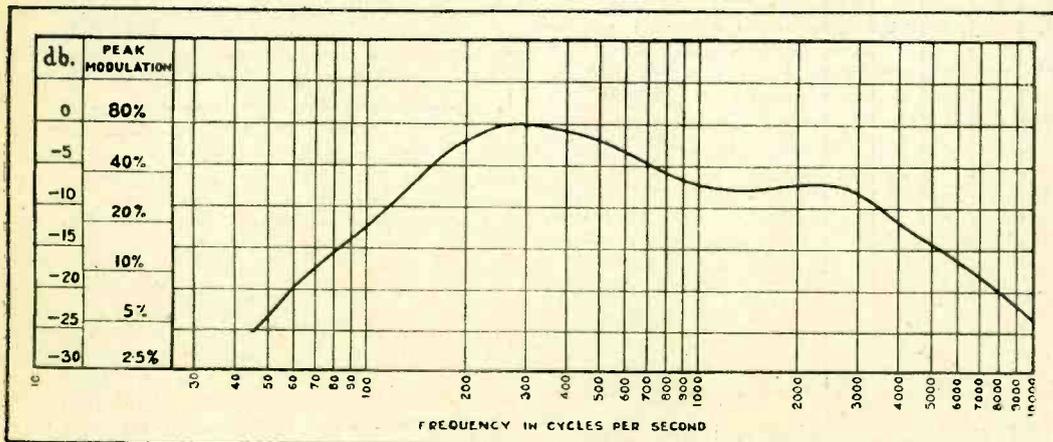


Fig. 3.—The energy in the sidebands plotted against the average frequency spectrum of a symphony orchestra. With the maximum peak modulation at 80 per cent. it will be seen that the energy at the higher frequencies falls away rapidly.

station is about twice or less than twice that of the unwanted station.

(Note.— In practical cases the most troublesome interference occurs at night between stations at considerable distances,

are left with the now familiar noises known as sideband heterodyning, i.e., a heterodyne between the one set of unwanted sidebands and the wanted carrier. If we continue this process still farther and make the receiver

News of the Week.

Current Events in Brief Review.

Here and There.

EXHIBITION fever at the present moment is not confined to Great Britain. The opening of the National Radio Exhibition at Olympia to-day coincides with the start of the Berlin Radio Show, which will remain open until Sunday, August 28th.

Bristol's Radio Train.

BRISTOL, which has always been a centre of wireless enthusiasm, will send a special radio train to London for the Olympia Exhibition on Wednesday next, August 24th. The train, which has been chartered by the Bristol "Evening World," will leave Temple Meads station at 1 p.m., arrive at Paddington at 3.55 p.m., and return at 11.50 p.m.

"Orders are Orders."

THIS is not a slogan intended to brighten the lives of exhibitors at Olympia. It is the title of the play now running at the Shaftesbury Theatre, London, in which extremely realistic stage effects are obtained from an H.M.V. gramophone amplifier. A special record was made at the Wellington Barracks by the London Scottish, and audiences in the theatre are able to hear, as part of the performance, the authentic sounds of troops drilling on parade, special bugle calls, and the ordinary noises of a barracks square during recreation time. The standard double turntable unit includes specially constructed pickups having engraved scales in order that any single groove on a record can be easily located. In addition to the stage effects the installation provides interval music from the orchestra pit and announcements from a number of loud speakers installed in the entrance foyer and bars.

A French Radio "War."

WHAT is regarded as "open warfare" between the State and private broadcasting organisation in France, seems to have broken out with the refusal by the Ministry of Fine Arts to permit *Radio Paris* to broadcast from the *Paris Opéra*.

We understand that the authorities at *Radio Paris* had definitely come to an arrangement with the management of the Opera, but that when the agreement was submitted to the Ministry the name *Radio Paris* was struck out and replaced by that of the State Broadcasting System. A preliminary sequel will be the broadcasting of "Marouf" by *Eiffel Tower* and other P.T.T. stations this evening (Friday). Other operas will follow during the autumn.

Radio Paris and the other private stations are known to have many energetic defenders in the French Parliament, and an interesting situation is developing.

The Amateurs' Union.

THE admission of the Suomen Radio Amateorillito r.y. of Finland, to membership of the International Radio Union during July, has brought the Union's total membership to twenty countries. This International federation, which was organised at Easter Congress in Paris in 1925, now represents nearly 50,000 amateur stations and is thus by far the largest radio organisation. The latest applications for membership have come from Mexico and the Dutch East Indies.

Twenty Years of Amateur Radio.

ON Saturday last, August 13th, amateur radio in the United States was officially 20 years old. It was the Radio Act of August 13th, 1912, that first recognised amateur radio stations in the United States. Since that time the number of American amateurs has grown from a few hundred to well over 30,000.

The American Radio Relay League, which is now the central organisation of the U.S. amateurs, was founded by Hiram Percy Maxim in 1914.

The Wireless Society of London, forerunner of the Incorporated Radio Society of Great Britain, was founded two years earlier.

The French Regional Scheme.

AT Rennes, Normandy, one of the first of the 60-kilowatt stations of the Ferrié broadcasting scheme may be in operation in a few months' time. Thanks to the promptness shown by the new French Postmaster-General, M. Queuille, the French Council of State has been moved to order the commandeering of certain territory at Thourie, near Rennes, for the construction of the station.

Our Paris correspondent indicates that France seems to have entered upon her national broadcasting scheme with the serious intention of carrying it through as quickly as possible. Sites are being chosen for the stations in the other zones, and the first to be in action will probably be the 60-kilowatt transmitter at Nice.

Broadcasting and the German Crisis.

UNEMPLOYMENT in the German broadcasting industry is threatened as a result of the reorganisation of the whole system under Government control. Our Berlin correspondent reports that the Ministry of Posts has informed all the German broadcasting companies that their concessions for broadcasting will cease on September 30th next instead of December 31st, 1937, as provided in the contracts. The Ministry takes advantage of a clause in the contracts permitting the termination of concessions at short notice in case of emergency.

New companies will have to be formed by October 1st, and although the present staff will probably be taken over as a whole, economy "cuts" and dismissals seem inevitable.

In the meantime, as a glance at the programmes printed in *The Wireless World* will show, the German programmes continue with military band concerts, dance music, and other items which amply disguise any suggestion of the current depression.

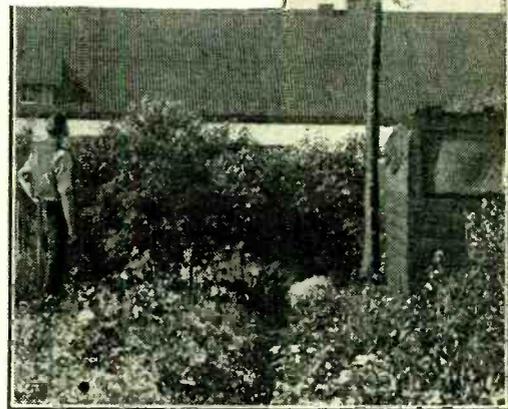
NEXT WEEK'S ISSUE

Will include a detailed, fully illustrated stand-to-stand record of the Show, entirely compiled at Olympia by the technical staff of THE WIRELESS WORLD from first-hand information.

Line Tests.

A RAILWAY freight wagon is being used by the Roumanian broadcasting authorities in their search for a suitable site for the new 150 kW. station. A temporary transmitter mounted on the wagon is roaming the railway system, sending out test signals at spots which are considered favourable and signal strength measurements are taken by specially appointed listeners.

The completed station is expected to be operating early in 1933.



A PLEASANT SURPRISE? Two years ago Mr. E. Symons, of Speke, Liverpool, purchased a bare pole to support his wireless aerial. The picture tells its own story.

120 Kilowatts from Spain.

THE new broadcasting station to be erected in Madrid in accordance with the Spanish Regional scheme will have a power of 120 kilowatts and will operate on the long waveband.

Radio Labour of Love.

HUNDREDS of thousands of words have been sent out from W6USA, the amateur station at Los Angeles, operated by W. A. Lippman, who, at his own cost, transmits messages on behalf of the international competitors in the Olympia games. Mr. Lippman is acting in conjunction with amateurs all over the world, who relay whatever messages are received until they reach their destination. Sometimes the messages cannot be relayed over the last stretch, in which case they are delivered either personally by the receiving amateur or by letter postcard.

In France, Too.

MR. LIPPMAN and his friends are not the only people in radio circles who labour for love. Our Paris correspondent tells of two young ladies who make it their hobby to take down in shorthand all the talks and commentaries given from the Paris P.T.T. station. A few hours afterwards the text, neatly typewritten, is sent to the respective authors.

There is, too, the case of a boy of fifteen years in the Landes Department who has filled 200 copybook pages with records of what he has picked up on his receiver. This reveals another revolution brought about by radio. Ten years ago the copying out of 100 or even 50 lines was considered punishment.

The Attraction of Foreign Listening.

The Capabilities of a Modern Receiver.

By
R. W. HALLOWS,
M.A.



IN the postbag of a writer upon wireless subjects the letter which appears more frequently than any other is that which asks how a valve can be added to an existing receiving set. The reason for this yearning for additional valves is that the listener insists nowadays upon being able to hear something of Continental broadcasting. Any manufacturer who put on to the market a receiving set designed purely for high-quality reproduction of the local station's programmes would inevitably lose a considerable amount of money, for there is nothing that annoys the man in the street to-day so much as being "tied to the local station." The position, in fact, is precisely the opposite of that foreseen two or three years ago by some of the Very Great in the world of wireless. These did not hesitate to proclaim that the passion for long-distance reception, which had then just begun to manifest itself, would soon die what they were pleased to term a natural death. They contended that improvements in the technique of both transmitting and receiving would force the listener to realise the truth of the old proverb "East, West, Home's best"; he would tune in nothing but his local station, and would come to regard the reception of broadcasts from abroad as a mere childish craze.

They Were Sadly Disillusioned.

Those who hold such opinions failed to see that the very improvements in transmission of which they spoke would work a revolution of a completely different kind. Many European countries have installed high-power transmitting plants of the most modern kind, with the result that most parts of this country are now, to all intents and purposes, within the service areas of a considerable number of Continental stations.

Actual measurements made in the neighbourhood of London last winter showed that the field strength of a good many Continental stations was well above what is regarded as

the service area minimum; whilst practical experiments have proved to the hilt that, except under the most adverse conditions, admirable reception is obtainable from stations hundreds of miles away. And the erection of numerous high-power stations abroad has had another far-reaching result. The months between October and March are admittedly the best for long-distance reception. Indeed, until comparatively recently very little that was genuinely worth hearing could be brought in by the wireless set during the remainder of the year. During the summer of 1932, even on unambitious sets, long-wave stations such as Huizen (1,875 m.), Radio-Paris (1,725 m.), and Zeesen (1,635 m.) have been well received in the south of this country at any time when they were working, whilst in the north Kalunborg and Motala have furnished excellent service. Even on the medium waveband Brussels No. 1 (509 m.), Lagenberg (473 m.), and Hilversum (296.1 m.) have nearly always been receivable in daylight.

From about 7 p.m. onwards the number of medium-wave Continental stations that could be well received during the months between May and August was extraordinarily large. The list includes, in addition to those already mentioned, Florence, Prague, Rome, Stockholm, Beromunster, Toulouse, Strasbourg, Brussels No. 2, Milan, the Poste Parisien, Heilsberg, Turin, Trieste, and, in many localities, Fécamp and Nuremberg.

From now onwards conditions for long-distance work will become rapidly more and more favourable until they reach their best in the autumn and winter. A very wonderful season it should be for the foreign listener owing to the number of powerful stations already in operation or to be opened within the next few months. Those who fail to take full advantage of the coming season's wonderful opportunities will be missing no small part of the entertainment that the wireless receiving set has to offer. A set used purely for local reception is rather like

a car employed merely as a town runabout. Long-distance reception gives one all the pleasures of touring.

I have indulged in long-distance listening since long before the days of organised broadcasting, and I do not find that my "childish craze" shows any signs of abating! On the contrary, it seems to me that every year the reception of foreign stations becomes more and more interesting. If it was a great thrill ten or twelve years ago to be able to receive barely intelligible speech and music that was just queer noise from the Eiffel Tower, it is a far greater one to-day to select an item from the programmes of Rome or Kalunborg or Budapest or Heilsberg and to bring it in with such perfection that musical friends are completely deceived when told (a lie committed in the sacred name of science) that it is coming from the London Regional fifteen miles away. I have gone farther, and fared yet more joyously by tuning in Langenberg and calling it London and then tuning in London and calling it Langenberg.

Importance of Tone Correction.

Quite often a critical friend has pointed out, whilst listening to what was really London, certain imperfections that inevitably accompany the reception of a station at a great distance, and has shown me, by comparison with what was really Langenberg, how much better in certain respects the nearer station must always be.

The reception of foreign stations is more worth while nowadays than it has ever been, partly because of the great number of first-rate transmissions available, and partly because the modern receiving set is capable of reproducing their broadcasts with the same volume and the same quality as those of the local station. This year one enormous advance has been made, the importance of which is not yet fully realised. This is the introduction of a tone-corrector. The rapidly increasing number of high-power transmitting stations using wavelengths within the limits of the medium waveband has made selectivity a more and more desirable quality in the receiving set. Even if the receiving set possesses selectivity of a high order the local station can more or less take care of its own quality owing to its spread; but the quality of more-distant stations is liable to suffer through the over-emphasis of low frequencies. Tone correction enables a proper balance to be struck even in sets that rely upon reaction.

The best planned of programmes from the home stations cannot please all listeners all the time. With the long-distance set all Europe is one's oyster, and its owner must indeed be hard to please if he cannot find something to his liking amongst the dozens of programmes from which he may take his choice.

UNBIASED

By FREE GRID.

Olympic Glimpses.

ALTHOUGH the exhibition does not open until the morning when you get this copy of "W.W.," I have already spent two strenuous days in Olympia endeavouring to get an advance look at the exhibits, but it has been uphill work, and I fear that, after all, I have not got much information in return for my pains. I use the word "pains" advisedly, as I feel stiff and sore all over as the result of being battered about by heavy packing cases borne on the backs of abusive individuals who, judging by their language, were evidently imported for the occasion from Billingsgate. In addition, I feel exceedingly tired, as, apart from my efforts to prise up the lids of sundry packing cases and peer into them, I was for a long time chivied about from pillar to post by the horde of Admirals of the Fleet who always infest Olympia.

Fortunately, I was able to satisfy them that I had a right to be present, and had no felonious intent. Quite early in the day I had had the good fortune to pick up a pocket wallet dropped by a plutocratic-looking person whom I recognised as the general manager of a firm of radio manufacturers of almost international repute. In this wallet I discovered an exhibitor's "pass" coyly nestling amid a miscellaneous collection of pawn tickets and *billets-doux*. I subsequently returned the wallet through the post with the contents intact, except for the pass, and salved my conscience by reflecting that had it fallen into the hands of any unscrupulous person its owner would have had to pay heavily in hush-money in respect of the letters.

The chief item of news which I was able to glean was that this year the exhibitors have decided to sell their sets by appealing to the women instead of to the men; consequently, all the young ladies from Paris have been sent packing, and in their place a theatrical agency is, I understand, supplying a chorus of matinée idols, whilst special lighting arrangements have been made so that due justice is done to synthetic complexions.

In the course of my explorations I was pleasantly surprised to find that quite a number of firms which were excluded last year have gained lawful entry this year by taking out British naturalisation papers in the form of factories built in this country. One or two, however, had, to my mind, a rather too garlicky atmosphere about them. I was glad to see that the good old Anglo-Saxon firm of A. Gesellschaft, Ltd., which I mentioned in my notes last year as being so prominent in Manchester, had weathered the financial storm, and was still carrying

on. I was rather sorry to see the tendency to adopt American expressions in the nomenclature of sets. The "Lowboy 7" by H.M.V., and the "Attoboy 8" by a firm of equal repute could, in my opinion, be more happily named.

I notice that the B.B.C. amplifier is to feed the loud speakers at the various stands, as was the case at both Olympia and Manchester last year. There can be no doubt that music forms a very pleasing audible background, provided that it is not so loud that one has to use a megaphone in order to make oneself heard when making an enquiry at a stand. I, for one, would be sorry to see it stopped, but I do hope that the powers-that-be will see that we get a little more music and a little less cackle than was the case last year.

Let us hope that some kindly disposed person has presented some new records, so that visitors will be spared the constant reiteration of "Good Night, Sweetheart" and other West African swamp songs which saturated the pick-up in 1931.

Stop!

THERE is one great self-imposed task which I intend to carry out during the exhibition. I shall arm myself with half a dozen test-records from my collection, and go round all the stands on which radio-gramo-

phones or gramophone motors are in evidence. Thus I shall be able to test some of the wild claims which have reached me during the past week or two from various manufacturers to the effect that their particular brand of automatic stop will function equally well on any old record. It may be remembered, but probably won't, that three weeks ago I raised a moan about the erratic behaviour of these arrangements, which function sometimes before the record has finished, and sometimes never at all. Although I absolved the makers of motors and stops from all blame, which I said was due to the fact that the gramophone-recording companies all seemed to have different ideas on the question of run-off tracks (just as thirty years ago they all had different ideas about the speed of recordings), yet several makers of these devices sent me letters claiming that their particular device would do the trick. One even claimed that his device required no run-off track at all!

It was significant, however, that not one responded to my invitation to send in a specimen for test purposes.



Appealing to the women.

I should like to take this opportunity of thanking all readers who wrote to me on this subject, and suggest that those who intend visiting the exhibition should take an odd record or two. And then, please send me in your experiences so that I may publish a full report in due course.

"F. G."—His Mark.

I HAVE been smitten by an idea which is really the outcome of a rather insulting letter from a reader. All of you who have written to me will, I feel sure, bear me out when I say that it is my invariable rule to give a reply to all letters received and to append my initials thereto. The reader in question rather unkindly suggests that these letters are never attended to by me in person, but that replies are sent and my initials forged by hiring varlets in the "W.W." offices. As an earnest of my good faith, I have determined that, in future, all my letters will be signed by my right-hand thumb-print only, a facsimile of which is reproduced just below. This will definitely prevent any unkind suspicions. When any of you receive a letter purporting to come from me, you will only have to compare the "signature" on it with the facsimile thumb-print.

In case you are still in doubt, it will only be necessary for you to send the two prints to Scotland Yard for comparison; in fact,



Free Grid, his mark.

you need only send the letter, and ask the officials if it tallies with any on record in their files.

Exhibitors at OLYMPIA.

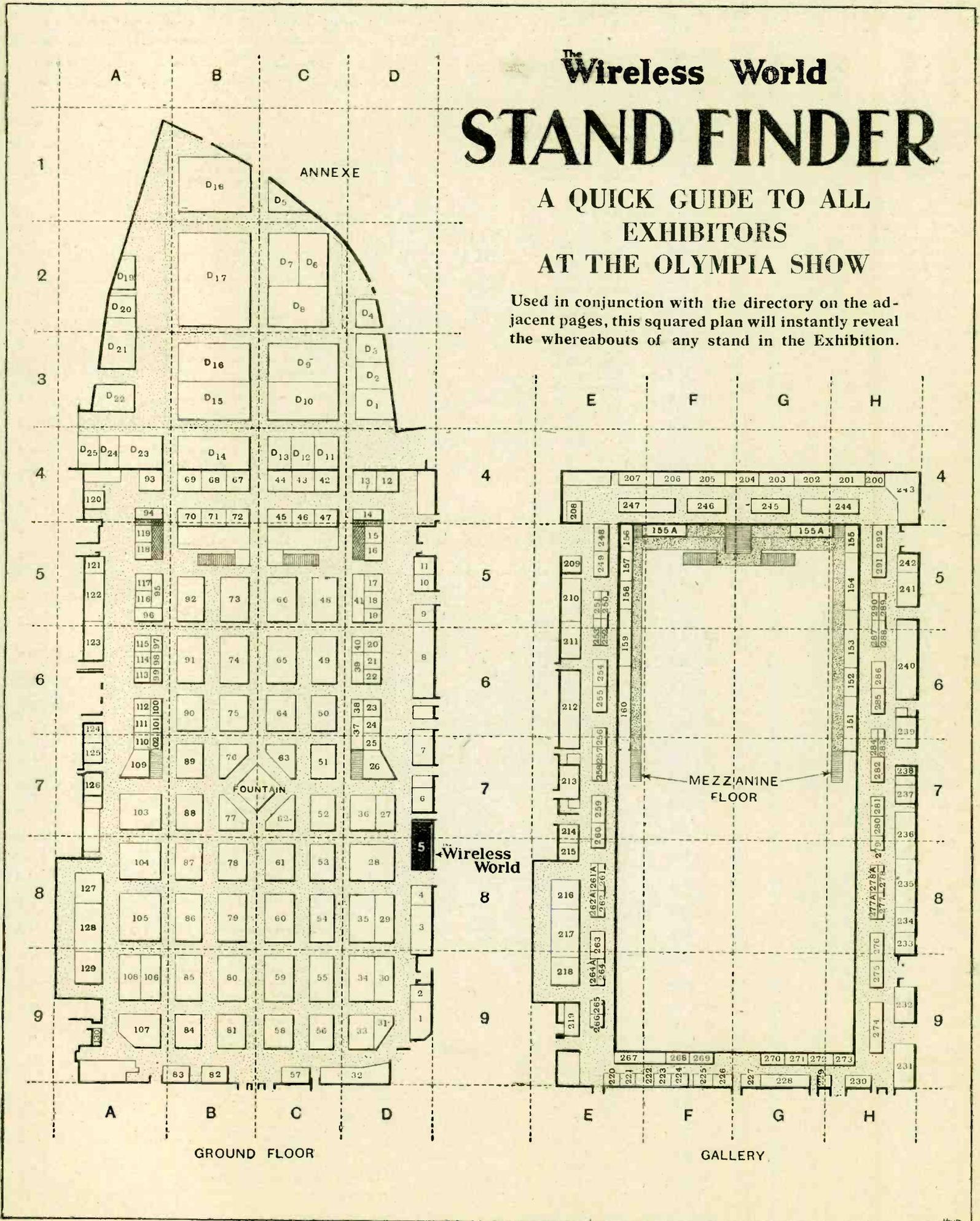
In the following list we give the names and addresses of the exhibitors, with stand numbers and (in heavy type) a reference to be used in conjunction with the plan on the next page for locating individual stands.

AD-A-GRAMS ... 116 A 5	CADISCH & Sons, R. ... 218 E 9	Dyson & Co. (Works), Ltd., J. ... 57 C 9
Carlton House, Regent St., S.W.1.	5-6, Red Lion Sq., W.C.1.	5, Godwin St., Bradford.
Adey Portable Radio ... 259 E 7	Carrington Manufacturing Co., Ltd. ... 123 A 6	Dept. of Overseas Trade ... 264 E 9
99, Mortimer St., W.1.	24, Hatton Garden, E.C.1.	Gt. Queen St., S.W.1.
Alliance Radio, Ltd. ... 19 D 5	Celestion, Ltd. ... 127 A 8	EAGLE Engineering Co., Ltd. ... 38 D 6
Burleigh Parade, London Rd., Sutton, Surrey.	London Rd., Kingston-on-Thames.	Eagle Works, Warwick.
Amalgamated Press, Ltd. ... 8 D 6	Cellgrave Co. ... 290 H 5	Eastick & Sons, J. J. ... 239 H 6
Fleetway House, Farringdon St., E.C.4.	6-8, Kent House Lane, S.E.26.	118, Bunhill Row, E.C.1.
Amplion (1932), Ltd. ... 68 B 4	Chloride Electrical Storage Co., Ltd. ... 61 C 3	East London Rubber Co. ... 211 E 6
82-84, Rosoman St., E.C.1.	Clifton Junction, Nr. Manchester.	29-33, Gt. Eastern St., E.C.2.
Apollo Gramophone Co., Ltd. ... 214 E 7	Churchmans, Ltd. ... 288 H 6	"Econasign" Co., Ltd. ... 269 F 9
4, Bunhill Row, E.C.1.	79, Maidenburgh St., Colchester.	137, Victoria St., S.W.1.
Automatic Coil Winder & Electrical Equipment Co., Ltd. ... 206 F 4	Citel Products, Ltd. ... 285 H 6	Edison Bell, Ltd. ... 27 D 7
Winder House, Douglas St., S.W.1.	134, Pentonville Rd., N.1.	Glengall Rd., S.E.15.
BAKER'S Selhurst Radio ... 83 B 9	City Accumulator Co. ... 249 E 5	Edison Swan Electric Co., Ltd. ... 75 B 6
89 Selhurst Rd., S.E.25.	7, Angel Court, Strand, W.C.2.	123-125, Queen Victoria St., E.C.4.
Balcombe, Ltd., A. J. ... 128 A 8	Clarion Radio Valve Co. ... 120 A 4	Electrical Devices Co. ... 47 C 4
52, Tabernaec St., E.C.2.	7, Duke St., Adelphi, W.C.2.	62, Conduit St., W.1.
Bell Piano Co., Ltd. ... 3 D 8	Clarke & Co. (M/C), Ltd., H. ... 91 B 6	Electrical & General Distributors, Ltd. ... 278A H 8
The Hyde, Hendon, N.W.9.	Eastnor St., Old Trafford, Manchester.	154, King's Cross Rd., W.C.
Belling & Lee, Ltd. ... 154 H 5	Climax Radio Electric, Ltd. ... 81 B 9	Electrical & Radio Products, Ltd. ... 33 D 9
Cambridge Arterial Rd., Enfield, Middlesex.	Haverstock Works, Parkhill Rd., Hampstead, N.W.3.	90, Regent St., W.1.
Benjamin Electric, Ltd. ... 40 D 6	Cole, Ltd., E. K. ... 25 D 7	Electro-Dynamic Construction Co., Ltd. ... 157 E 5
Brantwood Works, Tariff Rd., N.17.	Ekeo Works, Southend-on-Sea. ... 65 C 6	Devonshire Grove, S.E.15.
Benn Brothers, Ltd. ... 281 H 7	Columbia Graphophone Co., Ltd. ... 86 B 8	Ensign, Ltd. ... 212 E 6
154, Fleet St., E.C.4.	92, Clerkenwell Rd., E.C.1.	88, High Holborn, W.C.1.
Bernard Jones Publications, Ltd. ... 7 D 7	DEMONSTRATION ROOMS.	
58, Fetter Lane, E.C.4.	British Blue Spot Co., Ltd. ... D13 C 4	Epoch Radio Mfg. Co., Ltd. ... 41 D 5
Bird & Sons, Ltd., Sydney S. ... 158 E 5	British Rola Co., Ltd. ... D2 D 3	Exmouth House, Exmouth St., E.C.1.
Sarnesfield Rd., Enfield, Middx.	Celestion, Ltd. ... D9 C 3	Erie Resistor, Ltd. ... 4 D 8
Bowyer-Lowe & A.E.D., Ltd. ... 156 E 5	Cole, Ltd., E. K. ... D16 B 3	Waterloo Rd., Cricklewood, N.W.2.
Coombe Rd., Brighton, Sussex.	Columbia Graphophone Co., Ltd. D15, D22 B 3, A 3	Ever Ready Co. (G.B.), Ltd. ... 63 C 7
Bridger & Co., R. O. ... 280 H 7	Cossor, Ltd., A. C. ... D12 C 4	Hereules Pl., Holloway, N.7.
334, Goswell Rd., E.C.1.	Edison Swan Electric Co., Ltd. ... D4 D 2	FAUDELS, Ltd. ... 234 H 8
Britannia Batteries, Ltd. ... 126 A 7	Fay Home Recorders, Ltd. ... D5 C 1	36-40, Newgate St., E.C.1.
233, Shaftesbury Ave., W.C.2.	General Electric Co., Ltd. ... D21 A 3	Fay Home Recorders, Ltd. ... 255 E 6
British Blue Spot Co., Ltd. ... 35 D 8	Gramophone Co., Ltd. ... D3, D18 D 3, B 1	121, Victoria St., S.W.1.
94-96, Rosoman St., E.C.1.	Johnson Talking Machine Co., Ltd. ... D20 A 2	Ferranti, Ltd. ... 78 B 8
British Broadcasting Corporation, Ltd. ... 155A G 5	Kolster-Brandes, Ltd. ... D8 C 2	Hollinwood, Lancs.
Broadcasting House, W.1.	Lamplugh, Ltd., S. A. ... D24 A 4	Film Industries, Ltd. ... 261 E 8
British Ebonite Co., Ltd. ... 2 D 9	Lissen, Ltd. ... D1 D 3	60, Paddington St., W.1.
Nightingale Rd., Hanwell, W.7.	Lotus Radio, Ltd. ... D7 C 2	Five Point Products. ... 252 E 6
British G.W.Z. Co., Ltd. ... 282 H 7	McMichael, Ltd., L. ... D19 A 2	8A, Cross St., Islington, N.1.
205, Bedford Ave., Trading Estate, Slough, Bucks.	Marconiphone Co., Ltd. ... D6, D17 C 2, B 2	Flinders (Wholesale), Ltd. ... 241 H 5
British General Mfg. Co., Ltd. ... 29 D 8	Radio Gramophone Development Co., Ltd. ... D23 A 4	East Stockwell St., Colchester.
Brockley Works, Brockley, S.E.4.	Smurthwaite, F. W. ... D25 A 4	Forno Co. ... 100 A 6
British Goldring Products, Ltd. ... 20 D 6	Telsen Electric Co., Ltd. ... D10 C 3	Crown Works, Southmill Rd., Shirley, Southampton.
119, Finsbury Pavement, E.C.2.	Ultra Electric, Ltd. ... D14 B 4	Fox Publications, Ltd. ... 278 H 8
British Hard Rubber Co., Ltd. ... 220 E 9	Varley (Oliver Pell Control, Ltd.) ... D11 C 4	14, Britannia St., W.C.1.
Wharf Rd. Works, Ponders End, Middx.		Fraser Radio, Ltd. ... 253 E 6
British Ideal Patents, Ltd. ... 72 B 4		38, Crawley Rd., N.22.
Green St., Brimsdown, Middlesex.		Fuller Accumulator Co. (1926), Ltd. ... 76 B 7
British N.S.F. Co., Ltd. ... 18 D 5		Woodland Works, Chadwell Heath, Essex.
Waddon Factory Estate, Waddon, Surrey.		Fullotone, Ltd. ... 203 G 4
British Pix Co., Ltd. ... 43 C 4		73, Camden Rd., N.W.1.
118, Southwark St., S.E.1.		GAMBRELL Radio, Ltd. ... 21 D 6
British Radiophone, Ltd. ... 93 A 4		Merton Rd., Southfields, S.W.13.
Aldwych House, Aldwych, W.C.2.		Garrard Engineering & Mfg. Co., Ltd. ... 122 A 5
British Rola Co., Ltd. ... 45 C 4		Newcastle St., Swindon.
179, High Rd., Kilburn, N.W.6.		General Electric Co., Ltd. ... 105 A 8
British Thomson-Houston Co., Ltd. ... 119 A 5		Magnet House, Kingsway, W.C.2.
Rugby.		Gilbert & Co., Ltd., C. ... 232 H 9
"Broadcaster" ... 6 D 7		Arundel St., Sheffield.
68, Long Acre, W.C.2.		Gothic Electrical Supplies, Ltd. ... 201 H 4
Brown Brothers, Ltd. ... 240 H 6		Severn St., Birmingham.
26, Gt. Eastern St., E.C.2.		Graham Farish, Ltd. ... 50 C 6
Brownie Wireless Co. of Gt. Britain, Ltd. ... 62 C 7		Masons Hill, Bromley, Kent.
Nelson St. Works, Mornington Cres., N.W.1.		Gramophone Co., Ltd. ... 55 C 9
Bulgin & Co., Ltd., A. F. ... 151 H 6		363-367, Oxford St., W.1.
Abbey Rd., Barking, Essex.		Gripso Co. ... 226 F 9
Burgoyne Wireless (1930), Ltd. ... 98 A 6		32, Victoria St., S.W.1.
34A, York Rd., King's Cross, N.1.		Grosvenor Electric Batteries, Ltd. ... 42 C 4
Burdept, Ltd. ... 46 C 4		2+3, White St., E.C.2.
51-53, Church St., S.E.10.		Gutta Percha Co. (Telegraph Construction & Maintenance Co., Ltd.) ... 257 E 7
Burton, C. F. & H. ... 1 D 9		18, Wharf Rd., City Rd., N.1.
Bernard St., Walsall.		HACKER & Sons, H. ... 37 D 6
Bush Radio Ltd. ... 110 A 7		Perfecta Works, Ray Lea Rd., Maidenhead.
Film House, Wardour St., W.1.		Halford Radio, Ltd. ... 117 A 5
		39, Sackville St., W.1.

The Wireless World STAND FINDER

A QUICK GUIDE TO ALL
EXHIBITORS
AT THE OLYMPIA SHOW

Used in conjunction with the directory on the adjacent pages, this squared plan will instantly reveal the whereabouts of any stand in the Exhibition.



The latest *Wireless World* receivers can be seen on Stand No. 5, including the "Monodial A.C. Super," the "Modern Straight Five," the "Autotone Portable," and the "Wireless World Baby Superhet."

Exhibitors at Olympia—(continued).

Hambing, Ltd., A. W. 15-16, Alfred Place, W.C.1.	224	F 9	Mullard Wireless Service Co., Ltd. Mullard House, Charing Cross Rd., W.C.2.	79	B 8	Smith & Sons (Motor Accessories), Ltd., S. Cricklewood Works, N.W.2.	130	A 9
Hampton Radio, Ltd. 1-3, Vicarage Rd., Hampton Wick.	12	D 4	Murphy Radio, Ltd. Broadwater Rd., Welwyn Garden City, Herts.	248	E 5	Smurthwaite, F. W. 15A, Onslow Gdns., Wallington, Surrey.	22	D 6
Harlic, Ltd. Cambridge Arterial Rd., Enfield.	31	D 9	NATIONAL Accumulator Co., Ltd. 50, Grosvenor Gardens, S.W.1.	28	D 8	Sonochorde Reproducers, Ltd. 1, Willesden Lane, N.W.10.	262	E 8
Harwell, Ltd. Sessions House, Clerkenwell Green, E.C.1.	261A	E 8	National Radio Service Co. 15-16, Alfred Place, W.C.1.	244	H 4	Sovereign Products, Ltd. 52-54, Rosebery Ave., E.C.1.	152	H 6
Haynes Radio 57, Hatton Garden, E.C.1.	17	D 5	Newnes, Ltd., George 8-11, Southampton St., W.C.2.	200	H 4	Spencer Radio, Ltd. 136 Clerkenwell Rd., E.C.1.	14	D 4
Heayberd & Co., F. C. 10, Finsbury St., E.C.2.	13	D 4	New London Electron Works, Ltd. East Ham, E.6.	114	A 6	Standard Battery Co. 184-188, Shaftesbury Ave., W.C.2.	26	D 7
Hellesens, Ltd. Morden Rd., S. Wimbledon, S.W.19.	221	E 9	OLDHAM & SON, Ltd. Denton, Manchester.	48	C 5	Standard Telephones & Cables, Ltd. St. Chad's Place, 364, Gray's Inn Rd., W.C.1.	107	A 9
Henderson Wireless & Electrical Service 54, Queen's Rd., Brighton.	215	E 8	Ormond Eng. Co., Ltd. Ormond House, Rosebery Ave., E.C.1.	85	B 9	Stenibac, Ltd. 303, Essex Rd., Islington, N.1.	256	E 6
Henley's Telegraph Works Co., Ltd., W. T. Holborn Viaduct, E.C.1.	16	D 5	Osborn, Chas. A. The Regent Works, Arlington St., N.1.	87	B 8	Stratton & Co., Ltd. Balmoral Works, Bromsgrove St., Birmingham.	23	D 6
Hillman Brothers 123, Albion St., Leeds.	210	E 5	Overseas Trading Corporation 18, Ganton St., W.1.	32	D 9	Sun Electrical Co., Ltd. 118-120, Charing Cross Rd., W.C.2.	231	H 9
Hobday Brothers, Ltd. 21-27, Gt. Eastern St., E.C.2.	243	H 4	PAROUSSI, E. 10, Featherstone Bldgs., W.C.1.	291	H 5	Swift-Lovick & Sons, Ltd. Clarence Steel Works, Sheffield.	112	A 6
Hunton, Ltd. 114, Euston Rd., N.W.1.	271	G 9	Partridge & Mee, Ltd. 74, New Oxford St., W.C.1.	238	H 7	Sylves, Ltd. 144, Theobalds Rd., W.C.1.	260	E 7
Hustler, Simpson & Webb, Ltd. 317, Hoe St., Walthamstow, E.17.	30	D 9	Partridge, Wilson & Co. Davenset Works, Evington Valley Rd., Leicester.	67	B 4	TANNOY Products 1-7, Dalton St., S.E.27.	44	C 4
IGRANIC Electric Co., Ltd. 147, Queen Victoria St., E.C.4.	36	D 7	Pegasus, Ltd. Low Mills, Lower Wortley, Leeds.	159	E 6	Telegraph Condenser Co., Ltd. Wales Farm Rd., N. Acton, W.3.	53	C 8
Hiffe & Sons, Ltd. Dorset House, Tudor St., E.C.4.	5	D 8	Peto-Scott Co., Ltd. 77, City Rd., E.C.1.	94	A 4	Telsen Electric Co., Ltd. Aston, Birmingham.	66	C 5
Itonia, Ltd. 58, City Rd., E.C.1.	216	E 8	Philips Lamps, Ltd. 145, Charing Cross Rd., W.C.2.	247	E 4	Terrytone Radio Products Co., Ltd. 33, Crouch Hill, N.4.	268	F 9
JACKSON-Bell Distributors, Ltd. 68, Victoria St., S.W.1.	11	D 5	Philomel Radio Equipment Pickering St., Loose, Maidstone.	104	A 8	Thompson Diamond & Butcher 34, Farringdon Rd., E.C.1.	207	E 4
Jackson Brothers 72, St. Thomas St., S.E.1.	204	G 4	Portadyne Radio, Ltd. Gorst Rd., North Acton, N.W.10.	273	H 8	Trade Chronicles, Ltd. 6, Carmelite St., E.C.4.	10	D 5
Jewel Pen Co., Ltd. 21-22, Gt. Sutton St., E.C.1.	97	A 6	Powertone Products 88, Cromer St., W.C.1.	56	C 9	Tunewell Radio, Ltd. 54, Station Rd., New Southgate, N.11.	96	A 5
Johnson Talking Machine Co., Ltd. 96, Clerkenwell Rd., E.C.1.	228	G 9	Practical Radio Publishing Co. 30, Kirby St., E.C.1.	229	G 9	Tyrola Electric, Ltd. 21, East Road, N.1.	283	H 7
Junit Mfg. Co., Ltd. Junit Works, Steele Rd., W.3.	39	D 6	Priestly & Ford 3-11, Carrs Lane, Birmingham.	254	E 6	ULTRA Electric, Ltd. Erskine Rd., Chalk Farm, N.W.3.	73	B 5
KALISKY (Aldgate), Ltd., S. 146, Theobalds Rd., W.C.1.	236	H 7	Primus Manufacturing Co. Primus House, Willow St., E.C.2.	213	E 7	Umello, Ltd. 55, Gt. Marlborough St., W.1.	125	A 7
Kenwell Radio, Ltd. 200, City Rd., E.C.1.	121	A 5	Pye Radio, Ltd. Paris House, Oxford Circus, W.1.	15	D 5	Unicofon, Ltd. 23, City Rd., E.C.1.	250	E 5
Keith Prowse & Co., Ltd. 159, New Bond St., W.1.	292	H 5	R.G. Radio-Electric, Ltd. 51, Whitecombe St., W.C.2.	80	B 9	United Radio Mfrs., Ltd. 63, Lincoln's Inn Fields, W.C.1.	155	H 5
Kolster-Braudes, Ltd. Cray Works, Sidecup, Kent.	54	C 8	Radialaddin, Ltd. 47, Berners Street, W.1.	222	F 9	Univolt Electric, Ltd. 119, Finsbury Pavement, E.C.2.	115	A 6
L.E.S. Distributors, Ltd. 15-16, Alfred Place, W.C.1.	233	H 8	Radio Gramophone Development Co., Ltd. 18-20, Frederick St., Birmingham.	277	H 8	VANDERVELL, Ltd., C. A. Well St., Birmingham.	246	F 4
Lanplugh, Ltd., S. A. 89, Little Park St., Coventry.	99	A 6	Radio Instruments, Ltd. Purley Way, Croydon.	92	B 5	Varley (Oliver Pell Control, Ltd.) 103, Kingsway, W.C.2.	160	E 6
Lancashire Dynamo & Crypto, Ltd. 94, Petty France, S.W.1.	111	A 6	Radio Society of Gt. Britain 53, Victoria St., S.W.1.	90	B 6	WATMEL Wireless Co., Ltd. Imperial Works, High St., Edgware.	273	H 9
Lawson & Raphael 137, Regent St., W.1.	270	G 9	Ratcliff (Metals), Ltd., J. F. 21-31, New Summer St., Birmingham.	242	H 5	Wego Condenser Co., Ltd. Spencer House, South Place, E.C.1.	284	H 7
Lectro Linx, Ltd. 254, Vauxhall Bridge Rd., S.W.1.	225	F 9	Ready Radio, Ltd. Eastnor House, Blackheath, S.E.3.	258	E 7	Westinghouse Brake & Saxby Signal Co., Ltd. 82, York Rd., King's Cross, N.1.	89	B 7
Lever (Trix), Ltd., Eric J. 8-9, Clerkenwell Green, E.C.1.	262A	E 8	Redfern's Rubber Works, Ltd. Hyde, Cheshire.	106	A 9	Whiteley Electrical Radio Co., Ltd. Nottingham Rd., Mansfield.	108	A 9
Lissen, Ltd. Worpole Rd., Isleworth, Middlesex.	59	C 9	Regentone, Ltd. Regentone Works, Worton Rd., Isle- worth, Middlesex.	124	A 6	Whiteley, Ltd., Wm. Westbourne Grove, W.2.	267	E 9
Lock, Ltd., W. & T. St. Peter's Works, Bath.	101	A 6	Reproducers & Amplifiers, Ltd. Frederick St., Wolverhampton.	51	C 7	Wilkins & Wright, Ltd. Utility Works, Holyhead Rd., Bir- mingham.	118	A 5
Loewe Radio Co., Ltd. 4, Fountayne Rd., Tottenham, N.15.	223	F 9	Roberts, John 1-3, Bridgwater Viaduct, Knott Mill, Manchester.	69	B 4	Wingrove & Rogers, Ltd. Mill Lane, Old Swan, Liverpool.	129	A 9
London Electric Wire Co. & Smiths, Ltd. Church Rd., Leyton, E.10.	153	H 6	SELECTA Gramophones, Ltd. 81, Southwark St., S.E.1.	272	G 9	Wireless for the Blind 224, Gt. Portland St., W.1.	264A	E 9
Lotus Radio, Ltd. Mill Lane, Old Swan, Liverpool.	64	C 6	Selfridge & Co., Ltd. Oxford St., W.1.	219	E 9	Wireless League 12, Grosvenor Cres., S.W.1.	265	E 9
M.P.A. Wireless (1930), Ltd. 62, Conduit St., W.1.	95	A 5	Shapland & Petter, Ltd. Raleigh Works, Barnstaple.	274	H 9	Wireless Retailers Association of G.B. 1, Mitre Court, E.C.4.	266	E 9
McMichael, Ltd., L. Wexham Rd., Slough, Bucks.	58	C 9	Siemens Electric Lamps & Supplies, Ltd. 38-39, Upper Thames St., E.C.4.	287	H 6	"Wireless Trader" St. Bride's House, Salisbury Square, E.C.4.	9	D 5
Magnavox (G.B.), Ltd. 89, Kingsway, W.C.2.	21	D 6	Sifam Electrical Instrument Co., Ltd. York Works, Browning St., S.E.17.	88	B 7	"Wireless World" Dorset House, Tudor St., E.C.4.	5	D 8
Mains Radio Gramophones, Ltd. Vaughan St., Bradford.	102	A 7	Simpson's Electrical Grange Rd., Leyton, E.10.	289	H 5	Wright & Weaire, Ltd. 740, High Rd., Tottenham, N.17.	82	B 9
Manufacturers Accessories Co. (1928), Ltd. 85, Gt. Eastern St., E.C.2.	237	H 7	Sinclair Stafford 21, Kenwyn Drive, N.W.2.	71	B 4	YAGERPHONE, Ltd. Charlotte Cabinet Works, Ponders End, Middlesex.	286	H 6
Marconiophone Co., Ltd. 210-212, Tottenham Court Rd., W.1.	74	B 6	Six-Sixty Radio Co., Ltd. 17-18, Rathbone Place, W.1.	277A	H 8	ZETAVOX Radio & Television, Ltd. Zetavox Works, Coles Green Rd., Cricklewood, N.W.2.	103	A 7
Montague Radio Inventions & Develop- ment Co., Ltd. Beethoven Works, 24, Gt. College St., N.W.1.	49	C 6	Smith (Radio), Ltd., Arthur 56, Hazel Rd., Kensal Rise, N.W.10.	52	C 7			
Moore, Walter 6, Burnley Rd., Pudiham, Burnley, Lanes.	276	H 8		251	E 5			

BROADCAST BREVITIES

By Our Special Correspondent.

New Opera Scheme.

A GREAT scheme to make Britain "opera conscious" is the latest idea of the B.B.C. I am able to reveal that the Governors, largely through the advocacy of that very active member of the board, Lady Snowden, have decided that broadcasting can fulfil such a mission in a unique manner, not only by the frequent repetition of studio versions of the great operas, but by the systematic training of artists specially for the work.

Studio Presentation.

It is realised that there are several methods of presentation. One may be tried during the broadcasting of the Covent Garden Opera in the autumn, when a commentator in the studio will introduce the performance with explanations likely to render it intelligible to the ordinary listener. This is one form of "studio presentation," though by this term is generally meant the form of operatic broadcast now popular in Germany where specially prepared versions are carried out at the broadcasting station itself.

It is these condensed versions which, as I mentioned last week, the German authorities will generously place at the disposal of the B.B.C. Their preparation has taken seven years.

The B.B.C. Vintage.

The Corporation is now about to begin the preparation of its own "potted" operas—a job which will keep the Productions Department busy for a long time.

It is hoped that in a few years broadcast opera, if not such a preponderating feature in the British programmes as it is in Italy and Germany, will at least be as popular as the ordinary symphony concerts. I wonder?

B.B.C.'s Great Birthday Effort.

OVER-MODESTY has not always been a failing of the B.B.C., but in recent years the Corporation has certainly made little fuss over its birthdays. I learn that things may be different with the celebration of the tenth anniversary of broadcasting in November next.

Plans are still in the wild and woolly stage, but an attempt will probably be made to give listeners a round-the-world relay on a far grander scale than the contemplated effort last Christmas, which failed so dismally on account of imperfect co-operation among the different broadcasting authorities.

Expensive Jollity.

The chief obstacle likely to be encountered is the question of cost. "Surely," I said, when discussing the event with a B.B.C. man, "Surely the Post Office and other wireless concerns would make financial concessions on such an important occasion?"

He laughed sardonically. "Not a bit of it!" he declared. "No one gives us any concessions. If the B.B.C. stages a round-the-world relay, the B.B.C. must pay."

So let us remain calm and fully prepared for the news that the relay has been abandoned.

Misapprehension.

While talking of world broadcasting, I am glad to be able to qualify my recent statement to the effect that the B.B.C.'s new programme recordings for overseas use will be sold in whatever market they will fetch a price. Apparently this has been interpreted as meaning that any old cow puncher or bootlegger who strolls down "Petticoat Lane" in South Africa or Australia or Canada, may run up against a few slabs of B.B.C. programme and buy them for the price of a drink.

Explanations.

I am sorry that this impression has got around, as the necessary correction may cause disappointment among my Dominion and



THE MAN ON THE BRIDGE. A photograph taken from the centre of the moving wall in the Hamburg studio. By advancing or withdrawing the wall it is possible to alter the studio acoustics to suit different types of programme.

Colonial friends. I am assured by the B.B.C. that the recordings, which will not compete with local talent, will be available only to broadcasting organisations, and that there will be strict rules regarding the number of occasions on which they may be performed.

Come to Britain.

One important service which the records may render will be in connection with the "Come to Britain" movement. Commentaries on national events, such as the Welsh Eisteddfodau, the Highland Games, and the Changing of the Guard at Buckingham Palace, should fire the blood of our overseas cousins, not to mention those Americans who can still claim Anglo-Saxon ties. Other recorded programme material will include talks and vaudeville.

A Happier Newcastle.

NEWCASTLE listeners, after a period of inadequate signal strength which seems to have tried their patience, are much happier with the opening of the rebuilt 1½kW. transmitter working on the new wavelength of 211.3 metres. The latest tests reveal an immense improvement in radiation and quality.

Publishing Triumph.

Incidentally the B.B.C. must be the only publishers in London who are actually pleased when their products have a smaller circulation than that anticipated. With characteristic care the Corporation prepared a booklet showing Novocastrians how to tune in the low wavelength; the demand for the booklet was small at the outset, and since the power increased it has dropped to practically zero. The B.B.C. are delighted, assuming from this that no one needs any help.

The Case is Altered.

I had better forestall trouble by stating that the B.B.C. adopts a less carefree attitude towards its other publications.

Broadcasting Semi-private Talks.

CONGRATULATIONS to the B.B.C. on hitting on the very best method of securing listeners to the talks. In future certain talks are to be announced as "Semi-private," and will thus be assured of a very large audience.

The series will be called "To an Unnamed Listener," and the speaker will choose each time an intimate problem which it will be assumed faces some person or other at some period in his life. For example, if the subject should be "To a Young Man or Woman about to Start a Career," or "The Danger of Living Extravagantly," or "To a Young Man about to Marry," all those listeners who are not starting a career, or living extravagantly, or thinking of marrying, will regard themselves as merely overhearing a semi-private and very frank piece of advice which is being addressed particularly to one of their fellows who may need and, it is hoped, will profit by it. The actual subjects for the series have not yet been chosen.

All kinds of titles will suggest themselves, such as "The Danger of Accepting Gratuitous Advice," "To a Young Listener Who Has Not Paid His Licence Fee," "To a Young Man Who Cannot Get His Set to Work," and many similar.

The Organ in the Concert Hall.

ALL readers interested in the acoustic side of broadcasting will be eager to hear the first notes from the £8,000 organ which the John Compton Organ Company are to install in the concert hall of Broadcasting House under the supervision of Dr. W. G. Alcock, the organist of Salisbury Cathedral.

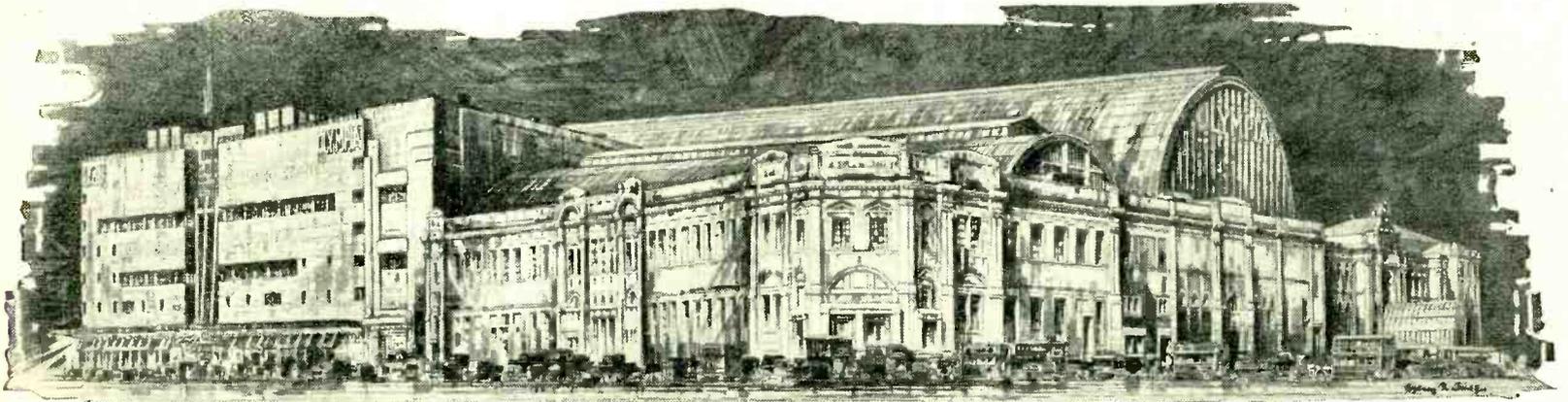
I understand that it will be an all-electric four-manual instrument, totally enclosed within a "swell" box, and played from a separate console on the stage.

The organ will be on "cathedral" lines, and quite unlike the average cinema organ; for this relief much thanks from at least one listener!

What to See At The Show.

AUG. 19th—27th.

11 a.m.—10 p.m.



A General Guide to Every Class of Exhibit.

AS this issue of *The Wireless World* appears on the opening day of the Olympia Show, it follows that our description of the new season's sets and components is in many cases prepared from advance information supplied by the manufacturers. Although we have had an opportunity of examining—and in some cases of testing—much of the apparatus that will be shown, we must wait until next week before we can present an entirely complete technical review of the individual efforts of every firm.

It is already abundantly clear that the present show is extraordinarily comprehensive: there is something for everyone, and no single field of wireless interest has been neglected. Take the battery set: last year, if we exclude portables, there were not more than two or three examples which were representative of advanced technique. The listener without a mains supply had a real grievance, but this year he is to have a wide choice of up-to-date battery sets with modern features, such as band-pass tuning. Further, painstaking efforts have been made to conserve anode current, and, at the same time, to provide a reasonable volume.

The general adoption of variable- μ H.F. valves has had a bearing on design; the freedom from cross-modulation and other interference troubles which is conferred by this valve has enabled designers in some cases to dispense with a two-circuit input filter. Indeed, band-pass tuning has suffered a slight—but a very slight—setback; it will still be found in most H.F. sets, except those of the less-expensive kind.

The superheterodyne principle has gained ground, as it was bound to do, and in many cases is combined with tone correction to a greater or lesser extent.

Speaking generally, a set without a built-in loud speaker is now a rarity, as also is one of the multi-circuit type without ganged tuning. Tuning dials of the new receivers are almost invariably calibrated in wavelength, or in station settings, or both.

In order that the following description of the new season's receivers may be of the

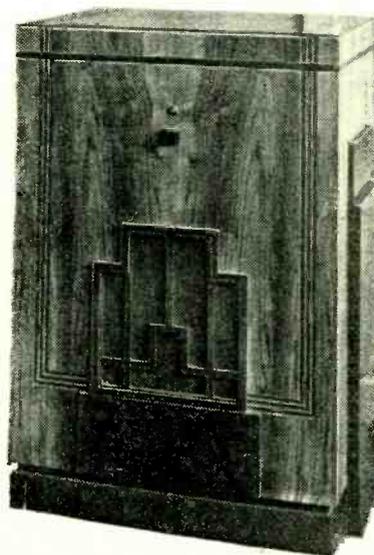
greatest possible assistance to those who are choosing sets for various purposes, and for use under different receiving conditions, they have been grouped in categories, under a more or less arbitrary system of classification.



SUPERHETERODYNES.

The superheterodyne forms one of the most interesting classes of receiver this year, and its rise to popularity has been so rapid that there are now few firms who are not showing at least one model; a number have abandoned the straight receiver almost entirely in its favour.

The Gramophone Co. is a noteworthy example



An H.M.V. ten-valve superheterodyne, with push-pull output and automatic record changer.

of this tendency. The most luxurious H.M.V. set is undoubtedly the Model 532 at 80 guineas. Ten valves are used, and the output stage consists of two push-pull P.X.4 valves rated to deliver 4,500 milliwatts to the loud speaker. The H.F. and both the I.F. stages have variable- μ valves, and three tuned circuits compose the pre-selector. The Model 470, at 32 guineas, is somewhat less ambitious, but again we find three pre-selector circuits and variable- μ valves both in the H.F. and the single I.F. amplifier.

From some points of view, however, the most interesting H.M.V. set is a six-valve battery portable superheterodyne with ganged tuning, and a signal-frequency H.F. stage. The total anode current consumption is stated to be only 10 mA., and the price is 17 guineas.

Not the least of the interest in the superheterodyne lies in the wide variety of design which it permits, and as a contrast to the foregoing we have the six-valve Eldeco portable. This is of the suit-case type, and again ganged tuning is employed, but the valves are arranged so that two stages of I.F. amplification are obtained. A similar receiver is available for operation from the mains, and in this are included a pentode output stage, and variable- μ valves.

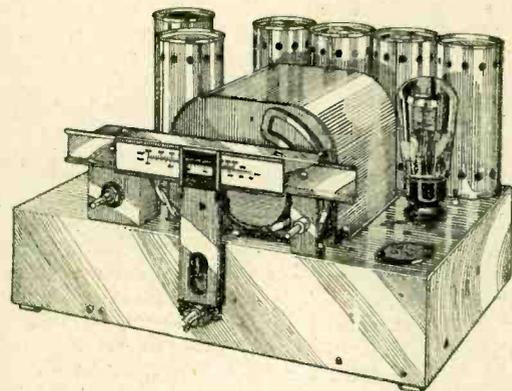
Arthur Smith has an example of the Stenode form of the superheterodyne; it is a radio-gramophone with an output stage rated at 5,500 milliwatts, and it is fitted with dual loud speakers. Eight tuned circuits are employed, variable- μ valves, a separate oscillator, and, since it is a Stenode, a tone-corrector stage. Another receiver of more modest nature is a five-valve superheterodyne in which the bi-grid type of detector-oscillator is used. A preliminary stage of variable- μ H.F. amplification is included, with power grid second detection and a pentode output stage.

The Gambrell-Halford receiver, the A.C. model of which was recently reviewed in the pages of this journal, is now available for D.C. mains supplies. Preliminary H.F. amplification is not used, but two stages of I.F. amplification are fitted.

The well-known firms of E. K. Cole and

What to see at Olympia.—

Varley are newcomers to the field of the superheterodyne, and both are showing five-valve models. The Ekco sets are available in a number of different cabinet styles ranging from a consolette to a radio-gramophone. Band-pass tuning is employed with variable-mu valves,



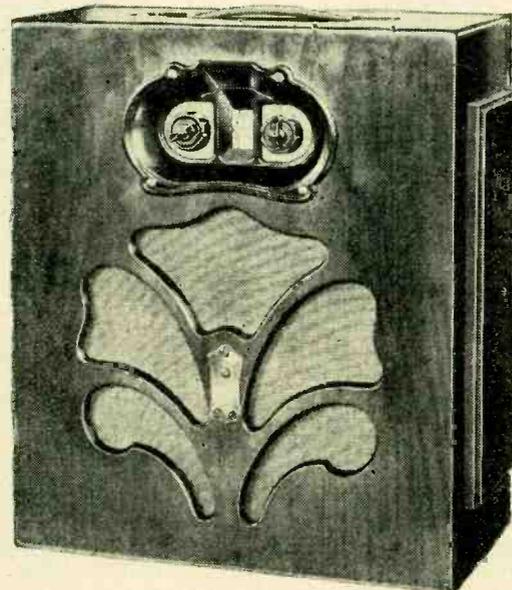
Chassis of the compact Ferranti superheterodyne.

and a metal rectifier for the H.T. supply. The Varley sets are also to be had with many different cabinet types, and at prices varying between 26 guineas and 48 guineas. The latter is, of course, a radio-gramophone, while the cheaper model is of the compact self-contained type.

Ferranti are showing a seven-valve superheterodyne of very modest dimensions, and this was recently reviewed in this journal. A moving-coil loud speaker is used, and variable-mu valves are fitted not only in the H.F. and I.F. stages, but also for the first detector, while band-pass tuning is naturally adopted.

The majority of superheterodynes are mains driven, as one would expect, in view of the high current demands of a large number of valves. Many battery models are shown, however, and the fact that H.T. current has often been kept down to a figure comparable with that of a more modest straight set speaks well for the skill of the designers.

A six-valve battery portable is exhibited by the Marconiphone Co.; it is priced at 17 guineas, and its low anode current consumption of 10 mA. is attained largely by the use of a high-efficiency pentode output valve. The Consolidated Radio superheterodyne is somewhat unusual for a battery receiver, in that it includes automatic grid bias; it is known as



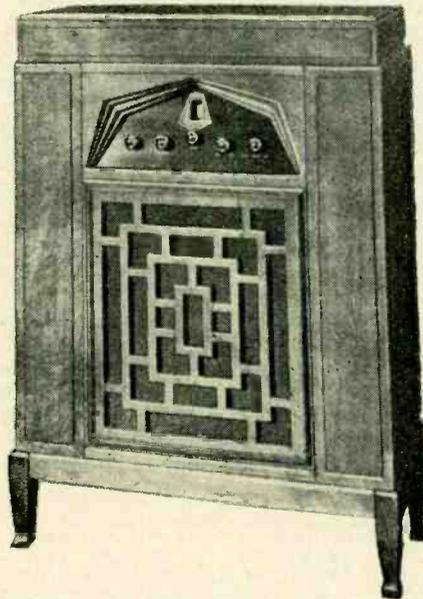
Illustrative of present tendencies: the Marconiphone superheterodyne portable, designed for long range and economical upkeep.

the Cam Superhet, and is priced at 15 guineas. Edison Bell has a five-valve battery superheterodyne in which the anode current consumption has been kept down to 9 mA., and on this score alone is worth attention.

Reverting to mains-driven sets, the G.E.C. model should not be passed by without examination. This has seven tuned circuits, and the band-pass principle is employed in both the signal frequency and the intermediate frequency circuits. Variable-mu valves are again standard, an output of 2,500 milliwatts is obtained from a pentode, and a heterodyne whistle filter is fitted. At the price of 26 guineas this receiver is distinctly attractive.

The Marconiphone Co. is another firm which has adopted the superheterodyne most wholeheartedly; a seven-valve set, the Model 258, is shown in radio-gramophone form, and is priced at 55 guineas. Eight tuned circuits are fitted, and are naturally in the form of band-pass filters; a preliminary stage of H.F. is employed. An output of 2,000 milliwatts is claimed, and a brilliancy control is included in the specification, while on the gramophone side an automatic record changer is an undoubted convenience. A similar receiver, the Model 256, is available, with less ambitious equipment and cabinet, at the price of 24 guineas.

A further example of the Stenode is to be found on the Selfridge stand; this is a radio-gramophone employing a large output stage. Three signal-frequency circuits are used, and, as the I.F. circuits are sharply tuned and



One of the most ambitious of the R.G.D. radio-gramophones. A ten-watt output is provided.

operate upon a low frequency, two tone-correction circuits are fitted in the L.F. stages to obtain the correct overall frequency characteristics. Exceptionally high selectivity is claimed.

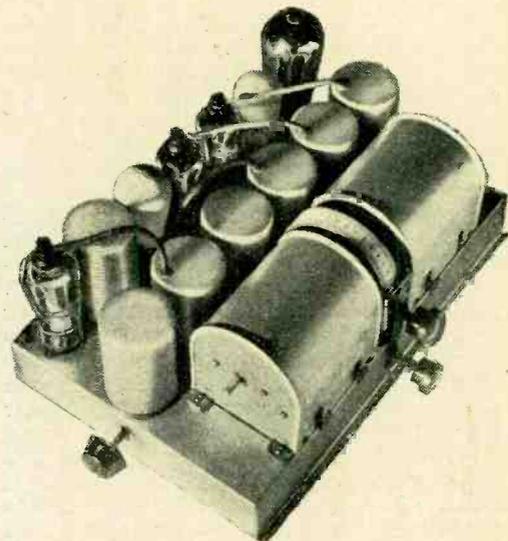
The Tannoy superheterodyne, again, is of the radio-gramophone type, with a band-pass pre-selector and aperiodic coupling to the first detector. Power grid second detection is used, and a triode output valve feeds the moving-coil loud speaker.

The R.G.D. receivers have for some years included at least one superheterodyne, and so it is not surprising to find that they are now concentrating their energies on this type. Their most ambitious radio-gramophone is the Model 901, at 80 guineas, which is available for A.C. or D.C. mains. It is a nine-valve instrument with a 10-watt, push-pull output stage. A band-pass pre-selector is employed, and there are two stages of variable-mu I.F. amplification.

A smaller radio gramophone, Model 701, is also available at 48 guineas; seven valves are

used, with one H.F. and one I.F. stage, and an anode-bend second detector.

Another firm to adopt the superheterodyne is Murphy Radio. Nine valves, including the rectifier, are used, and three tuned circuits



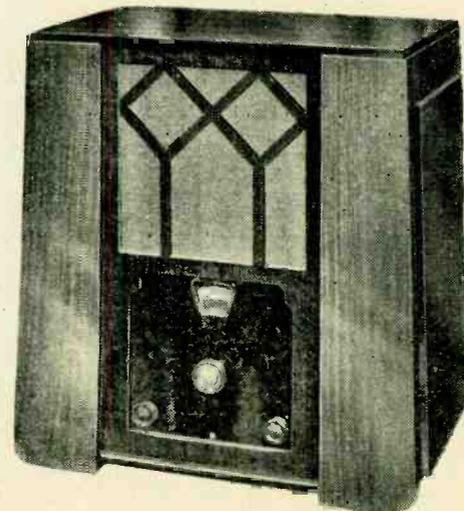
Burgoyne seven-valve superheterodyne chassis.

operate at signal frequency. Two I.F. stages are followed by a duo-diode second detector, from which automatic volume control is obtained. A scheme of this nature is distinctly interesting, and it is hoped to include further details in a later issue. The set is completed by an L.F. stage feeding the pentode output valve.

MULTI-STAGE H.F. SETS.

Perhaps the most noteworthy development in long-range receivers of the "straight" type is the almost universal adoption of the variable-mu valve. This development is well instanced by the Cossor Model 533 four-valve mains set, which has two H.F. stages with three tuned circuits, and a triode output stage rated to deliver 2,000 milliwatts to the moving-coil loud speaker. A similar type of receiver is available for battery operation, and, although the price is only £14, a moving-coil speaker is fitted.

The mains-operated G.E.C. Viking receiver falls into the same class, in so much as two H.F. stages are fitted; an output of 2,500 milli-



R.I. five-valve superheterodyne.

watts is obtained from a pentode. The most interesting feature of this set is the use of a screen-grid valve as a detector, and it is claimed that this results in a considerably improved performance.

What to see at Olympia.—

Push-pull pentodes are used to obtain a large output in the radio-gramophone shown by Hampton Radio, where, again, two H.F. stages are included. The apparatus is available for A.C. mains operation at 38 guineas, or for working from D.C. supplies at 41 guineas. Dynatron receivers are shown by Messrs. Hacker and Sons, but details are not yet available. The Lotus four-valve set has again two variable- μ H.F. stages and the usual pentode output valve, while the Burgoyne five-valve portable is notable for its remarkably low price of £5 19s. 6d.

The well-known firm of Philips is exhibiting receivers at Olympia, and the Model 630A is interesting as an example of progressive design. It is an A.C. mains set with two H.F. stages, and an unusual feature is that the four tuned circuits are arranged as two band-pass filters. It is claimed that the coils are exceptionally efficient, since they are wound with stranded wire on glass formers. A further point not without merit is that the tuning dial is fitted with a micrometer scale; the dial proper is normally graduated, but beneath it is fitted another small dial geared to make one complete revolution for each movement of one degree of the main dial. The small dial



New-type coils in the latest Murphy three-valve set.

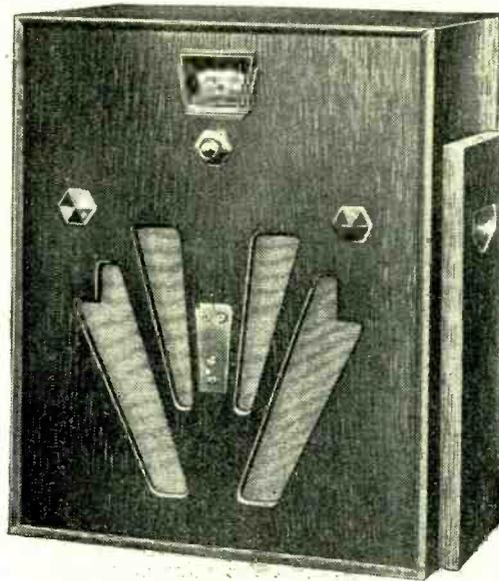
has ten divisions, so that it is possible to read the main dial accurately to one-tenth of one division. This receiver is priced at 23 guineas.

The battery, Model 830B, is even more unusual, for, although the circuit follows normal practice with two H.F. stages and a pentode output valve, a fifth valve is included to keep the total anode current consumption at a minimum. This "voltage regulator" valve is apparently connected in such a way that it varies the operating conditions of the pentode according to the signal voltage which it is called upon to handle. The total current consumption in the absence of a signal is only 5 mA., but when reproducing a deeply modulated programme it rises to 15 mA., so that the average current is considerably below normal. This would appear to represent a distinct advance in economical receiver design, and further details will be awaited with interest.

GENERAL-PURPOSE RECEIVERS.

Two years ago, the self-contained open-aerial set with built-in moving-coil loud speaker was hardly known, but last year it was fairly well established in favour. Now, the standard British set is of this type; without risk of inaccuracy, it may be stated that its general

specification includes an H.F.-det.-output three-valve circuit, as a rule with a pentode. In mains sets, the loud speaker is of the



Marconiphone band-pass battery set.

energised moving-coil type, and the containing cabinet measures very roughly 18in. high, 15in. wide, and 9in. deep. To avoid needless repetition, it may be assumed that the great majority of the following sets are built to this general specification.

In the general-purpose class, the Murphy A.C. Three, which originally appeared last year, may be taken as a first example. The earlier receiver is still available; but a "de luxe" model, improved in detail, now tends to replace it. This new set embodies cylindrical coils instead of basket windings, is fitted in a wider cabinet, and the smoothing system has been improved.

Practically all the G.E.C. sets are new, and it is evident that this great firm, with its exceptional facilities for design and manufacture, will in future occupy an even more prominent position in the world of wireless. Screen grid detector valves are fitted in all the sets, and a large undistorted output is provided even by the simplest and cheapest. The model in the present category is the "Gala," which embodies two tuned circuits and a heterodyne filter; an output of 2½ watts is provided by a pentode.

Band-pass tuning, power grid detection, and a volume control which is operative for both

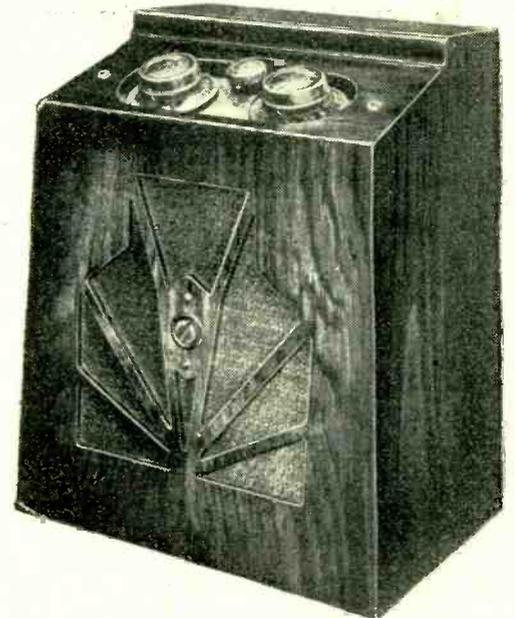


New Pye Model "G" receiver.

radio or gramophone reproduction are features of the Marconiphone Model 253, which is fitted with pick-up terminals. Models for A.C. and D.C. supplies are available.

As an example of present tendencies in battery set design, the Marconiphone Company are to show an H.F.-det.-L.F. set on modern lines, with band-pass tuning, a balanced-armature loud speaker, local-distance switch, and a high-efficiency pentode output valve. Total anode consumption is given as 8 milliamps.

From the technical aspect, the new Pye Model G is likely to prove one of the most interesting three-valve sets for A.C. mains operation. It is stated that the band-pass input filter is of a new type, while the L.F. interval coupling is claimed to provide the tone compensation which is necessary for a pentode output valve working with a moving-coil loud speaker. Apart from introducing compensation (which is usually done in the output anode circuit), this coupling is arranged to give a falling amplification characteristic above some 4,000 cycles, with a definite cut-off at 5,000 cycles. Other new productions of the Pye firm include the Model "K" two-valve A.C. set, with band-pass tuning,



An inexpensive Sovereign two-valve battery set.

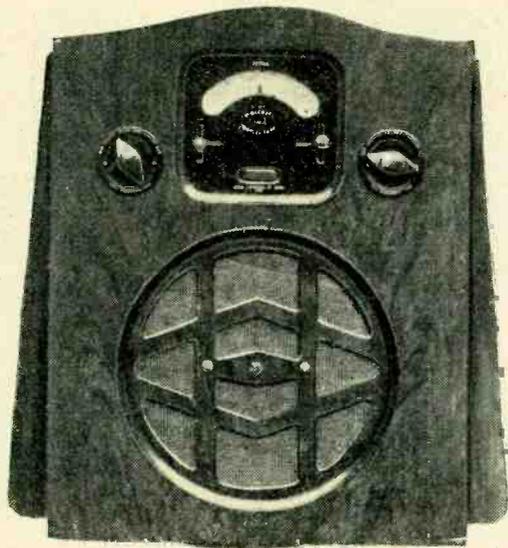
Among the selective battery sets to be shown is the new "Six-Sixty" receiver, with such features as band-pass input, combined reaction and volume control, and a high-efficiency output pentode. The Lotus "de Luxe" battery set, with a similar specification, is fitted with a permanent-magnet moving-coil loud speaker, and has automatic bias. Equally illustrative of the new tendency in battery-set design is the new Sovereign "Doric" set, with a similar type of loud speaker.

All of the entirely new H.M.V. sets are of the superheterodyne type, and so have already been described, but they are showing a fairly conventional self-contained general-purpose set, with all the desirable modern features. This, indeed, is an old friend, but it has been improved in detail. The "Transportable Radio-Gram," a self-contained table instrument, has been reduced in price to 25 guineas.

Westinghouse metal rectifiers are to be included in all the new Ekco sets. The model with which we are here concerned is the "Consolette," which is of fairly conventional design, and is housed in a moulded bakelite cabinet. The tuning dial is calibrated directly in wavelengths; the large station-indicating dial, one of the first of its kind, has now been improved, and is still included in the larger Ekco sets.

What to see at Olympia.—

Built-in frame aerials are perhaps not quite so much in evidence for mains-operated sets as one might expect, but this form of collector is employed in the McMichael "Duplex Mains Four," a self-contained set of the modern type, with an energised moving-coil loud speaker.



McMichael self-contained A.C. receiver.

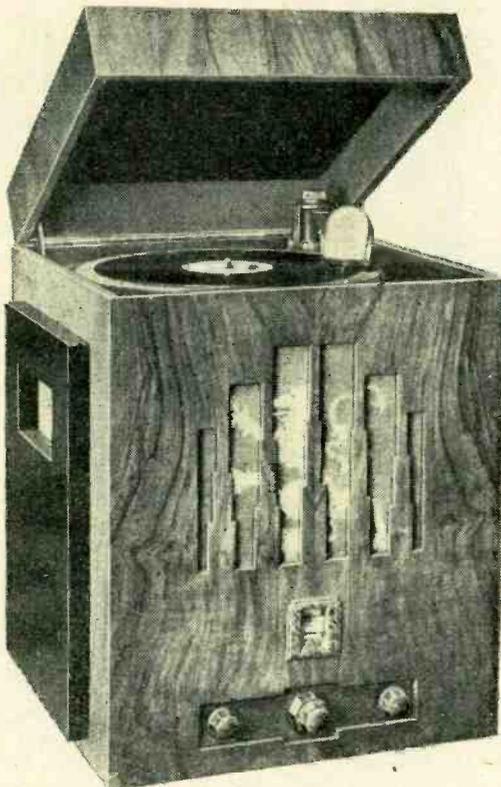
In addition to the three-valve set introduced in the spring, the Regentone firm are showing a cheaper mains-operated model of similar specification, which is to be sold at the low price of 12 guineas complete. The neat little two-valve A.C. set produced by this firm has apparently been extremely successful, as it is retained for the present season. It is an interesting sidelight on present tendencies that this will be one of the very few sets without a built-in loud speaker.

There must exist a real demand for chassis sets suitable for fitting an existing cabinet or other pieces of furniture. This demand should be met by the "Loradsa" chassis set shown by Arthur Smith. The Telsen H.F.-det.-pentode set, in its cheaper form, fills the same niche, as it is supplied at the price of 12 guineas in a plain box of unpolished wood. There are two tuned circuits, and 2 watts is fed to the moving-coil loud speaker.

So far as we can judge at present, there are no striking departures from accepted practice in the arrangement of band-pass filters, but it is interesting to see that the Varley firm, in

their "Square Peak Three," have gone over to the double-capacity system of coupling. There is no need to describe this set, as it was reviewed last week in these pages.

When practically every firm is showing a general-purpose set, it is almost invidious to pick out models for special mention. Among the many examples which embody interesting points of detail design is the "Climax" radio-gramophone, costing only 24 guineas, which, in addition to wavelength calibration, has a tuning dial with apertures through which the printed names of the principal stations are visible. The coils of most present-day sets are individually screened, but in the Alba chassis the filter coils are so disposed that this method of screening is rendered unnecessary. The same firm are also producing some interesting battery sets. On the British Acoustic Film Company's stand there is to be shown the new Bush Radio three-valve set, with several interesting features.



The compact Climax radio-gramophone.

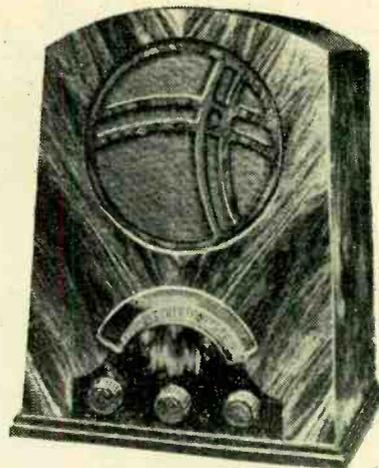
Before passing on to the next classification, we must not forget the R.I. Madrigal, a pioneer of its class, which has now been redesigned. It embodies a permanent-magnet loud speaker, and a small internal aerial for local-station reception. The E.R.P. concern, who were also early in this field, use a screen grid detector, resistance-coupled to a pentode; their new set costs only 14 guineas.

SHORT-RANGE SETS.

Relatively simple detector-L.F. two-valve receivers are obviously very popular; some of the new models are fitted with high-power output valves, and thus, for short-distance work, should be capable of meeting all requirements, except those of long range. As an instance we may take the Cossor Model 222, which supplies 2 watts of energy to a built-in moving-coil loud speaker. The same firm have a cheaper set fitted with a cone loud speaker.

The practice of building set and loud speaker as a single unit is just as well marked in the present category, and we are to find sets with this arrangement on the Brownie stand, where inexpensive models for both battery and mains feed are to be exhibited. Incidentally, the same company will show an H.F.-det.-L.F. battery set with an exceptionally large output.

Up to the present, the Clarke-Atlas firm have been best known as manufacturers of eliminators and mains equipment generally. They have now produced some interesting two-

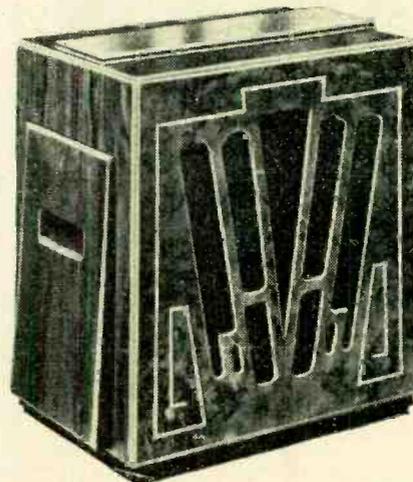


New Atlas two-valve set: A.C., D.C. and battery models are being shown.

valve sets for A.C., D.C., and battery operation. The mains models include provision for outside, inside, or mains aerial, and are fitted with a three-electrode output valve, feeding into an energised moving-coil loud speaker. The battery set has a pentode output valve, and includes a permanent-magnet loud speaker.

PORTABLE SETS.

Interest in portable sets will inevitably centre round the new superheterodynes, which have already been described. But the old favourites, with "straight" circuits, are still to the fore, in many cases having been improved in detail. The McMichael "Duplex," available either as a suitcase or cabinet model, has a 1-v-2 circuit, and is now fitted with automatic grid bias. It embodies the new McMichael tuning scale, in which the pointer is automatically transferred by operation of the wave-range switch to the appropriate wavelength scale. The Portadyne "Challenger" and the new Lotus portable are also examples of the same circuit arrangement, as are the Murphy and Pye "Q" sets. The Beethoven



Portadyne battery transportable set, with an H.F.-det.-2 L.F. circuit.

S.G.4 Portable has been improved in various details, particularly in regard to its circuit design, and is now sold at the extremely low price of 10 guineas.

SPECIAL SETS.

It is sometimes maintained that the set of the future will be tuned by what may be described as a push-button arrangement;



Bush Radio three-valve receiver.

What to See at Olympia.—

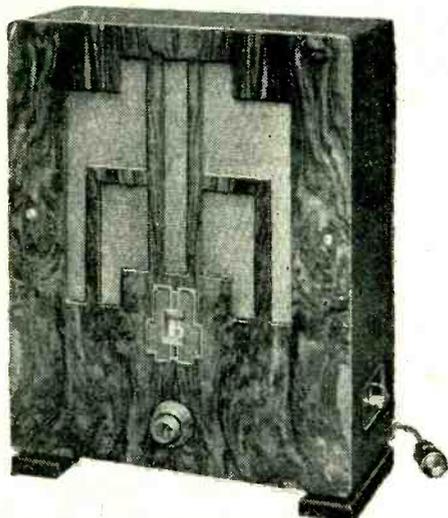
there will be no need for critical adjustments. Such sets have obvious attractions for those who do not concern themselves with technicalities. The principle of pre-selected tuning



A Tannoy high-power amplifier.

is embodied in a new M.P.A. set called the Multi-programme Automatic Ethatrope. Any one of twelve pre-selected stations, for which the tuning adjustment is presumably done internally, either at the works or by a service agent, can be selected at will by operation of a single knob; the name of the station selected is shown on the illuminated indicator. Basically, the set embodies a 1-v-2 circuit, and is for A.C. operation.

Even if the tuning system of the "Zetavox" (shown by Kenneth Brooks) is not the same, the result arrived at is similar. This set is



The Standard Telephones "All-wave" set.

operated by a push-button system, and is pre-tuned to the wavelengths of nine stations. It embodies automatic volume control, which we rather expected to see more widely used this year. One of the models is fitted with dual loud speakers, which, incidentally, are also employed in the Sinclair set.

In view of the imminent opening of the new B.B.C. short-wave service, one might reasonably have expected to see even more "all-wave" sets. Mention must be made of the Standard Telephones two-valve A.C. set, in which the wave-band (25-70 metres) is covered by a special plug-in coil unit. This set is fitted with a moving-coil loud speaker, and, as it marks the re-entry of Standard Telephones into the sphere of receiver construction, it will be studied with extra interest. A battery version of the same set is to be shown.

In the "Empire" class there is also the

McMichael Colonial Supersonic set, which covers medium and short wavebands. Stratton and Company (Eddystone) are, as usual, concentrating on short-wave apparatus, and are to show new sets and components.

The G.E.C. are showing an all-wave superheterodyne, with a tuning range of from 13 to 720 metres. Seven circuits are included, with band-pass filters. Particular stress is laid upon its construction, which is suitable for tropical countries.

The Kolster-Brandes superheterodyne is unusual in that three wave ranges are provided; these are 16/70 metres, 190/575 metres, and 800/2,100 metres. The valves are arranged conventionally, the first being a signal-frequency amplifier.

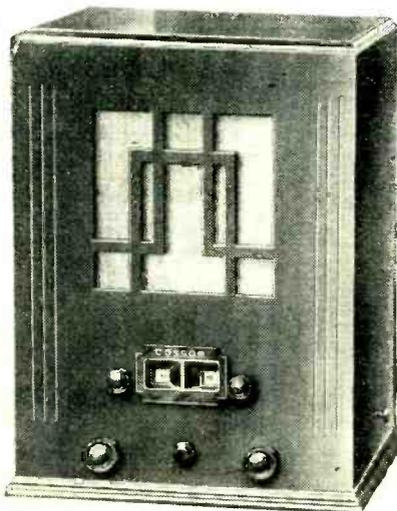
KIT SETS.

We have now come to look upon the introduction of a new Osram Music Magnet as a regular annual event. This year's model is a



Kolster-Brandes Model 321: short waves are receivable by the use of a special coil unit.

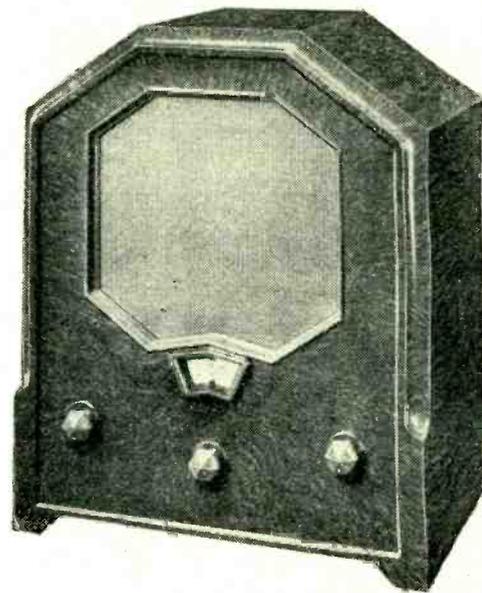
self-contained cabinet set, complete with a moving-iron loud speaker. Three battery-fed valves are used in an H.F.-det.-L.F. circuit, with a screened grid detector. There is a combined reaction and volume control, giving continuous regulation by means of a single knob. The valve panel is assembled, wired, and tested by the makers.



The latest Cossor Melody Maker, in self-contained form.

Another famous kit set, of which a new version has made its appearance, is the Cossor Melody Maker, also with a 1-v-1 circuit. One of the models is housed in an upright cabinet, complete with loud speaker.

Most firms seem to prefer this circuit arrangement for a kit set, and examples of it will also be shown by Lissen and several others. However, alternative valve combinations have

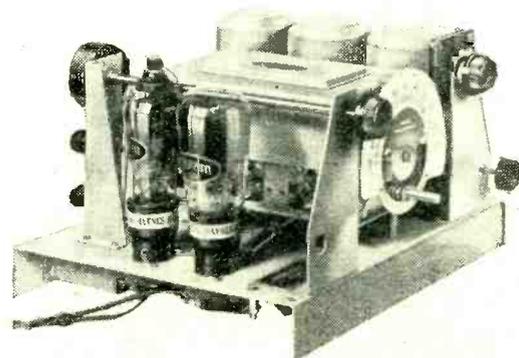


The New Osram Music Magnet.

their advocates, and Ready Radio and Lotus are sponsoring 0-v-2 kits.

A kit of parts for an unusually ambitious "Quality" set will be shown by Haynes Radio. With an undistorted output of 6 watts, this interesting chassis-built receiver embodies a link filter, one H.F. stage, power-grid detection, and a resistance-coupled L.F. amplifier. Two-unit construction has been adopted, and the set is also available in finished form.

While most of the kit-set designers have remained faithful to the straight set, Haynes Radio have also an A.C. receiver known as the Single Dial Superheterodyne. Band-pass filters are used for the signal frequency tuning, and also in the I.F. circuits; the second detector is a screen-grid valve, and the output



Haynes Radio kit set chassis.

valve is a pentode. For a small extra charge a modified kit is obtainable, in which an extra screen-grid valve is employed as a signal-frequency H.F. amplifier.

The firm of Ferranti produce a variety of kits, including types for specialised receivers and amplifiers. It would be impossible to enumerate them all here, and, indeed, it is unnecessary to do so, as the firm make a point of having technicians on their stand to help those whose requirements are of an unusual nature.

Sets of parts for sets described in the technical Press will be a leading feature of the Peto Scott exhibit, while the City Accumulator Co. are to show kits for radio-gramophones and for converting existing sets for gramophone reproduction.

What to see at Olympia.—

THE potential purchaser of a loud speaker at Olympia this year will not have an easy task. That is not to say that he will have any difficulty in finding the right type at the price he is prepared to pay; his embarrassment will arise rather from the extraordinarily wide range of makes offering apparently equal value as regards performance and price.

The past few months have produced an enormous increase in the number of small permanent-magnet moving coils, and this will undoubtedly be the predominant type at the Show. Small energised moving coils have also experienced a minor revival, but the majority

LOUD SPEAKERS

ing at 27s. 6d., complete with 3-ratio output transformer, and the "Challenger" and type 100 chassis are being continued.

The Epoch model A2 has been considerably increased in sensitivity, and the revised edition of the 20C model will also be shown at a reduced price.

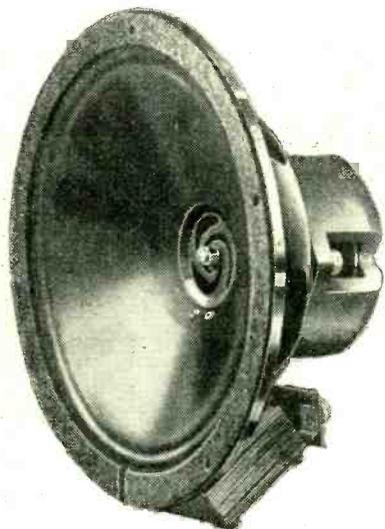
The Igranic permanent-magnet moving-coil chassis is now fitted with the latest type of two-claw magnet, and, together with 2-ratio output transformer, will be available at 32s. 6d.

A very neat and efficient loud speaker in cabinet form known as the "Permag" will be one of the principal exhibits in the stand of Baker-Selhurst Radio. This model is fitted with an output transformer of unusually generous proportions; and is capable of handling inputs up to 3.5 watts without distress.

The British-made "Motor" loud speakers are being shown on the stand of Electrical and General Distributors, Ltd., and the standard

nated the LS7 will be shown in redesigned form, and will be known in future as the "Universal" model.

The model 99PM, to be shown by the British Blue Spot Co., Ltd., is a robust instrument



Celestion PPM "Soundex"

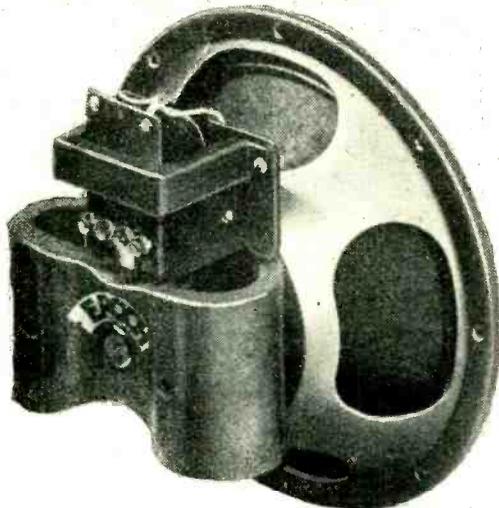
of the new season's models have been designed for use in sets where the field coil forms part of the smoothing circuit.

Comparatively speaking, the balanced-armature moving-iron loud speaker and the high-grade moving coil have been neglected, but it is gratifying to note that the few new examples which have appeared are of more than usual merit.

SMALL P.M. MOVING COILS.

The Celestion range of permanent-magnet moving-coil loud speakers for the coming season is unusually comprehensive. It is known as the PPM series, and the standard PPM model is being continued at 47s. 6d. A less expensive version of this model, known as the PPM9, will be shown, and the smallest of the series is the PPM "Soundex," which costs 27s. 6d. All these models are supplied with the new Celestion "Hylflex" diagram, and are fitted with a tapped output transformer.

Reproducers and Amplifiers, Ltd., will be showing an entirely new "Midget" model, sell-

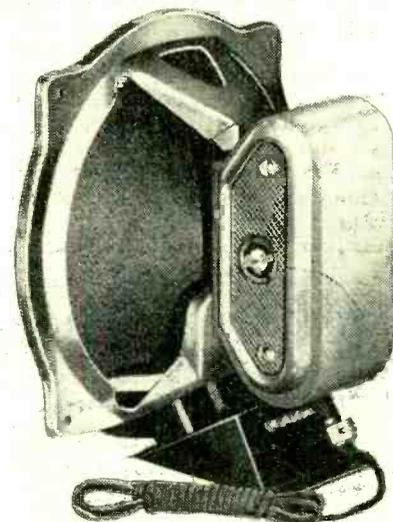


Epoch type 20C permanent magnet unit.

permanent-magnet model will be fitted with a 9 per cent. cobalt-steel two-claw magnet and a 7in. moulded cone. There is also a "Minor" model which will be supplied in a leatherette-covered baffle box.

H. Clarke and Co. (M/c.), Ltd., who are well known as manufacturers of eliminators and mains equipment, have entered the market with a permanent-magnet moving-coil unit which will be available both in chassis and cabinet form.

On the H.M.V. stand the efficient small permanent-magnet loud speaker previously design-



Blue Spot model 99PM.

fitted with a 1-ohm moving coil and is capable of handling 3.5 watts. A two-claw magnet with cadmium-plated poles is employed, and dust is excluded by end cheeks of "Milam" moulded material. An output transformer suitable for triode or pentode valves is included.

Ferranti, Ltd., are producing a new model M4. It will be fitted with a built-in output transformer, and it is anticipated that the price will be about £2 10s. The existing M1 and M2 loud speakers are being continued, and the latter will be available with an output transformer.

SMALL ENERGISED MOVING COILS.

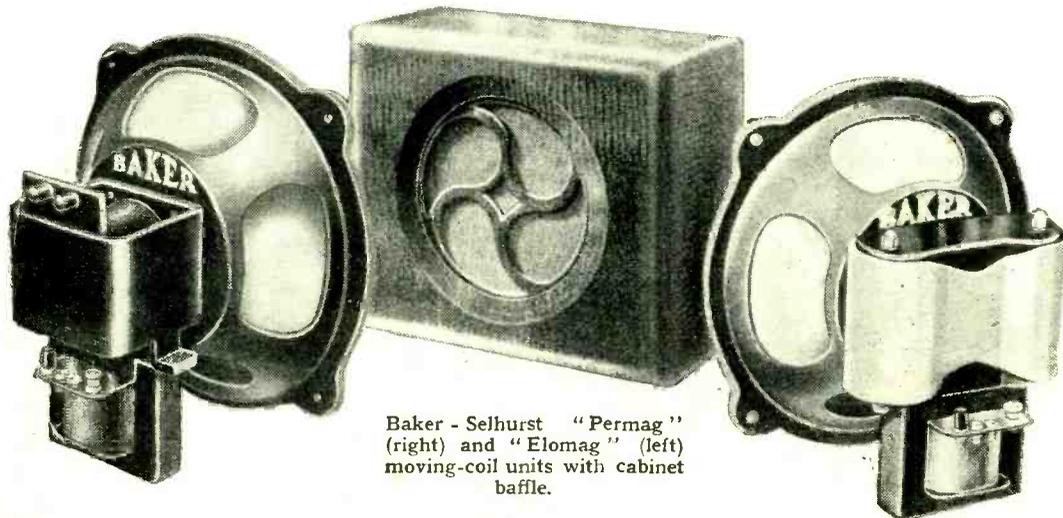
The majority of loud speakers in this category have been designed primarily for use in A.C. sets where the field winding forms part of the smoothing circuit, and in many cases a special balancing winding known as a "hum-bucking" coil is coupled to the field winding and connected in series with the moving coil to cancel out residual mains hum.



Clarke "Atlas" P.M.M.C.

The British Rola Co., Ltd., will be showing a very comprehensive range of loud speakers of this type. They will be divided into three main groups: Type F5, with 6in. diaphragms, Type F6, with 7½in., and Type F7, with 9in. diaphragms. All will be fitted with universal output transformers, and field windings of the following resistances will be available: 8, 2,000, 4,700, and 6,500 ohms. A permanent-magnet version of each type will also be shown.

Whitely Electrical Radio Co., Ltd., who have hitherto concentrated on small permanent-magnet moving coils will be showing for the



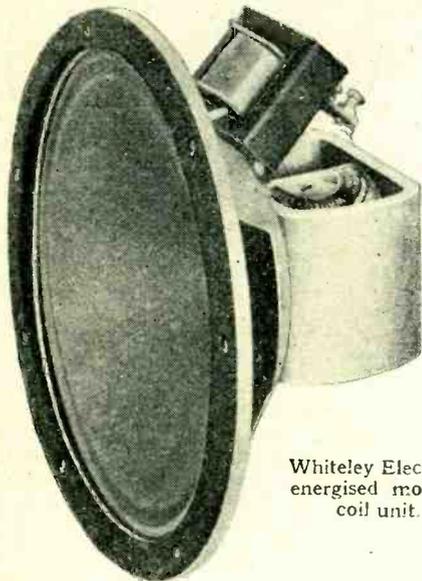
Baker - Selhurst "Permag" (right) and "Elomag" (left) moving-coil units with cabinet baffle.

What to See at Olympia.—

first time an energised model with alternative field resistances of 8 and 6,850 ohms. Resistances of 2,500 ohms and 4,700 ohms will be available to special order.

The mains-energised version of the Baker's-Selhurst "Permag" already mentioned is known as the "Elomag," and is priced at 34s., complete with transformer, and enclosed in the same type of cabinet. A special metal rectifier unit for supplying the field current from A.C. mains will also be shown.

From the constructional point of view the new mains and permanent-magnet models of Sonochorde Reproducers, Ltd., will repay examination. Instead of the usual centring



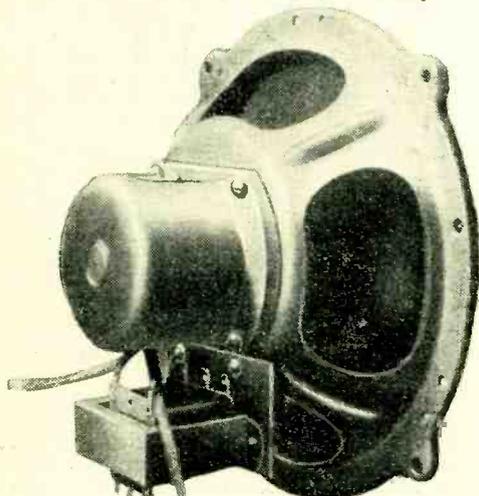
Whiteley Electrical energised moving-coil unit.

spider a small corrugated sub-diaphragm is used. This gives much greater lateral rigidity without restricting the axial movement of the coil and diaphragm.

Other notable additions to the small mains-energised class will be found on the stands of Electrical and General Distributors (British "Motor"), Ferranti (the new model D3), Epoch (redesigned E8 with "humbucking" coils), Ormond, and Stafford Sinclair. The latter make is equipped with a built-in fuse and will also be available with a tapped field winding.

LARGE MOVING COILS.

While the principal demand is for small-sized moving coils, there will always be a

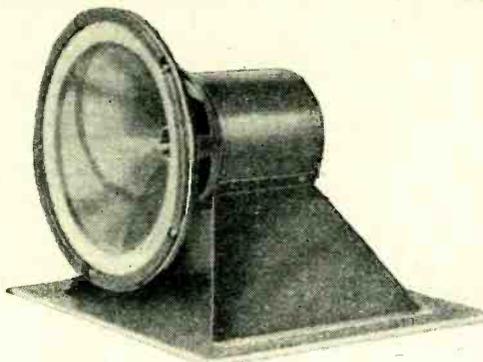


Epoch E8, which is available with "humbucking" coil.

market for reproducers specially produced to satisfy the needs of the connoisseur.

The Hartley-Turner loud speaker shown by the Automatic Coil Winder and Electrical Equipment Co., Ltd., is a good example of this class. The design shows many features of

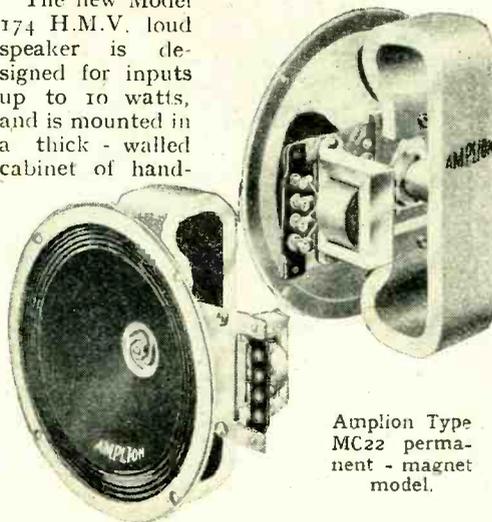
outstanding merit, and one of the most important is the special shape of the pole pieces to equalise the leakage flux on both sides of the gap. Large amplitudes can therefore be



Hartley-Turner moving-coil chassis (Automatic Coil Winder Co.).

developed without distortion, and frequencies as low as 32 cycles can be reproduced at their correct proportional amplitude. The principal diaphragm resonance is well below the audible limit, and the reproduction should therefore be free from "boom." There is no resonance in the region of 2,500-3,500 cycles, which is a frequent source of strident high-note response, but the output is stated to be well maintained up to 10,000 cycles. The diaphragm is of translucent bakelite and is centred by a flexible rear spider of special design.

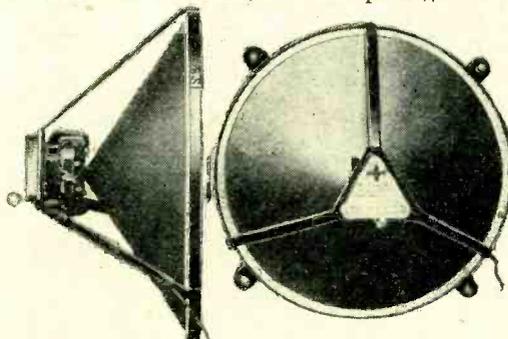
The new Model 174 H.M.V. loud speaker is designed for inputs up to 10 watts, and is mounted in a thick-walled cabinet of hand-



Amplion Type MC22 permanent-magnet model.

some appearance. The diaphragm is of duplex linen, starch-fixed and treated to resist moisture; special attention has been given to the fixing of the coil leads. A universal output transformer is included. The Marconiphone model 93 chassis is another unit of similar power-handling capacity.

Reproducers and Amplifiers will be showing a moving-coil unit of unusual ruggedness and strength. This model, known as the "Victory," is provided with an inner cone assembly mounted in a cadmium-plated steel frame. This assembly is in turn enclosed by an outer black-enamelled frame, and the openings in the

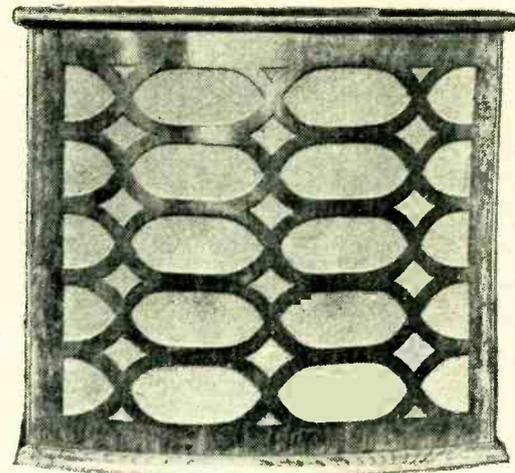


"Aylesbury-Trouton" moving-iron chassis (Shapland and Petter).

two frames are staggered. A 6-ratio transformer is fitted and the price will be 70s.

Amplion (1932), Ltd., will be showing an entirely new model known as the MC22. This has a 6½lb. chrome-steel magnet, and is fitted with a non-hygroscopic ribbed diaphragm. The power-handling capacity is between 5 and 6 watts. The Celestion PPM range also includes a large model (the PPM29), capable of handling 5 watts, and the Loewe Radio Co., Ltd., will be showing a permanent-magnet model with a 6½in. diaphragm and 3-ratio transformer giving a frequency range of 25 to 10,000 cycles.

Large loud speakers for public address and cinema work will be seen on the stands of



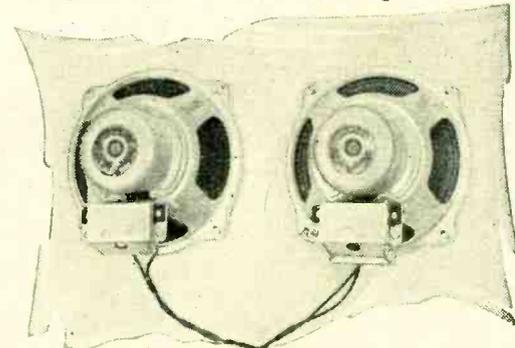
"Primustatic" loud speaker operating on the electrostatic principle.

Partridge and Mee, Baker's-Selhurst, Tannoy Products, and Epoch.

MISCELLANEOUS.

At the moment of going to press the Primustatic loud speaker would appear to be the sole example of the electrostatic principle to be found in the Show. In addition to the standard model a "Super" model will be shown and there will be an interesting combination of the electrostatic and moving-coil principles known as the "Dynamostatic" loud speaker.

One of the most interesting moving-iron movements will be found in the Aylesbury-Trouton loud speaker shown by Shapland and Petter. The main features are those covered by the patents under which the "Amplion Lion" was made, but several important improvements have been incorporated. Correct angular displacement of the armature is maintained for both close and wide adjustments, "belling" of the diaphragm at the periphery has been overcome, and the cone is attached directly to the armature, thus obviating the "whip" associated with a driving rod.

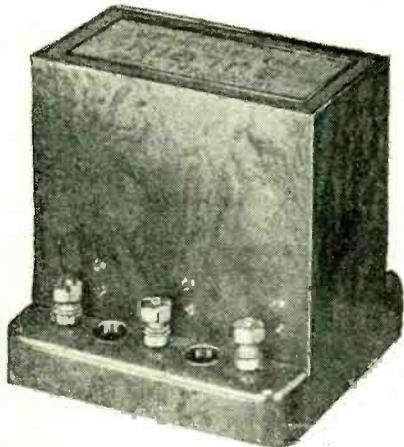


Magnavox dual compensated moving-coil units.

Dual-unit moving-coil loud speakers will probably make a last-minute appearance on many stands, and they will be the principal exhibit of Magnavox (G.B.), Ltd., who have been working on this principle now for some considerable time.

What to see at Olympia.—

SINCE components set the standard that can be attained in the home-constructed receiver, the announcements by the leading manufacturers of their programme for the forthcoming season is always awaited with keen interest by the amateur and the designer alike. For in this field use can be made only



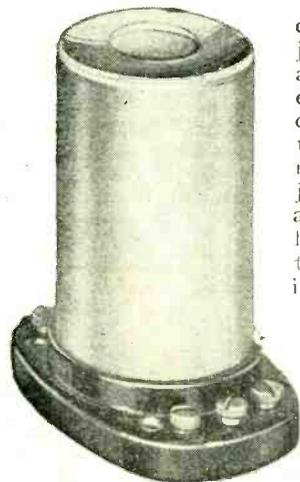
Bulgin Transcoupler; a parallel-feed L.F. transformer unit.

of the available components as a general rule, although there are occasions where some particular requirement can be met by a combination of small individual parts. Fortunately for those interested in this aspect of radio we are favoured with an enterprising industry, which realises that if a certain collection of small parts are often employed to serve a definite function they will have an added attraction if embodied in one single compact unit.

PARALLEL-FEED TRANSFORMER UNITS.

No better example of this could be found than the new parallel-feed transformer coupling units which is a development of the system of L.F. coupling introduced about a year ago and for which special miniature L.F. intervalve transformers were designed at the time.

The Bulgin Transcoupler and the Benjamin Transfeeda are two noteworthy examples of this new development, and although these models made their debut just over a month ago the early release detracts nothing from their interest, for, while



A cylindrical metal container is used to enclose the Benjamin Transfeeda, the terminals being mounted on a moulded base.

many readers may be familiar with the general principles, few would have had the opportunity to examine them at first hand. This desire can now be gratified, for both firms in question will be showing models of their respective coupling units. The new unit consists of a tapped anode resistance, a coupling condenser and a miniature L.F. transformer having a very high primary inductance.

Radio Instruments, Ltd., have now embodied their Parafeed model in a complete unit including the anode resistance and the coupling condenser. It has been arranged, however, that the transformer can be entirely isolated if necessary, thus enabling it to be used as a normal Parafeed in conjunction with a separate

COMPONENTS

resistance, or a choke. Further examples of these coupling units will be found on the stands of Bowyer-Lowe & A.E.D., Ltd., and the Formo Co., the latter firm's model being described as the Multi-Coupler.

TONE COMPENSATORS.

In certain quarters the use of highly selective circuits is advocated to combat the heterodyne nuisance, and this has given rise to a demand for special tone-correcting devices to compensate for the inevitable attenuation of the higher frequencies. An interesting development in this field is the Varley Rectatone L.F. transformer.

It enables correction to be made in the L.F.



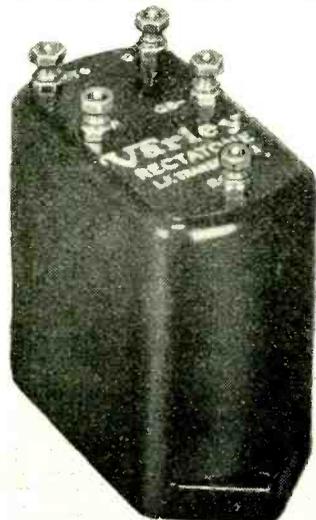
R.I. Parafeed L.F. coupling unit.

amplifier, the degree of compensation being effected by the use of an external resistance. If this resistance is omitted the transformer functions as a normal component giving an even amplification over a very wide band of frequencies.

Lissen, Ltd., will be showing a tone compensator designed to fit into the base of their Hypernik L.F. transformer while an attractive panel mounting device for tone correction will be found on the Harlie stand.

GANG CONDENSERS.

Totally screened and semi-screened gang condensers will dominate the stands of those

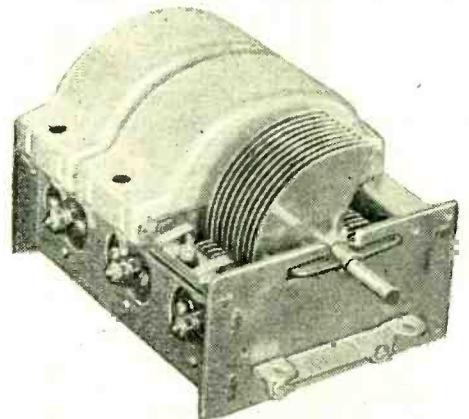


For tone correction an external resistance is used with the Varley Rectatone L.F. transformer.

firms specialising in the manufacture of this class of component; the new models show a great improvement over last season's types. The latest development is the new superheterodyne type in which one section is provided with specially shaped vanes to afford accurate tracking of the oscillator

without the aid of external padding condensers. The British Radiophone, Ltd., were the first to introduce a condenser of this type, and their now well-known models will be available for inspection during the following week.

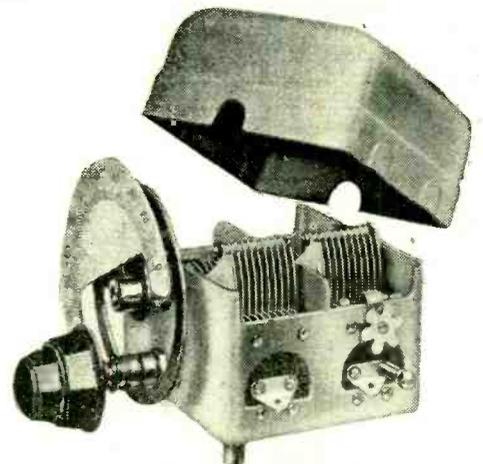
Wingrove and Rogers, Ltd., will have a new range of screened condensers styled the Polar "Star" series. They are built in



Polar "Star" three-gang superheterodyne condenser.

cadmium-plated steel frames fitted with aluminium vanes, and are provided with rigid end bearings. The trimmers are mounted so that they can be adjusted from the top, a convenience that most home constructors will appreciate fully. The "Star" series includes a number of superheterodyne condensers in which the oscillator section is fitted with specially shaped vanes.

Screened models of this type will figure also among the range of Utility condensers to be shown by Wilkins and Wright, Ltd. (Utility). The trimmers are controlled from the top and the range includes a number of superheterodyne types.



J. B. Unitune two-gang condenser.

Further examples of screened condensers will be shown by Jackson Bros., while both Lotus and Formo will have many interesting models, all new, for examination. Although Ferranti, Ltd., has for some time now made variable condensers, these have not been available as separate units, but were produced solely for use in their receivers. It has been decided this year to market the three-gang screened model separately, and it will undoubtedly attract considerable interest.

Some details have just come to hand relating to a series of new screened condensers that will be shown by the Igranic Electric Co. These will be of the mid-log law type and shown in two- and three-gang models.

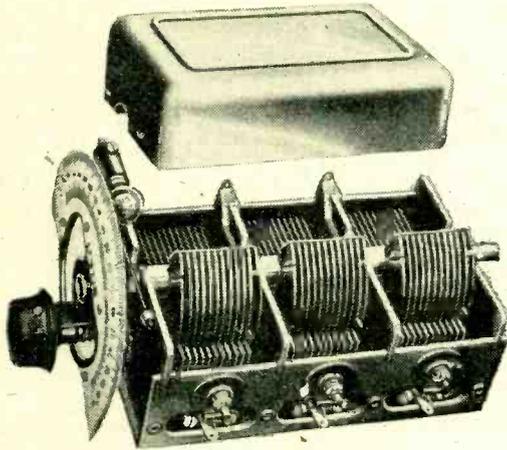
SCREENED COILS.

There have been no marked changes in the design of screened coils during the past twelve months, the small-diameter type has now

definitely established its superiority by virtue of compactness and general convenience. The outstanding feature this year, however, will be the many varieties of special superheterodyne coils consisting of screened oscillator units and compact band-pass I.F. transformers.

Colvern, Ltd., will have a fine display of coils, many of which will be familiar to the reader. The Colverdine band-pass superheterodyne I.F. transformer will be a prominent feature on this stand.

The new Formo coils should prove interesting as this firm have introduced a very novel, but exceedingly useful, feature in the form of coloured containers to identify the various types of coils. On the top of each coil former is a coloured disc corresponding to its screen, and a small circuit diagram has been included showing the terminals to which each winding is joined.

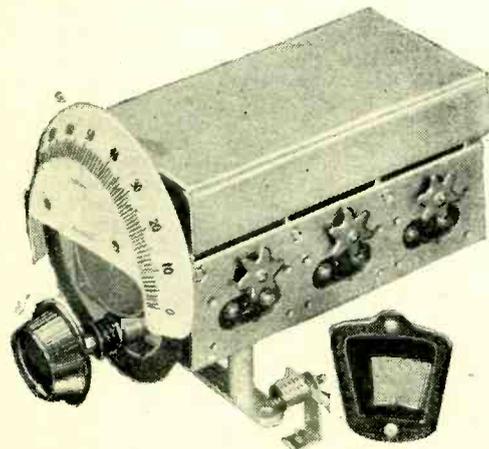


Lotus three-gang condenser and disc drive.

Varley will show a new range of screened coils, also a band-pass I.F. transformer, and other superheterodyne models housed in neat aluminium screens, and, of course, embodying waveband switching; while Wearite have a complete range of new coils. The band-pass I.F. transformer is housed in a copper container with the adjustments for the two small trimming condensers and the coupling protruding through the top of the screen.

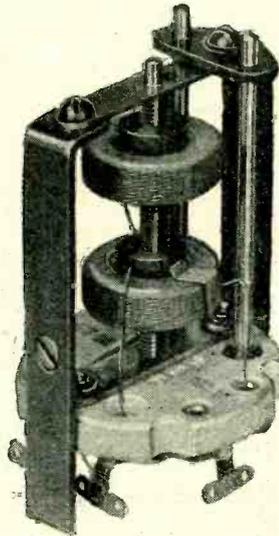
The new Cyldon superheterodyne band-pass I.F. unit is another example of accessibility to all controls, as the coupling as well as the condensers can be adjusted without removing the screening case.

A set of coils in somewhat larger containers than it is customary to use to-day will be on view at the stand of Turner and Co. (Tunewell). Lissen also have a range of coils, while other examples of present-day practice will be found on the stands of Lotus, Watmel, British General, and Igranic.



A feature of the new Formo condenser is the inclined scale.

We understand that the British Radiophone Co. will include in their exhibit a complete tuner unit consisting of an aerial coil and a band-pass H.F. intervalve coupling. It embodies a three-gang condenser, waveband switching, volume control, and on-off switch, the whole being mounted on a neat metal chassis, and the price is £3.

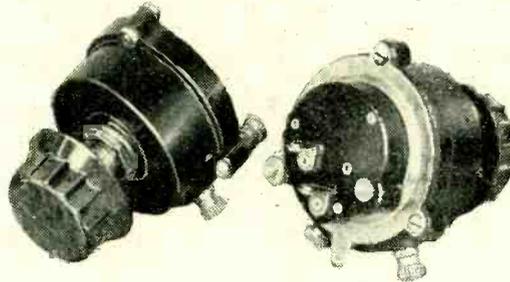


Cyldon superheterodyne I.F. band-pass unit removed from its case.

VOLUME CONTROLS.

Since a volume control is an essential adjunct to every modern receiver, all the leading component makers will have various models for examination. Considerable ingenuity is shown in many of the new designs to ensure silent operation, freedom from mechanical troubles, and smooth control. The various methods adopted, therefore, to achieve this will be found most interesting.

The Wearite Q.V.C. models are fitted with a small roller on the tip of the moving contact. This gives silent operation, relieves the fine wire element of mechanical stresses, and so minimises the likelihood of breakages. In the British Radiophone models a light, hair-pin-shaped spring, mounted on an insulated disc, makes contact between the wire element and a metal back-plate, by which simple but ingenious arrangement a perfectly smooth



British Radiophone volume controls with and without mains switch.

action is obtained, and the spindle is entirely insulated from the resistance. There will be a model embodying a mains switch, which is contained in a small housing attached to the back-plate of the moulded container.

A new model that will be found on the Lewcos stand should not be missed, as it embodies a most ingenious rocking-disc-type of contact. The action is delightfully smooth, and imposes no appreciable mechanical stress on the fine resistance wire.

Varley will show a range of improved volume controls, and, since Rotorohms are now being made in this country, there will be an opportunity to examine their many interesting models. Colvern, R.I., and Gambrell will each have some interesting specimens for examination, while Watmel have developed various new types, including provision for ganging, also some complete composite units embodying volume controls and switches.

New models fitted with dust covers and fully protected resistances will be seen on the Igranic stand, and many interesting models

are to be shown by the British N.S.F. Co., as well as by Bulgin and Bowyer-Lowe & A.E.D. Ltd.

FIXED CONDENSERS.

Considerable progress has been made during the past year in the development of the electrolytic type of condenser, and interest will naturally centre on those firms exhibiting these types. The T.C.C. recently introduced a series of aqueous-type electrolytic condensers for use in mains sets, and the various models will be available for examination at their stand. Some of the models are rated at 440 volts D.C. working, and are made in 8- and 4-mfd. sizes. There will be, in addition, a 7-mfd. type rated at 460 volts D.C. working. Various additions have been made to the paper-type smoothing condensers, and a special feature is to be made of block condensers consisting of various units embodied in a single case.

Tubular electrolytic condensers for chassis mounting, but in



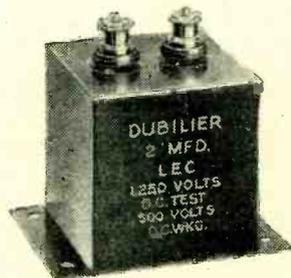
T.C.C. aqueous-type high-voltage electrolytic condenser.

this case of the "dry" variety, will be found among the very extensive range of Dubilier condensers. These models are rated at 450 volts D.C. working, and will be seen in 4-, 6-, and 8-mfd. sizes. For condensers of such high capacity and high working voltage the prices are exceptionally low, and these new Dubilier models should prove very popular indeed. The 8-mfd. size, for example, costs but 5s. 6d.

A range of paper dielectric condensers rated at 500 volts D.C. working, and listed at 1,250 volts D.C., styled the L.E.C. type, will be shown for the first time, while another new series is the type B.S. for use in battery sets, and rated at 250 volts D.C. working.

The British N.S.F. Co. will have some interesting condensers, including a range of "dry" electrolytic models rated at 450

Dubilier type L.E.C. and new "dry" electrolytic condenser in aluminium container.



D.C. working. These are tubular in shape, and designed for chassis mounting. Heayberd will have a very extensive range of condensers suitable for battery and mains sets, and available in all the usual sizes; while the Formo

What to See at Olympia.—

400-volt D.C. working type should not be missed, as the prices are most reasonable.

Then, of course, there will be the Ferranti Stand to visit, where a fine display of fixed condensers is to be made.

H.F. CHOKES.

Since it is of equal importance to stop H.F. currents getting into the L.F. amplifier as it is necessary to entice them into the earlier stages of a receiver H.F., chokes attain a certain prominence, for they serve for both functions. Mention here must, from necessity, be restricted to new and interesting types, of which the shielded variety is, perhaps, of greatest importance, since it definitely possesses no external field and cannot cause undesirable coupling.

Two firms will be showing models of this type. Wright and Weaire, Ltd. (Wearite), will have two styles for examination. One is a plain model, small in size, and housed in an aluminium case; while the other is similar but with the addition of a screened lead for connecting to the anode terminal on the H.F. valve. Bulgin will show three models: a midget variety, a special superheterodyne type with an inductance of 0.5 henry, and a standard model for normal use. Each is enclosed in a screened case finished in frosted aluminium.

SHORT-WAVE COMPONENTS.

Stratton and Co., Ltd., have for long specialised in the manufacture of short-wave equipment, so that the special components they will show this year will be awaited with interest. One new item is a small variable



Wearite screened H.F. choke fitted with shielded connecting lead for use with S-G valves.

condenser, designated the Eddystone Micro-condenser, and developed especially for ultra-short wave, i.e., 7-metre, receivers. It is provided with an extra terminal so that the miniature coil can be mounted on the condenser. This model is made in two capacities, viz., 16 mmfd. and 50 mmfd. maximum, respectively, and should prove ideal for the purpose it is intended.

Special condensers for use on the recognised short-wave broadcast band will be shown by Wingrove and Rogers (Polar), while Ormond, Lissen and Jackson Bros. will have many fine examples on view.

Coils will be found on the stands of Colvern, Ltd., Stratton and Co., Telsen, Ltd., and Lissen, Ltd., while the R.I. Antinodal short-wave coil will be featured together with the superheterodyne adaptor embodying this unit.

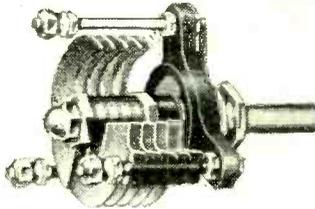
MAINS EQUIPMENT.

Although minor improvements have been made by the various firms specialising in battery eliminators, in general the design follows

much the same form as heretofore. Heyberd are employing a new style of container which will be found very attractive. A new feature is the provision of a safety fuse. Mains transformers for use with valve and Westinghouse rectifiers will be shown, together with a comprehensive range of smoothing chokes.

A. H. Clark and Co. (M/ch), Ltd. (Atlas), will have one new model, the A.C.300. It has two variable H.T.appings, one fixed voltage for the power stage, and provides four different grid bias voltages. A trickle charger is embodied for 2-, 4-, and 6-volt. accumulators.

A new type of container has been adopted for housing the Regentone models, and this has been standardised throughout their range. It is a solid drawer steel case, having an attractive Florentine bronze finish, and each model now has seven output tappings. The majority



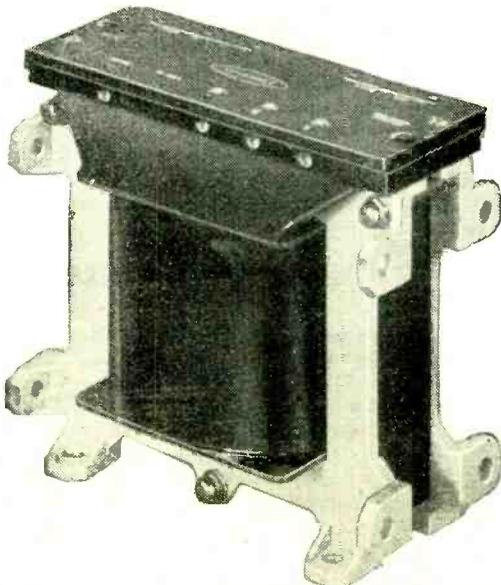
Eddystone special short-wave condenser for use on ultra-short wavelengths.

of Ekco units are housed in the same style of case, the dimensions of which are such that it fits comfortably in the battery compartment of portable sets. These models will be shown with and without trickle chargers.

In addition to a comprehensive range of complete units for D.C. and A.C. supplies, Ferranti will be catering for the home constructor, having prepared a number of designs suitable for building at home, and for which constructional broadsheets will be available. In addition to their existing range of mains transformers and L.F. chokes there will be a new model styled the B.10 choke.

Partridge Wilson and Co. are introducing a new range of Davenset mains transformers and smoothing chokes. Bakelite is employed throughout for insulating purposes, and a distinctive feature of the design is that they can be mounted in any one of three positions. Mains transformers will be shown for use with valve and Westinghouse rectifiers.

A particularly comprehensive range of mains transformers and chokes will be a feature of the Varley exhibit, while further examples will be shown by Radio Instruments, Ltd., Patridge and Mee, Ltd. (Parmeko), who, in addition, will have a long range of power amplifiers, including a 25-watt model, in Kit form, for home construction. J. Dyson and Co. (Works), Ltd. (Godwinex), also Turner



Davenset mains transformer. Note the special terminal board fitted with insulated connectors.

and Co., Ltd. (Tunewell), are two other firms who are specialising in mains equipment.

Rotary transformers for obtaining A.C. from the D.C. mains will be the outstanding feature of the Electro Dynamic Construction Co.'s exhibit, and with the most recent additions they will have ten different types

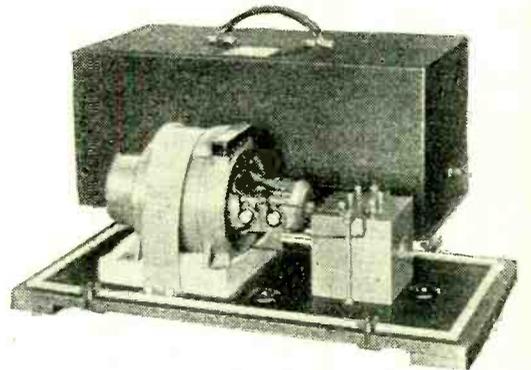


Complete range of new Westinghouse metal rectifiers.

ranging from 50 watts output to 600 watts output. A special alternator has been developed for driving from a motor car engine, giving an A.C. output for operating public address amplifiers and similar apparatus.

Another interesting development is a small rotary transformer operated from a two-volt accumulator, and giving about 150 volts D.C. at 15 mA.; it is intended for use with battery-type sets.

Although the principal features on the Crypto stand will be the special battery charging equipment for Service Stations, this firm will show, also, many interesting types of machines for operating A.C. receivers, amplifiers and radio-gramophones from the D.C. supply mains.



M.L. Rotary transformer, smoothing unit and silence cabinet.

On the stand of C. A. Vandervell (Rotax) will be a complete range of M-L machines, including small anode Converters for voltage raising. Another M-L type is the D.C. rotary transformer, of which various sizes up to 200 watts output and giving voltages up to 1,200 will be seen. For those who require an A.C. supply for operating receivers, etc., from the D.C. mains, they will find their requirements met by the M-L D.C. to A.C. Rotary transformer, of which various types will be available for inspection.

The Standard Battery Co., Ltd., will have two models of Rotary Converters; the type A gives 80 watts output, and the type B 180 watts output.

The Westinghouse programme for the coming season includes seven new metal rectifiers; four of these are low-voltage models suitable for battery charging, and three are high tension rectifiers styled the H.T.9, H.T.10, and H.T.11, respectively. The H.T.9 gives 300 volts of smoothed D.C. at 60 mA. when used in a voltage doubling circuit. The H.T.10 gives 200 volts D.C. at 100 mA., while the H.T.11 is a high-voltage model from which 500 volts of pure D.C. can be obtained at between 120 and 150 mA.

Eric J. Lever (Trix), Ltd., will make a

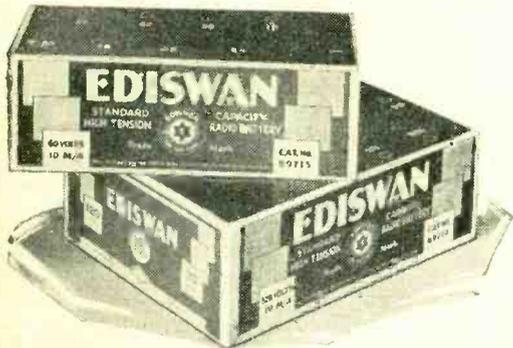
What to see at Olympia.—

special feature of mains-operated power amplifiers ranging from 2.5 watts output to 16 watts output, and there will be eight different types in all. A new range of mains transformers for use with the latest Westinghouse rectifiers, H.T.9, H.T.10 and H.T.11, as well as new models of their step-up and step-down transformers, will complete a very interesting display.

H.T. AND L.T. BATTERIES.

Since the dry-cell type of battery provides one of the most convenient sources of high tension it is not surprising to find many new types appearing this year. The Drydex range has been augmented by the addition of a new series styled the Brown Triangle models. These are for use with sets fitted with medium power output valves as they can be discharged economically at some 30 mA. The usual sizes will be shown by the Chloride Storage Battery Co., Ltd., who will include, also, improved designs of Exide H.T. and L.T. accumulators.

The principal feature of the Ever-Ready exhibit this year will be the very comprehensive range of special portable H.T. batteries, many



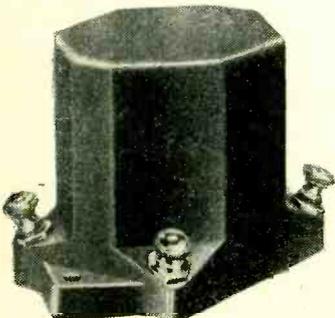
New series Ediswan H.T. batteries.

new types having been added recently. A new feature introduced by Oldham and Sons, Ltd., is the provision of a new style of moulded top for their L.T. cells. A small panel is provided in which a card, bearing the owner's name, can be inserted, and there will be a full range of "Lively O" H.T. batteries.

Some entirely new dry-cell H.T. batteries will be shown by the Edison Swan Electric Co., Ltd. Two types are now available, viz., a standard capacity and a super-capacity, the former for discharge up to 10 mA., while the super series can be discharged economically up to 20 mA.

Full O'Power batteries have been extended and a new series styled the Cadet models added. The prices will be found most reasonable. A new model styled the Ultra size is a recent addition to the Pertrix range made by the Britannia Batteries, Ltd. This class is fitted with slightly larger cells than were used hitherto, but the prices remain unchanged.

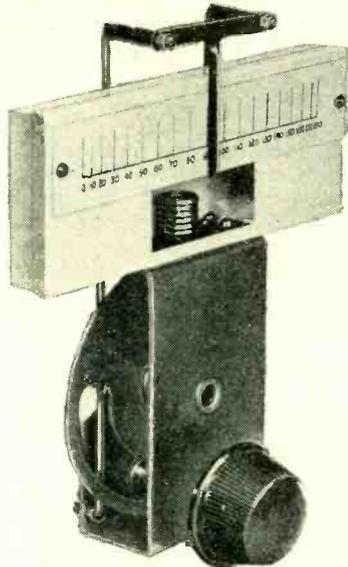
S. Smith and Sons (Motor Accessories), Ltd., make their debut in the radio field with a long range of L.T. and H.T. accumulator batteries.



Clarke's Atlas P.F.1 L.F. transformer for parallel-feed circuits.

Models will be shown for heavy discharge and also for slow discharge, as well as jelly acid cells and unspillable types for use in portable sets.

The Marconiphone Co., Ltd., have an improved range of H.T. batteries at very low prices, and further models of both H.T. and

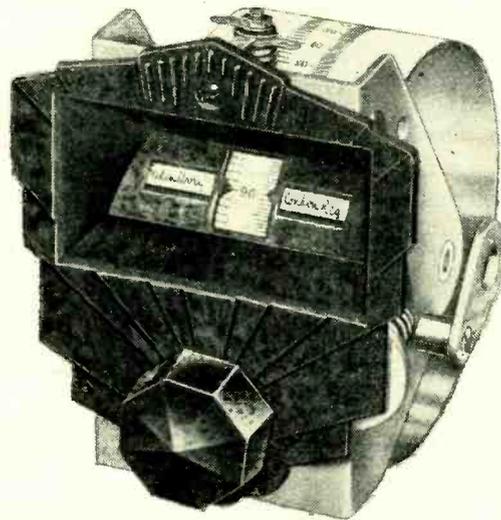


Straight Line Full Aperture Dial; a new Utility product.

L.T. batteries will be found on the stands of C.A.V. and Fuller. Primary batteries of the Leclanché type will be a feature of the exhibit of the Standard Battery Co. (Wates).

L.F. TRANSFORMERS.

A. H. Clark and Co. (M/c.), Ltd., will show a new Atlas L.F. transformer for parallel-feed circuits and known as the P.F.1. This model has a primary inductance of over 80 henrys and a step-up ratio of 1:4. The Formo "Nigen" is a new type also, having a nickel-iron alloy core and a screened winding. The outer case, however, is finished in aluminium. Another new model is the Bulgin "Connoisseur," also



Ormond Logging Drum Drive.

for parallel feed. It has a very high primary inductance—over 100 henrys—and the price is 6s. 3d.

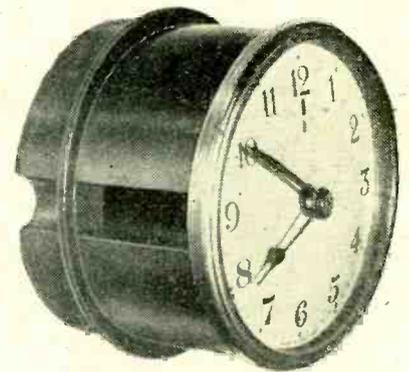
MISCELLANEOUS COMPONENTS AND ACCESSORIES.

The Lectro-Linx range of Clix specialities has been augmented from time to time during the past year by the addition of new terminals, insulated sockets, improved wander plugs, and a new version of their panel-type valve holder. The complete range will be seen on their stand. Belling and Lee, Ltd., have introduced a neat mains input connector comprising a two-pin plug mounted on a vertical bracket and an insulated socket portion for the supply leads. They will be showing also various types of connectors, fuse holders, terminals, and a range of battery cords.

Bulgin has an ingenious lightning arrester-cum-aerial switch, and Graham Farish will be showing, in addition to many other useful components, a novel earthing device styled the Filt Percolating Earth.

A unique tuning scale quite unorthodox in design will be found on the Utility stand. Described as a Straight Line Full Aperture Dial, it is fitted with a moving pointer, the scale remaining stationary and visible for the whole of its length. The scale is detachable, and can be calibrated to suit individual sets. Another example of a scale in which provision is made for home calibration is the Logging Drum Drive to be shown by Ormond.

Attention is directed to the new range of universal A.C. and D.C. measuring instruments introduced some little time back by Ferranti. These are of the moving-iron type, and the prices are quite reasonable. Sifam will be showing a most useful range of meters for A.C. and D.C. measurements, while further examples will be found on the stands of Bulgin and the Standard Battery Co. Those who are looking for an accessory somewhat out of the ordinary



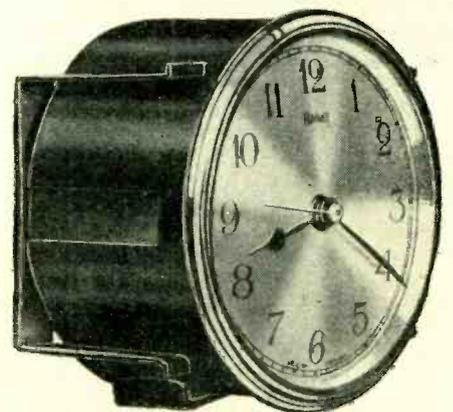
Junit electric clock movement embodying an adjustable fixing ring.

should visit the Junit stand, where they will find a special low-priced electric clock movement designed specially for incorporating in A.C.-operated receivers. It is of the flush-fitting type, and it costs but 30s.

Ferranti, Ltd., will have an electric clock movement also, which can be utilised in the same manner.

The Automatic Coil Winder and Electrical Equipment Co., Ltd., will show a special adaptor for their well-known Avometer. It has been developed to facilitate measuring the various voltages on the electrodes of a valve under working conditions in the set.

There will be an exceptionally fine display of cabinets for housing receivers, radio-gramo-



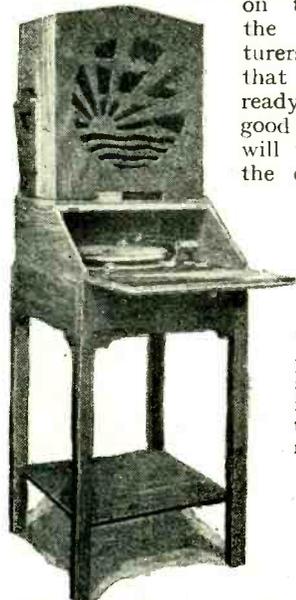
Ferranti electric clock movement for incorporating in A.C. receivers.

phones and loud speakers on the stands of the Carrington Manufacturing Co., Ltd. (Camco), W. & T. Lock, Ltd. (Kabilok), and C. A. Osborn.

What to see at Olympia.—

THE electrical reproduction of gramophone records through the low-frequency side of broadcast receivers has long since passed the experimental stage, and accessories for the conversion of existing sets for this purpose will constitute an important feature of the Show.

Complete radio-gramophones will be found on the stands of all the leading manufacturers, but it is probable that many people, already in possession of a good broadcast receiver, will visit the Show for the express purpose of

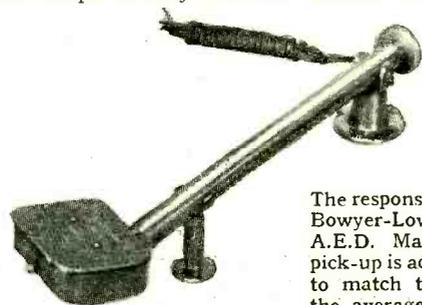


"Bureau-Gram" pedestal by Lawson and Raphael for converting A.C. transportables to radio-gramophones.

finding how to extend the entertainment value of their sets by the addition of gramophone equipment.

PLAYING DESKS.

The conversion need not involve any constructional work of a technical nature, for if the set is equipped with pick-up terminals the whole of the gramophone equipment, including turntable, pick-up and volume control, can be purchased in a single compact unit known as a "playing desk." The Bowyer-Lowe and A.E.D. record-playing unit is a good example, and incorporates the company's latest Mark III pick-up, a log-law volume control, and Simpson's electric turntable. The small depth of the latter component has enabled the makers to adopt a very shallow walnut cabinet of



The response of the Bowyer-Lowe and A.E.D. Mark III pick-up is adjusted to match that of the average moving-coil loud speaker.

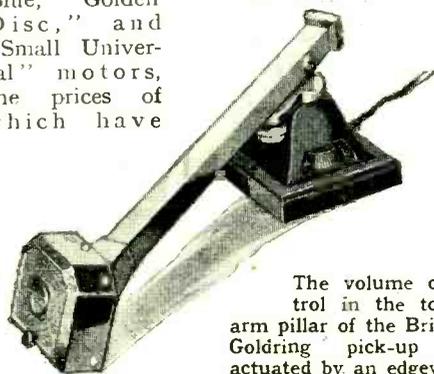
neat design. The H.M.V. Model 116 playing desk has been reduced in price to 7 guineas, and now includes provision for fixed resistances in addition to the volume control, by means of which the output can be adjusted to suit any type of receiver.

Another type of playing desk of rather attractive design will be shown by Messrs. Lawson and Raphael. It is known as the "Bureau-Gram," and forms a pedestal upon which the majority of self-contained mains transportable sets can be mounted with advantage. In standard form it costs 10 guineas, and includes a B.T.H. pick-up and Garrard induction motor. The same underlying idea is to be found in the Apollo playing desk, though this is made only as a table model. There are two types available, one for A.C. mains and the other with a spring motor, at the very attractive figure of £2 18s. 6d.

GRAMOPHONE EQUIPMENT

GRAMOPHONE MOTORS.

Those contemplating the construction of a playing desk or the conversion of an existing gramophone will find a wide range of electrically driven turntables from which to choose. Harlie, Ltd., will be showing three new induction motors of neat design. They are of the self-starting high-speed type, and the governor gives a range of turntable speeds from 75 to 85 r.p.m. The smallest of the range, known as the "Midget" model, is fitted with a 10in. turntable and costs 39s., while the Model 62 de luxe has a handsome bakelite unit plate, and sells for 55s. The Garrard motors are continued in practically the same form as last year, and the same applies to the B.T.H. "Synchro-Blue," "Golden Disc," and "Small Universal" motors, the prices of which have



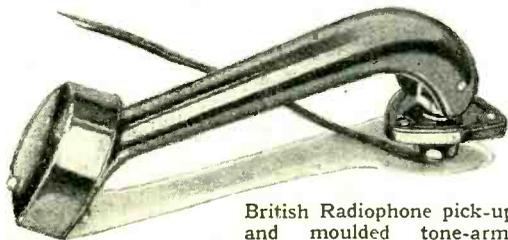
The volume control in the tone-arm pillar of the British Goldring pick-up is actuated by an edgewise dial.

been revised. A new B.T.H. motor—the "Truspeed"—will be shown for the first time. Complete with automatic stop it weighs only 6 lb. 8 oz., and the power consumption is between 6 and 8 watts.

PICK-UPS.

Many new pick-ups will make their debut, and in the majority of cases it has been found possible to obtain the necessary rising characteristic in the bass without amplitude distortion. This feature will be found in the new Harlie Model 65 pick-up and in the Celestion type W8. The latter replaces the old W5 pick-up, and is fitted with a rotating head; the output is from 1.0 to 1.5 volts R.M.S.

In the new Mark III pick-up to be shown on the stand of Bowyer-Lowe and A.E.D., Ltd., the response has been specially modified with the object of giving an even overall response in conjunction with the average moving-coil loud speaker. The windings have an unusually low impedance, so that a robust wire-wound



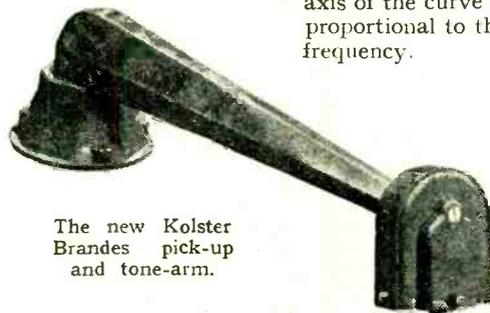
British Radiophone pick-up and moulded tone-arm.

volume control potentiometer of low resistance can be used without losing high notes.

A novel form of built-in volume control is to be found in the pick-up and tone-arm to be exhibited by British Goldring Products, Ltd., and consists of an edgewise knurled knob let into the tone-arm pillar. In the "Unit" pick-up now marketed by the G.E.C. the length of tone-arm and the tracking angle are both adjustable, while in the redesigned Mar-

coniphone Model Kr7A the pick-up leads are now completely screened. The new British Radiophone and Kolster Brandes pick-ups should also repay a careful examination.

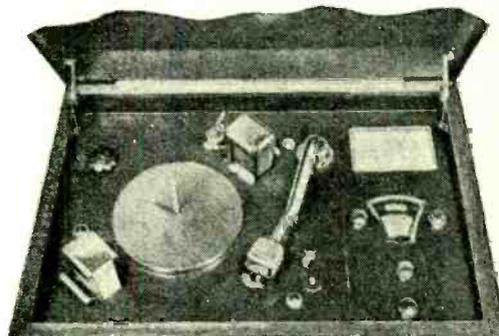
A rapid and accurate method of obtaining pick-up characteristics will be shown by H.M.V. The test record is of the falling tone type, and the output from the pick-up after amplification is passed to a recording voltmeter, which traces the curve on paper drawn at a constant speed through gearing from the record turntable. In this way the horizontal axis of the curve is proportional to the frequency.



The new Kolster Brandes pick-up and tone-arm.

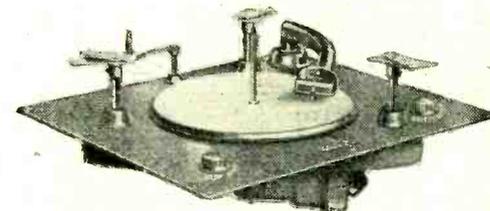
RECORD CHANGERS.

The introduction of continuous series of records in album form has done much to stimulate the demand for automatic record-changing devices. Gramophone enthusiasts who have been unable hitherto to afford such a luxury will this year be sorely tempted, for the H.M.V. record-changer which formed part of the equipment of their more expensive models last year will be available in playing desk form at the very attractive price of 12 guineas. The controls have been simplified and rendered more silent in operation, and the instrument will play eight records or repeat a single record up to eight times.



H.M.V. record-changer, which will be available in playing desk form.

The news that the Garrard Engineering Company have produced a record-changer of simple and original design should ensure a good attendance at their stand. The mechanism is very simple, and a single cam drum controls the whole of the movement. During the playing of the record no part of the record-changing mechanism is in motion, and the full power of the motor is available for driving the turntable. At the end of each record the standard Garrard throw-off mechanism actuates a clutch which brings the cam drum into action. The records are held by three supports, and selection of the next record is made by rotating knife-edge blades. The unit will be supplied in chassis form, and together with a pick-up of Garrard's own manufacture will cost £10.



The new Garrard record-changer, which will include the maker's own pick-up.

What to see at Olympia.—

AFTER the plethora of new valve types of the last two years, valve makers and valve users may well be grateful for an apparent lull in the flow of inventions, permitting the time for improvements in design and a general consolidation of the new positions. The benefits are already obvious in greater consistency among specimens of the same type, in the achievement of rigidity of construction and in the almost complete conquest of microphonic noise. Whilst there are not any noteworthy new principles introduced, there will be found some important improvements and additions to the series already existing.



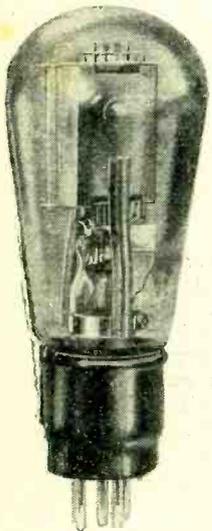
Osram VDS, an indirectly heated variable-mu valve for D.C. mains.

There is good news for the D.C. user, who can now take his choice from a number of H.F., detector and small output valves quite equal in efficiency to those used in modern A.C. sets. Detector valves with low input impedance due to a reduction of interelectrode capacity have just made their appearance and should assist in improving the selectivity of a receiver by virtue of a decrease in damping of the tuned grid circuit.

In the output range the pentode shows no sign of waning in popularity, as will be evident from a visit to any of the valve manufacturers' stands.

H.F. VALVES.

The variable-mu valve seems to have almost entirely superseded the ordinary screen-grid valve. This is only natural as there is no function which the S.G. valve can perform which cannot be better carried out by the variable-mu type. Of newcomers belonging to this class mention should be made of the Mazda AC/SG.VM, having a slope of 2.2 mA/volt and a generous grid bias of about 45 volts, ensuring a full control of volume from zero to a high maximum. Special care has been taken in so designing the screen feed potentiometer advocated for this valve that the screen volts rise considerably above the mean level between -4 and -10 volts bias where cross-modulation might otherwise make its appearance. The new Mullard valve of variable conductance is styled the VM₄V and is very sensitive at low bias voltages.



Cossor PT.41B, a new directly heated pentode with an anode dissipation of 12 watts.

mu amplifier containing valves which will be in no way inferior to the A.C. type. The new Marconi and Osram VDS is an indirectly



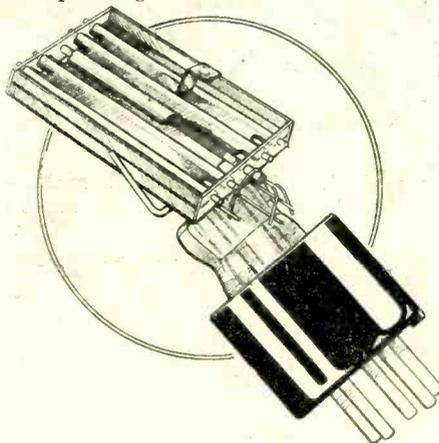
heated D.C. valve consuming 0.25 amp. at 16 volts, being a counterpart to the latest VMS₄ with a slope of 2.4. Owing to certain properties of the screening grid it is advisable to use the same compensated feed arrangement as that already published for the VMS₄, but the resistances should have half the normal value.

A simple circuit can be employed with this series of D.C. valves comprising independent automatic grid bias in the cathode lead of each valve as the heater-cathode insulation is quite unaffected by a difference of potential up to 110 volts. Another variable-mu valve with indirectly heated cathode for D.C. mains is the Mazda DC/2SG.VM, having a heater to carry 0.1 amp. at 20 volts and the high mutual conductance of 2.2 mA/volt.

DETECTORS.

There are signs of a slight revival of anode bend rectification in the second detector position in superheterodynes, and there is an increasing use of the screen grid valve as detector in straight sets, but interesting as these developments are, they do not call for the manufacture of new valve types.

As a power grid detector the new Mullard



The record mutual conductance of 12.6 mA/volt is obtained in the Standard Micromesh PAI output valve. This illustration shows the cooling fins and the close-spaced electrodes.

904V will be of considerable interest, for not only has a new rigid unit construction been embodied which completely defeats microphonic troubles, but also in designing the electrodes the makers have paid special attention to residual capacity, with the result that the input impedance is considerably reduced and damping of the preceding tuned circuit is thereby minimised. The Mullard PMI HL—a valve which has gained considerable popularity as a detector—has been redesigned both mechanically and electrically and is most sensitive at 20 to 50 volts H.T. As a consequence it is extremely economical in anode current.

The Standard Micromesh type HLAI is a new detector for A.C. mains with the remarkable mutual conductance of 8 mA/volt. In this valve and others of the series, close spacing of electrodes has been reduced to a fine art, and in spite of clearances which have hitherto been considered impracticable, the valves stand up to rough usage and a system of cooling fins ensures freedom from grid emission. The anode-to-grid capacity in the HLAI is only 5 mmfds., which is reflected back to the input side as quite a small impedance.

Little modification is being made to the well-known detectors already on the market, and the following, which are representative of

their class, will be retained for the coming season: The Cossor 41 MHF and 41 MHL, Marconi and Osram MH₄, Mazda AC/HL and AC₂/HL, and Mullard 354V.

OUTPUT VALVES.

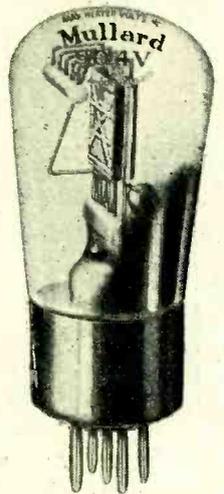
The most striking additions to this class are undoubtedly a series of pentodes, the sensitivity and mutual conductance of which will be seen to be of a very high order. Directly heated pentodes for A.C. mains will be conspicuous and a number of well-known set makers are including them in their more ambitious products. The redesigned Marconi and Osram PT₄ has a directly heated filament (4 volts 1 amp) and is rated for 250 volts on both screen and anode. Its mutual conductance is nearly 3 and the anode dissipation 8 watts. Another directly heated pentode which will find ready application in ambitious radio-gramophones and amplifiers for public entertainment is the Marconi and Osram PT₂₅, requiring 2 amps at 4 volts for the filament. The maximum dissipation is 25 watts, about 40 per cent. of which can be extracted as undistorted A.C. output. In the Cossor range the PT₄₁ and PT₄₁B are new pentodes of the directly heated type with liberal outputs. The second of these has a dissipation of 12 watts and will feed satisfactorily the largest type of moving-coil speaker. Other new output valves of interest are the Mazda PP₃/250 and the DC/2P for A.C. and D.C. mains respectively. The former has a slope of 6.5 and will dissipate 12 watts, while the latter has a heater demand of 0.1 amp. at 35 volts, ensuring extremely economical running.

One of the most outstanding valve exhibits will be the standard Micromesh PAI with the record mutual conductance of 12.6. No less than 1½ watts A.C. output can be obtained with 11 volts bias and 200 volts on the anode, these exceptional characteristics being obtained by small clearances.

Little change has taken place in the range available, for the good reason that the standardised types A, B and C developed last season have met practically every demand in receiver design. Both in the directly and indirectly heated types the makers have paid attention to slow heating, thus minimising the effect of high initial voltages on switching on. There is extended use of the hot cathode mercury vapour rectifier where the total current required is beyond the capabilities of the three ordinary standardised types. A new rectifier is being marketed by Standard Telephones and Cables styled the micromesh RI giving nearly 300 volts D.C. at 60 mA.

MAINS RECTIFYING VALVES.

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Mullard 904V—a special A.C. detector valve having a low input impedance.



Mazda AC/SG.VM—a new high-slope variable-mu valve for A.C. mains.

Letters to the Editor.

The Editor does not hold himself responsible for the opinions of his correspondents.

Correspondence should be addressed to the Editor, "The Wireless World," Dorset House, Tudor Street, E.C.4, and must be accompanied by the writer's name and address.



Why I Read "The Wireless World."

SEVERAL of your expert contributors have honoured Mr. Tomes with a reply to his first letter; may I, as an amateur, reply to his second letter?

First, I would like to tell him why I have been a regular reader of *The Wireless World* for three and a half years. In January, 1929, I understood crystal sets only. Since then I have passed through all the phases of grid, anode bend, power-grid rectification, low-frequency amplification, D.C. and A.C. mains. To-day with power-grid rectification, push-pull output, and the best m.c. speaker on the market, I obtain a quality of reproduction which those who know say is better than that obtained from any commercial set. In other words, I realise that the object of your paper is to educate and assist the amateur to obtain the best results, and I have been educated. None of the circuits you have published have been spoilt to save expense, and you have never recommended any but the best components. This is precisely the direction in which Mr. Tomes has failed to realise the purpose of your paper, and he has most definitely ignored the value of education.

What, exactly, is the extent of Mr. Tomes's wireless knowledge? On his own showing it is the possession of a radio-gram, built for a child to operate and at a competitive price.

With regard to his statement that half the oscillation is caused by what he calls the "Purist" brigade, if he himself knew how to read a circuit diagram he would also know that, whatever other wireless journals do, you do not sponsor circuits with reaction on the aerial, and none of your readers would be so foolish as to use one that did.

If Mr. Tomes is content to "stay put" with his expensive set, why does he read "The Wireless World" at all?

London, W.C.1.

BM/CBYD.

Empire Broadcasting.

THE "Outspoken Opinion from Kenya" in your issue of June 22nd, just to hand, must have been read with delight and appreciation by thousands of loyal Britishers throughout the Empire who, like myself, seldom miss an opportunity of filtering in the thin, attenuated, "atmosphericky" bits of music and speech we are able to get (on some evenings) from our homeland per G5SW. As Mr. Mann says, we do this from sheer sentiment, as there are dozens of other short-wave stations in other countries whose programmes reach us infinitely more intelligibly and pleasurably than G5SW. For instance, during the whole of our last summer there was hardly a morning that I did not dress and shave to the loud-speaker accompaniment of a good steady musical programme either from W3XAL or WSXX, and in the evenings, in spite of sentiment, one soon abandons hope of G5SW and tunes in something more intelligible.

What is the result? One sees in many an English home an American or Dutch receiving set installed, where one knows that, all things being thought equal, a British-made set would have been given preference. The layman knows little, if anything, about the theory of wireless, or the comparative ability of various nations to manufacture good receiving sets, but is naturally influenced largely by aural

demonstrations as to what better results can be received from America, Russia, France, Italy, or Holland than from England, and wireless salesmen are not slow to work that particular argument for all they are worth.

However, we are all looking forward to the good things promised for somewhere about the end of this year, when I understand from your columns the long-abused Experimental Station is to be superseded by something more steady and reliable—also, I trust, more audible.

Cape Town. ANDREW C. FULLER.

B.B.C. and Canned Music.

A BRIEF glance through this week's *Radio Times* reveals the fact that over nine hours of the time devoted to musical programmes by the B.B.C. are filled up—to use an Americanism—with "canned music." Even the Brighter Sunday movement has been altered to advertise various records made by well-known companies.

Surely this is absolutely unnecessary. Admittedly it is pleasant to hear a resurrection of such famous artists as Patti, Caruso, and others, but why should we have a record of, say, Peter Dawson, Stiles Allen, or Jack Hylton's Band when the B.B.C. can perfectly well afford to pay these artists and thereby help the ever-burning problem of unemployment? Are there not countless thousands of first-class musicians eking out a pitiful existence on the street corners of every large town in this country?—a number that has not been decreased by the introduction of "talkies." If the B.B.C. are so poor, then they should not have spent £500,000 or more on Broadcasting House. A cheaper building would have sufficed.

I make this appeal to you to start some movement and thereby help those who are ever working to solve this unemployment problem. Maybe it is only to help a few, but it will be an excellent start.

MARTIN WOODROFFE.

House of Commons.

What the Ear Hears.

THE letter by Mr. Hughes in your issue of July 29th deserves careful reading. It serves as a reminder that what the listener requires is a simulacrum of the musical image perceived by the occupant of, say, the twelfth row of the stalls in a concert hall.

The test of first-class reproduction is thus largely a matter of the recognition of each separate individual instrument in the orchestra. Although paying due attention to frequency and amplitude, we are apt to forget that it is the manner in which the notes of a musical instrument are caused to vibrate that largely determines its character, e.g., the difference caused by bowing a string or plucking it.

Thus, although in discussing the reproduction of transients we very generally think of the clapping of hands or the clash of cymbals, it is really the "transient commencement" of every note that we need to reproduce most faithfully in order to get the effect of "naturalness" in our homes.

In my own wireless receiver, where I use a diode and one stage of low-frequency R.C. coupling, I have considerably improved reception by increasing the coupling condenser to

0.2 mf. with a corresponding reduction of the grid leak to 100,000 ohms. In this connection one may usefully recall some remarks on low-frequency amplification in the "B.B.C. Handbook for 1929," page 314. In discussing the time constant of R.C. coupling in relation to transients, it is pointed out that transients will be properly reproduced provided the condenser is made large enough.

South Croydon. W. A. SADGROVE.

Broadcast Reproduction.

I AM no expert, but the recent discussion in your columns on the frequency range of receiving sets has opened my eyes to the possibilities and limitations of broadcasting and has been of absorbing interest to me. In common, I believe, with many others of your readers I hope to see more of this.

Mr. Tomes hopes for less. For, says he, "If you want quality you must pay for it, not waste time and space in bickering."

This appears to epitomise the whole of Mr. Tomes's argument, and it is perhaps a pity that he should need a column in which to say it. Mr. Tomes rules out a discussion of frequency range, which is largely a discussion of quality. "What is quality?" is a question which seems to present no problem to him, and how to achieve it (except by purchase) is no affair of his.

Does he imply that you have only to pay and you will, *ipso facto*, receive quality? Faith, we know, is admirable in certain circumstances, and very comforting in the absence of exact knowledge, but it is no true guide in the purchase of a wireless set.

Does Mr. Tomes really believe in always accepting what is offered to him—provided, of course, that he pays a Rolls-Royce price for it?

F. S. AUBYN.

London, N.W.4.

IN Mr. Tomes's reply to Messrs. Cross, Turner and myself he informs us that the recent discussion on "Broadcast Reproduction" has not enabled us to progress one iota.

I maintain it has, inasmuch that it has definitely proved that the decapitation of the upper register to 5,000 cycles is absolutely undesirable, although at the present time it is unavoidable except in localities where field strength is high and receivers are designed for the reception of local stations only.

Although speech and music may sound very good at the above "cut off," both sound excellent, in my opinion, when the "top" is extended. I look forward to the time when we can have as much "top" as we require, and for those who don't—well, all they have to do is to fit a "guillotine" in the shape of a tone control and "behead" their reproduction accordingly.

As regards the "Purist" brigade being responsible for the oscillation nuisance, may I point out that a real "Purist" would never dream of fitting reaction to a quality receiver.

In conclusion, I would ask Mr. Tomes if he has yet heard the "Monodial A.C. Super," a product of *The Wireless World* laboratory, and which for range, selectivity, and good quality under the present conditions is the "goods."

WM. G. YOUNG.

Sparkhill, Birmingham.

READERS' PROBLEMS.

THESE columns are reserved for the publication of matter of general interest arising out of problems submitted by our readers. Readers requiring an individual reply to their technical questions by post are referred to "The Wireless World" Information Bureau, of which particulars, with the fee charged, are to be found on page 144.

Apportioning the Volts.

STATING that he intends to derive H.T. supply for a new receiver through a Westinghouse Style H.T.8 rectifier, a querist seems to doubt whether it will be possible to operate his valves at their maximum anode voltage rating—in his case, 200 volts.

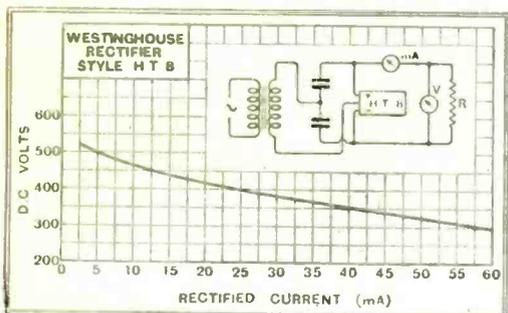


Fig. 1.—A basis for voltage calculations: output curve of a metal rectifier, showing the voltage corresponding to different loadings.

The position is that the proposed set is estimated to consume 45 milliamps., and that a loud speaker field winding of 2,500 ohms resistance will be used for smoothing purposes.

Reference to the output curve which accompanied our review of this rectifier shows that, for a load of 45 milliamperes, the unsmoothed D.C. voltage will amount to practically 335 volts; the loss in the field winding will be $2,500 \times 0.045 = 112.5$ volts. This leaves $335 - 112.5 = 222.5$, or, say, 220 volts, for the receiver itself. The curve is reproduced in Fig. 1.

Thus, the type of rectifier in question would appear to be quite suitable for the set; allowing 200 volts for the anode circuit, there will still remain over 20 volts for bias purposes, which will probably be adequate.

We are inclined to think that our correspondent has been working from the smoothed output voltage data as provided by the manufacturers of his rectifier. It should be remembered that this data takes into account the loss in voltage in a smoothing choke; this loss will not arise in the case which we are considering, or, rather, is allowed for by deducting the voltage absorption in the loud speaker field, which, of course, provides the smoothing.

Imperfect H.F. Filtering.

IN describing a rather peculiar form of instability to which his short-wave receiver is prone, a correspondent states that the trouble occurs only when he is using headphones; it is entirely absent when a loud speaker is employed.

Here we have almost certain proof that whatever H.F. filter device is included in the detector anode circuit is ineffective, or at any rate that wandering H.F. currents are present in the output stage.

A short-wave set suffering from this disability is never a pleasant piece of apparatus to handle, and we recommend that the detector filter system should be overhauled and improved. At the same time, it would probably be worth while to add a choke-condenser filter in the output anode circuit.

A bad earth is often a contributory cause of effects such as those under discussion.

Earthed Condensers or Earthed Coils?

IT is usual to arrange the components of a capacity-coupled band-pass filter in the manner shown in Fig. 2 (a); the condenser rotors are earthed, and the low-potential ends of the coils are "in the air," being connected to the earth line through the coupling condenser C. Practically speaking, there is no alternative to this arrangement when succeeding circuits in the receiver are tuned by the same ganged condenser. In order to apply grid bias to the valve directly associated with the filter, the coupling condenser is shunted by a resistance of 1,000 ohms or so.

Electrically, the arrangement illustrated in Fig. 2 (b) is exactly similar; the coupling condenser C is still common to both tuned circuits, and so acts as a link between them. But the connection of components is reversed; coils are earthed, and condenser rotors are slightly above earth potential. No special precautions are needed here in order to obtain bias, either from a battery or automatically, for the succeeding valve.

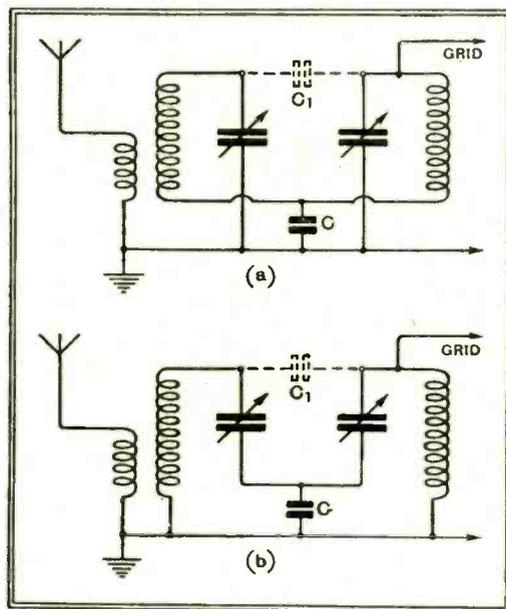


Fig. 2.—Alternative arrangement of a capacity-coupled band-pass filter.

This should make matters clear to a querist who has a set of "potted" coils in which the low-potential end of the windings is electrically connected internally to the screening covers, which it is desired shall be earthed directly. The (b) circuit is clearly the one for him to use, but he must remember that care must be taken to insulate the condenser frame.

Although it does not affect the position directly, we have shown in dotted lines the connection of small "top-end" coupling condensers (C_1), as our correspondent intends to use a filter of the double-capacity type.

Electrolytic Condensers Unsuitable.

ALTHOUGH electrolytic condensers have many attractions, it should be borne in mind that they cannot be connected in A.C. circuits; consequently, their use is definitely ruled out as reservoir capacities in voltage-

doubling circuits with metal rectifiers. We are here referring to the series-connected pair of condensers through which A.C. is fed to the rectifier.

This paragraph is prompted by a reader who submits for criticism the circuit diagram of an H.T. eliminator which he proposes to construct. Electrolytic condensers may be used for smoothing the output from a metal rectifier as satisfactorily as that of any other, but they must not be used for the purpose for which our querist shows them in his diagram.

Detector Current Variations.

WE are asked to say what is the maximum permissible depression of detector anode current—as compared with the normal current under no-signal conditions—which should take place in a power grid detector normally consuming 8.5 milliamps.

This is a matter about which it is impossible to be definite without very complete data regarding the receiver. But in most modern sets the decrease in current may safely amount to about 1 milliampere.

In Terms of Frequency.

A READER who expects shortly to be leaving this country for Egypt intends to take with him a short-wave set, mainly for reception of the B.B.C. station 5SW. He sees from our list that this station operates on a wavelength of 25.53 metres, and fears that he will be troubled with interference from the French station Pontoise, of which the wavelength is 25.63 metres, and which he understands is a fairly powerful transmitter.

His fears should be groundless. For the benefit of those who have not turned their attention to short-wave reception, it is worth while to point out that our usual—but rather reprehensible—habit of thinking in wavelengths is apt to be misleading when we are concerned with this band. In terms of frequency there is a difference of about 50 kilocycles between the two stations in question—enough to accommodate several other telephony frequency channels.

FOREIGN BROADCAST GUIDE.

LISBON (CT1AA)

(Portugal).

Geographical position: 38° 42' N.; 9° 8' W.
Approximate air line from London: 975 miles.
Wavelength: 282.2 m. Frequency: 1,063 kcs.
Power: 2 kW.

Time: Greenwich Mean Time.

Standard Transmission.

22.30-01.00 B.S.T. (Mon., Wed., Sat.).
On short wave (31.25 metres) 23.00-01.00 Thur., Fri.
Announcer: Man.

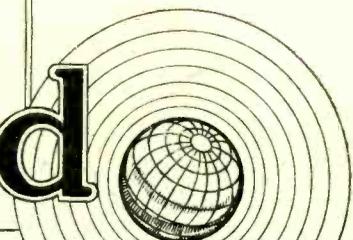
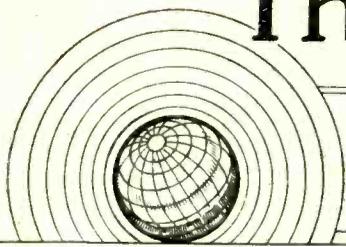
Call: *Estação Radio Lisboa.*

(On Fridays from B.S.T. 22.00 broadcasts are also carried out on 31.25 m. (9,598 kcs.) when announcements are made in Portuguese, Spanish, French and English.)

Closes down with the playing of the Portuguese National Anthem (gramophone record).

The Wireless World

A
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22nd Year of Publication



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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.

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EDITORIAL COMMENT.

Influences at Olympia.

A "Value-for-Money" Season.

IT is always of interest when visiting the Wireless Show year by year to look for outstanding changes in fashion or indications of particular technical developments which have played a prominent part in influencing the new designs.

This year, although fashion does not seem to have played much part, yet technical changes have had their share of influence in deciding what the manufacturers would produce. Perhaps the outstanding direction in which progress has been made has been in the matter of selectivity, rendered necessary, first, because stations can no longer be separated from one another with an unselective set, and, secondly, for the reason that the public to-day demands a receiver which is capable of giving at least a fair choice of foreign stations.

It is no doubt for this reason that the superheterodyne receiver, the popularity of which was revived in this country largely through the recommendations of this journal, is in evidence in some form on the stands of almost every manufacturer of prominence. Next in order of importance we would put the fact that no mains receiver of to-day is regarded by the public as complete unless provision is made for the set to be used in conjunction with a pick-up for reproduction of gramophone records. There is no doubt that the public expects to be able to listen to both wireless and the record at will, and the experience of manufacturers in the past has been that wherever gramophone reproduction was not provided for the popularity of the receiver suffered in consequence.

Band-pass tuning, or some equivalent method of obtaining selectivity with quality, has been adopted in the design of straight sets including the simplest types as a result of the need for selectivity even for home listening where stations under the alternative programme regional scheme had to be adequately separated.

There are innumerable directions in which improvement and progress is in evidence, and this is nowhere better revealed than by an examination of the quality of many of the new components. These it will be found have been designed and produced with a degree of precision quite unknown even at the highest prices a year or two ago, and yet prices to-day are generally lower.

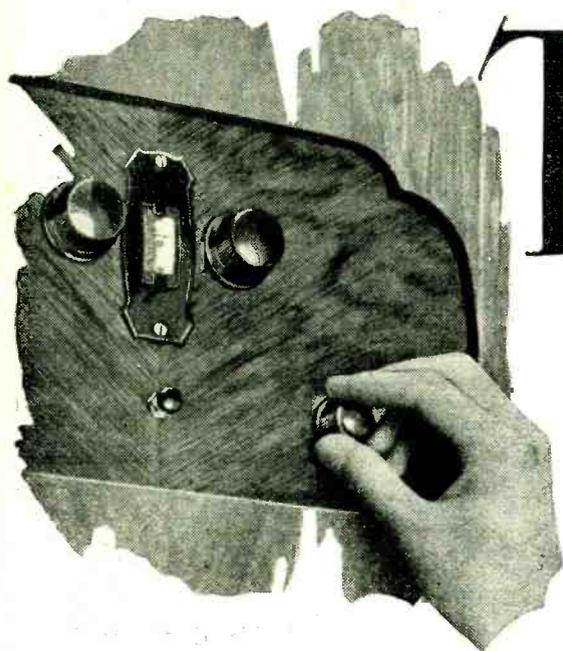
The outstanding impression of this year's products is the extraordinarily high value which is given at prices certainly no more exalted than those which were asked a year or two ago for products which were little less than shoddy by comparison.

The Second-hand Set.

Making Way for New Models.

THERE has probably never been a wireless exhibition in this country when the temptation to the public to buy new receivers was so great as it is this season, not only because of the attractiveness of the new receivers themselves, but also because reception conditions have changed so much during the past year that many sets at present in use are insufficiently selective and have, consequently, become obsolete—very often long before they have actually begun to show signs of wear. How ever tempted one may be to buy a new receiver, there is always a natural disinclination to do so unless something can be realised by the sale of the receiver which it is to replace.

There would seem to be room in the industry for organisations undertaking to purchase second-hand sets with a view to modifying them to meet present-day conditions, and to resell them amongst those members of the public who may not at the time feel justified in the outlay necessary for the purchase of a new receiver. The problem of what to do with the old set is probably more pronounced to-day than it is likely to be in the future, because sets of to-day are, we believe, designed to be sufficiently selective and robust to render them unlikely to become obsolete in the near future, and they are likely to go on giving good service for a number of years.



Tone Correction Explained

A Brief Summary of the Properties of Selective Tone-corrected Circuits.

THE term "tone correction" is to a certain extent self-explanatory. As a general principle it has been in common use ever since broadcasting began and embraces all cases where the amplification characteristic of audio-frequency stages has been modified to cor-

rection is employed to increase range and sharpen tuning, the distortion may be so great as to render speech quite unintelligible and music a travesty of the original.

Selectivity and Quality.

In the early days of broadcasting the obvious remedy of employing only flatly tuned circuits could be advocated with confidence, and the corresponding lack of selectivity could be tolerated with impunity. The subsequent increase in the number of European broadcasting stations, however, has forced upon us the necessity of providing knife-edge selectivity, and the struggle to preserve quality of reproduction in face of this essential selectivity has been one of the most difficult problems with which the designer has had to contend.

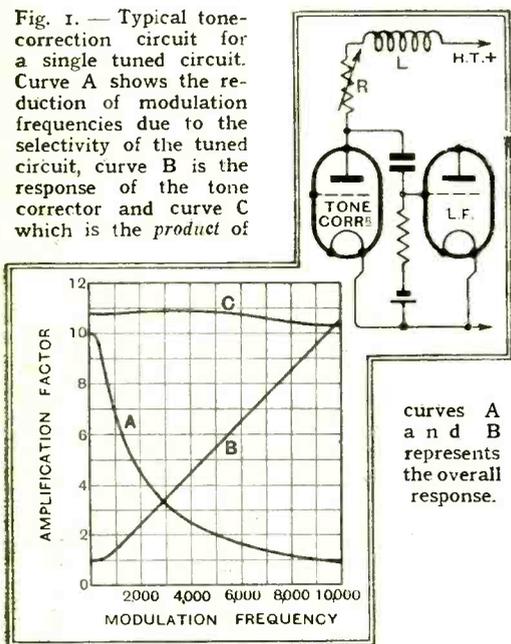
The band-pass filter offers a solution which has found wide acceptance. This is a special type of coupled tuning circuit which gives a flat-topped resonance curve instead of the sharp peak usually associated with a single tuned circuit. The sides of the resonance curve are, however, steep, thus providing the requisite selectivity, while the flat top ensures that all the side bands of the transmission essential to good quality of reproduction are passed on with equal strength. The success of band-pass tuning depends to a large extent on the accurate

THE principle of tone correction applied to highly selective circuits is one which is likely to exercise an important influence on future receiver design. The object of this article is to put the beginner in possession of the essential features of the system in its present state of development.

but it is more difficult to preserve the correct shape and band-width of the resonance curve over the range of wavelengths covered by a straight receiver circuit.

With tone correction, on the other hand, no attempt is made to prevent loss of high notes in the tuning circuits; they are given the highest possible selectivity without regard

to quality, with the result that the output from the detector may be quite unintelligible. The balance is then restored by one of the L.F. stages which is specially designed to give greater amplification of the high than of the low frequencies. The beauty of this system is that the degree of correction can be very easily adjusted between wide limits by a variable resistance, so that in a straight receiver any variation in selectivity at different points of the waverange is readily compensated, and the operator can adjust the quality by ear to suit his own individual taste.



curves A and B represents the overall response.

rect distortion arising in other parts of the apparatus. The circuits associated with the early Round magnetic microphone used by the B.B.C. and the McLachlan "Novotone" pick-up correcting device may be cited as typical examples.

More recently tone correction has come to be associated almost exclusively with the special case of loss of high notes due to highly selective tuning circuits. It is a matter of practical experience that when the transmission from a broadcasting station is passed through a tuned circuit followed by a detector, the resulting audio-frequency output is distorted. Provided the circuit is tuned exactly to the carrier wave of the station, the distortion is always of the same type and is characterised by strengthening of the low tones and attenuation of the high tones. The sharper the tuning the greater the distortion, and where a high degree of

adjustment of the coupling and the ganging of the tuning condensers. This is easily accomplished for a single fixed setting as in the intermediate stages of a superheterodyne,

There is evidence that a higher figure of merit in the matter of selectivity combined with quality is ultimately to be obtained from tone-compensated circuits, but at the

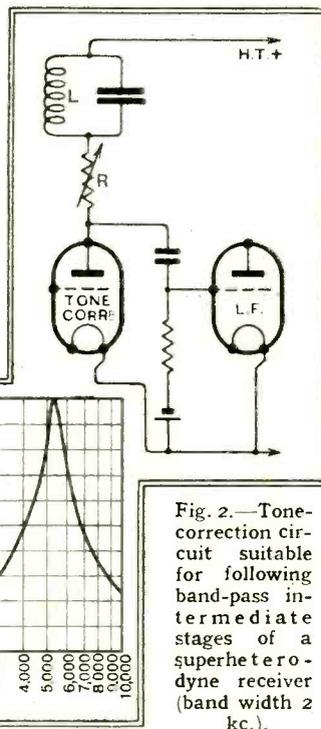


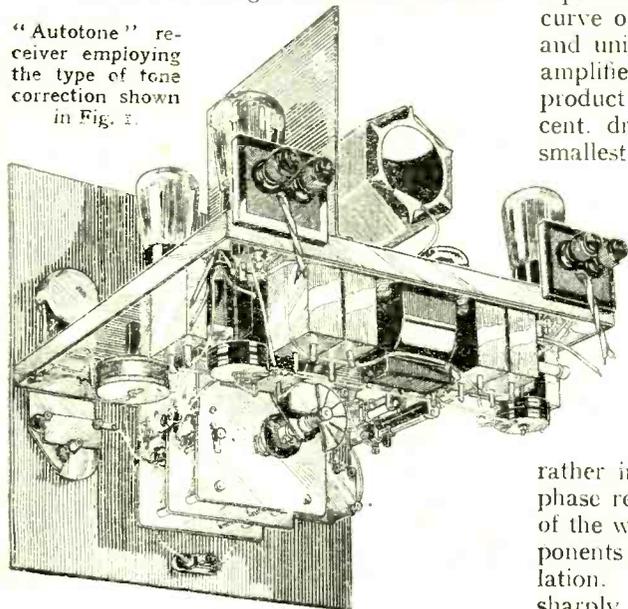
Fig. 2.—Tone-correction circuit suitable for following band-pass intermediate stages of a superheterodyne receiver (band width 2 kc.).

Tone Correction Explained.—

moment it is on account of their inherent flexibility and ease of adjustment that they offer so attractive an alternative to the band-pass filter.

It must not be thought that tone correction

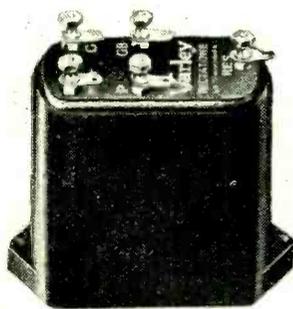
"Autotone" receiver employing the type of tone correction shown in Fig. 1.



to restore the tonal balance is represented by an inductance and resistance in series in the anode circuit of the valve. By assigning suitable values to the constants of this circuit we obtain an amplification characteristic represented by B. The overall response curve of the set, assuming a linear detector and uniform amplification elsewhere in the amplifier is given by C which represents the product of curves A and B. There is a 5 per cent. drop at 10,000 cycles, but since the smallest difference which would be noticed by the ear is of the order of 20-25 per cent., the correction is perfect for all practical purposes.

The Detector.

A question which is frequently asked is why the tone-correction stage does not restore also the unwanted modulation of adjacent stations. The explanation is rather involved, and is concerned with the phase relationship between the carrier wave of the wanted station and the sideband components of the wanted and unwanted modulation. Theory and practice agree in that sharply tuned circuits with symmetrical resonance curves followed by tone correction of the type shown in Fig. 1 are capable of giving immunity from the modulation of



Varley "Rectatone" low-frequency transformer.

stations on neighbouring channels while restoring completely the attenuation of high notes due to the sharpness of tuning of the circuit. The system does not, however, give immunity from heterodyne whistles due to interaction of the carrier waves though the strength of the whistles may be reduced by the well-known effect of demodulation of a weak by a strong signal.

This effect can take place only with a linear detector such as a diode, power grid or leaky grid (with small inputs). For other very good reasons a linear detector is absolutely essential to the success of tone-corrected circuits. Any detector, such as anode bend, which introduces harmonics in its output, must be avoided like the plague. Followed by a tone-correcting stage which favours the high frequencies all such spurious frequencies will be over-emphasised, and the reproduction will be unnaturally strident.

So far we have been dealing with the ideal case of a single tuned circuit of high selectivity, and we have seen that with a linear detector and a tone corrector comprising an inductance and resistance in series in the anode circuit of a valve, exact compensation for high-note loss is provided. There are, however, other applications of tone correction in which a uniform rise of amplification with frequency is not required. In the intermediate amplifier of a superheterodyne receiver, for instance, in which band-pass coupling is

employed, it may be convenient, in order to obtain maximum selectivity, to legislate for a flat-topped response over 2 kilocycles to give reasonable stability. This will give a uniform audio response up to 1,000 cycles and tone correction can then be employed for frequencies above 1,000 cycles. A tuned corrector circuit of the type shown in Fig. 2 will give the desired response, and has the added advantage of a high-frequency cut-off which helps to reduce carrier heterodyne interference. A similar principle is involved in the recently introduced Varley "Rectatone" low-frequency transformer.

For the experimenter who wishes to try out the principles of tone control in connection with gramophone as well as radio circuits, the "Multitone" transformer is a component which will provide all the scope he is likely to require, since it

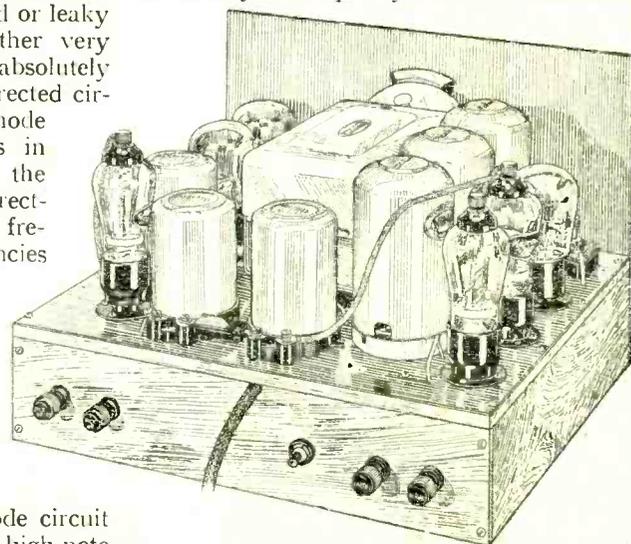


"Multitone" type "Toco 4" tone-control transformer.

is capable of giving a falling as well as a rising characteristic, and for an intermediate position of the tone control gives practically straight-line amplification.

The distortion of the modulation from a broadcasting station due to the selectivity of a single tuned circuit, can be exactly compensated by tone correction in the low-frequency stages following the detector, provided that the detector is linear and does not introduce harmonics. If the selectivity is made very high, as in the "Stenode" principle, the resulting output will not contain any trace of sideband interference from stations on adjacent channels, although carrier heterodyne whistles will remain.

When means are found of ensuring the stability of highly selective circuits with reaction, this system of reception, in conjunction with tone correction, will provide an unrivalled performance in the matter of selectivity and quality. In the meantime,



"The Monodial" superheterodyne receiver incorporates a tone-correction circuit of the type shown in Fig. 2.

tone correction is likely to find wide application in the intermediate stages of superheterodyne receivers.

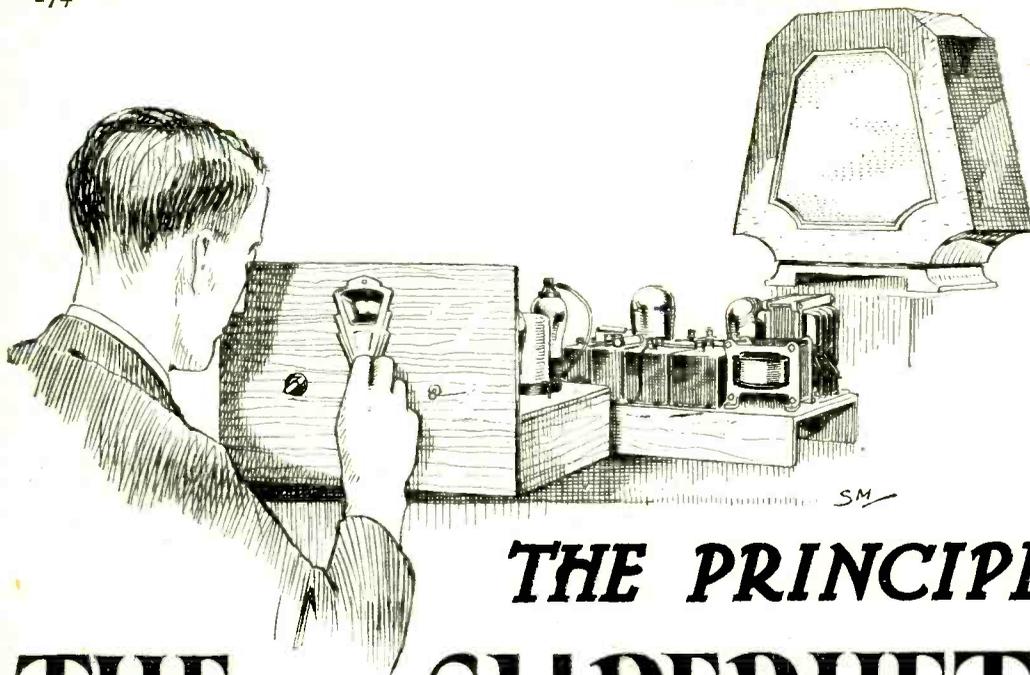
as an idea post-dates the band-pass filter. As long ago as 1923-24 it formed the subject of patents by H. J. Round and P. W. Williams, but it is only recently that full recognition has been accorded to advantages of the system. While Dr. Robinson's "Stenode" receiver and *The Wireless World* "Autotone" were giving practical proof of the high performance that may be expected, the theoretical aspects of the principle have been the subject of a keen controversy to which most of the leading authorities have contributed. The fundamental principles have now been firmly established, and for the benefit of new readers it is proposed to run through the salient features in order that they may be in a position to appreciate further developments of this most promising system.

Exact Compensation.

The fundamental simplicity of the tone-correction circuit will be apparent from the circuit of Fig. 1. Curve A represents the reduction of modulation with frequency due to a circuit with a coil magnification of 500—quite a usual figure when making use of reaction. The tone-correction stage required

RECENT ARTICLES ON TONE CORRECTION.

- "The Wireless World."
 - Band Pass or Tone Correction. F. M. Colebrook. Sept. 2nd, 1931.
 - Selectivity and Tone Correction. F. M. Colebrook. Dec. 30th, 1931; Jan. 6th, 1932.
 - Correspondence. Feb. 3rd, 1932; Feb. 17th, 1932.
 - Putting Back the High Notes. W. T. Cocking. May 17th, 1932.
 - Tone Correction and Distortion. N. W. McLachlan. June 8th, 1932.
- "The Wireless Engineer."
 - Apparent Demodulation of a Weak Station by a Strong One. F. M. Colebrook. Aug., 1931.
 - Editorial. Aug., 1931.
 - Amplifier Tone-control Circuits. M. G. Scroggie. Jan., 1932.
 - Editorial. April, 1932.
 - Apparent Demodulation. E. Mallett. May, 1932.



THE PRINCIPLE OF THE SUPERHETERODYNE

The Basic Difference Between Straight and Frequency-changing Receivers.

ALTHOUGH the superheterodyne is now very old, as age is reckoned in radio, it is only within the last two or three years that it has been successfully employed for the high quality reproduction of broadcasting. The application of the band-pass principle to it has been responsible, perhaps more than any other single development, for its extraordinarily rapid rise to popularity,—a popularity which bids fair completely to oust the straight multi-stage receiver. Until band-pass filters were employed, the simultaneous attainment of selectivity and quality was unknown and the receiver was useless for satisfactory broadcast reception. The benefits conferred by this step towards the modern superheterodyne cannot be too highly stressed, since for the first time it permitted the retention of its inherently high selectivity, while making it capable of giving quality of reproduction second to that of no other receiver.

Subsequent development proceeded apace, and took the form chiefly of removing a number of special forms of interference, of simplifying the operation, of reducing the number of valves, and of eliminating background noise. It should be mentioned at this point that the principle of tone correction has now made the use of band-pass filters no longer essential, and the view is expressed by some that they are, in fact, undesirable. It is generally held, however, that the band-pass filter is preferable to any extreme form of tone-correction as it is known to-day. Perhaps the most satisfactory scheme of all is a judicious combination of the two methods, in which the filters are designed to pass only a comparatively narrow band of frequencies, and tone correction is relied upon to restore only the highest notes. In this way, all the advantages of the band-pass filter are retained, with most of those

of tone correction, and the inherent disadvantages of the latter are absent. This particular method was adopted in the design of the Monodial A.C. Super¹, and proved so successful that the principle has

THE development of the superheterodyne has been so rapid and so much attention has been focused upon the details of design that the fundamental principles are often apt to be overlooked. In this article will be found a description of the basis upon which all superheterodynes function, whatever be their type, and the essential difference from the straight set is clearly defined.

been adhered to in *The Wireless World* Baby Super².

The great strides forward in superheterodyne design, starting with the introduction of the band-pass filter³ and culminating in the development of a single-valve frequency changer⁴, have all been described in the

pages of this journal. When discussing new developments, however, it is rarely practicable to recapitulate more than a few of the most important details of earlier work, and it is usually assumed that the reader has some prior knowledge of the subject. Many articles on the superheterodyne, therefore, must, in the absence of such knowledge, have been incompletely understood; it is fitting, therefore, at this present time, to present afresh a description of the basic principles of this receiver, and to point out just wherein it differs from the familiar straight set.

The essential difference between the two receiver types lies in the method of tuning from one station to another. In the straight set, every tuned circuit throughout the receiver is tuned to the frequency of the incoming signal, and when changing from one station to another, it is necessary to change the resonance frequency of each circuit by adjusting the variable condensers. Now the amplifier portion of a superheterodyne is very similar, and consists of valves coupled by coils and condensers which form resonant circuits tuned all to the same frequency. No provision, however, is made in this amplifier for varying the tuning; the amplifier is fixed, and designed to function at only one frequency. In order to make use of it, therefore, it is preceded by a piece of apparatus whose purpose it is to change the frequency of the desired station to that of the amplifier. Instead of tuning by adjusting the amplifier to operate upon the signal frequency, as in a straight set, we work the other way round, and alter the frequency of the signal to conform to the requirements of the amplifier.

The fact that the amplifier, or as it is usually termed, the intermediate frequency amplifier, is required to work only upon one frequency leads to a number of important

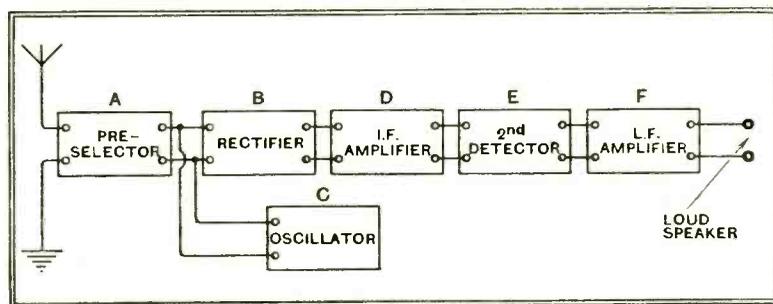


Fig. 1.—The schematic diagram of a superheterodyne demonstrating the various fundamental parts.

¹ *The Wireless World*, April 13th, 20th and 27th, 1932.
² *The Wireless World*, Aug. 19th, 1932.
³ *The Wireless World*, Nov. 5th and 12th, 1930.
⁴ *The Wireless World*, July 29th and Aug. 5th, 1932.

The Principle of the Superheterodyne.—

points. Provided that the frequency-changing process be carried out with constant efficiency, neither the sensitivity nor the selectivity of the receiver will vary over its tuning range, and the quality of reproduction will also be unaffected by the frequency of the signal. Furthermore, we have the opportunity of using special types of circuit in the amplifier. Perhaps the chief point, however, is that within limits we can choose the particular frequency upon which the amplifier is to operate.

With ordinary tuning circuits, the lower the frequency the higher the selectivity and the greater the amplification which can be obtained. The intermediate frequency, therefore, is nearly always chosen to be considerably lower than that of the incoming signal. The actual frequency used, however, is limited by other considerations arising out of the frequency-changing process, and it may be said here that the optimum frequency for conditions in this country has been found to be 110 kc., corresponding to a wavelength of 2,725 metres.

The part of the superheterodyne which at first appears most incomprehensible, however, is the frequency-changing process. It should be understood that, strictly speaking, the frequency of the incoming signal is not changed, it is merely used to produce another frequency of any desired value. This other frequency is produced simply by mixing a locally generated oscillation of different frequency with the incoming signal and rectifying the mixture; the output of the rectifier will be found to contain the desired new frequency.

The Frequency Changer.

The matter may be made simpler by a reference to Fig. 1, which shows the various superheterodyne stages schematically. The signal picked up by the aerial passes through a number of tuned circuits A, which are tuned to its frequency, and which may

The output of this amplifier is then passed to the second detector E from which the signal emerges in the usual low frequency form, and passes through any ordinary type L.F. amplifier F to the loud speaker.

It will be seen that frequency changing is essentially the rectification of the combina-

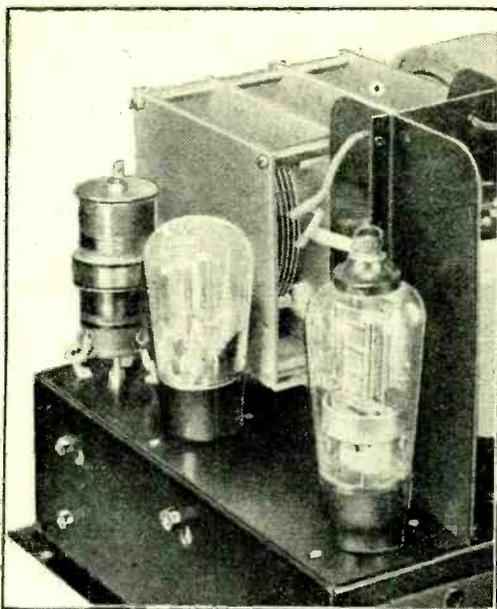
either 2,110 kc. or 110 kc., therefore, it will select that frequency and amplify it just as if it were transmitted from the broadcasting station at that frequency. In practice, the high frequency resulting from the sum of the incoming and locally generated oscillations is rarely used, because of the difficulties attendant upon attaining adequate selectivity from tuned circuits resonating at a high frequency. It is the difference frequency which is always used.

Now it will be observed that there are two local oscillator frequencies which will beat with the incoming signal to produce the intermediate frequency. In the above example, the oscillator was set to 1,110 kc. to beat with 1,000 kc., but if it be set to 890 kc., it will also produce an I.F. of 110 kc. This factor was apt to prove a little disconcerting with old-type superheterodynes, for every station could be received at two settings of the oscillator dial. With modern single-control receivers, however, it is not evident, for the pre-selector circuits, having only one dial setting for any station, tend to prevent the formation of repeat points.

Second Channel Interference.

It will have been noticed, however, that as there are two oscillator frequencies for any desired station, so there are two stations for any oscillator setting which may be converted to the intermediate frequency. Thus, with the oscillator set at 1,110 kc. to receive a station on 1,000 kc., a station working with a frequency of 1,220 kc. will also produce the 110 kc. beat frequency. It is the purpose of the pre-selector circuits to prevent any such signal from reaching the grid of the first detector, and upon their efficiency depends almost entirely the degree of freedom from this effect which can be obtained in practice.

The station producing this effect, which is known as second channel interference, is always spaced from the desired station by twice the intermediate frequency, and it will



The essential components for the frequency-changing process in a typical modern superheterodyne.

tion of two different frequencies. The output of the first detector contains the two original frequencies, and also two others whose numerical values are equal to the sum and difference of the two original frequencies. Thus, if the incoming signal has a frequency of 1,000 kc., corresponding to a wavelength of 300 metres, and the local oscillator is set to generate a frequency of 1,110 kc., there will still be these two frequencies in the rectifier output. There will also be, however, a frequency of 2,110 kc.,

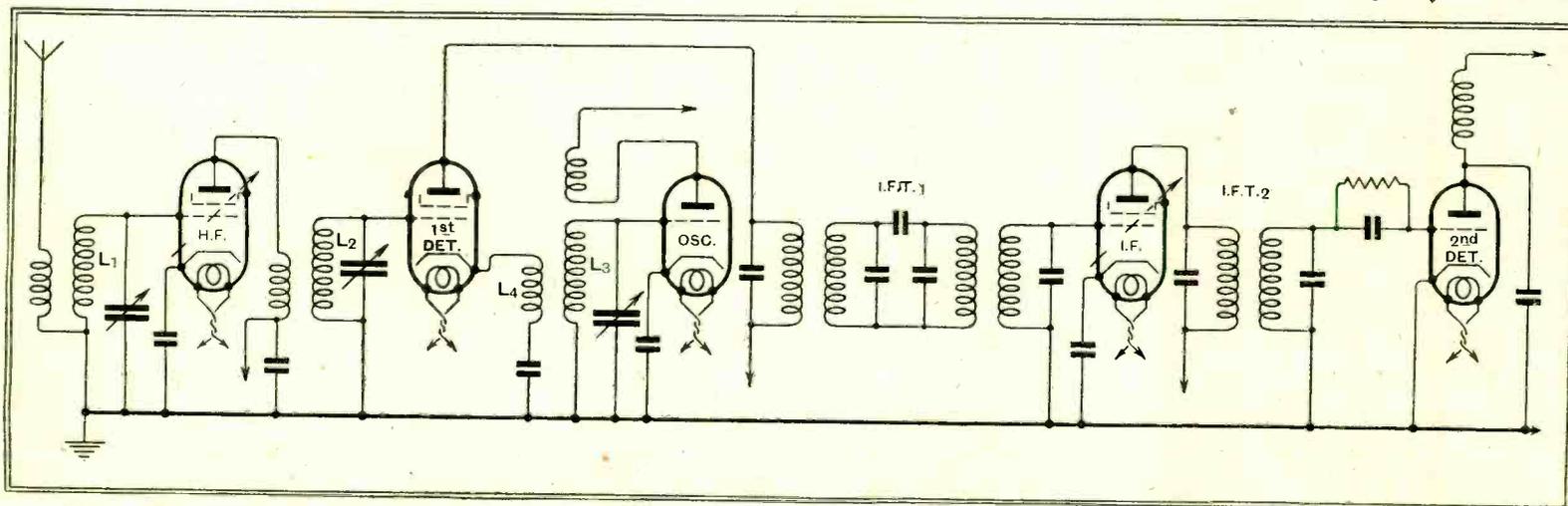


Fig. 2.—The skeleton circuit diagram of a modern superheterodyne showing the details of the pre-selector, oscillator and I.F. tuning systems.

or may not be associated with a valve amplifier, and it is then applied to the input of the rectifier, or first detector, B. A local oscillator is provided at C to supply a current at any desired frequency to the rectifier. The output of the rectifier contains, among other frequencies, the desired beat frequency which is selected and amplified by the intermediate frequency amplifier D.

corresponding to the sum of, and one of 110 kc., corresponding to the difference between, the two original frequencies. In the practical case, the rectifier produces harmonics, so that there will also be multiples of these frequencies, as well as others due to signals on wavelengths adjacent to that of the desired station.

If the intermediate frequency be tuned to

be obvious, therefore, that the higher the intermediate frequency, the more effective will be the input circuits in preventing it. It is this which prevents the general use of a very low intermediate frequency, at which the maximum adjacent channel selectivity can be obtained. Experience has shown that with the standard frequency of 110 kc. two tuned circuits in the pre-selector will

The Principle of the Superheterodyne.—

afford complete freedom from second channel interference, except when receiving a station spaced by 220 kc. from a local.

With an ordinary superheterodyne used near Brookmans Park, for example, interference is to be expected on 623 kc. due to the London Regional, and on 927 kc. due to the London National. Since only two stations are affected by this, it is not serious, but it can always be prevented by the use of more selective pre-selector circuits, and three tuned circuits will render second channel interference negligible even on a local. There are a number of other possibilities of interference of a similar nature which were discussed in detail in an earlier article⁶. They are not so serious as second-channel interference, however, and their elimination depends entirely upon the use of pre-selector with screening of all circuits preceding the I.F. amplifier.

Notes on the Circuit.

The skeleton circuit diagram of a practical superheterodyne is given in Fig. 2, and it will be seen that two tuned circuits, L_1 and L_2 form the pre-selector and are coupled by a stage of variable-mu H.F. amplification. It might be thought that the adoption of signal frequency amplification was vitiating the superheterodyne principle of using a fixed frequency amplifier. In one sense it is, for it does tend to introduce one drawback of the straight set, namely, less constant amplification over the tuning range. The attainment of the total amplification upon two different frequencies, however, almost entirely eliminates troubles from instability, it reduces very considerably background noise, it greatly simplifies the design of the volume control, and it leads to rather greater efficiency. Its use, therefore, is amply justified where a high degree of amplification is required.

Returning to Fig. 2, the first detector is an anode bend detector employing a screen grid valve, and the oscillator L_3 is coupled into its grid circuit through the medium of the coupling L_4 included in the cathode lead. The output of the detector contains among many other frequencies the desired intermediate frequency which is passed to the I.F. amplifier through a special filter I.F.T.1. The process is now exactly comparable with that of any straight set, and after amplification by the variable-mu I.F. valve and passing through the second filter I.F.T.2, the signal is applied to the grid of the second detector which is of the power-grid type.

It will be seen, therefore, that it is only in regard to the frequency-changing process that the theory of the superheterodyne is in any way different from that of the straight set. The pre-selector, the intermediate frequency amplifier, the second detector, and the low-frequency circuits all follow exactly the same laws. Any differences which may be found in practice are due to slight differences in the nature of the work which the apparatus is called upon to perform. The I.F. amplifier, for instance, is only different from a straight H.F. amplifier because it need work upon a single fixed frequency of low value.

AMATEURS TO CO-OPERATE WITH H.M. FORCES.

Formation of the Royal Naval Wireless Auxiliary Reserve.

AT last British wireless amateurs are to be given an opportunity to assist His Majesty's Forces. The following important official statement outlines a scheme which will be welcomed by a large section of the amateur community:—

1. *The Secretary of the Admiralty announces the institution of a Royal Naval Wireless Auxiliary Reserve (R.N.W.A.R.) in Great Britain and Northern Ireland, to be recruited largely from Wireless Amateurs owning transmitting sets.*
2. *The object of the Reserve is to provide a reserve of operators trained in Naval procedure, for Naval Service afloat or ashore in war or emergency.*
3. *The Country will be divided into Areas, Districts, Sections, and Units. Units will consist of small groups up to a maximum of five transmitting stations.*
4. *Organised training will be arranged commencing with unit training. Inter-unit and section training will follow, with the aim of providing a network of R.N.W.A.R. stations linking up districts, and finally areas themselves. These W/T Stations would be exercised at handling W/T traffic according to Naval practice.*
5. *Exercise transmissions will be given either by Naval W/T Stations or from selected R.N.W.A.R. stations.*
6. *The Reserve will be under the orders of the Admiralty through the Admiral Commanding Reserves.*
7. *The internal administration of the Reserve will be conducted through the machinery of a Committee termed the Royal Naval Wireless Auxiliary Reserve Committee. The President of this Committee will be the Admiral Commanding Reserves or his representatives.*
8. *The members of the Committee will normally consist of officers or honorary officers of the R.N.W.A.R., who will be appointed annually by the Admiralty.*
9. *In drawing up the scheme and in framing the Regulations for the Reserve, the Admiralty have had the benefit of the advice of the following gentlemen:*
Mr. H. Bevan Swift.
Mr. J. Clarricoats.
Major W. H. Oates.
Captain H. S. Pocock.
Mr. A. E. Watts.
These gentlemen have consented to continue their good offices by serving on the first R.N.W.A.R. Committee with Admiralty representatives until February, 1933, when it is expected that a regularly constituted Committee can be appointed.
10. *Those interested are requested to apply for further particulars by post to:—*
The Admiral Commanding Reserves,
Queen Anne's Chambers,
Tot Hill Street,
London, S.W.1.

opportunities to serve in times of national emergency and on occasions when the official means of communication to isolated spots have broken down. Such services have, by the terms of their licences, been beyond the scope of amateurs in this country, however great their enthusiasm for good causes. The institution of a Royal Naval Wireless Auxiliary Reserve, which gives amateurs a real opportunity of serving their country, is the result of painstaking work on the part of officials at the Admiralty in conference with representatives of amateur interests, including the Radio Society of Great Britain.

Difficulties Overcome.

The idea of such a scheme has been broached on more than one occasion in recent years, but again and again difficulties have been encountered; it was, therefore, extremely gratifying to the Radio Society to be approached on the question in January last, when the Admiralty asked whether the Society would be prepared to give its support to a Naval Reserve scheme.

We understand that training for positions in the R.N.W.A.R. will be decentralised as far as possible, taking the form of instructional classes organised by a Unit Petty Officer. There will be two types of training (a) for Operators; (b) for Watchers. Periodical proficiency tests will be arranged and handbooks of instruction issued by the Admiralty. Test transmissions on special wavelengths and using Naval call-signs will be given at pre-determined intervals.

Candidates will be enrolled as Watcher 1st or 2nd class, or as Operator 2nd class, advancement being made as a result of periodical ability tests. Candidates must be over 18 years of age and of British parentage. Enrolment is not open to men serving with H.M. Forces, or to members of any police force.

Watchers, 1st and 2nd Class.

Watchers 2nd class will not be required to pass a test, but must carry out the conditions of service as laid down in the special Admiralty Handbook and they will be given one year in which to qualify as Watcher 1st class. Watchers 1st class must possess receiving apparatus capable of use on all amateur and Naval high-frequency bands. They must be capable of receiving plain language English sent for 5 minutes, 4-letter code for 3 minutes and 4-figure cypher for 3 minutes, in each case at 10 words per minute.

It is understood that fuller particulars regarding allowances, uniform, mobilisation arrangements and general instructions—to be published in the special handbook—are to be outlined at the Convention tomorrow (Saturday) of the Incorporated Radio Society of Great Britain.

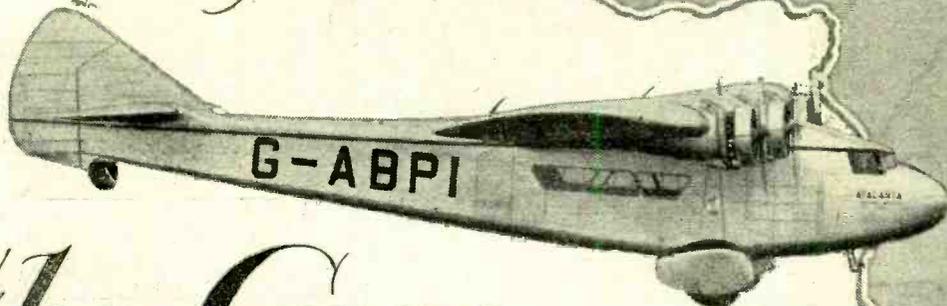
⁶ Why the Whistles? *The Wireless World*, March 2nd, 1929

For many years British amateurs have envied amateurs in America their frequent

From Croydon

To

The Cape



The Wireless Chain on the New Empire Air Route.

By FLIGHT-LIEUTENANT R. F. DURRANT, A.F.C., R.A.F.O.

AS the hands of the clock on the Control Tower of Croydon near 12.30 p.m. every Wednesday the four engines of the 42-seater Handley Page aircraft of Imperial Airways start up and with propellers "ticking over" the passengers for Athens, Egypt, the Sudan, Central and South Africa embark.

After landing at Le Bourget they entrain for Brindisi and from this point the wireless organisation commences.

The stage Brindisi—Athens—Crete—Alexandria is accomplished in a four-engine "Short" flying boat equipped with the Marconi A.D.18.A. transmitting and receiving apparatus giving a two-way range in flight up to 400 miles.

The wavelength at present in use for the entire route from Croydon to Cape Town is 333 kc/s—900 metres.

Across the Mediterranean.

Brindisi Airport wireless ILI was the first station worked on 900 metres on our flight to Athens. After one hour's flying communication was also established with SVK Corfu, a W/T station erected by the Air Orient Air Line.

Flying steadily across the Mediterranean, communication is maintained with the s.y. "Imperia," call sign GLYV and Alexandria Aviation Radio SUH. The yacht "Imperia" is equipped with a Marconi $\frac{1}{2}$ kW. transmitter C.W. and I.C.W. and Bellini Tosi D/F equipment for giving D/F bearings to all aircraft flying over the Mediterranean.

On arrival at Alexandria I was able to inspect the very efficient transmitting station at Raz-El-Tin. Three transmitters are constantly working on 600, 900, and 2,100 metres remotely controlled from the radio receiving room situated over the main railway station building at Alexandria. A short train journey to Cairo is made and the flight through Africa proper commences from Heliopolis Aerodrome, Cairo.

The aeroplane in which the writer made the flight from Cairo to Cape Town was a De Havilland 66 (Hercules type) interna-

tional marking and call sign GAARY. This was the first three-engine commercial aircraft to be flown over the route. The personnel on board included Air Commodore A. Fletcher, C.M.G., Ground Services Manager, Imperial Airways; Major H. G. Brackley,

D.S.O., the Air Superintendent; and Mr. Francis Ellis, Imperial Airways Senior W/T operator. The wireless apparatus installed was the Marconi A.D.6 combined transmitter and receiver aircraft equipment, placed behind the centre engine bulkhead, the W/T operator sitting alongside the pilot.

Atmospheric conditions are, on the whole, good from dawn until 11 a.m. local time throughout Africa. After that hour static gradually increases and on most days two-way communication is difficult after midday. With the advent of short wave, which will soon be installed, this difficulty will be overcome.

Each administration on this 7,000-mile Empire air route has co-operated in supplying the necessary ground wireless organisation in order that the machines carrying the air mail are in constant communication with the aerodrome stations of arrival and departure.

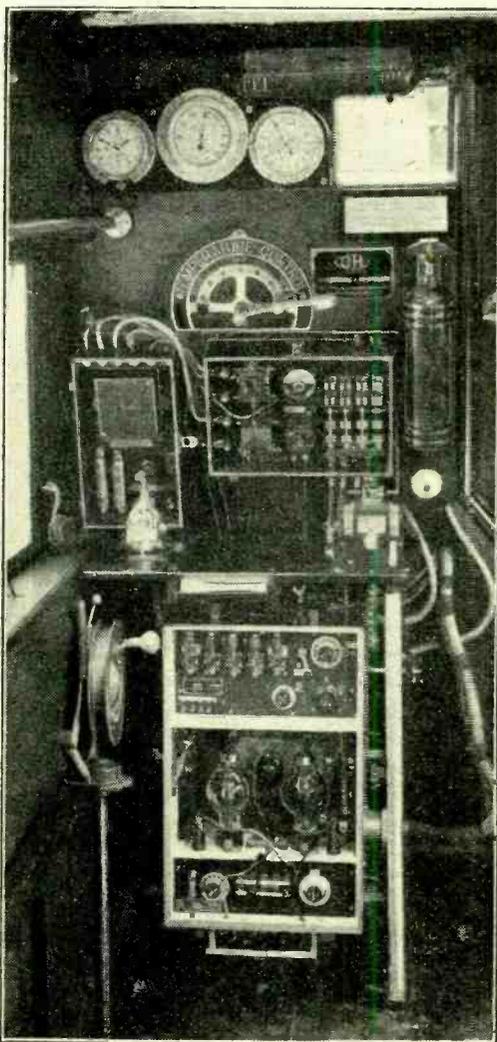
A "Dead" Zone.

When flying south from Cairo it was possible to maintain good communication with Heliopolis until nearing Assuit. The aircraft then worked Assuan, although a "dead" zone approximately twenty-five miles long was noticed when over the "Valley of the Kings" north of Luxor.

In the heat of the afternoon atmospherics became extremely fierce.

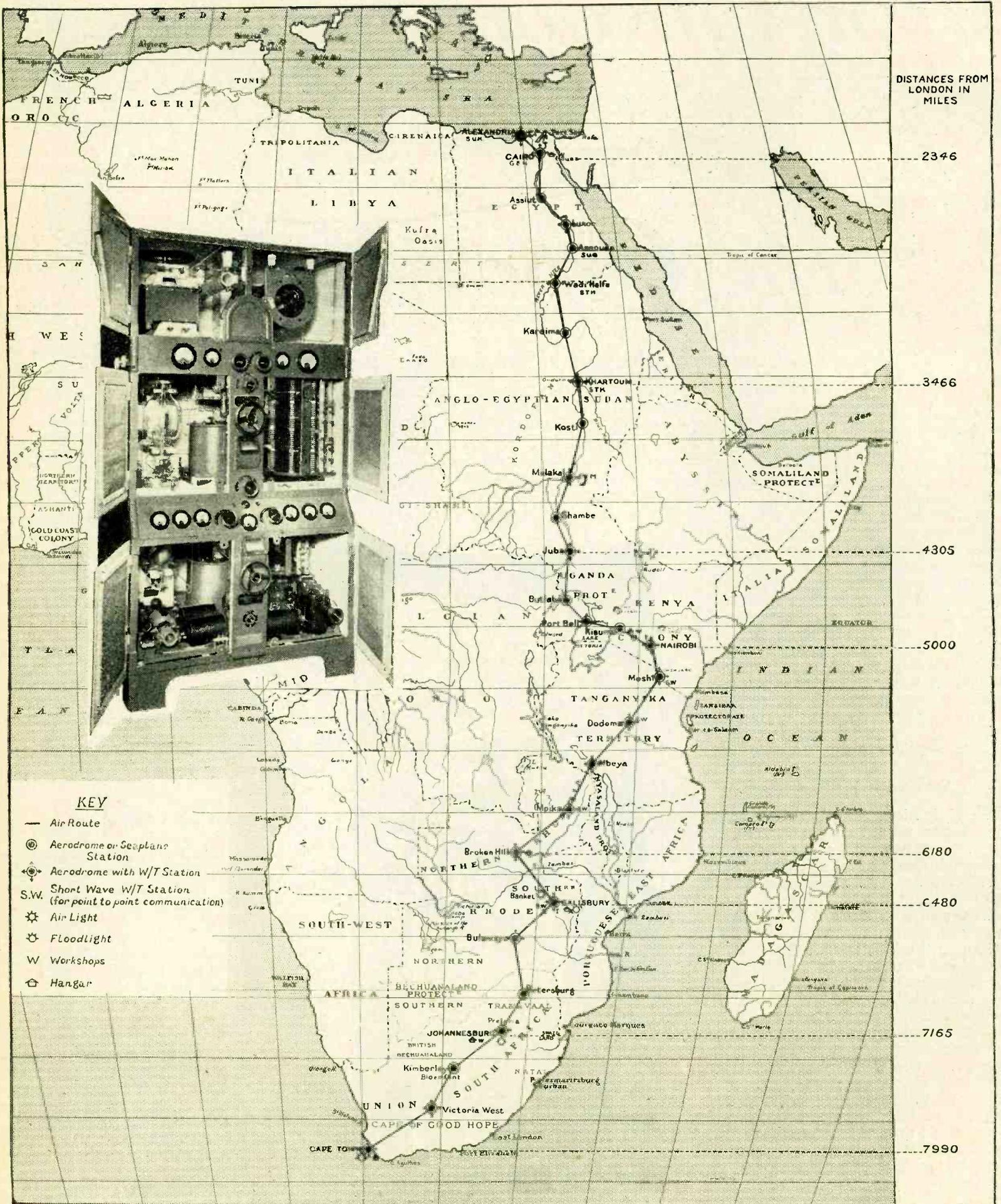
The next main wireless station is in the Sudan at Wadi Halfa where the station consists of a 450 watt (input) transmitter showing an aerial current of 5 amps. The transmitter is supplied with H.T. and L.T. either from a motor or a $1\frac{1}{2}$ -h.p. Petter engine together with a double voltage D.C. generator. The tuning arrangement provides for eight frequencies on a stud switch. This equipment is practically standard throughout the Sudan and is equipped for continuous wave telegraphy only. The receiver employs a simple oscillator detector with a wave range of 400-3,000 metres. A single stage of low frequency amplification is included.

After Khartoum, where aircraft reception



The compact Marconi A.D.6 transmitter and receiver on the De Havilland 66 plane, in which the author recently participated in the first direct civil flight from Cairo to Cape Town.

HOW THE TRANS-AFRICAN AIR ROUTE IS ORGANISED.



No fewer than sixteen radio-equipped aerodromes maintain touch with the Imperial Airways' planes between the time of their leaving Cairo or Cape Town and their arrival at the other end of Africa. *Inset.*— A TA4A Marconi transmitter (medium wave) of the type installed at Kampala, Nairobi, Mbeya, Broken Hill, Salisbury and Bulawayo.

From Croydon to the Cape.—

is carried out in the General Post Office with a remotely controlled transmitter, a stop was made at Malakal, a typical small Sudanese town whose wireless station was also remotely controlled, reception being done at the Post Office.

From Malakal, flying south to Juba, we had to "reel in" the 200 feet of trailing aerial several times owing to severe atmospheric conditions and the approach of a "line squall," which was successfully circumvented.

From Juba the course is south to Kampala (Uganda) and here the first of a series of medium power long-and-short wave stations has been specially erected for African civil aviation. Kampala W/T station has been erected on an exceptionally fine site, its exact location being Kululo Hill. The long-wave transmitter here is the Marconi T.A.2 with an input power of 2.2 kilowatts—the short wave T.N.7 having an input of 1 kilowatt. The station, in addition to working aircraft north and south bound, communicates with Juba and Nairobi.

Transporting Gear by Air.

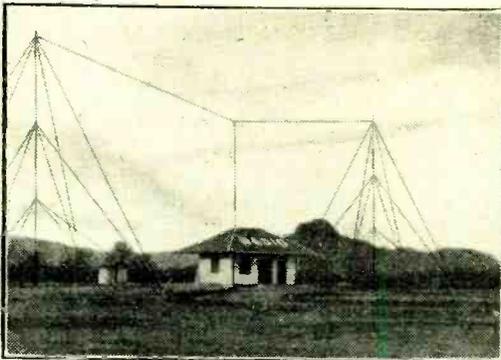
The next main step was Nairobi, where the 900-metre transmitter is located alongside the "beam" transmitter of the International Communications Company. The 900-metre antenna is supported from a triatic above the "beam" aerials.

Flying south through Tanganyika the aircraft worked Nairobi until in touch with Mbeya; two intermediate refuelling aerodromes (Moshi and Dodoma) are equipped with short-wave transmission and reception for point-to-point working, and a long-wave receiver is also used at Dodoma.

The night stop was Mbeya, which is normally reached by road 400 miles from the nearest railway. The road is impassable from October to March, and as all wireless equipment had to be transported from Dar-es-Salaam, together with six months' fuel

supply, the erection and installation reflects great credit on all concerned, and proves the immense value of air transport in these regions.

From Mbeya to Mpika, the next stop, we flew over dense bush, and after losing



The radio station at Dodoma aerodrome, one of the refuelling points.

Mbeya's signals communicated ahead with Broken Hill. Leaving Mpika the following day in good weather we approached to within 100 miles of Broken Hill.

Suddenly, the weather changed rapidly, visibility became very bad, and we were forced to turn back and make a landing on an emergency landing ground some 150 miles north of Broken Hill.

An Obliging Native.

When we landed an agile native who suddenly appeared from space, climbed a nearby tree and secured our aerial, while a big-game hunter who had witnessed our descent from his camp came up and greeted us. In the course of conversation he informed us that the nearest telegraph office was 170 miles distant! Broken Hill were informed of our position. For emergency working the propeller from the wind-driven generator is removed and the generator is motored by means of a small 2-stroke petrol engine which is normally used as a "gas starter" for the main engines.

The humidity, combined with tropical rain, made it essential for us to dry out the radio apparatus before taking the air the following day.

On arrival at Broken Hill we began to feel that we should shortly be entering civilisation again. Bulawayo was the next long-wave centre to be worked (the first halt, Salisbury, had short-wave transmission only) and followed our progress with a long-wave receiver.

Shortly after leaving Bulawayo we heard

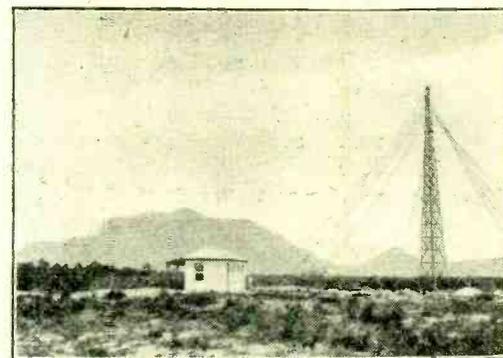
the new aero W/T station at Germiston, Johannesburg, and two-way working took place at 350 miles. Germiston is also fitted with Bellini-Tosi direction finding and transmitted several very useful bearings to us.

The W/T stations in the Union of South Africa, viz., Germiston, Victoria West and Cape Town, have all been erected under the supervision of Captain Kos, of the Post Office Engineering Department, Pretoria.

From Johannesburg south we left the atmospheric-laden ether, and the 1,000-mile flight from the City of the Goldfields to Cape Town was made in one day, with excellent service from the wireless stations at Victoria West and on 600 metres from Slangkop, Cape Town.

First Civil Wireless Flight.

The extremely variable meteorological conditions which prevail over the Hex River mountains and adjoining district has necessitated the erection by the Union Government of special weather reporting stations at Beaufort West, Matroosberg Rail, Worcester, Tulbagh, and Cape Town, which are linked by telephone.



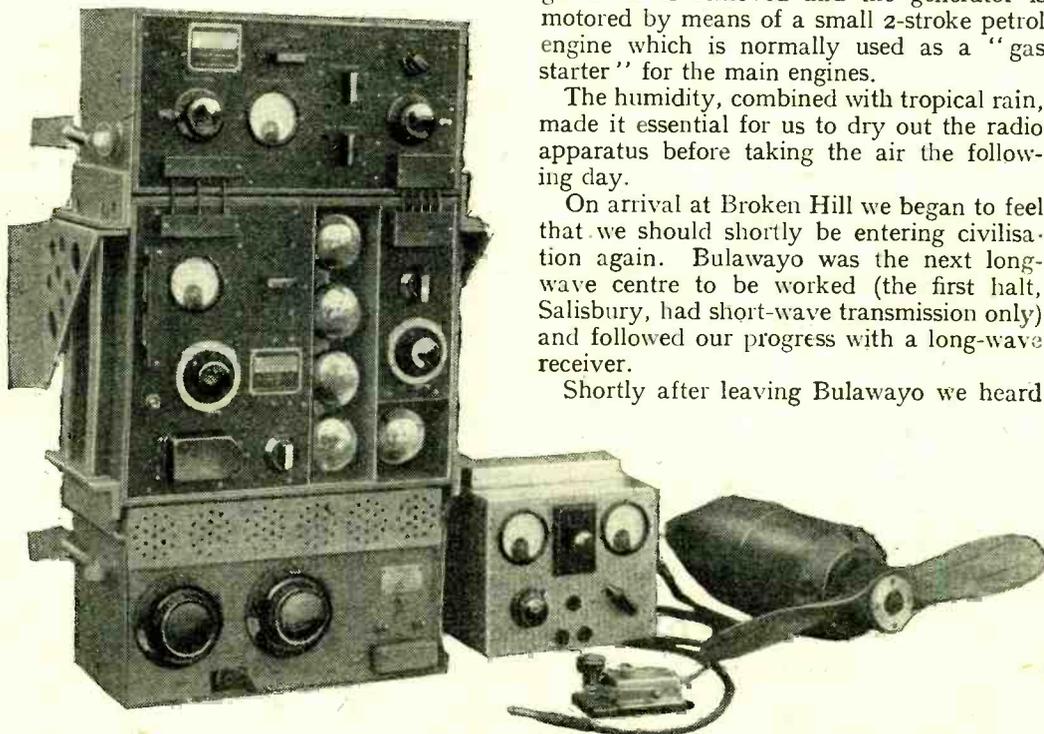
Just outside Cape Town is Wingfield airport. The wireless station is seen in the photograph.

On sighting Table Bay mountain we reeled in our aerial with a final "GB. CU." to all concerned, having accomplished the first direct civil wireless flight through the dark Continent.

"Wing Coil" direction finding will prove a valuable aid to aerial navigation over sections of the route where the absence of distinguishing land marks renders navigation difficult, and all aircraft are now fitted with this apparatus.

"WIRELESS AND SHIPPING"

THE August 17th issue of our esteemed contemporary, "The Shipping World," holds special interest for all to whom maritime wireless telegraphy and telephony make a strong appeal. This "Wireless and Shipping" number contains several articles by authorities in their respective spheres concerning the influence which wireless, the direction finder and the echo-sounding devices are exercising in safeguarding life and property at sea. The principal article is by Marchese Marconi, who gives his personal recollections of 38 years of progressive research. Other contributors include Sir Archibald Hurd, Messrs. W. A. Souter and J. Herbert Scrutton, both members of the Council of the Chamber of Shipping, M. Auguste Hubert, president of the Comité International Radio-Maritime, Dr. S. H. Long, and Messrs. R. Ferguson, G. Nevill, W. Platt, and J. Lewis.



The specially designed "Empire Airways Equipment" manufactured by Standard Telephones and Cables, Ltd., for use on the African air route. It will be fitted on the new "Atalanta" machines of the type shown in the title picture. The units include a combined long- and short-wave transmitter and their accompanying receivers.

Radiolympressions.

By Free Grid.

ALTHOUGH I was quite tired out from the previous day's exertions, 11 a.m. last Friday found me on the doorstep of Olympia, together with a great many other people. A bad start was made, I fear, as the doors were over two minutes late in opening, and my consequent demand for something off the price of my admission ticket only led to an insolent retort. I was greatly impressed by the vast size of the exhibition, and at once saw that I should be unable to do the rounds of even the stands in one day, still less visit all the demonstration theatres in the annexe, or try the new dance floor in the National Hall.



Led to an insolent retort.

Immediately after bursting into the main hall I received quite an unpleasant shock, and for the moment thought that the exhibition was no improvement on that of last year. Things quickly improved, however, and by lunch-time everything was normal, every stand being ready to receive visitors.

A New Stunt.

The first thing that caught my eye, or rather my ear, was an entirely new stunt that has been adopted this year by certain stand-holders who desire to avoid answering technical questions, and that is to create such an unearthly din with the loud speakers on their respective stands that any would-be enquirer soon tired of screeching his questions and eventually melted away, completely baffled by the loud speaker. (No pun intended.)

I had happened to notice an individual with a hopeful look on his face attempting to get an assistant to read his hands as he went through the motions of the deaf and dumb alphabet. Thinking that this was a genuine case, and knowing the alphabet myself, I at once gave him the D.C. signal (see International Maritime code of signals) and came to his assistance. After extracting his question from him I attempted to shout at the assistant, but with no success, and so I tore a leaf out of my notebook and wrote the question. The apparently deaf man followed my example, and after much tedious

work with pencil and paper all the information that we were able to get was that the technical man had gone to tea.

It was only after we left the stand that I discovered that my new-found friend was possessed of perfectly normal "earsight."

Suspicious Confirmed.

After refreshment I returned to this particular stand. I happened to drop the pencil with which I had just written my query and it promptly rolled under the booth. Diving down to pick it up, I nearly electrocuted myself by placing my hand on the secondary terminals of the mains transformer of a large L.F. amplifier which was standing just behind the curtain which hung down from the edge of the stand. Even then I should not have suspected anything had not the assistant's face turned a dull brick-red.

I was about to ask why the amplifier was there when suddenly a shrewd suspicion flashed through my mind, and, dropping on my knees, I rent the curtain asunder, and made a swift examination. Unhappily, I found that my worst suspicions were confirmed. The input leads from the B.B.C. amplifier, instead of being coupled up to the loud speakers on the stand, were joined to the primary of a special "line" transformer, and thus fed into the amplifier.

I must say that I considered that the Exhibition authorities had done all in their power for the comfort of visitors, but I hardly expected them to provide, gratis, professional dancing partners on the floor of the National Hall. Such a gracious act showed the height of hospitality.

The *matinée* idols, whose presence I forecast last week, were there in great numbers, draping themselves tastefully around the



Should have dismissed the matter from my mind.

various stands in the manner of the languid young men you see at the Motor Show. I was quite wrong, however, when I prophesied the disappearance of the band-box beauties, who were there in full force distributing the usual improving literature.

There was a strange incident, or, rather, series of incidents, which at first I was totally



They were there.

unable to account for. On several occasions as I approached a stand an important-looking individual—apparently the manager—hurried forward and handed me a component, bidding me examine it carefully. Each time I happened to notice that the component was one having a highly polished surface either of metal or of moulded insulating material. Furthermore, after a brief examination I was entreated to remove my gloves in order to examine the component better. It all seemed to me to savour rather of the stationer's shop at Christmas time, when you are usually requested to remove your gloves in order not to damage the Christmas cards. Not seeing that any harm was likely to come from keeping my gloves on, or that I could examine the component any better by taking them off, I did not yield to the entreaties. This seemed to cause some disappointment.

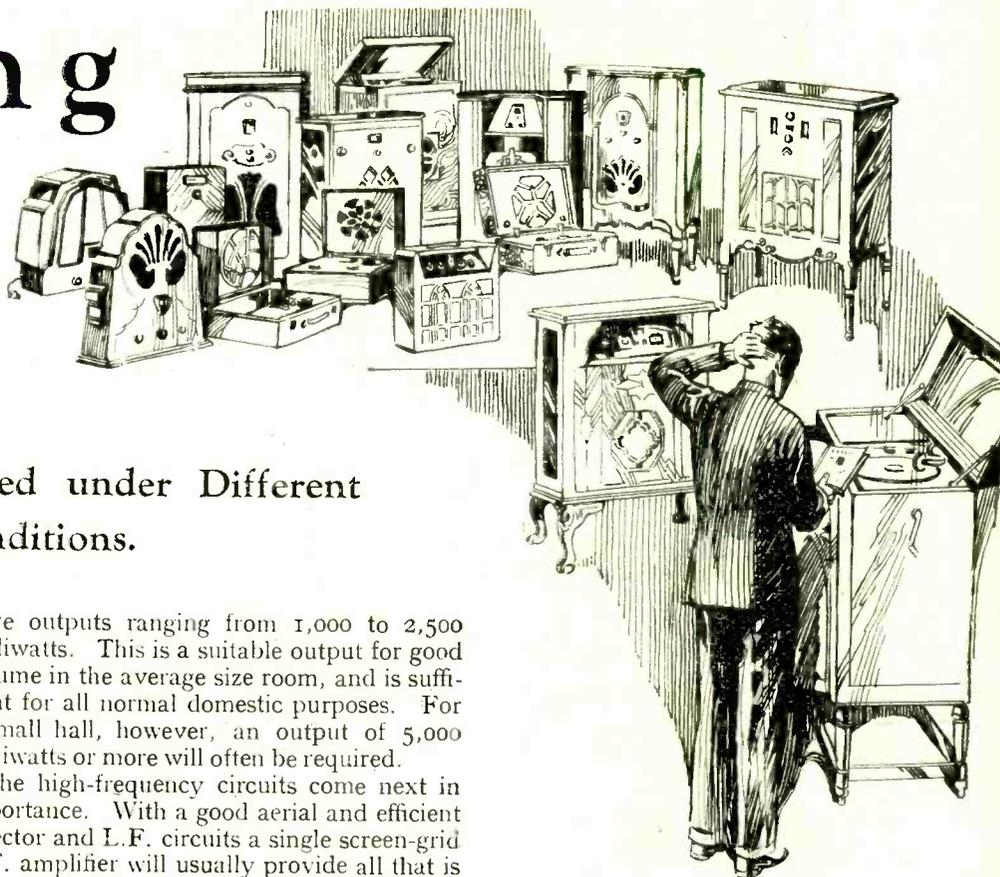
A Stranger's Generosity.

On another day, as I made one of my many subsequent tours, the same thing happened on the first stand I visited, only on this occasion I was requested by the manager to join him in a light lunch. I must confess that I felt a little peckish, and although such generosity from a complete stranger seemed rather suspicious, I assented. As we rose to go after our meal I observed money and a few whispers passing between my host and the attendant handmaiden. I should have dismissed the matter from my mind had I not noticed my host empty the dregs of my glass on to the carpet, and wrap it (the glass I mean, not the carpet) carefully in his handkerchief and pocket it, apparently with the full cognizance and approval of the aforementioned handmaiden.

We parted company and I moved off, thinking charitably that it takes all sorts to make a world, when suddenly, as I approached another stand, the same thing happened, namely, an invitation to a light lunch. Needless to say, I at once smelt a rat, and angrily demanded an explanation. After much equivocation and prevarication I eventually found out that the whole ridiculous procedure was an attempt to identify me by obtaining my right-hand thumb print in order to compare it with the one published in my notes last week.

Unfortunately for the gentleman who stood me the lunch I am naturally left-handed, and consequently did not hold my glass of ginger beer in my right hand. Either he was so unobservant that he did not notice it, or he was so lacking in knowledge that he did not know that the left-hand thumb print is entirely dissimilar to that of the right.

Choosing a Set.



The Performance Required under Different Listening Conditions.

THE task of selecting a wireless receiver is often a matter of considerable difficulty, not because the choice is in any way restricted, but because it is so wide that the prospective purchaser is apt to become lost in unimportant byways. He will, unless he be of cool and careful temperament, become involved in a mental controversy over the respective merits of, say, the different forms of detection, to the exclusion of the more fundamental and important properties of selectivity, quality, and sensitivity.

Before one can choose a receiver it is necessary to have some idea of the performance which will be required, and of the conditions under which it is to be used. It is obviously wasteful to buy an ultra-sensitive, ultra-selective superheterodyne solely for local reception; it is just as unsatisfactory to buy an unselective type of two- or three-valve receiver for receiving Continental programmes when the set is to be used within sight of the aerials of a modern twin-wave transmitter.

The output stage is the first point to be considered, for upon this depends the maximum undistorted volume which can be obtained. In the case of a battery receiver the output is always limited by considerations of economy in upkeep, and it is rare for it to exceed 1,000 milliwatts. A more usual figure would be 350 milliwatts, and this may be taken as satisfactory for moderate volume in a small room. In the case of a mains set there is far less restriction, and most receivers

have outputs ranging from 1,000 to 2,500 milliwatts. This is a suitable output for good volume in the average size room, and is sufficient for all normal domestic purposes. For a small hall, however, an output of 5,000 milliwatts or more will often be required.

The high-frequency circuits come next in importance. With a good aerial and efficient detector and L.F. circuits a single screen-grid H.F. amplifier will usually provide all that is required in the way of Continental reception, particularly if reaction be fitted. With a poor aerial, however, or where foreign stations are considered of great importance, two H.F. stages are usually advisable.

Selectivity.

So much for mere amplification; nowadays, selectivity is of at least equal importance, and the degree necessary depends not only upon the presence or otherwise of a powerful local station, but also upon the sensitivity of the set. Two tuned circuits are normally sufficient completely to separate two locals, but do not allow much scope for foreign reception in their vicinity. Three tuned circuits are included in most single H.F. sets, and a number of the more important Continental programmes can then be received in spite of the presence of a local. The four tuned circuits fitted to many two H.F. sets, however, are obviously better, and so the advantages to be gained from this type of receiver are not merely increased sensitivity but also greater freedom from interference.

If great use is to be made of foreign programmes, however, there is no doubt that the superheterodyne offers a considerably improved performance, for it is inherently more selective than the straight set. It is usually more sensitive also, but that is incidental, since straight sets are obtainable with sufficient amplification for any purpose. Many types of superheterodyne are to be found; some employ only four or five valves and give moderate sensitivity with high selectivity; others have ten or more valves, and aim at the highest useable sensitivity and selectivity. The majority, however, include six or seven valves and are sensitive enough to receive most worth-while stations on quite a poor aerial, while their selectivity is usually sufficient to permit reception of any station spaced by more than 18 kc. from the local, so that

its blanketing effect is almost completely removed.

Turning now to quality of reception, it may safely be assumed that most modern receivers have L.F. circuits giving substantially even amplification of all important musical frequencies. Where the selectivity is not very high, therefore, the overall frequency response may often be taken for granted, for few three- and four-valve sets are selective enough to give serious sideband cutting. The matter is entirely different with the superheterodyne, however, for it is then only too easy to obtain a large loss in the upper register. It is important to see, therefore, that the set includes either band-pass filters in the I.F. circuits or tone correction in the L.F. amplifier. One of these methods, or a combination of both, is an essential to good quality reproduction with a superheterodyne.

Volume Control.

When satisfied about these important and fundamental features of the receiver, attention should be paid to the details of the design upon which so much depends. Many of these make chiefly for ease of operation, and are so obvious that they need no mention here. The volume control should not be overlooked, however, particularly if the set is to be used near a local station, and it is wise to make sure not only that it is of a type giving a sufficiently wide range of control, but that it is distortionless throughout its range.

When a decision has been reached upon technical grounds as to the most suitable receiver, a demonstration should be arranged. When all is said and done it is results which count, and one can never be quite certain that the most perfect receiver theoretically will fulfil its promise in a practical test.

WITH the enormous number of wireless sets now on the market it becomes increasingly difficult to discriminate between the multitudinous claims of each. The number of valves is but one of the factors which must be considered along with the rival claims of the superhet. and the ambitious straight set. This article, couched in non-technical terms, sets forth the essential points which must be looked for in the light of varying listening conditions.

News of the Week.

Current Events in Brief Review.

Italy's Radio Show.

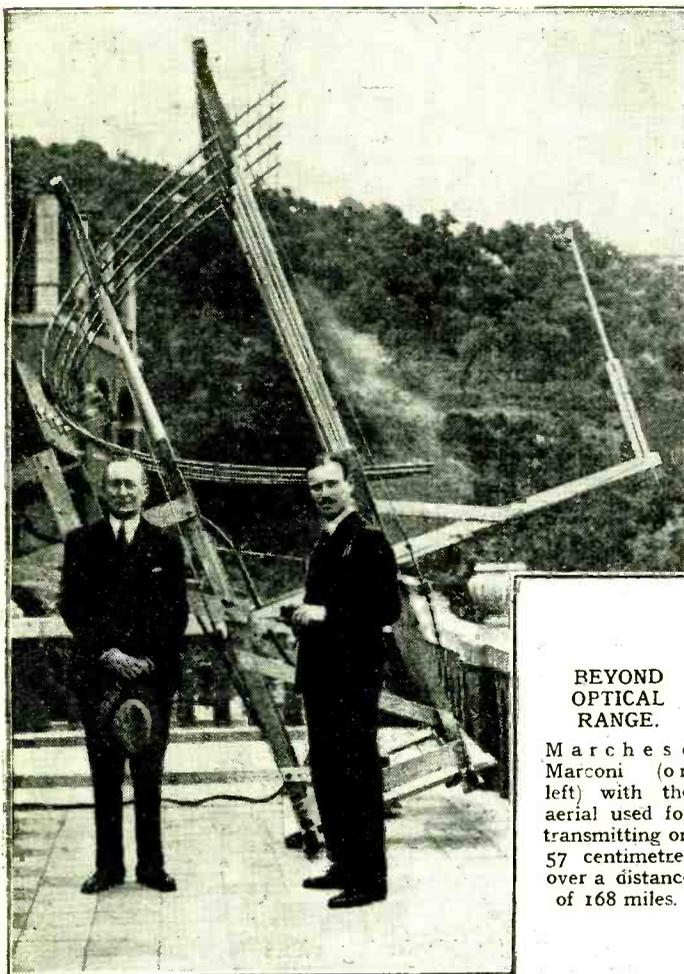
ITALY'S National Radio Show is to be held this year from September 10th to 20th in the Palace of the Society of Fine Arts, at Milan. The exhibition has the support of the Italian Broadcasting authorities, and will be thoroughly representative of all phases of wireless activity.

Rival Radio Shows in Paris.

AT least 160 firms have taken stands at the official wireless show, which is being held in Paris from September 8th to the 18th next. This show, organised by the French Radio Traders' Association, will be held in the Grand Palais, Avenue des Champs-Élysées. There is, of course, to be a rival show, described as an International Wireless Exhibition, to be opened on September 3rd at 31, Boulevard des Italiens.

BEYOND OPTICAL RANGE.

Marchese Marconi (on left) with the aerial used for transmitting on 57 centimetres over a distance of 168 miles.



Ultra-short-wave Feat.

MARCHESE MARCONI offered the world a new thrill last week, when he succeeded in transmitting on the ultra-short wavelength of 57 centimetres over a distance of 168 statute miles. Telegraphy and telephony messages were sent from Rocca di Papa, near Rome, to Cape Figari, Sardinia. By covering a distance so far in excess of the optical range it would seem that the Marchese has opened up fresh possibilities for research into the behaviour of waves of very high frequency.

Prizes for Olympia Visitors.

THE radio competition organised by the *Evening Standard* has attracted considerable attention. Each visitor to the Olympia Radio Show is handed a card giving full particulars. A word such as "Radiolympia" is given and competitors are asked to compose a sentence about wireless of words of which the initial letters, in order, make up the given word, which is changed each day.

Prizes consisting of up-to-date radio sets of the leading makes are awarded to competitors who, in the opinion of the Editor of the *Evening Standard*, send in the best sentences. Competitors must get their cards stamped at the *Evening Standard* stand in the National Hall. This will be done at any time within the hours that the Exhibition is open for any competitor who is carrying a copy of the *Evening Standard* of that day. The prizes include British Blue Spot, Clarke's Atlas, Mullard, Zetovox, Ekco, Cossor, Phillips, and Lotus products.

Broadcasting from Bristol.

A SOUND-PROOF broadcasting studio is to be erected in the Colston Hall, Bristol, next month for the Bristol Radio Exhibition, from which various programmes during the Exhibition week will be broadcasting throughout the Western Region.

We learn that every available stand has been booked by exhibitors.

Distress in I.F.S.

GRAVE concern is being felt by the radio trade of the Irish Free State in connection with the development of the "Tariff War." According to the *Irish Radio News*, dealers find themselves practically at a standstill. A number of the large firms had stocks sufficient to last a few months, and are still selling these stocks at the old prices. It is the small retailer and service man depending upon the regular sale of apparatus for a living who is feeling the pinch.

"Those of us," writes our contemporary, "who have devoted any time or labour to the development of radio in the Free State view the matter with concern. It is hard to dissociate the position from politics, but we must attempt to do so."

"On September 19th the Dublin Radio and Gramophone Exhibition is billed to open at the Mansion House. At the time of writing we cannot see how this exhibition can be held."

New Television Development.

THE movie camera is coming to the aid of German television. The German Fernseh A-G, with which the British Baird Company is associated, are demonstrating a new television transmitter for outdoor scenes in which the cinematograph film plays a leading part. Instead of directly scanning the event, the new apparatus photographs the scene on an ordinary film, which is developed in ten seconds and then passed to a television transmitter which immediately broadcasts it. The ten-second lag is regarded as negligible, and the process considerably improves the quality of the reproduced image.

Raid on Austrian Licence Money?

TROUBLE has arisen in Austria on a little question of thirty millions of schillings. According to a correspondent, the Postmaster-General is this amount short on the year's working, and the Finance Minister considers

he should make up the deficit from his own pocket.

It is but a step from the Post Office to the radio cash box, and fears are general among listeners that the Postmaster-General, who is also Chief of the Austrian Broadcasting Co., will use listeners' money in order to fill the breach. Listeners are protesting, but the fund is in danger.

"Prom." Devotees in France.

M. PAUL BERCHE, a Paris radio critic, after launching an attack on the French broadcasting programmes, concludes with the reflection: "Happily we have the foreign concerts, particularly those relayed by London from the Queen's Hall."

The Silly Season.

AN instrument called a "Radiesthesia" has been evolved by Father Tremoulet, who, according to our Paris correspondent, caused a sensation recently at Toulouse. While lecturing on his invention, which consists of a rod sensitive to radiations from the human body, the Rev. Father asked one of his audience to test its efficacy. One man asked the lecturer to find out how much gold he had in his purse. The rod recorded 17 to 18 vibrations, which apparently corresponded to a 20-franc piece. And this was the coin the man had in his pocket!

Next week: the Sea Serpent.

Pilot Authors Kits.

THE popularity of the Pilot Authors Kit service, which was inaugurated by Messrs. Peto Scott, Ltd., at the last radio exhibition, has become so pronounced that the company has had to make other arrangements for the wholesale distribution of these kits to ensure that adequate stocks are at all times available to home constructors.

The solution has been found in the appointment of the British Radio Gramophone Co., Ltd., as wholesale distributors. Their address is "Pilot House," Church Street, Stoke Newington, London, N.17.

Four-in-one Record.

THE "Four-in-One" gramophone record which has just been issued by the British Homophone Company provides the public, as its name suggests, with four tunes on a 10-inch record. This alone would not constitute an extraordinary feature, there being no arbitrary ruling as to the length of a "tune." What the company offers, however, is a record in which each side plays for six minutes instead of three, with the result that it is possible to accommodate on one side two dance tunes or other selections, each of a length which just fills the ordinary 10-inch record, playing for three minutes a side. The result is achieved by the use of a narrower groove than is usual, but the inventor, Mr. W. D. Sternberg, claims that this can be carried out without unduly sacrificing the bass register.

The records are issued by the Victoria Music Publishing Co., Ltd.

Telefunken Gramophone Records.

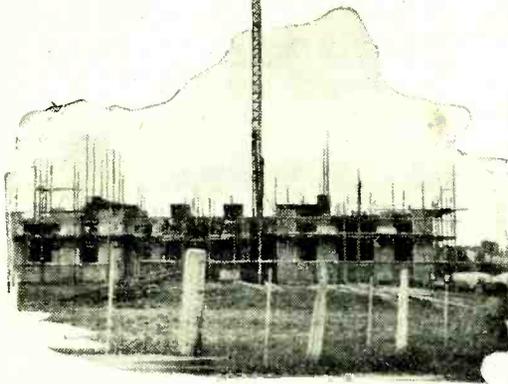
THE well-known German firm Telefunken has now entered the gramophone business and is producing records bearing the title "Telefunken."

THE WAVELENGTH PROBLEM.

Part 2.—The Limitations of 9 Kilocycle Separation.

By NOEL ASHBRIDGE, B.Sc., Chief Engineer, B.B.C.

The Western Regional station near Williton, Somerset, in course of construction.



IN the first instalment of this article, which appeared last week, consideration was given to the problem of frequency separation and interference and certain conclusions were reached. First, it was pointed out that there was little to be gained at the transmitting end by cutting off at 5,000 cycles, and secondly, if there is to be freedom from interference at the limit of the service area the reproduction of frequencies above some 4,000 cycles cannot be obtained.

Dealing with the first point, if we assume that it is desirable in a receiver to reproduce faithfully frequencies up to 6,000 cycles per second, then one would have to cut off in the unwanted transmitter at 3,000 cycles per second, which is, of course, a contradiction. In fact, to get complete freedom from interference at the limit of the service area we should have to cut off in both transmitter and receiver on a theoretical basis at 4,500 cycles per second, but practically at about 4,000 cycles per second, thus robbing all listeners living in areas of strong field-strength of any hope of first-class reproduction.

Service Area.

With regard to the second point, we ought to consider what is meant exactly by service area. Supposing we take the limit of the service area as 5 m/v per metre (it used to be $2\frac{1}{2}$ m/v per metre in the days of low-power stations), then in the case of two stations of 50 kW we shall, of course, have 5 m/v per metre from the wanted station, and after dark we must expect to have a mean of somewhere about 2 m/v per metre from its neighbours, even if they are very distant stations, and the peaks may come up to as much as 5 m/v per metre. In some cases even higher readings than this have been recorded. This means that on an average we get jamming unless we cut off in the receiver at about 4,000 cycles, and even then we shall find that we get interfer-

ence on the occasions when the field-strength of the unwanted station rises appreciably above its average value, unless the transmitters also cut off at about 4,000 cycles per second. Fig. 5 gives a curve which shows the peak values of down-coming ray at different distances from a station. From this it will be seen that interference from a station is by no means proportional to one's distance from it outside a range of about 150 kilometres, and that the peak values of the indirect ray occur at distances of the order of 400 to 800 kilometres. This curve has been taken from a series of international tests which have been carried out during the past 18 months.

The Necessary L.F. Response.

We now come to the highly controversial question of what audio-frequency range it is necessary to reproduce for full appreciation of a programme. It has been said that response up to 4,000 cycles is sufficient for most purposes and that, therefore, the interference problem does not exist. However, it is my opinion that for really good quality one must reproduce in the receiver at least something up to 6,000 or 7,000 cycles. So far as the transmitter is concerned the response should be better than this when conditions such as the response of the cable circuits to the station permit; this,

*I*N the second and concluding instalment of this article by the Chief Engineer of the B.B.C. it is shown how the frequency separation of broadcasting stations is limited by the band of audio-frequencies which it is necessary to cover to give full effect to the programmes. There are two alternatives for the future: to retain the 9 kc. separation and to ensure good quality reproduction for those living in areas of high field strength, or to have a wider separation and reduce the number of stations in Europe.

of course, is for the benefit of those living in areas where the field strength exceeds, say, 10 m/v per metre. It would seem from practical results that it is not altogether essential to reproduce the upper frequencies strictly in their true relationship. That is to say, if one begins to cut off at 4,000 cycles, and there is still some appreciable response left in the receiver up to 6,000 or 7,000 cycles, a sufficiently good effect is obtained from the point of view of plain,

straightforward listening. On the other hand, if one cuts off completely at 4,000 cycles per second, then the deficiency is very marked.

Views on this question are very divergent, and there is still a school who say that it is essential to reproduce practically everything which is produced in the studio. In this case we should have to go up to at least 10,000 cycles per second, and even considerably beyond, which is seldom possible either in the transmitter or receiver. However, in dealing with the difficult problems of broadcasting, compromise is, as usual, unavoidable, and the figures given above certainly do give satisfactory broadcasting so far as practically every ordinary type of listener is concerned. On the other hand, as an argument against those people who think that broadcasting would not be spoiled artistically by a cut-off at 4,000 cycles per second, we must compare broadcasting with the gramophone. A gramophone record reproduces something appreciable up to and a little beyond 5,000 cycles per second, and yet the lack of upper frequencies is noticeable to the critical ear. We also have to consider the future, and it may be that with new methods of recording, such as that known as "hill and dale," there will be good response considerably above 5,000 cycles, and no broadcaster wishes to see a state of affairs which will prevent broadcasting ever giving such good quality as can be obtained from an ordinary commercial gramophone record. This, of course, is what would happen if we came to an international agreement to cut off in the transmitter sharply at a frequency equivalent to half the separation between stations.

Importance of Harmonics.

It seems possible that the divergent views concerning the band of audio-frequencies which must be reproduced may be partly due to a difference of opinion as to what type of programme is the most important. Thus, if nothing but plain speech were ever transmitted, it would not be at all unreasonable to consider a sharp cut-off at 4,000 cycles, although, of course, the natural characteristics of individual voices would be lost to some extent. If, however, one considers the problem from the music point of view, then we have to consider not only the fundamental frequencies of the notes, because the harmonics are almost as important as the fundamentals. Again, if one considers radio plays, it is very difficult indeed to get realistic reproduction of certain effects with a very limited frequency band, because "noises" of various kinds contain important harmonic components.

Summing up, we find that the separation of broadcasting stations is really limited by

The Wavelength Problem.—

the band of audio-frequencies which it is necessary to cover in order to give full effect to the programmes. It is not merely a question of how close two broadcasting stations may approach in order to avoid interference from the point of view of the selectivity of the receivers; in fact, we can assume that in future there is no limit to the selectivity of receivers other than the limit just mentioned, namely, the band of frequencies which it is necessary to reproduce. There seems no reason to suppose that the receiver of the future cannot be made far more selective than is permissible for good quality, but the fact always remains that we cannot separate overlapping sidebands from each other unless the strength of the wanted ones is several times greater than that of the unwanted. However, this does not mean that very highly selective receivers cannot be used with advantage in circumstances where it is preferable to sacrifice high quality than to suffer interference.

Opinion Abroad.

At this stage it will be interesting to consider what is the general opinion amongst European broadcasters concerning these problems. I can say straight away that there is no difference of opinion on the fundamental technical considerations, but there are different ways of looking at the problem from the purely practical point of view. In many countries there is a tendency towards the opinion that it is better to say that receivers must cut off completely at even 4,000 cycles per second than to consider the political difficulties of increasing the separation between stations. At the same time the opinion has been expressed that in future we must only consider that broadcasting is reliable when high field strengths of the order of, say, 10 m/v per metre and upwards are available. This means, if we assume that there is to be no deliberate cutting off of modulation frequencies in the transmission, that there are two alternatives to consider for the future, viz. :—

(1) To stick to the separation of 9 kc/s and say that those living in areas of high field strength can always get good quality, while those living in areas of comparatively weak field strength must be prepared to cut off below the limit of frequency which gives really good reproduction.

(2) To have a wider separation and to reduce slightly the number of stations in Europe as a whole.

Bearing these two alternatives in mind, the whole problem becomes entirely one of policy in relation to the existing state of affairs in each country. No one has ever pressed for a larger separation than 11 kc/s, but from experiments which we have made at Tatsfield we have computed that the range for good reproduction can be increased by 50 per cent. by this means. There is little doubt that if all countries in Europe were just starting broadcasting, and no large stations were yet in existence, a larger separation would be advantageous, purely from the point of view of giving the best service to the largest number of people.

However, plans for the future, as already stated, depend on the results of the Madrid

Conference, which takes place in September and will probably last until some time in November. After that, in the early part of next year, it is anticipated that there will be a meeting of the U.I.R. It will then become a question as to whether a re-arrangement of wavelengths is necessary,

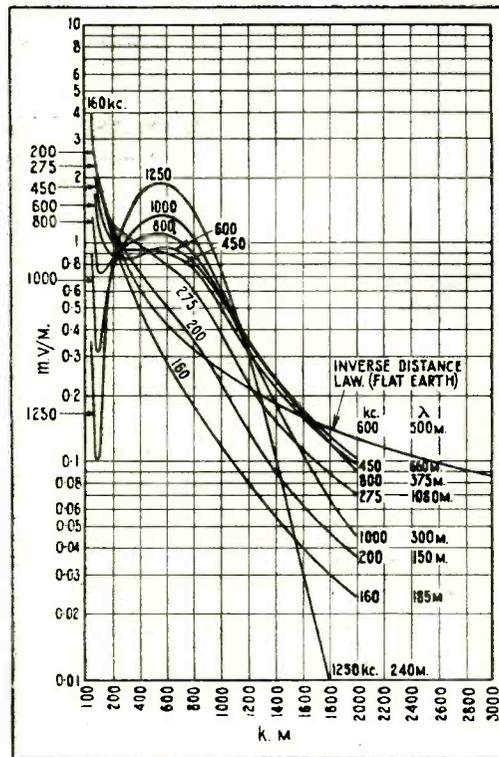


Fig. 5.—A series of international tests gives these mean peak values (m.v./M) of the down-coming ray at different distances from the transmitter. It will be seen that interference is not proportional to the distance (k.m.) that a receiver is located from the transmitter.

and whether there should be a meeting of Post Office Administrations. This will depend partly on whether additional wavebands are obtained for broadcasting at Madrid. In any case, however, it is not impossible that an attempt will be made to re-arrange stations in such a way as to reduce mutual interference, using the knowledge which has been obtained from the

many international tests as a guide to the geographical placing of stations which are neighbours in the waveband. There is also the question as to how many international common waves should be retained, and, last but not least, what is to happen on a permanent basis to those stations which are at present working on more than the standard channel spacing and, of course, those which as a result are working at less than the standard spacing. In these latter cases, the reduced separation has been possible because the stations involved are on low power, but at any time the power of these stations may be raised.

Limitation of Power.

Then, of course, there is the vexed question of limitation of power. At first sight it would seem to be logical to agree to limit the power of broadcasting stations in such a way as to be of mutual benefit to everyone concerned. Agreement on this point, however, is not likely to be obtained without difficulty, the trouble being always that the exact conditions existing for each station are not the same. Actually there are some stations where the authorities in charge do not consider that the limit of the service area must be taken as the fading limit—in fact, their whole object is to cover as big an area as possible by day or by night, including indirect ray reception as part of their normal objective. For this object the limitation of power is much less attractive than when an attempt is made to give a service of a more reliable character, because if one can tolerate a "service" which neglects the effect of fading, actually one can probably also neglect the effect of frequencies above 4,000 cycles per second. One thing, however, is certain, and that is that broadcasting has become so important to the inhabitants of nearly every country in Europe that some kind of solution is bound to be found to almost any difficulty which may arise, but it may take time. In the meanwhile it is impossible to plan definitely for the future, or to decide on possible modifications of the transmitting system not already adopted.

The Wireless World INFORMATION BUREAU.

Conditions of the Service.

(1) THE service is intended primarily for readers meeting with difficulties in the construction, adjustment, operation, or maintenance of wireless receivers described in *The Wireless World*, or those of commercial design which from time to time are reviewed in the pages of *The Wireless World*. Every endeavour will be made to deal with queries on all wireless matters, provided that they are of such a nature that they can be dealt with satisfactorily in a letter.

(2) Communications should be addressed to *The Wireless World* Information Bureau, Dorset House, Tudor Street, E.C.4, and must be accompanied by a remittance of 5s. to cover the cost of the service. The enquirer's name and address should be written in block letters at the top of all communications.

(3) The fee of 5s. covers the reply to any wireless technical difficulty, but in special cases, where the enquiry may involve a considerable amount of investigation, an increased fee may

be necessary. In such cases a special quotation will be made.

(4) Questions should be clearly written and concisely worded in order to avoid delay. Where enquiries relate to trouble experienced in receivers built to specifications in *The Wireless World* a complete account should be given of the trouble, and especially the symptoms.

(5) Where reference is made to published articles or descriptions of apparatus, the title of the article, the date of publication in *The Wireless World*, and the page reference number should be given, in order to facilitate reply.

(6) Full circuit diagrams, constructional details of apparatus, or values of components for home-designed receivers cannot normally be supplied, but circuit diagrams sent in with queries will be checked and criticised.

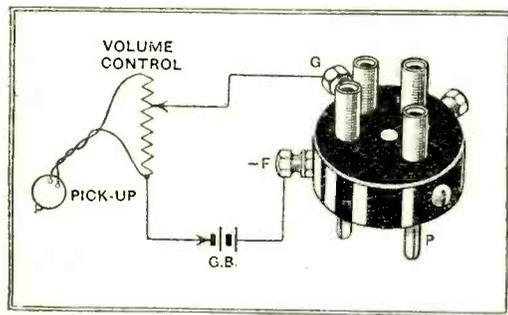
(7) Particular makes of components cannot, in general, be recommended, but advice will be given as to the suitability of an individual component for a particular purpose specified by the enquirer.

HINTS and TIPS.

THE careful set constructor generally checks the trimming condenser adjustment of a newly-built receiver at a number of tuning points. This is all to the good, but there is sometimes a tendency to work up from the bottom to the top of the wavelength scale, and then to leave the adjustment made at the highest wavelength as final.

Ganging.

In ninety-nine cases out of a hundred this is wrong. Trimming condensers are bound to be more effective at the lower end of the wavelength scale, where the tuning condensers are at minimum capacity. Consequently, trimming adjustments at this end of the scale are much more critical, and it is much easier to determine the correct setting either by aural or visual means.



An adaptor for isolating the grid of a valve from the receiver circuits. Connections for a gramophone pick-up are shown. Both the adaptors illustrated on this page are Bulgin products.

IT is generally accepted that the broadcast wave band embraces wavelengths between about 200 and 550 metres; present tendencies in design make it increasingly difficult to cover this band with one sweep of the tuning condenser. So far as wavelength range cover is concerned, the limit is determined by the value of stray capacities across the tuned circuits, and so no effort should be spared to reduce them. Incidentally, with regard to multi-circuit "ganged" sets, with which we are here mainly concerned, it must be remembered that the chain is no stronger than its weakest link, and so there is little point in attempting to reduce "strays" in several circuits if the value associated with any one circuit in the chain is inevitably fixed at a high value.

Stray Capacities.

The amateur who is following a complete receiver design more or less in its entirety can do very little to reduce the value of stray capacity, but he should remember the need for care in making high-potential grid circuit connections. These leads should be short, and, moreover, should not run in close proximity to earthed metal work. Further, indiscriminate use of screened wire in the H.F. circuits is to be avoided, as it is bound to increase the shunt capacity.

With regard to the detector valve, it is worth while to bear in mind that an anode circuit choke has an effect on the tuning of the grid circuit of the valve. When it appears that the minimum wavelength to which

PRACTICAL AIDS TO BETTER RECEPTION.



the detector grid circuit may be tuned is unduly high, it is worth while going to the trouble of substituting another type of choke.

IT would seem that valve adaptors are hardly appreciated as they deserve to be. These handy little gadgets, in their most usual form, consist of a plug-and-socket device for interposing between a valve and its holder; terminals are fitted in such a

Valve Adaptors.

way that the circuit between the anode pin and its socket is interrupted. The primary object of this interruption is to allow the insertion of an anode current milliammeter, but the adaptor has other applications. For instance, it can be used in making an experimental substitution of some other form of intervalve coupling in place of that included in the set, thus reducing the number of internal alterations necessary. Similarly, it enables the user of a self-contained set to substitute another type of loud speaker without any other change, except, perhaps, a single short-circuiting connection.

For stage-by-stage tests, an adaptor is equally useful, as it renders the operation of connecting a pair of headphones in the detector or intermediate L.F. anode circuit merely a matter of a minute or so. Generally speaking the adaptor can be joined in any L.F. circuit with the assurance that it is most unlikely to be responsible for instability or any other untoward happening. There is some possibility that in the detector anode circuit it may cause trouble, but this may generally be avoided by connecting a simple filter circuit to the adaptor anode terminals.

Another type of adaptor is primarily intended for the connection of a pick-up to a receiver in which provision for this addition has not been included. The device consists of an ebonite disc carrying four valve sockets; filament and plate sockets are connected internally to corresponding pins on the underside, but the grid socket is left entirely free. On interposing the adaptor between a valve and

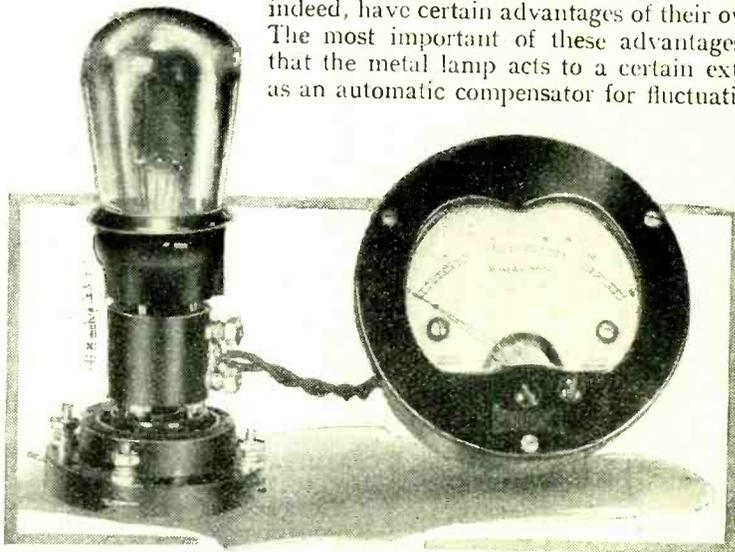
its holder, the grid is completely disconnected from the internal wiring of the receiver, and so any external additions to the grid circuit may be made without trouble.

Apart from its use for radio-gramophone conversion, this grid adaptor is useful for applying test voltages, and for checking the operation of self-bias systems by the temporary use of a battery.

IN a modern D.C. mains set, it is always necessary to insert a resistance in series with the valve heaters to absorb surplus voltage. The amount of energy dissipated here is a good deal greater than that with which we are generally accustomed to deal in wireless receivers, and so discrimination must be used in choosing a suitable absorbing resistance.

Lamp Resistances.

Either wire resistances or lamps are generally favoured for this purpose. Carbon lamps were at one time preferred to those of the metal filament type, but an authoritative article, published some time ago in *The Wireless World*, showed that the latter are quite suitable to use, and, indeed, have certain advantages of their own. The most important of these advantages is that the metal lamp acts to a certain extent as an automatic compensator for fluctuations



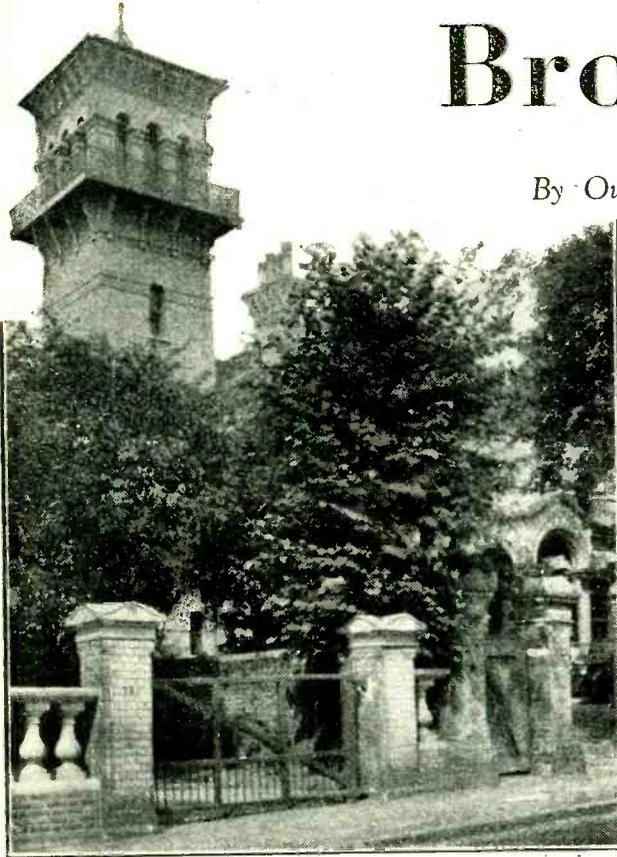
A convenient connection point for an anode milliammeter: an adaptor interposed between a valve and its holder.

in mains voltage; this is due to the special filament characteristics of which the resistance increases with a rise of temperature.

It is not always easy to find exactly the right lamp to use in all circumstances, and sometimes it becomes necessary to connect in series a small additional resistance of the wire-wound type; this can conveniently be in the form of a rheostat, in order that precise adjustment of heating current may be made with the help of a meter.

Broadcast Brevities.

By Our Special Correspondent.



There is a check "visor," as the B.B.C. engineers call it, behind the transmitter, consisting of a mirror drum giving a picture 8in. by 3in.

Who Will Be Organist?

WITH the B.B.C.'s interesting decision to erect the first British organ intended solely for broadcasting purposes, there arises the question of the appointment of an official organist. Organ virtuosi are rather more common in this country than really first-class soloists on other instruments; for entertainment on the pianoforte and violin we still resort to the long-haired continental variety.

It is quite likely, I learn, that

A RESEARCH "RETREAT." In the leafy quietness of this former Jewish Home of Rest in Nightingale Lane, B.B.C. engineers carry out tests with new apparatus. The building is the latest acquisition of the B.B.C.

Ultra-short-wave Vans.

THE licence figures may take an upward leap in West London during the next few weeks when the B.B.C.'s ultra-short-wave test vans begin to roam the streets on the track of the elusive 7.75-metre transmissions from the roof of Broadcasting House. Not that the engineers will try to arouse suspicion, but the public no longer associates plain vans solely with furniture on the uneasy payment system; more usually the P.M.G. sleuths are suggested, and few people have the courage to confirm their fears by asking the driver.

Mr. Noel Ashbridge and the Tests.

Twelve ultra-short-wave receivers are about to leave the B.B.C. work benches at Clapham and will be put to use almost immediately. At present Mr. Noel Ashbridge, who is taking a personal part in the tests, is unwilling to publish a regular schedule, and amateur interlopers are, frankly, not welcomed. But later on, I am assured, the keen radio man will be invited to assist.

Before then, however, the ultra-short waves will have been used for the television transmissions.

B.B.C. Drama by Television.

MR. VAL GIELGUD is treading very warily in the organisation of television programmes. The items already broadcast show the type of display which must be expected for the next few weeks, but I understand that when technical improvements or the size of clientele justify it, the Productions Department may essay to give us a taste of drama.

Getting in the Harp.

The television lens will be taking a big "eye-ful" on Tuesday, August 30th, when a harpist and her instrument will both be accommodated in the picture. Accompanists at present sit at their piano in the dim recesses of studio "B.B.," behind the reflector screen, and pick out their notes with the aid of a candle.

Checking the Image.

The actual television transmitter is located in the silence cabinet, the artiste being close up to it in the studio, so that the image is actually picked up through the sound-proof window.

the B.B.C.'s choice of organist will fall on Berkeley Mason, who is well known for his masterly performances on the Queen's Hall organ.

Broadcasting House.

NO one can blame the B.B.C. for making capital out of Broadcasting House. The move from the old headquarters into the revolutionary building in Portland Place has been stage-managed in a way which kills any suggestion that the Corporation is slow to seize an opportunity. The Press of the world has eagerly published photographs of the outside and inside, and lest any one should have missed these pictures, the Corporation has added to them with noble reproductions in its own periodical publications.

All the pictures that could conceivably have been taken are now collected in a vermilion-covered volume selling at the price of one crown; and the B.B.C. will clinch matters in September by the publication of a book describing "B.H." from a technical viewpoint.

"A Present from Portland Place."

Next Christmas I expect our Aunts will be presenting us with Broadcasting House paperweights, and in the following summer cousins from the country will, no doubt, be taking home the new Val Myer mugs.

Well, it's good for trade.

Carl Rosa Again.

THE reappearance of the Carl Rosa Operatic Company in the programmes this autumn marks the healing of a breach which has lasted since 1929, when the Carl Rosa people and the B.B.C. broke off relations on the question of the opera subsidy.

Under the new arrangement two operas will be broadcast from each B.B.C. region which the Carl Rosa Company visits in the course of its tours between September and next February.

Touring the Regions.

There will be eight Carl Rosa operas broadcast, the first being from Bristol during the week beginning on September 26th. Later,

the opera company will visit towns in the Midlands, North and Scottish regions. In each case one or two acts will be broadcast.

Empire Tests Next Month.

THE latest news regarding the Empire short-wave station is that the transmitter is "on the way." Parts of the gear have already arrived at Daventry.

It is probable that the first unmodulated transmissions will be made at about the end of September.

The Winter Symphony Concerts.

THE promenade concert season is only a few days old, but already plans for the season of B.B.C. Symphony Concerts which starts on October 19th are well advanced. Artistes already engaged are: Backhaus, Harriet Cohen, Cortot, Myra Hess, Huberman, Lamond, Harold Samuel, Schnabel, Adolph Busch, Casals, Arthur Catterall, Mischa Elman, Albert Sammons, Muriel Brunskill, Elena Gerhardt, Elisabeth Schumann, Elsie Suddaby, Arthur Cranmer, Roy Henderson, Dennis Noble, and Walter Widdop.

The B.B.C. Symphony Orchestra, led by Arthur Catterall, will play at each concert, and Adrian Boult will conduct rather more than half of each series. Sir Henry Wood, Sir Landon Ronald, and Ernest Ansermet will also conduct during the season.

In Honour of Elgar.

The last three concerts before Christmas, November 30th, December 7th, and December 14th, will be devoted to the works of Elgar to commemorate his seventy-fifth year.

Those Fat Stock Prices.

THE B.B.C. is concentrating its attention on the farming industry with a view to discovering in what way the microphone can be of assistance in promoting farmers' interests. As a preliminary step farmers throughout the country are being asked a series of questions the answers to which will furnish the B.B.C. with some guidance in framing its future activities on behalf of the industry. An attempt is also being made to find out if the present time of farming talks (7.0 p.m. on Wednesdays) suits the farmers, whether they make any use or not of the Fat Stock Prices broadcast at 6.0 p.m., if the present timing of the weather reports is suitable, and if a weather report at 6.30 in the morning would be of any value.

The Scott Centenary.

IN commemoration of Sir Walter Scott, the centenary of whose death occurs this year, a play will be broadcast in the National and Scottish Regional programmes on September 20th, and a tribute to Scotland's greatest novelist will be paid by Colonel John Buchan, M.P., in a talk on September 21st.

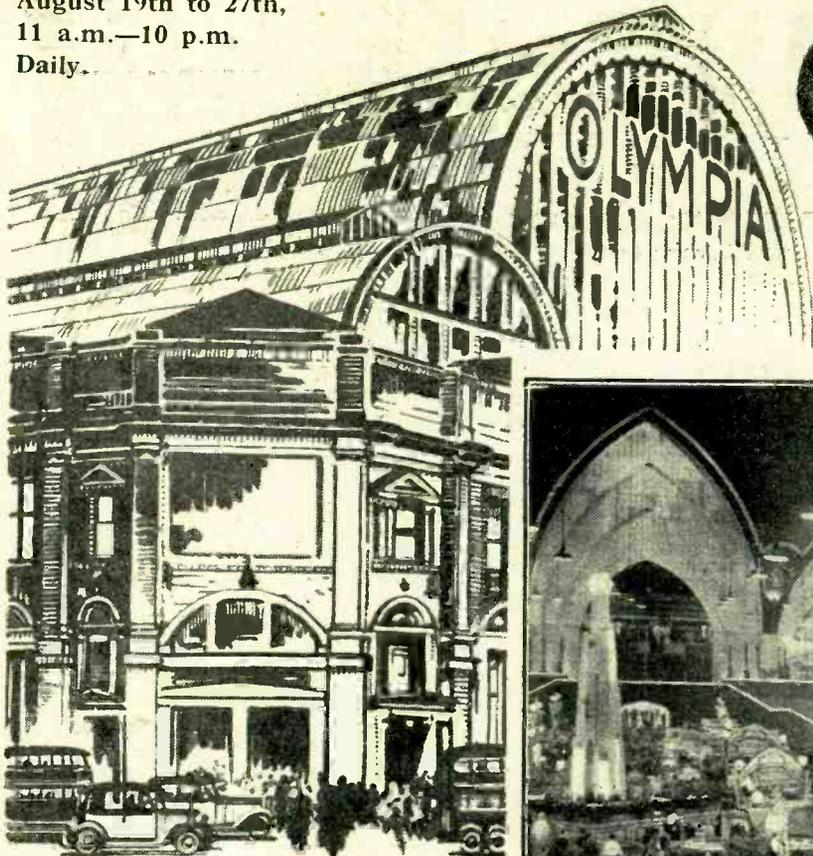
An Express Programme.

NON-STOP variety will be outdistanced by a John Watt show which is to be broadcast nationally on September 10th. "Crescendo," a vaudeville programme, will not even recognise the meaning of the word stop, for all the items, singers, dance bands, orchestra, organ, pianos, etc., will follow one another at breathless speed from beginning to end of the programme. There will be no announcements and everything will be done from one studio.

Are They Downhearted?

T-O-NIGHT (Friday), West Regional provides an orchestral concert entitled "Back from the Holidays"!

August 19th to 27th,
11 a.m.—10 p.m.
Daily.



OLYMPIA 1932



AD-A-GRAMS. (116)

As its name implies, this accessory is an adaptor for converting an existing wireless receiver into what is, in effect, a radio-gramophone. A turntable, rotated by an induction motor, is housed in a shallow polished hardwood box, on top of which practically any receiver may be placed. The unit, which is complete with pick-up, auto-



Ad-a-grams radio-gramophone adaptor.

matic stop mechanism, and volume control, slides forward when it is put into operation.

Ad-A-Grams, Carlton House, Regent Street, S.W.1.

ADEY. (259)

The Adey Baby portable is a particularly fine example of a complete four-valve self-contained receiver in miniature form. Including H.T. and L.T. batteries, the overall size is 14in. x 14in. x 6in., and it weighs about 12 lb. The price complete, including a travelling cover and a spare L.T. accumulator, is £15 15s.

Adey Portable Radio, 99, Mortimer Street, W.1.

ALBA. (128)

A range of receivers and radio-gramophones of advanced design constitutes the principal exhibit of this firm. Described as the Alba series, there are battery models

STAND- TO-STAND REPORT.

IN this Stand-to-stand report of the Tenth Annual Radio Show the technical staff of *The Wireless World* have endeavoured to present to our readers a comprehensive account of the Exhibition, commenting upon items of special interest shown at every stand visited.

Although our report has been prepared with sufficient precision to make it fully representative of the Show, yet no descriptive account, however complete, can take the place of a personal visit, so that we hope any readers who have not yet seen Olympia will make an endeavour to do so before the Show closes tomorrow, Saturday, at 10 p.m.

Next week's issue will contain a special account of the Show from the point of view of general tendencies in design and a more detailed description of all that the Show has revealed in the way of new developments.

as well as a wide selection of D.C. and A.C. receivers and radio-gramophones.

Attention is directed to a "Stenode" radio-gramophone embodying a seven-valve receiver chassis. Two models are shown. One priced at 70 guineas includes an automatic record changer.

A. J. Balcombe, Ltd., 52, Tabernacle Street, E.C.2.



Adey light-weight Baby portable.

Olympia 1932.—

ALLIANCE. (19)

On this stand an interesting A.C.3 receiver is shown; three tuned circuits are employed with a variable-mu H.F. valve, and ganged potentiometers are used for the volume control. A moving-coil loud speaker is fitted, and the price is 14 guineas. A screen-grid portable is also shown.

Alliance Radio, Ltd., Burleigh Parade, London Road, Sutton, Surrey.

AMPLION. (68)

The principal Amplion exhibit is a permanent-magnet moving-coil loud speaker chassis, with the popular two-claw magnet and a "doped" ribbed cone. This instrument is stated to be capable of dealing with an input of over 5 watts, and is fitted with a "Universal" transformer, which is also centre-tapped so that it may be used in push-pull circuits. The price is only 39s. 6d.

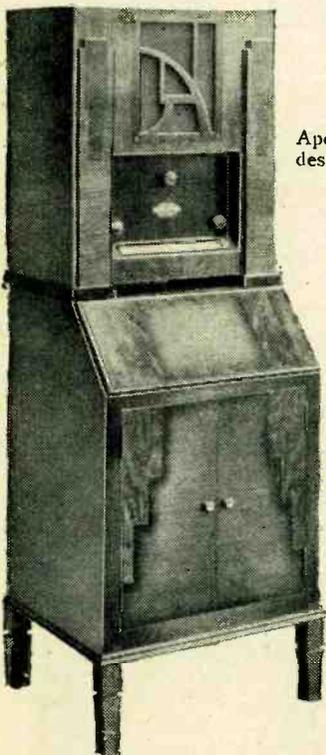
The other new Amplion product is a pick-up, mounted on a moulded bakelite arm, and supplied complete with a built-in volume-control potentiometer. Judging by the output curve, this accessory should be exceptionally satisfactory for all-round use; there are marked rises at each end of



The new Amplion pick-up.

the frequency scale, with a fairly rapid cut-off after the 4,000-cycle mark.

Amplion (1932), Ltd., 82-84, Rosoman Street, E.C.1.



Apollo playing desk and record cupboard.

APOLLO. (214)

In addition to a wide selection of the well-known manufacturers' products, there is shown on this stand a playing desk combined with a record cupboard, the feature

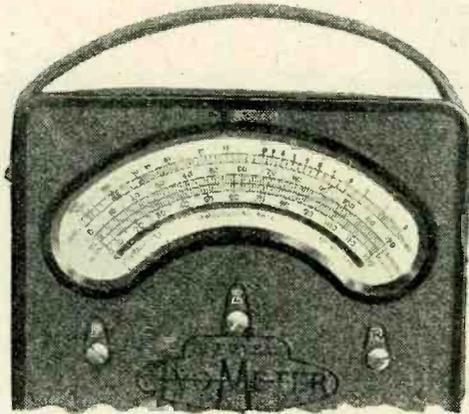
of the design being that it forms a base for a cabinet-type receiver. Fitted with an electric gramophone motor, pick-up, and volume control, the price is £8 8s.

There is a table model available for mains operation, or it can be supplied fitted with a spring motor.

Apollo Gramophone Co., Ltd., 4, Bunhill Row, E.C.1.

AUTOMATIC COIL WINDER. (206)

Two items of special interest to the experimenter are to be seen on this stand.



New "Universal" Avometer with A.C. scale.

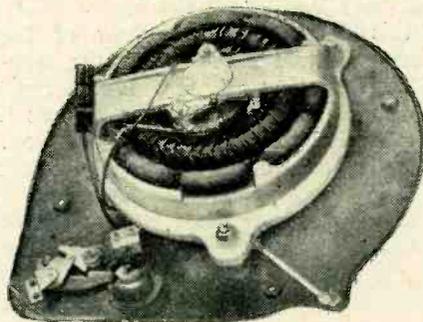
First, there is the new "Universal" Avometer, which, in addition to the standard D.C. ranges, has now been adapted, by means of a built-in Westinghouse rectifier, to measure A.C. volts and amps. in the following ranges: 0-1.2, 0-12, 0-120, and 0-1,200 volts; 0-0.12, 0-1.2, and 4-12 amps. The price is 12 guineas, and a calibrated fuse is fitted as in the Standard Avometer.

Secondly, there is the Avodapter—a valve-testing unit incorporating a plug adjustable for 4- or 5-pin valve holders—at 25s. The plug with a 6-way lead is obtainable separately for 7s. 6d.

Automatic Coil Winder and Electrical Equipment Co., Ltd., Winder House, Douglas Street, S.W.1.

B.T.-H. (119)

Two important additions have been made to the B.T.-H. range of gramophone motors. The "Truspeed" is probably unique in that it combines the advantages of self-start-



B.T.-H. slow-speed "Universal" motor.

ing with constant-speed synchronous running. A two-pole machined and balanced rotor is employed, and is geared to give 78 r.p.m. on 50-cycle mains. The motor is fitted with a very simple type of fully automatic switch, and the price is 49s. 6d.

The same type of stop is supplied with the new "Universal" motor, which is also of unconventional design. It is an eight-pole motor fitted with a shallow large-diameter

rotor running at turntable speed. The commutator has forty-two segments, and the governor, which runs at high speed, is placed accessibly in a slot below the turntable. The price, including external regulating resistance, is £5 10s.

The prices of existing models have been reduced as follows: "Golden Disc," £3 7s. 6d.; "Small Universal," £2 17s. 6d.; "Synchro Blue," £1 12s. 6d.

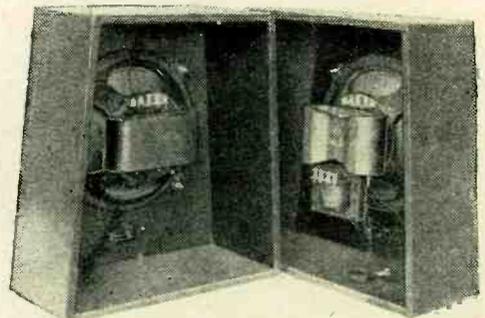
British Thomson-Houston Co., Ltd., Rugby.

BAKER'S "SELHURST." (83)

The Permag and Elomag series of moving-coil loud speakers are quite new, and although small in size should be very efficient. In the Permag models a two-claw magnet is used, while the Elomag is an energised-type companion model, which is available either with a 2,500-ohm field or for use on D.C. supplies of 100-150 and 200-250 volts. Special rectifiers are listed for use on A.C. Variable-ratio input transformers are fitted and in cabinet form the Permag model costs 47s. and the Elomag type 34s.

There are two other models known as the Permag Minor and the Elomag Minor. They embody smaller magnet systems and modified input transformers, the prices being 37s. and 34s. respectively as cabinet models.

Since the characteristics of the senior and junior models of each type are somewhat dissimilar, they have been embodied into a dual compensated assembly, and each is housed in a separate cabinet but supplied from a single input transformer. In this form the Permag dual compensated loud speaker unit, complete, costs £4 10s., and the price of the Elomag, or energised type, is £4.



Baker's Permag senior and junior models arranged as a dual compensated loud speaker.

Forming a suitable background for the new models is an extensive range of moving-coil loud speakers varying in size and price to suit every requirement.

Baker's Selhurst Radio, 89, Selhurst Road, S.E.25.

BECOL. (2)

In addition to panels, ribbed ebonite formers for high-grade tuning coils and H.F. chokes are the principal exhibits.

Manufacturers will be interested in the wide variety of extruded rods for switch rotors and many other purposes.

British Ebonite Co., Ltd., Nightingale Road, Hanwell, W.7.

BEETHOVEN. (49)

One of the main exhibits on this stand is the All-Electric Three, a three-valve set in which a screen-grid valve is used as a detector. Ganged tuning is fitted, together with a frame aerial, and there is a pentode output of 2 watts to the M.C. speaker; the price is 14 guineas.

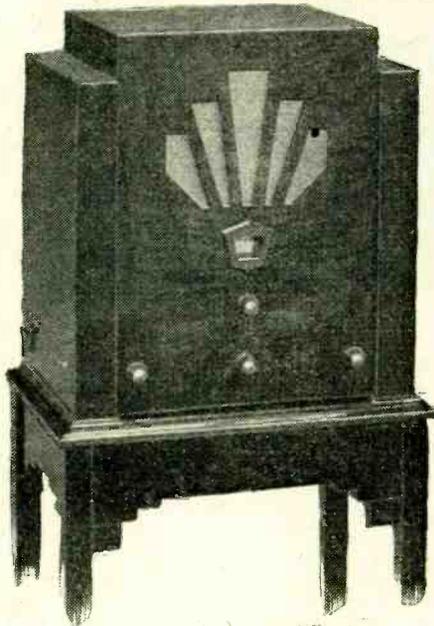
Olympia 1932.

The Beethoven portable sets are also shown, and the S.G.4 model at 10 guineas should not be overlooked.

Montague Radio Inventions and Development Co., Ltd., Beethoven Works, 24, Great College Street, N.W.1.

BELL PIANO CO. (3)

The receivers produced by this firm are of the three-valve S.G.-det.-L.F. type, and are substantially built in a cadmium-plated steel



"European Three" A.C. set (Bell Piano Co.).

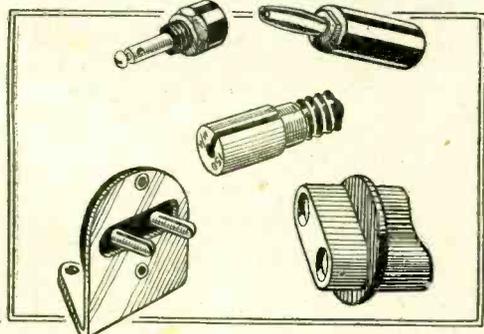
chassis. Band-pass input tuning is standard, as also is the provision of a tone control which functions both on radio and gramophone.

The radio-gramophone model, which includes a Bowyer-Lowe Mark III pick-up and Collaro motor, is available in two styles of cabinet, and costs 27 guineas. Alternative cabinets are also provided for the table model, which is known as the "European Three," and is priced at 16 guineas.

Bell Piano Co., Ltd., The Hyde, Hendon, N.W.9.

BELLING-LEE. (154)

On this stand there is a very wide range of indicating terminals, plugs, sockets, and fuses, the finish of which is beyond reproach. Of new additions for the coming season, mention must be made of the "Scrufuse," which, as its name implies, screws into a socket and is intended to take the place of the bulb type of fuse. There are a number of advantages claimed; one of them is that the length of the fuse is much greater, and another that colour-coding is easily



New Belling-Lee flush plug, Scrufuse and mains connector.

achieved for the different values of fuse. There are five different ratings, from 60 mA. upwards, and the price in each case is 6d.

Another innovation of considerable interest now that metal chassis have become so popular, is a flush mounting socket for standard plugs; it is self-bushing, and does not require separate insulators.

An extremely useful fitting selling at 1d. is a "Twin Tap" battery plug which makes it possible to take two connections from one battery socket.

There is an interesting demonstration being given on the stand showing the manufacture of 60 mA. fuses using a phosphor bronze wire 1-25th the diameter of the average human hair.

Belling and Lee, Ltd., Cambridge Arterial Road, Enfield, Middlesex.

BENJAMIN. (40)

The Transfeeda intervalve coupling is the principal exhibit, and an exceptionally good frequency characteristic is claimed. It consists of a transformer with a primary inductance of 85H., a parallel-feed resistance, and coupling condenser all contained within one case, and it is priced at 11s. 6d.

The well-known range of valveholders is also shown, together with a number of switches, and the prices of many have been reduced.

Benjamin Electric, Ltd., Brantwood Works, Tariff Road, N.17.

BLUE SPOT. (35)

In addition to the WS400 receiver, which is continued, there are two new four-valve battery sets with two variable-mu screen



Blue Spot type K252 battery receiver.

grid H.F. stages, detector, and alternative triode and pentode output circuit. The K252 with inductor loud speaker is priced at 12 guineas, and the R336 with the new 99PM moving coil at 16 guineas.

The 99PM moving-coil chassis is a substantial job fitted with a large two-claw permanent magnet and costs 59s. 6d.

The 100U inductor is continued, but a new balanced-armature unit—the 66K at 15s., or with cone chassis at 19s. 9d.—has been introduced to supplement the more elaborate 66R unit.

A special feature is made of these units in a variety of soundly made and attractive cabinets.

British Blue Spot Co., Ltd., 94-96, Rosoman Street, E.C.1.

BOWYER-LOWE & A.E.D. (156)

The Mark III pick-up is the outstanding exhibit on this stand. Its characteristic has been developed to avoid the shortcomings of the average small moving-coil loud speaker, which generally has a bass resonance at 100-150 cycles and a high-frequency resonance at about 3,500 cycles. The latter peak is avoided in the Bowyer-Lowe pick-up by placing the armature resonance at 4,500 cycles. Between 100 and 150 cycles there is a slight dip, and below 100 cycles a rising characteristic is obtained by tone-arm resonance. The price of this model is 30s., and a smaller model, known as the Beta, is available at 25s.



Bowyer-Lowe & A.E.D. record playing unit.

A neat self-contained playing desk incorporating the Mark III pick-up, a range of wire-wound volume controls and a new parallel-feed L.F. transformer complete the display on this stand.

Bowyer-Lowe and A.E.D., Ltd., Coombe Road, Brighton, Sussex.

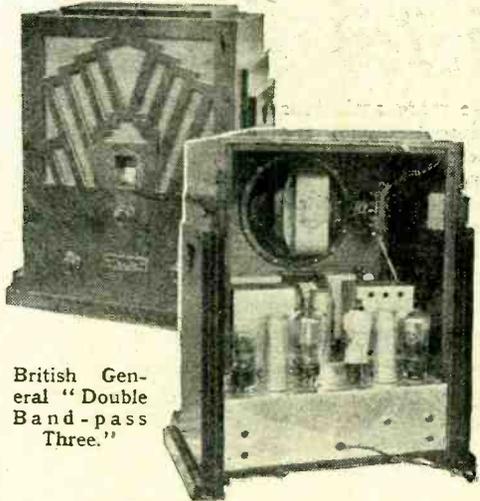
BRITISH G.W.Z. CO. (282)

This firm is showing a wide range of dry batteries for all purposes, and in particular has a range of H.T. batteries of "standard" and "power" types at very moderate price.

British G.W.Z. Co., Ltd., 205, Bedford Avenue, Trading Estate, Slough, Bucks.

BRITISH GENERAL. (29)

This firm has re-entered the receiver market with a range of five new sets. The principal model is the Double Band-pass Three at 18 guineas, which incorporates band-pass filters in the H.F. as well as the aerial circuit. A Rola P.M. speaker is fitted, and in the radio-gramophone version dual unit loud speakers have been adopted. A battery version with permanent-magnet moving-coil loud speaker is also available.



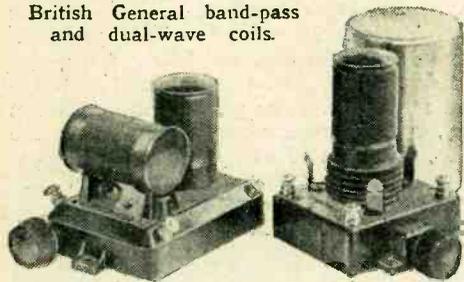
British General "Double Band-pass Three."

Olympia 1932.—

Additions to the list of components include a new band-pass unit with a band width of 3 to 4 kc., and screened dual-wave coils matched to work with the above. The price of both types is 9s. 6d.

British General Manufacturing Co., Ltd., Brockley Works, Brockley, S.E.4.

British General band-pass and dual-wave coils.

**BRITISH GOLDRING PRODUCTS.**

(20)

Pick-ups form the chief exhibit on this stand, and these are obtainable at 32s. 6d. complete with built-in volume control. A swivel head is fitted, and an adjustable spring counterbalance. A large variety of automatic needle cups is also to be found.

British Goldring Products, Ltd., 119, Finsbury Pavement, E.C.2.

BRITISH HARD RUBBER CO. (220)

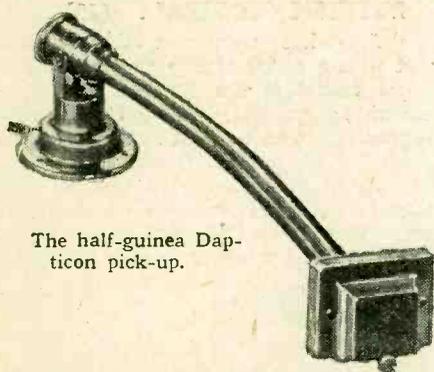
A material that will not discolour, even when exposed to strong sunlight, and known as Permol ebonite, forms the principal exhibit of this firm. It is available finished polished black, mahogany, and walnut at very reasonable prices.

In addition there is a wide selection of ebonite tube and rod, also extruded material, including ribbed coil formers.

British Hard Rubber Co., Ltd., Wharf Road Works, Ponders End, Middlesex.

BRITISH IDEAL PATENTS. (72)

Three different receiver chassis, fitting into cabinets of various styles, are shown by this firm. Two of the sets are for battery feed,



The half-guinea Dapticon pick-up.

the more ambitious model including a permanent-magnet moving-coil loud speaker. Both have variable-mu valves and single-knob tuning.

A pick-up at the exceptionally low price of 10s. 6d. (the "Dapticon Junior") is also shown.

British Ideal Patents, Ltd., Green Street, Brimsdown, Middlesex.

BRITISH N.S.F. CO. (18)

Dry electrolytic condensers are shown on this stand; the capacity is 8 mfd. and they are rated for 450 volts peak working. A range of tubular-type paper condensers of various voltage ratings, and of both the inductive and non-inductive type, is also

exhibited; the capacity values range from 50 mmfd. to 0.25 mfd.

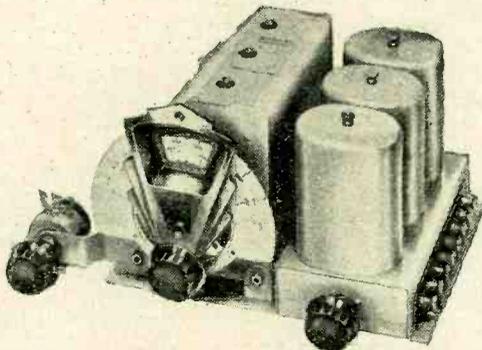
Wire-wound resistances of from 100 ohms to 10,000 ohms, in ratings from 1 watt to 6 watts, and composition types with values between 1,000 ohms and 10 megohms and ratings from ½ watt to 3 watts form an interesting section.

Volume controls with or without a combined switch are available in values up to 20,000 ohms in the wire-wound type, and in values of from 5,000 ohms to 10 megohms with a composition resistance element.

British N.S.F. Co., Ltd., Waddon Factory Estate, Waddon, Surrey.

BRITISH RADIOPHONE. (93)

What may be described as a complete band-pass tuning unit, sold under the trade name of "Radiopak," has just been introduced. The unit, which is really the nucleus of a modern H.F.-det.-L.F. three-valve set,



"Radiopak" band-pass tuning unit.

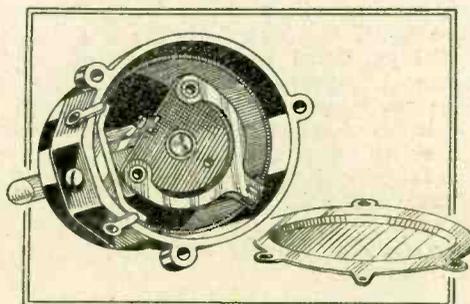
comprises three coils and wave-range switches, a three-element Radiophone condenser with dial, and a combined on-off switch and volume-control potentiometer. All these components are mounted on a metal chassis, and the three control knobs are symmetrically disposed. Reaction may be applied.

It is stated that both coils and condensers are matched within the closest limits. An unusual feature is observed with regard to the filter, in which sensibly constant band width is obtained by a "mixed" coupling; instead of interposing these circuits between the aerial and the first valve they are made to serve as an intervalve coupling.

The "Radiopak" measures some 6 in. in length by about 6 in. in width, and so a set built around it may be extremely compact.

Other Radiophone exhibits include wire-wound potentiometers, with a novel form of insulated double contact brush devised to minimise wear on the resistance element; connection to the brush is made through a rubbing contact on the metal cover plate and not through the spindle. A new pick-up, with adjustment for damping and centring, is shown, while the well-known ganged condensers have been improved in detail.

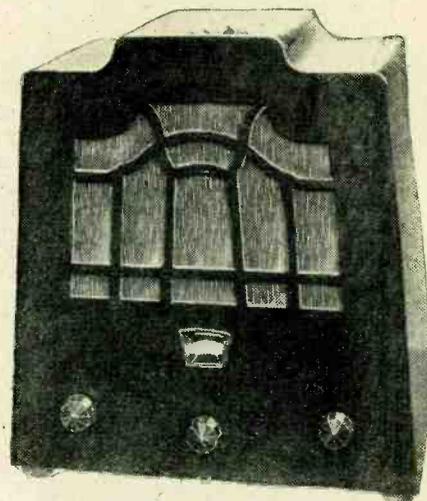
British Radiophone, Ltd., Aldwych House, Aldwych, W.C.2.



Radiophone potentiometer contact brush.

BROWNIE. (62)

Extremely good value for money is to be found in the four new receivers which form the 1933 programme of this company. There is a two-valve battery set which sells at the



Brownie Dominion two-valve mains set.

extraordinarily low figure of £3 to include cabinet, valves, royalties, a built-in moving-iron speaker, and a neatly designed all-steel chassis. The circuit comprises a regenerative-detector valve coupled by a transformer to a two-volt power valve. Another two-valve set, in this case designed for A.C. mains operation, is being marketed, and is styled the Dominion Two-valve Mains Receiver, selling at 9 guineas complete. The circuit contains a detector transformer coupled to a pentode, and the set is built as an all-steel chassis housed in a figured oak cabinet. Mains rectification is effected by a valve, and there is provision for a gramophone pick-up. A moving-coil speaker is built in.

In addition to these there is a three-valve screen-grid mains receiver with ganged control and built-in moving-coil loud speaker selling at 15 guineas, also a four-valve battery set selling at £12 10s. known as the



Brownie Dominion Battery S.G.4 set.

Dominion Battery S.G.4, with two transformer-coupled low-frequency stages.

Brownie Wireless Co. of Great Britain, Ltd., Nelson Street Works, Mornington Crescent, N.W.1.

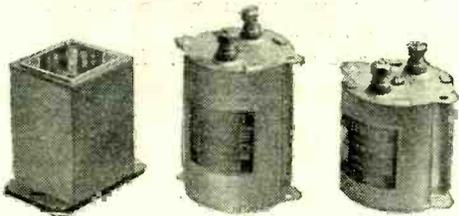
BULGIN. (151)

A number of additions have been made to this firm's already immense range of small

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components. Leaving on one side the innumerable plugs, jacks, terminals, indicating lights, and other parts that are additions to a set rather than components integral with it, we were interested in the range of high-frequency chokes. These are available with inductances of 500,000, 250,000, and 198,000 microhenrys (the first is for superheterodynes), and there is also a dual choke capable of carrying $\frac{1}{2}$ ampere for use in series with the mains on D.C.-driven sets.

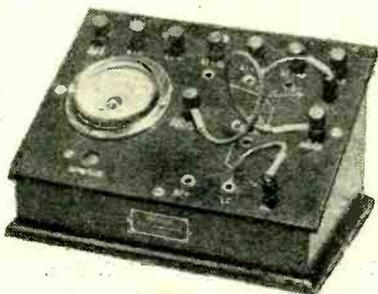
There is a full range of L.F. chokes ranging in price from 10s. 6d. to 15s. 6d., and a choke-filter output unit including both choke and condenser in one case. Two models of a small nickel-iron transformer for parallel-feed connection are available; one has terminals, the other, tags contained in the space of a rim circle for mounting through a metal chassis.



Two Bulgin H.F. chokes and a nickel-iron transformer.

A whistle-filter, intended to be connected between set and loud speaker, is available in two models, one cutting at 3,250 cycles and one at 4,750 cycles. The latter will also find application as scratch-filter for gramophone work.

An emission-tester for valves, based on the use of an oscillating circuit, which ensures even a low-consumption valve giving a fairly high anode current, is offered at 35s.



The Bulgin emission-tester.

Having discussed about one-thousandth of the lines offered, we suggest that the visitor should apply for a catalogue.

A. F. Bulgin and Co., Ltd., Abbey Road, Barking, Essex.

BURGOYNE. (98)

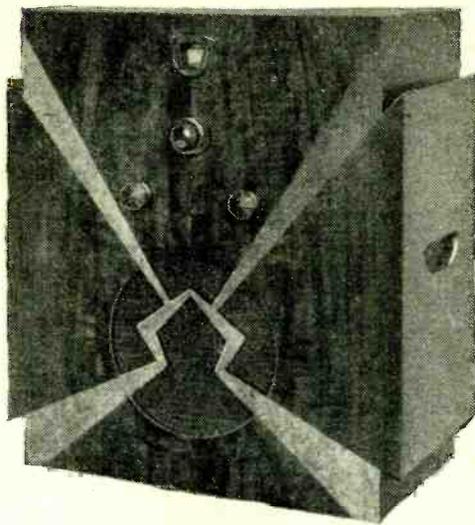
Self-contained sets at extremely low prices are exhibited here. As an example, there is a five-valve portable at £5 19s. 6d., and a three-valve H.F.-det.-L.F. battery set, complete with a moving-coil loud speaker, at 10 guineas. Ganged tuning is included.

Burgoyne Wireless (1930), Ltd., 34a, York Road, King's Cross, N.1.

BURNDEPT. (46)

The Wandering Minstrel Band-Pass Three is shown on this stand. The specification includes a variable- μ H.F. valve, detector, and pentode output stage. A spot light tuning system is fitted, and a universal mains transformer for voltages between 100 volts and 250 volts. The price is £16 19s. 6d.

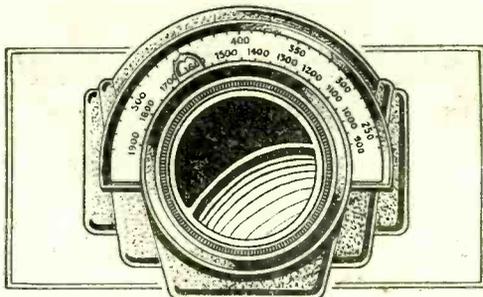
The Merryvox cone loud speaker at £1 in a walnut cabinet should not be overlooked,



Burgoyne three-valve receiver.

nor the range of Merrymaker battery and mains sets.

A selection of the well-known Burndept components is shown, and includes H.F. chokes, variable condensers, and the Etho-



Burndept Ethovernier dial.

vernier dial. This last is now available in a flush-mounting form with a considerably improved appearance.

Burndept, Ltd., 51-53, Church Street, S.E.10.

BURTON. (1)

The new S.G.P. all-electric three-valve receiver incorporates an all-metal chassis designed on thoroughly up-to-date lines. An inductively coupled band-pass tuner precedes the screen-grid H.F. amplifier, which



Burton S.G.P. radio-gramophone.

is tuned-grid coupled to a power-grid detector followed by a power pentode feeding a B.T.H. loud speaker of the energised type. The volume control combines reaction with pre-H.F. volume control, and there is provision for a pick-up as well as a mains aerial. In the standard table cabinet the price is 16 guineas, and a bureau console model is available at 19 guineas. The cabinet of the latter model is similar in design to the S.G.P. radio-gramophone, but a sloping desk, complete with inkwells, takes the place of the motor board. The desk is easily detached should the purchaser desire later to convert to a radio-gram.

The S.G.P. radio-gram, which is priced at 26 guineas, is housed in a well-proportioned cabinet, and has side compartments for records. It is fitted with a 2½-watt output valve and B.T.H. pick-up and motor.

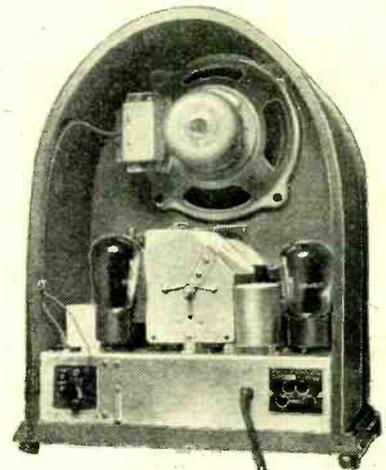
To the existing comprehensive range of Burton components has been added a new super-type rotary switch at 6s. This is a four-position switch capable of switching three coils for long and short waves, changing from radio to gramophone, and is fitted with a toggle make-and-break switch designed for mains voltages.

Other items justifying a visit to this stand include a new valveholder at the remarkably low price of 4½d., a new trickle charger, and a universal cone chassis.

C. F. and H. Burton, Bernard Street, Walsall.

BUSH RADIO. (110)

On this stand a single set, priced at 17 guineas, is on view. It is an A.C.-driven three-valve set with a band-pass input, one



Bush Radio three-valve set.

H.F. stage, and a screen-grid detector resistance-coupled to a pentode giving 3 watts output to the moving-coil speaker. A choke-filter output is used, the speaker-field serving as smoothing choke. Volume control is obtained by variation of screen volts.

Bush Radio, Ltd., Film House, Wardour Street, W.1.

C.A.C. (249)

The C.A.C. low-frequency coupler, an arrangement of linked wire-wound resistance coils, is used in the ambitious radio-gramophone kit set which is sponsored by this firm. A two-unit system of construction is adopted, the power supply components being separately mounted.

Konductite, which is aluminium-coated paper with many applications for screening purposes, is also shown, together with power transformers and heavy-duty L.F. chokes.

City Accumulator Co., 7, Angel Court, Strand, W.C.2.

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C.A.V. (246)

Many of the C.A.V. low-tension batteries have been redesigned or improved in detail. For instance, the glass-cased cells are fitted with moulded lids, irreversible terminals,

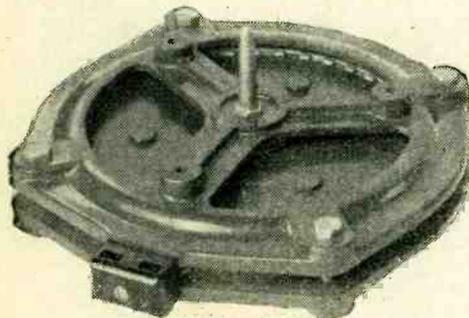
C.A.V. dry battery and the new mass cell with writing panel.



and gravity indicators. One side of the container has a sand-blasted panel, on which the name of the owner and dates of charging may be written. This latter feature is also embodied in the mass-type slow-discharge cells.

Dry high-tension batteries, in standard and triple capacities and the usual voltages, have just been introduced. Jelly-electrolyte cells for almost every type of portable form a prominent exhibit.

The well-known M.L. converters, for the supply of H.T. from L.T. accumulators, are also exhibited; new models, designed for easy connection to many well-known short-wave sets, should do much to solve the H.T. supply problem for overseas listeners. Mains



M.L. synchronous gramophone motor.

transformers have just been introduced by the M.L. firm, which also makes bakelite mouldings for the radio trade.

C. A. Vandervell, Ltd., Well Street, Birmingham.

CAMCO. (123)

The cabinets displayed on this stand are notable on account of their excellent finish and reasonable price. The models available are too numerous to describe individually, but the "Melodee" loud speaker No. 2 cabinet merits special mention, as it has been endorsed by a leading manufacturer for use with their dual-unit moving-coil loud speakers.

The "Empire" cabinet used in the "Wireless World" Baby Super is on view, and there is a beautifully grained "Grosvenor" pedestal cabinet constructed entirely of Empire-grown wood.

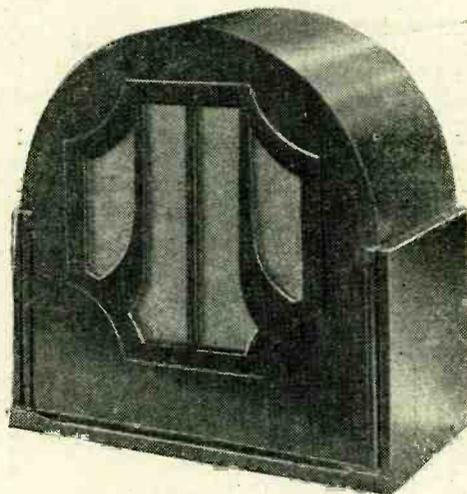
Carrington Manufacturing Co., Ltd., 24, Hatton Garden, E.C.1.

CELESTION. (127)

The special feature of the Celestion exhibit this year is the PPM range of small permanent-magnet moving-coil loud speakers.

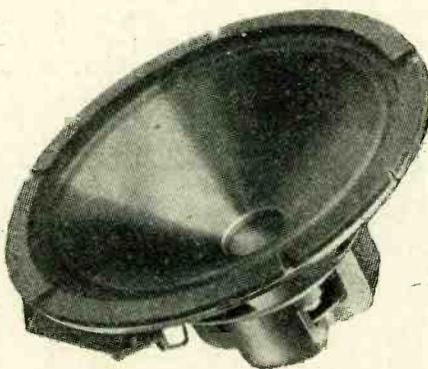
First introduced by the PPM (Standard) model, the range has been extended and now affords a wide choice either in the form of chassis or as cabinet models. The cabinet design has been given careful attention so that good acoustic properties are combined with a handsome appearance.

The special "Hyflex" moulded diaphragm is fitted to the new models, of which the PPM Soundex is the smallest. Mounted in a well-made walnut cabinet it costs but 50s. The PPMo chassis is an intermediate size measuring 8 1/2 in. in diameter overall. In common with each other model in the range it embodies a universal-type tapped input transformer providing a suitable ratio for all valves in common use to-day, and the price is 35s.



Celestion cabinet permanent-magnet loud speaker, the PPM59 model.

The same general form of construction and all the attributes of the PPM type are found in the new series of energised models. The D.C. Soundex is an inexpensive chassis, for its price is 30s. only, which includes the input transformer. It is obtainable as stock type fitted with field windings of 2,500 ohms, 4,700 ohms, or 6,600 ohms, and an adequate flux density can be obtained with a 4-watt dissipation, the normal working range being between 4 and 8 watts.



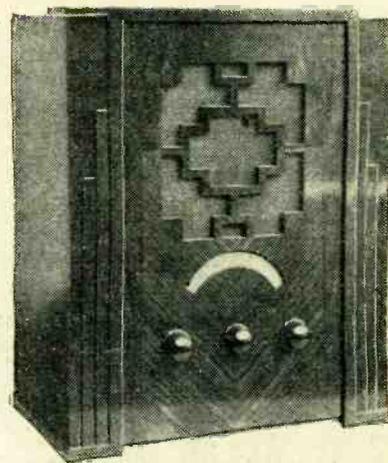
Celestion PPM29 chassis embodying new "Hyflex" diaphragm.

The D.C.8 is a larger model, and its price is 35s. in chassis form.

Celestion, Ltd., London Road, Kingston-on-Thames.

CELLGRAVE. (290)

The chief exhibit on this stand is the Excalibur Three receiver, manufactured by Walker, Fuller, and Ellis; it is a battery set with detector and two low-frequency stages. Automatic grid bias is arranged, and the price of the set, includ-



Cellgrave self-contained receiver.

ing built-in permanent magnetic moving-coil speaker, is 10 guineas.

Cellgrave Co., 6-8, Kent House Lane, S.E.26.

CHAKOPHONE. (38)

A two-valve A.C. set at 9 guineas is one of the most prominent exhibits of this firm; a triode output valve is fitted with a metal rectifier for the H.T. supply. Another set, the Selective Two, includes a pentode output valve and a moving-coil speaker, and is available for either A.C. or D.C. mains at 13 guineas.



The Chakophone Junior A.C. Two.

Two- and three-valve battery sets and a complete range of moving-coil loud speakers will also be found on this stand.

Eagle Engineering Co., Ltd., Eagle Works, Warwick.

CIFEL PRODUCTS. (285)

This stand shows a two-valve set, either for A.C. or D.C. mains, intended to provide high-quality reproduction from the local station. In each set a pentode output valve feeds a moving-coil speaker, an indirectly heated D.C. pentode being used for the D.C. version.

A band-pass three-valve set for A.C. mains only is also shown.

Cifel Products, Ltd., 134, Pentonville Road, N.1.

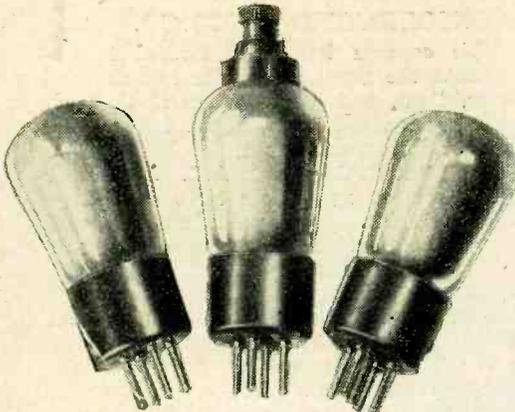
CLARION RADIO VALVE CO. (120)

The new series of British-made Clarion valves include battery, indirectly heated A.C., and D.C. mains types, as well as screen grid H.F. amplifiers. As an example, the P.X.2 two-volt output valve, with a 2-volt filament consuming 0.2 amp., has an A.C. resistance of 1,850 ohms and a con-

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ductance of 1.5. Prices are lower than those usually ruling, this particular valve costing 8s. 6d.

Clarion Radio Valve Co., 7, Duke Street, Adelphi, W.C.2.

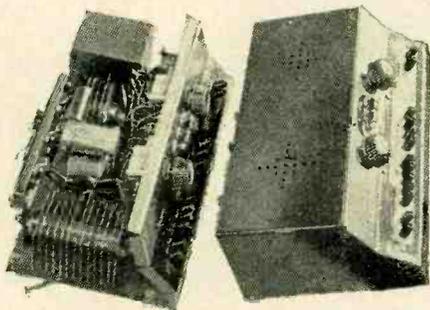


Representative Clarion valves.

CLARKE'S ATLAS. (91)

A new venture on the part of this firm, hitherto best known for their mains equipment, is the introduction of self-contained two-valve sets for A.C., D.C., or battery feed. These det.-L.F. receivers are fitted with the new Atlas moving-coil loud speakers, the permanent-magnet model being used, of course, in the battery-fed set. The loud speakers, which are available in chassis or cabinet form, have a two-claw permanent magnet.

Many of the eliminator units are retained, but one of the most popular models of last season has been redesigned; now known as Type A.C.300, it includes the valuable—and, we believe, exclusive—feature of a limiting resistance, arranged to prevent that sometimes dangerous rise of voltage which normally occurs when an eliminator is connected to a set which imposes an abnormally light load. Tappings on this resistance are led out to a number of sockets, marked to correspond with various output currents; all the user has to do is to estimate roughly the total anode con-



Clarke's Atlas new A.C. eliminator, with and without cover.

sumption of his set, and then to insert a plug in the appropriate socket.

The maximum output of the A.C.300 unit is 25 mA. at 150 volts; it includes a Westinghouse metal rectifier, a ½-amp. trickle charger, and grid bias tappings. There are two variable voltage outputs, and the price is £6 10s.

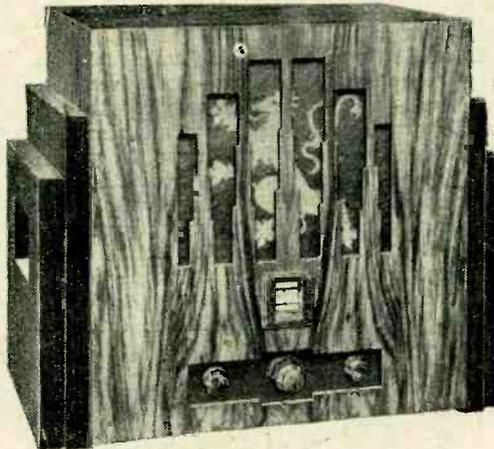
H. Clarke and Co. (M/C), Ltd., Eastnor Street, Old Trafford, Manchester.

CLIMAX. (81)

The Climax model A.C.3 is a complete radio-gramophone in miniature and oper-

ates entirely from the A.C. mains. It employs an H.F.-det.-L.F. circuit, a band-pass input filter, and a tuned grid H.F. coupling. Following a power grid detector is an L.F. transformer, and finally a pentode output valve. Other items of the equipment include a Collaro electric gramophone motor, an energised moving-coil loud speaker, and a special felt-lined lid to eliminate mechanical noises emanating from the pick-up. The A.C.3 is contained in a well-made cabinet finished in figured walnut, and the price is 24 guineas, including valves and royalties.

There is a companion model in which the gramophone side has been omitted, but otherwise it embodies all the features of



Climax "Balanced" Band-Pass Three receiver.

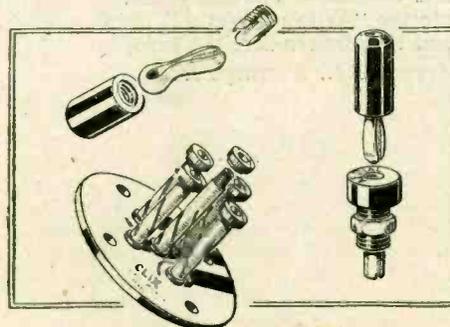
the A.C.3. This is known as the "Balanced" Band-Pass Three and costs 16 guineas.

Climax Radio Electric, Ltd., Haverstock Works, Parkhill Road, Hampstead, N.W.3.

CLIX. (225)

That a loose wire could be connected to a fixed point in so many different ways would be inconceivable were it not for the variety of plugs, sockets, terminals, and connectors included in the Clix range. The "Master" plug is one of the newest models, and is designed to make a perfect contact when inserted in the sockets of any make of dry battery. There are two models available, but the price is the same in both cases, namely, 1½d., which includes engraving.

The Clix chassis mounting valve holder is now available fitted with small terminals on the ends of the socket. The form of



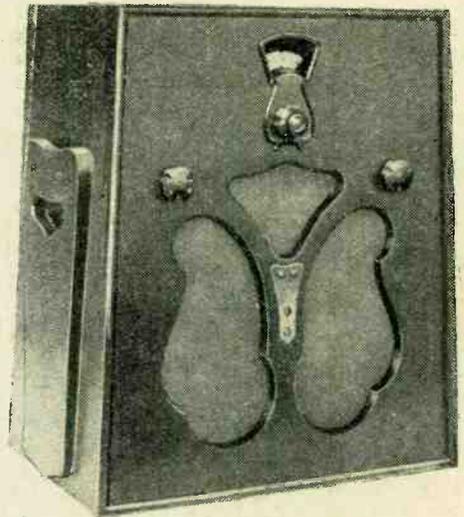
Some Clix specialties.

construction is the same as in the earlier models, and a five-pin type costs 9d.

Lectro Linx, Ltd., 254, Vauxhall Bridge Road, S.W.1.

COLUMBIA. (86)

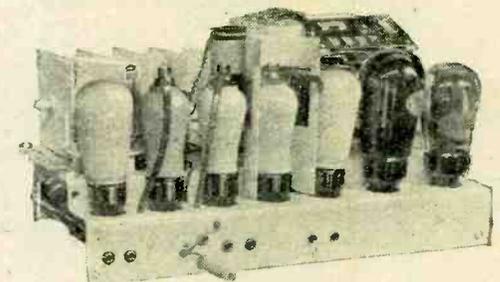
The Columbia range of receivers and radio-gramophones has been extended considerably this year, and now there are no



Self-contained three-valve battery receiver the Columbia Model 354.

fewer than nine different receivers at prices from £4 7s. 6d. to 24 guineas, and six radio-gramophones ranging in price from 28 to 90 guineas. The least expensive of the sets is a two-valve self-contained battery model, which has been carried forward from last season at a reduced price. A new addition to this class is the Model 354. It employs a three-valve circuit—H.F.-Det.-L.F.—and includes an inductively coupled band-pass input filter. Complete with speaker and batteries, the price is £9 17s. 6d.

Passing over the intermediate models we find at the other end of the scale a seven-valve, including rectifier, A.C. superheterodyne receiver, described as the Model 356. The circuit consists of a band-pass input filter, a predetector H.F. amplifier, oscillator, a screen-grid first detector, one I.F. amplifier employing band-pass tuning, and a



Columbia seven-valve A.C. superheterodyne chassis.

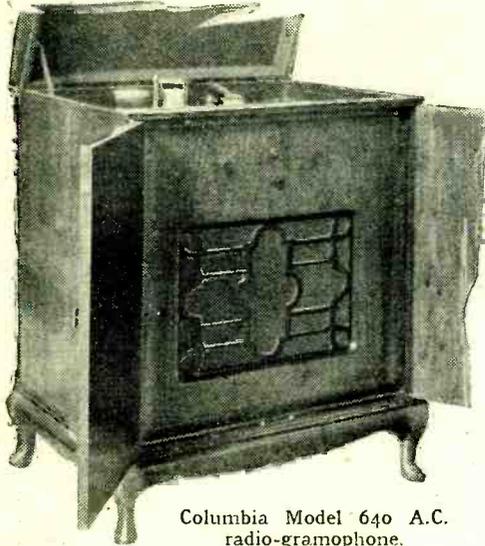
second detector transformer coupled to a PX4 output valve. Included is an energised moving-coil loud speaker, and the scale is calibrated in wavelengths; separate scales are brought into view by the wave-change switch for each range.

This chassis is built into the model 631 radio-gramophone, the additional equipment consisting of an electric gramophone motor and an automatic record changer holding eight 10in. or 12in. records. In this case the chassis is mounted on end with the tuning control and illuminated scale in the gramophone compartment. Provision is made for the use of an external loud speaker, and the price is 52 guineas.

The Model 640 is the highest-priced instrument in the Columbia range, yet, con-

Olympia 1932.

Considering its specification, it represents very good value, even at 90 guineas. The circuit consists of a band-pass input filter, a pre-detector H.F. amplifier, oscillator, screen-grid first detector, two band-pass coupled L.F. amplifiers, anode bend second detector, and two L.F. stages. The output is provided by two P.X.4 valves working in push-pull. Other items in the equipment



Columbia Model 640 A.C. radio-gramophone.

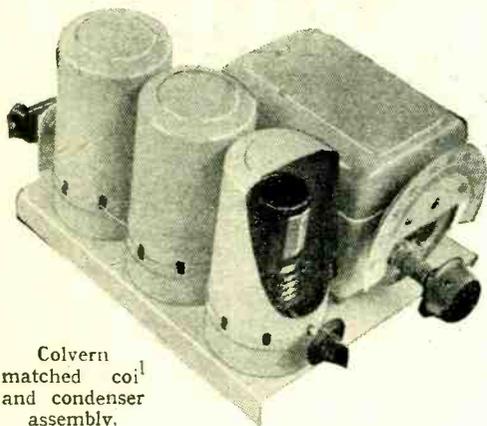
consist of an automatic record changer playing eight 10in. or 12in. records, moving-coil loud speaker, and an electric motor. There is ample power to operate four extra loud speakers if required.

Mention must be made here of the excellence of the Columbia cabinet work.

Columbia Graphophone Co., Ltd., 92, Clerkenwell Road, E.C.1.

COLVERN. (245)

There are a number of new additions to the well-known range of Colvern tuning coils. Special interest attaches to the improved intermediate-frequency amplifier coils for superheterodyne receivers. The Colverdine DO.110 belonging to this type is an important new component to follow a combined detector oscillator, and type K.63 is a new oscillator coil for use in the

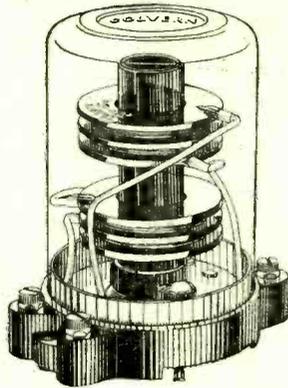


Colvern matched coil and condenser assembly.

construction of a single-dial superhet.; the inductance on the two wavebands is 126.9 and 1,056 microhenrys when screened. The Link band-pass filter, with slight modification, is retained for the coming season. The properties of this component are now well known and provide a means of maintaining practically constant selectivity and sensitivity over the waveband by the judicious use of common capacity and negative mutual inductance coupling.

In the comprehensive range of tuning coils available there are H.F. transformers, tuned-grid inductances, and various band-pass filters, all of which are totally screened and incorporate waveband switching within the base, so that the ganging of a number of members is easily achieved. It is interesting to note that the inductance of these coils when screened has been standardised at 157 and 2,190 microhenrys for the medium and long waves respectively. No keen student of superheterodyne technique can fail to be deeply interested in the well-explained treatise on single-control tuning of the superheterodyne as given in the new Colvern pamphlet. A fund of information is given as an appendix showing the mathematics involved in calculating the constants of the oscillator circuit so as to obtain the minimum ganging error on both wave ranges.

In addition to coils, this firm specialises in wire-wound resistances—both variable and fixed—known as Colverstats. In the variable potentiometer series all standard values are available from 1,000 to 50,000 ohms in the 10-watt rating, while there is a miniature model measuring only 1½in. in diameter rated at 3 watts, having resistance values from 25 to 25,000 ohms. The wire-wound strip resistances made in 23 different values between 10 and 50,000 ohms are made of uniform length, are rated to



Colverdine band-pass intermediate coil (Colvern).

dissipate 5 watts, and can be assembled side by side in the form of a pack, for which purpose special mounting collets are fitted.

A ganged triple condenser assembly, together with three coils, is being shown for the first time in which the balancing of capacity and inductance has been so carefully carried out that constructors can rest assured of simultaneous resonance in the three circuits when the unit is incorporated in a receiver.

Amateurs will find a large number of constructional sets containing Colvern components assembled on this stand. These include the "Wireless World" Baby Superhet and the Modern Straight Five.

Colvern, Ltd., Mawneys Road, Romford, Essex.

CONCORDIA. (208)

In addition to standard instrument wires and flexible cables, etc., this firm are showing a number of special conductors for radio purposes. One of the most interesting innovations is "Slip Quik" connecting wire for internal wiring; the insulation consists of double cotton, rubber, and braiding, the whole being paraffined and arranged so that sufficient of the covering may be slipped back from the end to expose the conductor with a minimum of effort. The perfect internal connecting wire has yet to be devised, but this appears to be a notable advance.

Other important products are Reception stranded and insulated weatherproof aerial wire, screened pick-up leads, and screened sleeving for H.F. work.

Concordia Electric Wire Co., Ltd., New Swaley, near Nottingham.

CONSOLIDATED RADIO CO. (34)

This concern has been formed to coordinate the resources of the former Rees Mace, Cam, and Rolls-Caydon Companies, and a series of self-contained attractive table-model receivers are shown.

The "Rolls-Caydon" A.C. and D.C. Three sets at 15 guineas have an S.G.—power grid det.—power pentode circuit, and cost 15 guineas. The same chassis is used in the "Rees Mace" table radio-gram. at 24 guineas, which, in spite of its compact design, plays 12-inch records with the lid closed.

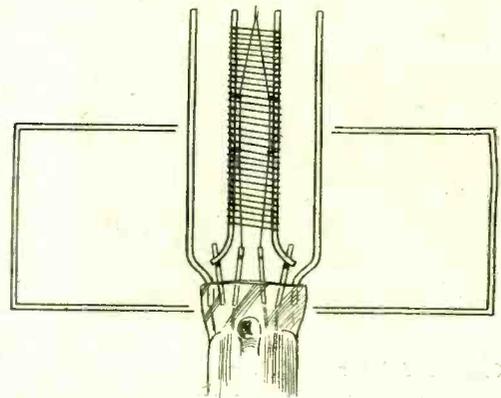
The "Cam" five-valve superhet., a battery-operated set including automatic grid bias, and the "Rolls-Caydon" S.G. Transportable Four, represent excellent value in view of their quality at 15 guineas and 12 guineas respectively.

Consolidated Radio Co., Ltd., 75, Kilburn Lane, W.19.

COSSOR. (60)

The well-known range of valves has been considerably augmented, and the electrode assemblies of all types have been strengthened, with the result that microphonic noise is now almost non-existent. Last season saw the demand for heavy-duty pentodes with directly heated filaments, and to meet this two valves of this type have now made their appearance. There is the P.T.41B, rated for 400 volts on the anode and 300 volts on the screen. The mutual conductance is 2.25 mA/volt. The second valve, styled P.T.41, has a higher mutual conductance of 3.0, and is rated for 250 volts on the anode and 200 on the screen.

To the battery range has been added the 220H.P.T., a highly sensitive pentode which will give a remarkable output when the anode current is as low as 2.8 mA. The variable-mu screen-grid valves for battery



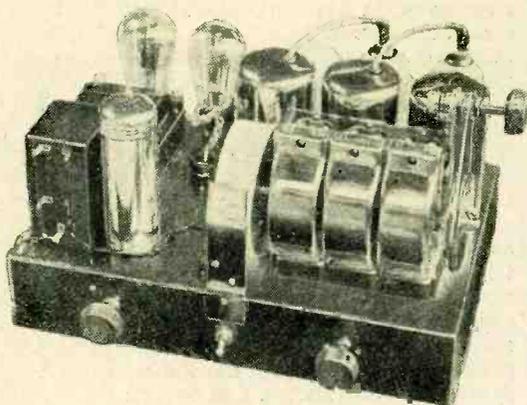
Electrodes of the Cossor 210H.F. valve. Note the 7-point suspension.

and mains operation should be examined with interest as this type of valve is fast superseding the ordinary screen-grid valve. Its properties are such that an ideal volume control can be arranged without in any way upsetting the ganging of a receiver, and the dangers of rectification in the H.F. amplifier are avoided.

Among the sets exhibited, the 533A is an interesting model with two variable-mu stages. The aerial, although linked by a single tuned circuit, is so loosely coupled

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that adequate selectivity is obtained. The layout is exceptionally clean, and the metal chassis is of massive construction. The well-known Cossor Melody Maker (models



Cossor 553A chassis.

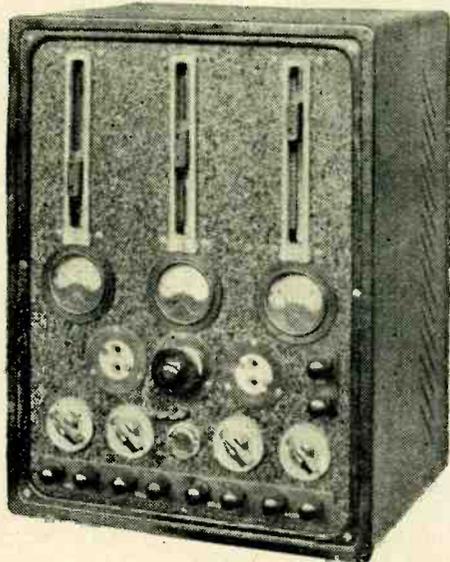
334 and 335), selling at £6 7s. 6d. and £7 17s. 6d. respectively, have been considerably improved since last year, and are now built on a new all-metal chassis and variable-mu valves are incorporated, which ensure an even better degree of selectivity.

There are two interesting cathode ray demonstrations on this stand, one of which enables visitors to see the waveform of their voices, while the other shows the characteristics, both static and dynamic, of any valve, arrangements being made to demonstrate the effect of a change in load.

A. C. Cossor, Ltd., Cossor House, Highbury Grove, N.5.

CRYPTO. (111)

This firm specialises in the production of battery-chargers of all types for A.C. mains,



Three circuit Crypto battery-charger using valve rectification.

both series charging and the constant potential system being allowed for. Valve-chargers range in price from £6 15s. to £22, while a constant potential charging equipment using a rotating commutator rectifier and giving an output up to 50 amperes at 8 volts can be had for £34.

Lancashire Dynamo and Crypto, Ltd., 94, Petty France, S.W.1.

CYLDON. (158)

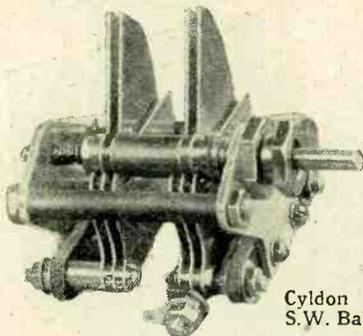
The well-known Cyldon variable condensers are displayed on this stand, and the range has been extended by the addition of a special model for the 5-metre waveband.

This is of the series gap type with two sets of fixed and moving plates, and the connections are made only to the fixed plates. The difficulty of making a good non-inductive contact to a rotating element is thus avoided by using what are virtually two condensers in series. The minimum capacity is 3 mfd., and the maximum 25 mfd., and the price is 8s. 6d.

An intermediate frequency transformer resonating at 110 kc. has been introduced, and it is provided with external adjustments. It is listed at 9s. 6d.

A large portion of the stand is devoted to special apparatus, among which is an oil-immersed variable condenser of the type used on the Polar Expedition; it is rated for working at 5,000 volts R.M.S.

Sydney S. Bird and Sons, Ltd., Sarnesfield Road, Enfield, Middlesex.



Cyldon 5-metre S.W. Babe series-gap condenser.

DAGENITE. (244)

This exhibit consists of high-tension and low-tension accumulators. There are two distinct types, one of which is fitted with a tell-tale device consisting of coloured floating hydrometer beads giving an indication of the stage of charge. There are three coloured balls operating in separate channels, and these rise or fall according to the specific gravity of the acid. A number of the portable L.T. batteries contain jellied acid, and a new feature in the mass type of battery is the lid, in which the usual method of fixing the pillar with a rubber washer and lead nut is obviated. With the new method it is claimed that acid leakage is impossible, and that the plates will not become twisted when the terminals are screwed or unscrewed.

National Accumulator Co., Ltd., 50, Grosvenor Gardens, S.W.1.

DANIPAD. (113)

Although the business of this firm is mainly connected with ebonite, a number of complete receivers are also exhibited. These range from a simple two-valve self-contained mains set, with a moving-coil loud speaker, to a five-valve model with band-pass tuning.

There is also a comprehensive show of components and accessories.

Danipad Rubber Co., Ltd., 5-7, Market Street, Finsbury, E.C.2.

DARWINS. (70)

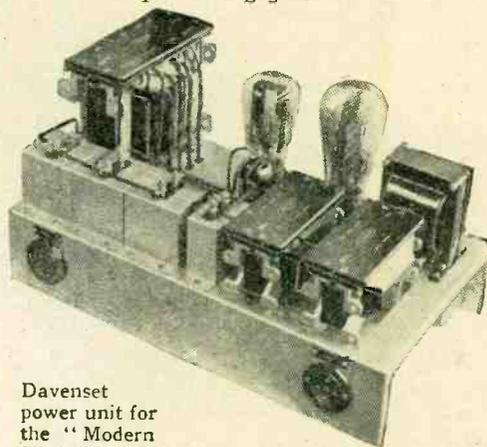
Permanent magnets of every type are shown on this stand, and prominence is given to examples of the latest form of "two-claw" construction.

Darwins, Ltd., Fitzwilliam Works, Sheffield.

DAVENSET. (159)

One of the most prominent exhibits on this stand is a range of mains transformers and smoothing chokes for which special efficiency is claimed. They are characterised by a particularly neat appearance with concealed and protected terminals.

The power unit of the "Wireless World" Modern Straight Five, built with Davenset mains components on a steel chassis, is on view; it is priced at £15.



Davenset power unit for the "Modern Straight Five."

A large portion of this stand is occupied by a display of battery chargers ranging from small models for charging car accumulators to large equipment for accumulator charging stations.

Partridge, Wilson, and Co., Davenset Works, Evington Valley Road, Leicester.

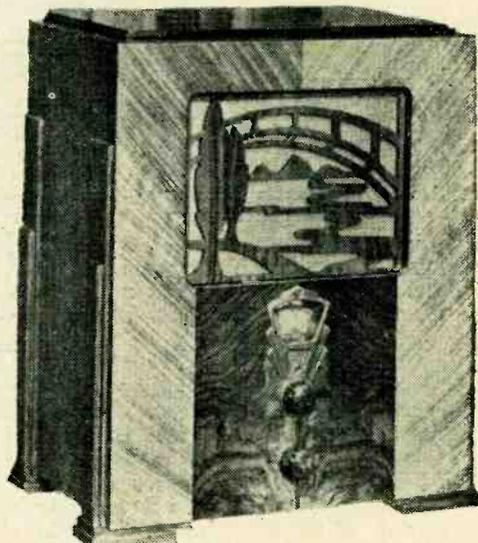
DE LA RUE. (227)

This stand is devoted to a comprehensive display of bakelite mouldings primarily of interest to manufacturers.

Thos. De La Rue and Co., Ltd., 90, Shernhall Street, E.17.

DIBBEN. (77)

Two receivers, the "Cromwell" and the "Monarch," form the chief exhibits of this firm. Of these receivers, the former uses two variable-mu stages of amplification, followed by a screen-grid valve arranged as an anode-bend detector, this being resistance-coupled to a PM24M output pentode. There are three tuned circuits in all. There is only one knob in addition to that con-



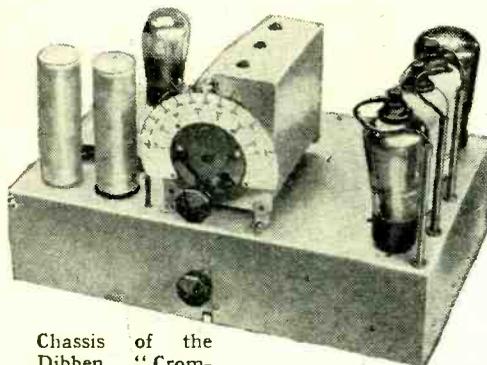
The "Cromwell" four-valve all-mains set made by Dibben & Sons.

trolling the tuning; it is a combined on-off switch and volume control, the knob also switching over to long waves when pulled out. As a radio-gramophone, in which the motor and pick-up are housed in a drawer below the set at a height convenient for access when sitting down, the price is 26 guineas, the set alone costing 18 guineas.

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In addition the "Monarch" three-valve set is available either for battery or mains operation.

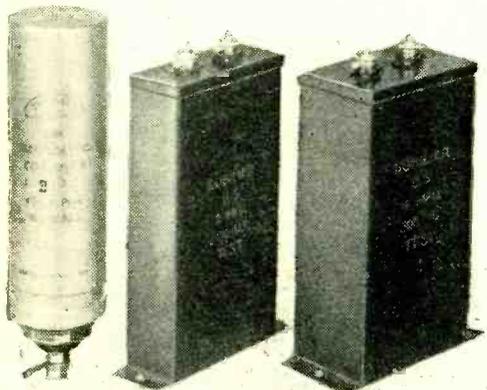
Wm. Dibben and Sons, Ltd., Antelope Buildings, St. Mary's Road, Southampton.



Chassis of the Dibben "Cromwell" receiver.

DUBILIER. (84)

The high-voltage dry electrolytic condensers which hitherto were reserved for manufacturers' use are now available to the home constructor in 4-, 6-, and 8-mfd. sizes. The prices are most reasonable, being 4s. 6d., 5s., and 5s. 6d. respectively. These models are rated at 450 volts D.C. working and are suitable for use in D.C. circuits only. The well-known 610 and 620 types now include a new series ranging from 0.0001 mfd. to 0.0005 mfd. fitted with grid leak clips, while other modifications to existing models take the form of an increase



Dubilier dry electrolytic and new style B.S. condensers.

in the voltage at which they are tested. Since the working potential has not been changed, these condensers show a higher safety factor than formerly.

A slight change has been effected in the construction of the L.S.A. type, and these are now mounted in tall boxes. They are tested at 1,000 volts D.C., and the sizes range from 0.5 mfd. to 10 mfd. Rated at 400 volts D.C. working, a 4-mfd. size costs 8s. A new addition is a 500-volt working condenser styled the Type L.E.C. Made in five different capacities and tested at 1,250 volts D.C., the price is 12s. 6d. for 4 mfd.

A wire-wound resistance known as the "Spirohm," and rated at 10 watts, is another new Dubilier product. The values range from 200 ohms to 50,000 ohms, and the price is 2s. for 1,000-ohm size and 5s. for one of 50,000 ohms.

Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, N. Acton, W.3.

DULCETTO-POLYPHON. (235)

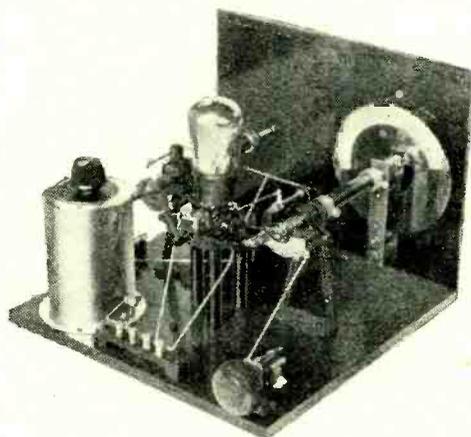
This is now primarily a wholesale business, but the Dulcetto "Double-bank" portable amplifier for public address work is a product exclusive to this firm.

Dulcetto-Polyphon, Ltd., 2-3, Newman Street, W.1.

EDDYSTONE. (23)

Short waves are the keynote of this exhibit, which includes a new range of coils for 13.5/550 metres. An ultra short-wave choke for the 5/10 metres range is priced at 1s. 6d., and a series of substantially built variable condensers with maximum capacities ranging from 15 mmfd. to 100 mmfd. are listed from 4s. 6d. upwards.

A 7-metre superheterodyne converter is shown, and the kit of parts is priced at



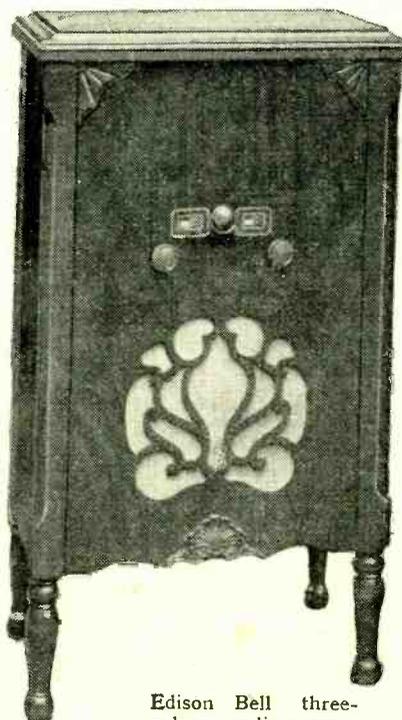
Eddystone 7-metre superheterodyne converter.

£2 11s.; only a single valve is used. The All Wave Four has a range of 12/2,000 metres, and is provided with automatic grid bias.

Stratton and Co., Ltd., Balmoral Works, Bromsgrove Street, Birmingham.

EDISON BELL. (27)

The 1933 receiver programme of this firm is unusually comprehensive, and covers a wide range of types. There is a five-valve



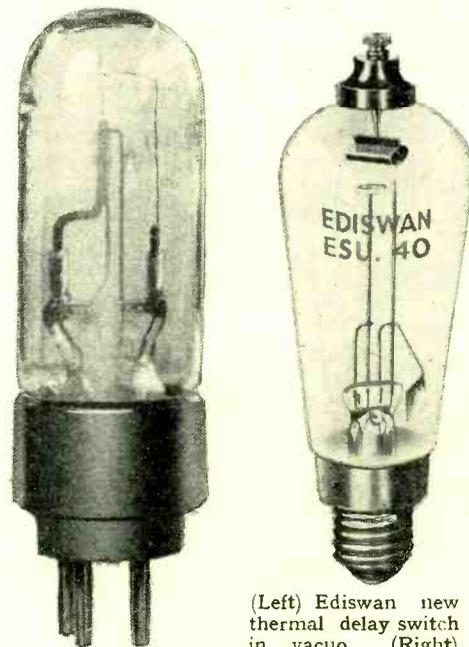
Edison Bell three-valve radio-gramophone.

superheterodyne in which it is claimed that second channel interference has been completely eliminated. One H.F. stage at fundamental frequency is embodied, and a single-valve frequency changer consisting of a screen-grid valve follows. This set in the form of a chassis is built into various ambitious cabinets. A radio-gramophone having a straight circuit with three valves is also being shown. In it there is band-pass tuning followed by a variable-mu amplifier with bias volume control, and this is coupled by the parallel-fed method. A particularly ingenious tuning control is used, consisting of two concentric discs, one for short and the other for long waves, and there are two windows, each exposing a different waveband. By this means the reading of the dials, which are calibrated to show fifty stations, is made simple. An inexpensive permanent magnetic moving-coil loud speaker is being shown, and sells at 50s.

Edison Bell, Ltd., Glengall Road, S.E.15.

EDISWAN. (75 & 230)

Of the various exhibits on this stand the amateur will probably find the range of Mazda valves the most interesting. New additions include four variable-mu valves, one for battery sets, two for A.C. mains, and one for D.C. mains. The last mentioned, designated the DC/2SG.VM, is indirectly heated, and passes 0.1 amp. at 20 volts; its slope is 2.2. Other new valves include two



(Left) Edison new thermal delay switch in vacuo. (Right) Hot cathode mercury vapour rectifier.

D.C. series, one in which the heaters consume 0.5 amp. at 6 or 8 volts and the other where the consumption is 0.1 amp. at 20 to 35 volts. In the directly heated output class there is a newcomer called the PP3/250, the filament of which consumes 1 amp. at 4 volts. The slope is 6.5, and the maximum watts dissipation 12.

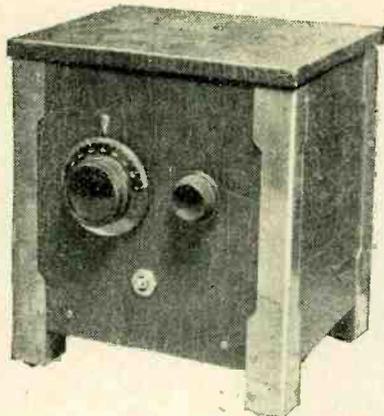
An important new component is a thermal delay switch in which the bi-metal strip is mounted in vacuo, and is thus not affected by outside atmospheric conditions. The small model handling up to 200 mA. will probably be sold at 7s. 6d. There will be a second model handling up to 5 amperes. The use of hot cathode mercury vapour rectifiers in heavy power amplifier equipment is becoming more important, and therefore the range of these accessories being shown should prove of interest.

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There are a number of R.K. speakers exhibited, including the Senior model with both energised and permanent-magnet fields. The minor R.K. speaker is now marketed in a fumed oak or walnut cabinet complete with multi-ratio transformer.

Of the B.T.-H. pick-ups mention should be made of the "Minor" with embodied volume control which gives an output of ½ volt at about 1,000 cycles. There is a large range of Edison dry cell H.T. batteries of a new type being shown.

Edison Swan Electric Co., Ltd., 123-125, Queen Victoria Street, E.C.4.



The "Ealex" short-wave converter.

EELEX. (239)

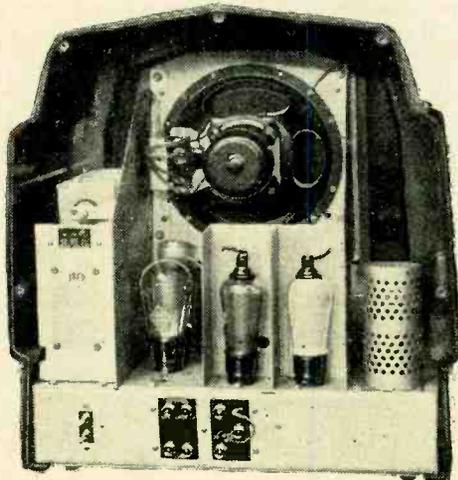
An interesting feature of this stand is the short-wave converter, available both for battery and A.C. mains drive. The single valve operates as an autodyne frequency-changer, the receiver to which it is attached being used as intermediate amplifier of a superheterodyne. In the two-valve model the autodyne valve is preceded by a stage of amplification at the received frequency. Prices range from £3 to £5 17s. 6d., complete with valves.

The exhibit, apart from the wholesale section, is completed by a centre-tapped dual-range frame aerial, spring-loaded testing prods, and an infinity of sockets, plugs, and terminals. The latter are now available in a pattern with interchangeable name-plates.

J. J. Eastick and Sons, 118, Bunhill Row, E.C.1.

EKCO. (25 & 65)

The new five-valve superheterodyne is one of the chief exhibits on this stand, and it is available for either A.C. or D.C. mains. A two-valve frequency changer with a single variable-mu I.F. stage is used. An I.F.



The Ekco S.H.25 superheterodyne.

rejector circuit is connected in the aerial lead, and a special point is made of a novel method of eliminating second-channel interference. The usual band-pass pre-selector is used, but a small condenser is connected between the aerial and the grid of the first valve to form, in conjunction with other circuits, a rejector at the second-channel frequency. A heterodyne whistle filter is fitted and a "local-distance" switch, and the model S.H.25 is priced at 24 guineas.

A three-valve set at 17 guineas, the Console M23, is shown; two tuned circuits are employed, and the valves are arranged as S.G. H.F. stage, detector, and pentode output. A moving-coil loud speaker is fitted as a matter of course.

A wide range of mains units is on view, and it is claimed that most models are suitable for fitting to portable receivers.

E. K. Cole, Ltd., Ekco Works, Southend-on-Sea.

ELDECO. (47)

Superheterodynes are prominent on this stand, and the model S.H.6 portable has six valves with two stages of I.F. amplification and triode output to the built-in loud speaker. Band-pass I.F. circuits are fitted, and are adjusted to have a pass-band of 9,000 cycles. The price is 21 guineas. An all-mains superheterodyne is also being exhibited, and in this variable-mu valves are fitted, and the pentode output valve feeds a moving-coil loud speaker.

Multitone, Ltd., are showing on this stand the Multitone tone-correction transformer, with which it is possible to obtain almost any desired type of response curve. The adjustment of a single potentiometer allows of characteristics rising from low frequencies to the very high frequencies, a flat curve, or a considerable attenuation of the upper frequencies to be obtained. An ingenious arrangement of a cinematograph on the stand shows the resonance curve obtained with any particular setting of the tone control.

Electrical Devices Co., 62, Conduit Street, W.1.

ELECTRICAL & GENERAL DISTRIBUTORS. (278a)

The policy of this firm, as distributors, is to concentrate on a few outstanding products, and the receivers and components represented on this stand include Hart-Collins radio-gramophones and receivers, H.S.P. portables, Tekade "Motor" loud speakers, and Everett Edgcombe synchronous clocks.

Electrical and General Distributors, Ltd., 154, King's Cross Road, W.C.1.

ELECTRICAL & RADIO PRODUCTS (33)

The "Mayfair" 7-valve superhet. radio-gramophone is the star set in the E.R.P. range. Variable-mu valves are used in the pre-detector H.F. and I.F. stages, and the price is 36 guineas.

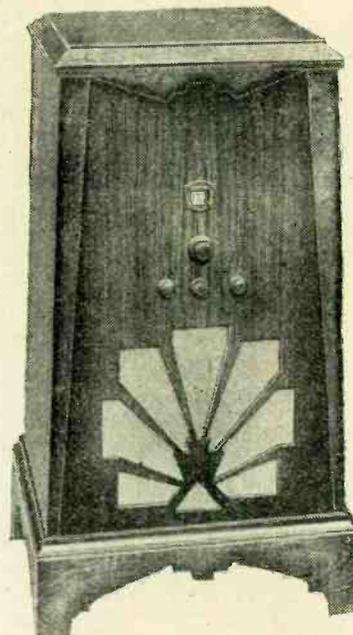
The "Gainsborough" models are four-valve receivers with two variable-mu H.F. stages, a screen-grid detector and a triode power valve. The table model costs 18 guineas, and in console radio-gramophone form the price is 30 guineas.

A three-valve S.G.-det.-pentode set—the "Marlborough"—is made for both D.C. and A.C. mains and costs 14 guineas, while the price of the "Clarendon" detector-pentode set for both types of supply is 10 guineas.

All the above are fitted with energised moving-coil loud speakers.

The "Claremont" S.G. battery trans-portable, with balanced-armature speaker, costs 10 guineas, and the "Belgrave" portable is to be continued at 9 guineas.

Electrical and Radio Products, Ltd., 90, Regent Street, W.1.



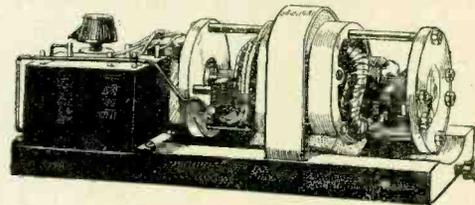
Hart-Collins "Passport IV" radio-gram. (Elec. & Gen. Distributors.)

ELECTRO-DYNAMIC CONSTRUCTION CO. (157)

The exceptionally good balance and silent running of the rotary converters produced by this firm is demonstrated on this stand.

A new D.C. to A.C. converter for badly fluctuating supplies has been produced with a guaranteed fluctuation of not more than 5 per cent. A.C. output for D.C. input variations up to 35 per cent.

For those who wish to derive H.T. (150 volts) from their 2-volt L.T. supply, a new converter has been produced with the remarkably high efficiency of 49 per cent. in the 15 mA. model and 50 per cent. in the



Electro-Dynamic 2-volt H.T. converter.

30 mA. model. A special filter has been developed to prevent H.F. entering the L.T. circuit. The price complete is £8 10s.

Electro-Dynamic Construction Co., Ltd., Devonshire Grove, S.E.15.

ELECTRON. (48)

A special display of Superial aerial wire is made on this stand, together with a number of useful aerial accessories. A copper gauze earth plate is also shown, and with 25ft. of insulated wire is priced at 2s. 6d.

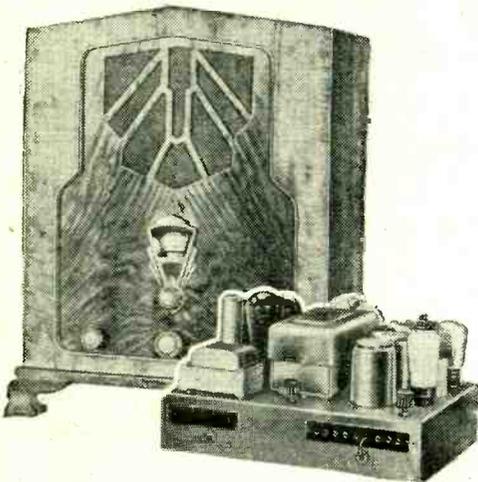
New London Electron Works, Ltd., East Ham, E.6.

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EPOCH. (41)

A special feature is being made of a new permanent-magnet moving-coil speaker which is priced at 27s. 6d.; this includes a 5-ratio transformer, and the instrument is stated to be capable of handling an input of 5 watts. A similar speaker of greater sensitivity is the 20th Century P.M., which sells at 35s. A range of energised speakers is also shown, and humbucking can be fitted to these at an extra charge; these types range from midget models to those intended for cinema work.

A three-valve set, the F.M.3, is shown, and includes a variable- μ H.F. stage with three tuned circuits, detector and pentode output stage. A tone control is included,



The Epoch three valve receiver.

and the general mechanical finish reaches a high standard.

Epoch Radio Manufacturing Co., Ltd., Exmouth House, Exmouth Street, E.C.1.

ERIE. (4)

Carbon resistor elements for the set manufacturer, marked in accordance with the R.M.A. colour code and ranging from 100 ohms to 4 megohms at rating of $\frac{1}{4}$ to 3 watts, are the speciality of this firm.

Erie Resistor, Ltd., Waterloo Road, Cricklewood, N.W.2.

EVER READY. (63)

Dry batteries for all wireless purposes are to be found on this stand, and a special feature is being made of H.T. batteries for the new portable-set types.

A complete range of accumulators is also displayed.

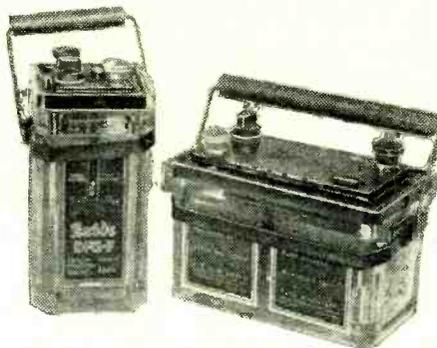
Ever Ready Co. (G.B.), Ltd., Hercules Place, Holloway, N.7.

EXIDE & DRYDEX. (61)

The popularity of the D series of L.T. accumulators of the mass type has been sufficiently well marked for the manufacturers to have increased the range. There is now a DXG 2-volt cell of the squat type having an ampere-hour capacity of 35 at the 100-hour rate, and, if discharged slowly, 58 ampere hours can be obtained. A feature of interest is a small identification plate on which the owner's name can be written. The cell is so shaped that it is extremely unlikely that it will ever be inadvertently upset.

On this stand there is every conceivable type of accumulator, as well as a range of Drydex dry-cell H.T. batteries; the latter are colour-coded as follows: Red Triangle for low-power receivers, Green Triangle for

slightly greater discharges, Orange Triangle representing triple capacity where the H.T. current is 10 mA. upwards, Brown Triangle—a new series—for discharges from 10 to



New Exide cells. (Left) Hydrometer bead pattern. (Right) D.X.G. type.

30 mA., Blue and Yellow Triangle for portable sets having a limited space for the H.T. battery.

Cells with coloured hydrometer beads showing the state of discharge are being shown for the first time.

Chloride Electrical Storage Co., Ltd., Clifton Junction, near Manchester.

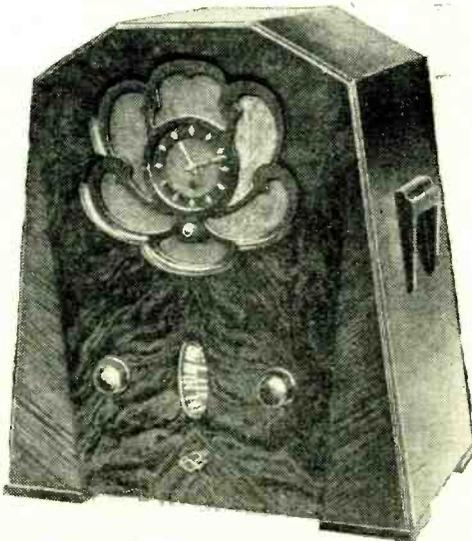
FAY HOME RECORDERS. (255)

Various types of home recorders are shown on this stand. The usual practice of employing aluminium alloy discs is adhered to, and one model is priced at 1 $\frac{1}{2}$ guineas. The No. 4 model, however, is electrically driven and includes a loud speaker; it is priced at 15 guineas.

Fay Home Recorders, Ltd., 121, Victoria Street, S.W.1.

FERRANTI. (78)

The most outstanding item on this stand is undoubtedly the new superheterodyne, the circuit of which incorporates a variable- μ H.F. stage followed by a screen-grid first detector and separate oscillator, one variable- μ I.F. stage working at 135 kilocycles, a triode second detector, and a triode output valve capable of delivering 1,000 undistorted milliwatts to the moving-coil speaker. The whole, with a scale calibrated in wavelengths, sells at 22 guineas complete with valves, while for one guinea more a scale calibrated with station names may be had. The addition of a Ferranti electric clock in the speaker grille increases the price to 25 guineas. There is a tone control

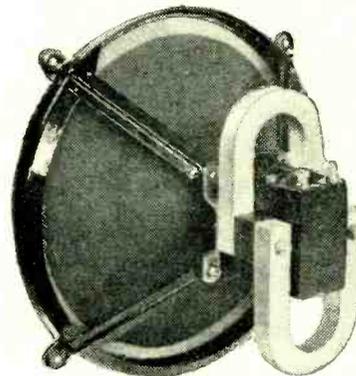


Ferranti 7-valve superheterodyne with station-scale and clock.

which allows a condenser to be switched across the output transformer if desired.

In addition to this completed receiver a wide range of kit sets of high quality is offered, both battery and mains users being very fully catered for. The A.C. kit, without valves, but otherwise complete, costs £12 8s. 6d., the battery kit selling at £9 4s. 6d. Both models use band-pass tuning with coils of exceptionally high efficiency. More ambitious kits for the critical listener are the AC6a and the AC12, which are capable of delivering 6 and 12 watts respectively to the loud speaker. In these an intermediate L.F. valve is used between detector and output stage. The L.F.-output part of these kits is also supplied separately as a gramophone amplifier, and may be attached to the detector of any set.

The new Inductor loud speaker, with an impedance at mean speech frequencies of about 5,000 ohms, is offered at 30s.; it will deal with A.C. inputs up to 2 watts without distress. There is a full range of permanent-magnet moving-coil speakers, from the M1 with 100,000 lines in the gap at £8 18s. 6d., to the M4 with 35,000 lines in the gap, which sells, complete with multi-ratio output transformer, for the modest sum of £2 15s. In addition there is the energised moving-coil speaker, available with field windings for either 100 or 200 volts, which costs, with three-ratio output transformer, only £2 10s.



Ferranti new inductor loud speaker.

Low-frequency transformers at all prices, ranging from the AF7 at 30s., with a primary inductance of 400 to 100 henrys at 0 to 10 milliamps, down to the AF10 at 6s. 6d., with an inductance of 35 to 20 henrys at 0 to 6 milliamps., are available for every possible purpose. The new smoothing choke, Bro, combining an inductance of 50 to 30 henrys at 0 to 50 milliamps. with the moderate D.C. resistance of 600 ohms, is good value at 11s.

Mains transformers and eliminator kits to suit all sets are also on view.

Ferranti, Ltd., Hollinwood, Lancs.

FILM INDUSTRIES. (261)

This firm is showing the moving-coil horn-type loud-speaker unit which attracted so much attention when first introduced. They have recently developed two new models fitted with 7in. cone diaphragms and described as the types P.A.C.1 and P.A.C.2 respectively. A permanent magnet is employed giving a high flux density, and the working impedance of the coil is 8 ohms in both models. The price of the P.A.C.1, which will handle 3 watts, is 45s., including transformer. The P.A.C.2 embodies a larger magnet system, handles 5 watts, and costs £4 15s., also with transformer.

Film Industries, Ltd., 60, Paddington Street, W.1.

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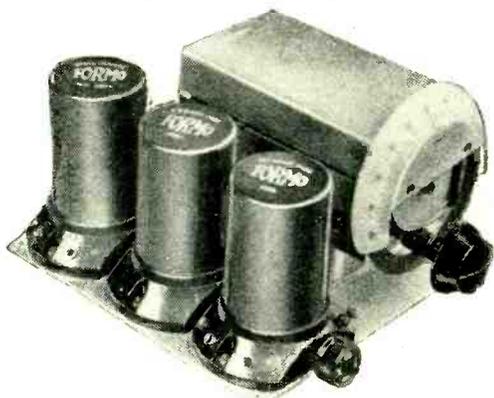
FIVE POINT PRODUCTS. (252)

This firm is showing the Five Point, a differential condenser for insertion in the aerial circuit of sets to give increased selectivity and provide volume control. When fully rotated to the minimum position it earths the aerial.

Five Point Products, 8a, Cross Street, Islington, N.1.

FORMO. (100)

Screened-ganged condensers, in dual or triple form, are one of the most important of the many new Formo products. Of

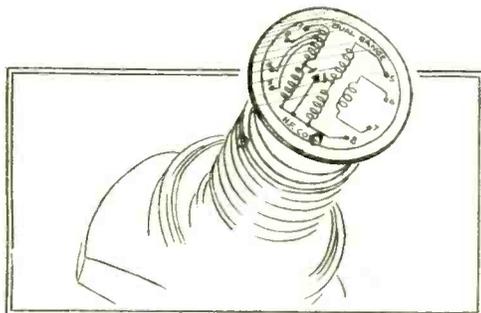


A tuning unit with the new Formo coils and gang condenser.

unusually compact dimensions, and with all desirable modern features, these components are sold at exceptionally low prices. The trimmers, mounted internally and operated by star wheels, are less liable to derangement than in the usual position.

Screened coils for nearly every purpose are included in the new Formo programme; they are neat and compact, and their windings would appear to be well devised in relation to their size. A colour scheme of identification has been standardised, and, as an additional convenience, each coil bears a disc with a printed circuit diagram showing the external connections of the windings.

The Formo Multicoupler differs from other parallel-fed transformer units in that all the terminal points are accessible externally, with the result that it may be used as a plain



Terminal identification diagram on Formo coil.

resistance-fed transformer, as a resistance-fed auto-transformer, or, with the addition of a by-pass condenser, as a similar coupling unit with self-contained decoupling resistance; with this object, the built-in resistance is tapped. By making the appropriate external connections, various ratios of transformation are available. Data relating to the unit shows high and constant amplification between 50 and 5,000 cycles.

Among other interesting new products is the Nigen L.F. transformer, costing only

8s. 6d., and housed in a double screening container of cylindrical form.

Formo Co., Crown Works, Southmill Road, Shirley, Southampton.

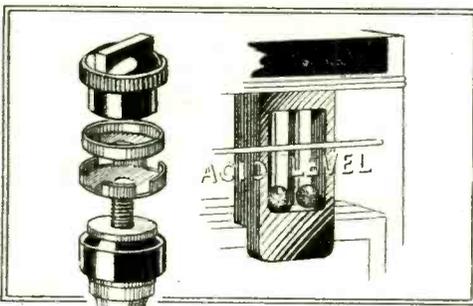
FRASER RADIO. (253)

This firm is showing a D.C. mains two-valve set, which is priced at 10 guineas. A pentode output valve is fitted, and a lamp resistance is used for breaking down the main voltage. The A.C. model at the same price includes a metal rectifier, and both are fitted with moving-coil loud speakers.

Fraser Radio, Ltd., 38, Crawley Road, N.22.

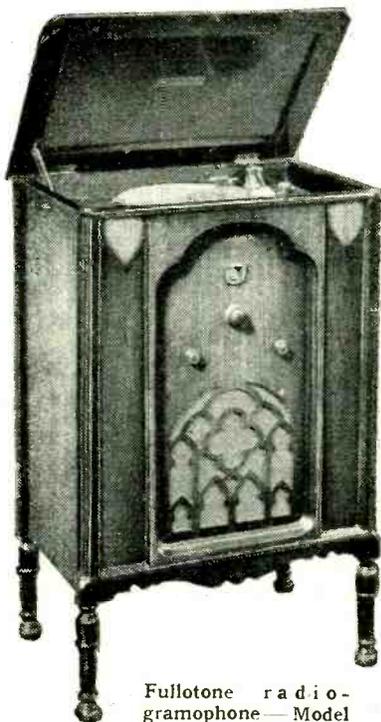
FULLER. (76)

The exhibits on this stand consist entirely of the well-known range of accumulators and dry batteries, to which a number of new lines have been added for the present season. The slow-discharge "Mammoth" cells are available in capacities from 22 to 120 ampere-hours at prices from 4s. 6d. to 14s. in glass boxes, while the "Standard"



Terminal and charge-indicator of Fuller accumulator.

cells, including a gravity-indicator, can be had in glass, celluloid, or ebohite cases. Both types have a double-grease-cup terminal with a special grip for connector pins. There are also many non-spill accumulators for portable sets. High-tension accumulators



Fullotone radio-gramophone—Model 260.

of three different capacities are also being shown.

Fuller Accumulator Co. (1926), Ltd., Woodland Works, Chadwell Heath, Essex.

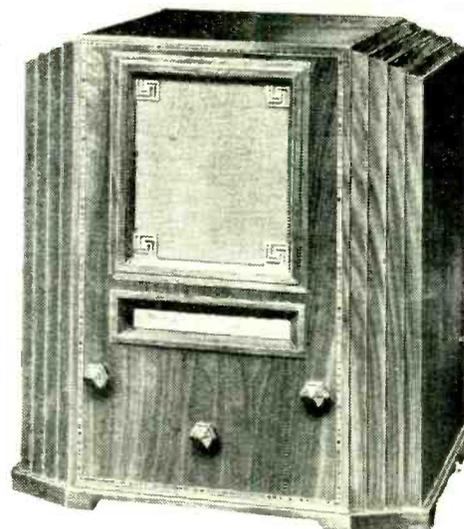
FULLOTONE. (203)

There are no fewer than eight different receivers being shown by this firm. The all-electric three-valve radio-gramophone for A.C. mains selling, complete with electric gramophone motor, pick-up, and moving-coil speaker, at 16 guineas is undoubtedly good value for money. The H.F. amplifier contains a variable-mu valve, and the grid detector is followed by a power pentode. Another set of interest is an all-mains three-valve model at 14 guineas, containing band-pass tuning and variable-mu amplification, with bias volume control.

Fullotone, Ltd., 73, Camden Road, N.W.1.

G.E.C. (105 & 109)

The G.E.C. has introduced for the coming season six new receivers, of which one is the Osram Thirty-Three Music Magnet, four are A.C. models, and there is one D.C. set. More than usual interest will attach to these models, for in every case a screen-grid valve is employed as a detector, and in the majority this is followed by a resistance-fed L.F. transformer. The inclusion of a heterodyne filter with a cut-off at about 9,000 cycles should go a long way towards rendering the new G.E.C. sets immune from this annoying type of interference.



G.E.C. five-valve A.C. superheterodyne.

One of the new models takes the form of a three-valve radio-gramophone employing an H.F.-det.-L.F. circuit and A.C. operated. Described as the Carnival model and housed in a conventional pedestal-type cabinet finished in walnut, the price is 30 guineas. It includes a Magnet electric motor with automatic stop, an energised moving-coil loud speaker, and is station calibrated.

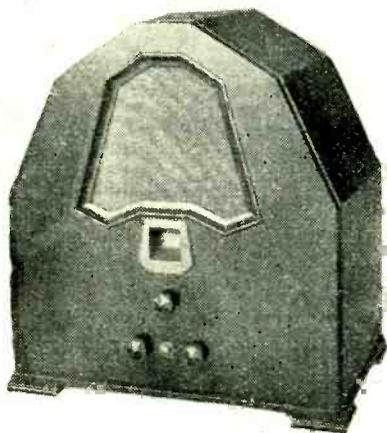
The specification of the new A.C. Superheterodyne is attractive. It has five valves plus a mains rectifier, band-pass tuning of both input and I.F. circuits, with a variable-mu valve in the latter position, built-in moving-coil loud speaker, and a heterodyne filter, to mention but a few of its salient features. The price is 26 guineas.

The Osram Thirty-Three Music Magnet builds up into a self-contained three-valve (H.F.-Det.-L.F.) receiver, the loud speaker, and the batteries, being housed in the finely moulded bakelite case. This is finished in grained walnut and the kit, complete with three Osram valves, costs 9 guineas.

So far as accessories are concerned, the additions include an induction-type gramophone motor for A.C. supplies and fitted

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with automatic stop the list price of which is £4 15s., and a new permanent-magnet moving-coil loud speaker.



Cecophone Nomad four-valve D.C. receiver, a G.E.C. product

On a separate stand is a unique display of Osram valves, including all the latest types. There are two new variable-mu tetrodes, the V.S.2 for battery use, fitted with a 2-volt filament, and the V.D.S., which is an indirectly heated D.C. type. The last-mentioned conforms with the other valves in this series, the heater being designed to operate at 16 volts, and it requires 0.25 amp. The V.M.S.4 now has better characteristics than heretofore, while the same applies to the P.X.4 and the P.T.4.

The power valve class has been extended and includes two 25-watt output valves, P.X.25 and the P.T.25, these being a triode and a pentode respectively.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

GAMBRELL. (21)

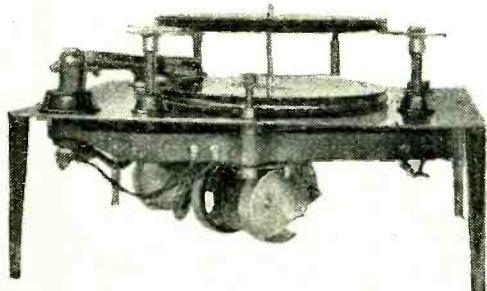
The Gambrell-Halford superheterodyne is shown on this stand; an H.F. stage now precedes the frequency changer and only a single I.F. valve is used. Push-pull pentodes are employed in the output stage, and are claimed to deliver 4½ watts to the loud speaker. Provision is made by means of a socket at the rear of the chassis for the connection of a short-wave converter. Two valves are used in the converter, which is priced at 9½ guineas, and the range of 15-60 metres is covered in two steps.

The well-known Novotone tone corrector for gramophone reproduction is being shown, as are plug-in coils and volume controls.

Gambrell Radio, Ltd., Merton Road, Southfields, S.W.18.

GARRARD. (122)

In view of the fundamental soundness of design of the spring and electric gramophone motors made by this firm it is not surprising to find that no detail changes have been made to any of the models in the already comprehensive range.



Garrard record changer unit.

The main interest in this stand centres round the new Garrard record-changer, which, in chassis form complete with pick-up, costs £10. There are three record supports fitted with spring selector blades, and the unit will play eight 10- or 12-inch records. The mechanism is controlled by a single cam drum driven through a clutch from the induction-type turntable motor. "Reject" and "Repeat" controls are fitted, and the motor stops automatically at the end of the last record.

Garrard Engineering and Manufacturing Co., Ltd., Newcastle Street, Swindon.

GILBERT. (232)

The record-changer fitted to the Gilbert Four-valve Radio-gram is unique, in that it



Record changer in the Gilbert radio-gram.

turns each record over and plays both sides. The time taken for each operation is approximately eighteen seconds, and the magazine holds twelve records. This is one of the most interesting designs in the show.

C. Gilbert and Co., Ltd., Arundel Street, Sheffield.

GODWINEX. (57)

Eliminators and mains components are the chief products of this firm, and a new series of mains transformers and chokes of generous design, including a special model for the "Monodial Super," are shown. Special metal rectifiers for running existing D.C. sets from A.C. mains have been developed, and the "Airmax" short-wave

up to 20,000 ohms, and at 4s. 6d. for higher resistances.

The Gard lightning arrester is shown, but a special feature is being made in this exhibit of the Filt earth. This consists of a copper cup containing a chemical substance with the aid of which it is claimed that a highly efficient earth contact can be secured.

Graham Farish, Ltd., Masons Hill, Bromley, Kent.

GRESLEY RADIO. (276)

This firm is showing a well-made three-valve A.C. set incorporating an energised moving-coil loud speaker, and selling for 14 guineas. It is known as the Model 144 Band-Pass 3, and, as the name implies, a band-pass input filter precedes the S.G.

high-frequency amplifier, which is followed by a detector and power pentode.

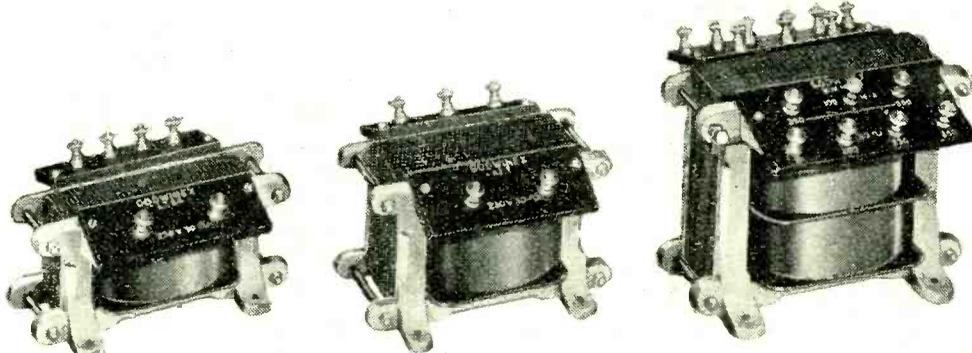
The No. 99 battery model follows the same design, but a low-consumption pentode and permanent-magnet moving-coil are employed. A well-finished table, with quartered walnut front, is available for either of the above models at 1 guinea.

Battery eliminators and trickle chargers for A.C. mains are also made by this firm.

Gresley Radio, Ltd., Ordsall Lane, Salford, Manchester.

GRIPSO. (226)

Indicating switches are shown in various forms, one model in particular having been



Godwinex mains transformers and smoothing chokes.

coils and H.F. chokes are being continued.

J. Dyson and Co. (Works), Ltd., 5, Godwin Street, Bradford.

GRAHAM FARISH. (50)

A useful range of components, including fixed and variable condensers, grid leaks, and Ohmite resistances, is shown on this stand. A potentiometer-type volume control in which the resistance wire is embedded in bakelite is available at 3s. 6d. for values

designed to combine the dual functions of wave-band and battery switching. There is a wide range of connectors, also two very useful easy-to-fix clips, by means of which a good earth connection can be made to a pipe or to a tube buried in the ground.

Gripsco Co., 32, Victoria Street, S.W.1.

GROSVENOR. (42)

A large range of dry batteries for all wireless purposes is on view on this stand. H.T.

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batteries are available in all voltages and capacity ratings, and, in addition, a display is made of electric torch cells.

Grosvenor Electric Batteries, Ltd., 2-3, White Street, E.C.2.

GUTTA PERCHA. (257)

The new damp-proof "Telconite" and the firm's Mu-metal, Radio-metal, and Pyromic alloys are the principal exhibits on this stand. Expert technical information regarding these products is obtainable on the spot.

Gutta Percha Co. (Telegraph Construction and Maintenance Co., Ltd.), 18, Wharf Road, City Road, N.1.

H.M.V. (THE GRAMOPHONE CO.) (55)

The whole of the available space on this stand is taken up by a series of efficiently illuminated bays, each containing a different model in cabinet and chassis form.

The three new models this year are all superhets. The new "Superhet Ten Autoradiogram," at 80 guineas, heads the list, and a special model built into an all-glass cabinet clearly reveals the high standard of workmanship which is typical of all H.M.V. models. The circuit is based on last year's Model 531, but numerous refinements, including variable-mu valves, have been included. A new type of record-changer has



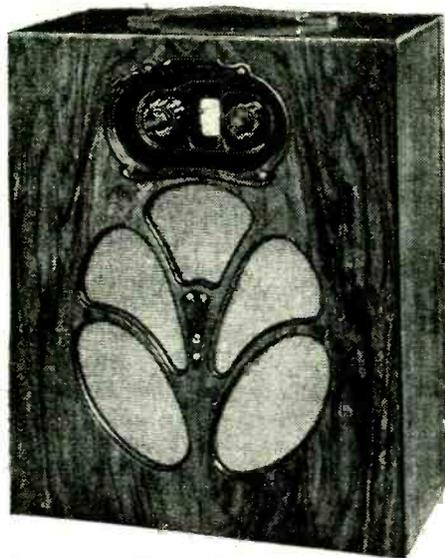
H.M.V. Superhet Lowboy Seven Model 470.

been adopted, in which a three-position knob takes the place of the selector dial in the original design. The first position cuts out the automatic mechanism and the instrument can be used as an ordinary gramophone, the second position gives automatic record changing up to a maximum of eight records, while the third position enables any record to be repeated indefinitely. Another improvement is the provision of a spring-loaded turntable spindle, which ensures a positive drive even with slightly warped records.

The second new model is known as the "Superhet Radiogram Seven," and costs 50 guineas. It is available also as a radio receiver known as the "Superhet Lowboy Seven" at 32 guineas. As in the ten-valve model, the seven valves include the power

rectifier. Again a predetector variable-mu H.F. stage with band-pass input is employed, but there is only one I.F. amplifier, and the second detector is coupled through a 7:1 transformer directly to the single PX4 output valve. The power output to the energised moving-coil loud speaker is 2½ watts.

The last, but by no means the least important, of the new receivers is the "Superhet Portable Six." It is contained in a walnut cabinet no larger than the average portable, weighs 34 lb., and has an H.T. current consumption of only 10 mA. The circuit comprises a predetector H.F. stage, first detector, oscillator, band-pass I.F. amplifier, leaky grid second detector, and a pentode output valve working into a balanced armature loud speaker. For a portable the performance should be exceptionally good, and the price of 17 guineas is very attractive.

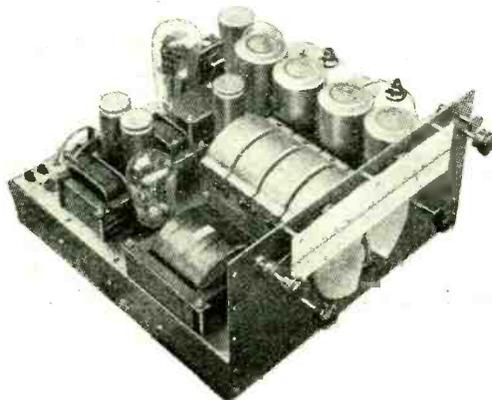


H.M.V. Superhet Portable Six Model 459.

The new models are well supported by many well-tryed H.M.V. receivers and radiograms. The models 521, 522, and 531 continue as before, but the model 501 will in future be known as the "Transportable Radiogram," and the price has been reduced to 25 guineas. The model 435 now costs 17 guineas, and will be known as the "de luxe Radio Four."

Another important price reduction concerns the "Auto Record Player," which, with the original type of record-changing mechanism, will now be available at 12 guineas.

The Gramophone Co., Ltd., 363-367, Oxford Street, W.1.



Dynatron Ether King chassis.

HACKER. (37)

Straight receivers are found to be favoured on this stand, and the Ether King at 60 guineas has two variable-mu H.F. stages



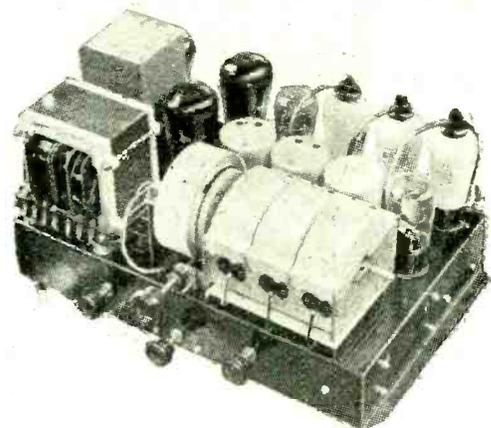
Dynatron Ether Lord radio-gramophone.

with four tuned circuits, a power grid detector, and push-pull P.P.5/400 output valves. Dual loud speakers are employed, and for the station selector a horizontal scale is fitted.

A three-valve set is available at 19 guineas for A.C. or D.C. mains, and the favourite valve combination of screen-grid H.F., detector, and pentode output is used.

A special feature is made of receivers which are suitable for use without appreciable modification on either type of supply mains.

H. Hacker and Sons, Perfecta Works, Ray Lea Road, Maidenhead.



Gambrell-Halford superheterodyne chassis.

HALFORD. (117)

The Gambrell-Halford superheterodyne chassis, favourably reviewed in "The Wireless World" some months ago, has been improved in several respects, a signal-frequency H.F. stage having been added, and variable-mu valves having been substituted. Provision for the use of a mains aerial, and also of a short-wave adaptor unit (which is shown), has been made in the new model.

It is worth while noting that this set is available in chassis form, as well as in various cabinets, including a radio-gramophone with automatic record changing.

Another model, entirely new, is planned on very ambitious lines and includes a total

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of ten valves. Short waves are receivable without additional apparatus, the bands covered being 15-60, 200-1,000, and 1,000-2,000 metres. The apparatus is housed in a large and exceptionally handsome radio-gramophone cabinet, with automatic record changer and space for 150 records.

Halford Radio, Ltd., 39, Sackville Street, W.1.

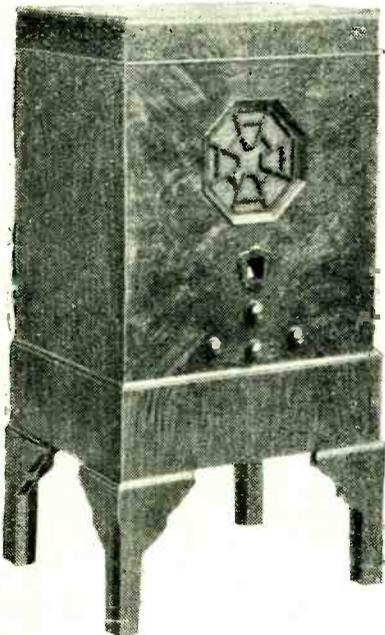
HAMBLING. (224)

One of the chief products of this firm is an all-wave tuning unit described as the Autokoil. This covers a wave-range of from 200 to 2,000 metres, giving continuous tuning throughout, and it can be fitted either in an aerial circuit or employed as an H.F. intervalve coupling coil using the tuned grid circuit. A variable reaction coil is embodied, also a small variable coupling condenser, and the price is 12s. 6d.

A. W. Hambling, Ltd., 15-16, Alfred Place, W.C.1.

HAMPTON RADIO. (12)

This firm is showing a six-valve radio-gramophone at 38 guineas; it includes band-pass tuning with two variable- μ H.F. stages and push-pull pentode output to the M.C. speaker. A D.C. mains model is available at 41 guineas.



The Hampton console radio-gramophone.

A smaller set, the Cantor, is of the H.F., det., pentode type, but this also includes a moving-coil speaker and is priced at 16 guineas for A.C. or D.C. mains.

Hampton Radio, Ltd., 1-3, Vicarage Road, Hampton Wick.

HARLIE. (31)

The Harlie de Luxe pick-up No. 36 has been improved and will retail at 27s. 6d. with integral volume control. A new standard model, No. 65, with fixed head, has been introduced at 22s. 6d., but the tone arm is hinged vertically to facilitate needle changing.

Three entirely new induction-type gramophone motors of compact design have been developed, the model 61 "Midget" at 39s., a model 63 two-pole motor at 45s., and a de Luxe model 62 at 55s. The latter motor is supplied complete with the model 36 pick-up and automatic stop for £4 5s.

The range of gramophone accessories, including the Harlie Tone Selector at 4s. 6d., is continued.

Harlie, Ltd., Cambridge Arterial Road, Enfield, Middlesex.

Harlie "Midget" induction motor.

**HARWELL. (261a)**

The main exhibit of this firm is a range of wire-wound potentiometers, some of which comprise two separate resistance elements in series: by this plan exceptionally high resistance values may be attained without loss of mechanical strength or undue increase in overall size.

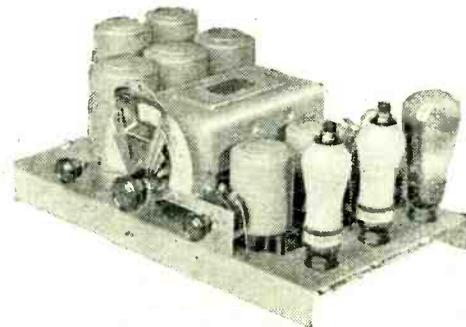
There are also exhibited on this stand the new British-made Hydra condensers in all capacities.

Harwell, Ltd., Sessions House, Clerkenwell Green, E.C.1.

HAYNES RADIO. (17)

The principal exhibit on this stand is a Quality Receiver; a single variable- μ valve is used, and the three tuned circuits include a link-coupled band-pass filter. A power grid detector feeds the L.F. circuits, in which resistance-capacity coupling is used throughout, and the output stage is capable of delivering 6 watts to the moving-coil loud speaker. Provision is made in the mains equipment for the field supply of additional speakers, and dry electrolytic condensers are employed in the smoothing circuits. The apparatus is built in two units, and is available as a radio-gramophone at £35 17. 6d. A kit of parts for building this receiver can be obtained for 19 guineas, including five valves and loud speaker.

This firm's A.C. Single Dial Superheterodyne is also being shown, and has been redesigned to obtain greater accuracy of ganging. It is claimed that tracking errors on the medium waveband do not exceed 0.2 per cent., and on the long waveband 0.4 per cent.; this has been accomplished by the adoption of a circuit involving four padding



Haynes Radio A.C. single dial superhet.

condensers. In other respects the circuit is substantially the same as that of the previous model, and a two-valve frequency changer is followed by a single variable- μ

I.F. amplifier. Screen-grid anode bend second detection is used, and the pentode output valve is rated to deliver 2 watts to the moving-coil loud speaker. The complete receiver is priced at £21 10s. complete, but is also available in kit form at 18 guineas, including valves, moving-coil loud speaker, and metal chassis.

Haynes Radio, 57, Halton Garden, E.C.1.

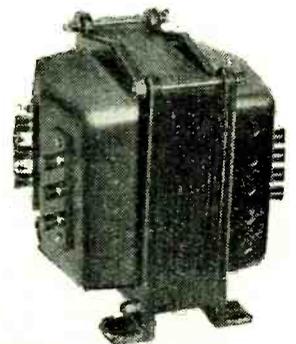
HELLESENS. (221)

A wide selection of dry and wet electrolytic condensers in many different capacities and for various operating voltages, as well as a complete range of Hellekens dry-cell H.T. batteries, form the main items of interest in this exhibit.

Hellekens, Ltd., Morden Road, S. Wimbledon, S.W.19.

HEYBERD. (13)

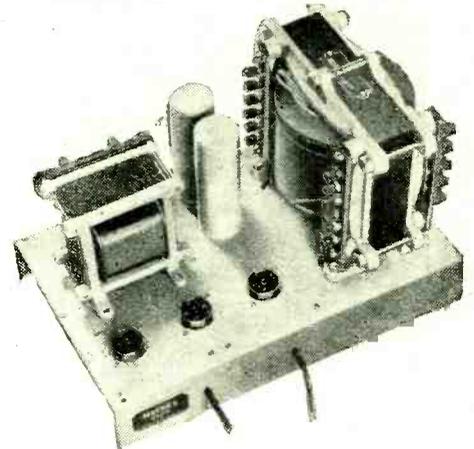
Mains equipment forms the principal exhibit of this firm, and a number of eliminators, many of which are also available in kit form, are prominently displayed. A special feature is made of an eliminator for portable sets, which is priced at 85s



The Heyberd W. 33 mains transformer.

Mains transformers and smoothing chokes of all types are well in evidence.

F. C. Heyberd and Co., 10, Finsbury Street, E.C.2.



The power unit of the Haynes Radio quality amplifier.

HENLEY'S. (16)

This firm is showing a comprehensive display of materials for soldering, and a special feature is made of the Solon electric soldering iron. Resin-cored solder is also on view.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.

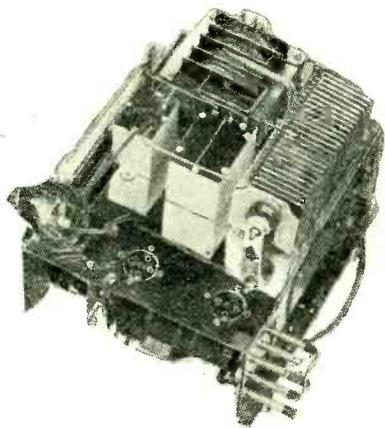
HUSTLER, SIMPSON & WEBB. (30)

A neat table radio-gram. receiver is the principal exhibit on this stand. The three-valve chassis is in two sections, and the controls are neatly distributed on the loud-speaker fret. A variable- μ S.G. stage is followed by a power grid detector and a directly heated pentode. With Garrard or Collaro motor the price is £22 10s.

The "A.C. Two" is a detector-pentode

Olympia 1932.—

set with Westinghouse rectifier and Rola energised loud speaker. In the "D.C. Two" the speaker field (120 ohms) forms part of



Set (right) and chassis (left) of the Hustler, Simpson & Webb "Aerodyne A.C. Two."

the mains potential divider, which is of the vitreous wire-wound type. Both these models are of exceptionally robust design, and the tuning coils are designed to eliminate break-through on long waves. The price is 10 guineas in each case.

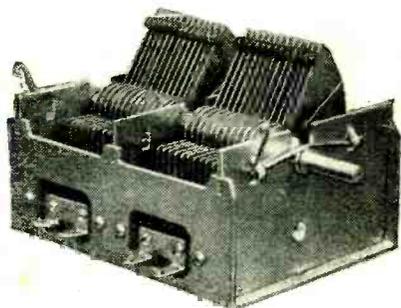
There is also an S.G. battery receiver with P.M. moving coil at 9 guineas.

Hustler, Simpson and Webb, Ltd., 317, Hoe Street, Walthamstow, E.17.

IGRANIC. (36)

So many new components have been introduced this year by the Igranic Electric Co. that a brief mention only can be made to a small selection, of which the type T.24B L.F. transformer is by no means the least interesting. It is a general-purpose model made in two ratios, viz., 1:3 and 1:5, and the primary winding is capable of carrying up to 10 mA. of D.C. and yet maintain an adequate inductance. It costs 5s. 6d. in either ratio.

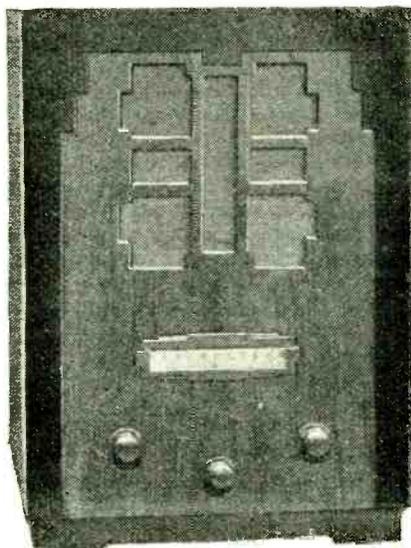
The new dual-range screened coils follow present-day practice in that they are very compact and embody wave-band switches. Provision is made for linking the switches when two or more coils are used. Igranic gang condensers are available in two- and three-gang types; the sections are accurately matched and fitted with small trimmers. Others items of interest include a binocular H.F. choke priced at 3s. 9d., a range of small- and large-capacity fixed condensers, an illuminated drum dial, and a new L.F. choke. Known as the C.H.2 model, this choke is wound in two sections, which can be joined either in parallel or in series. With the series connection the choke has a constant inductance of 40 henrys with any value of D.C. flowing up to 40 mA. Joined in parallel, the inductance becomes 10



Igranic screened gang condenser with dust cover removed.

henrys, but then it will carry up to 80 mA., and the price is 9s. 6d.

The new permanent-magnet loud speaker has a diameter of 9in., and the price is



32s. 6d., which includes a three-ratio input transformer.

Igranic Electric Co., Ltd., 147, Queen Victoria Street, E.C.4.



Inexpensive L.F. transformer: the Igranic model T.24.B.

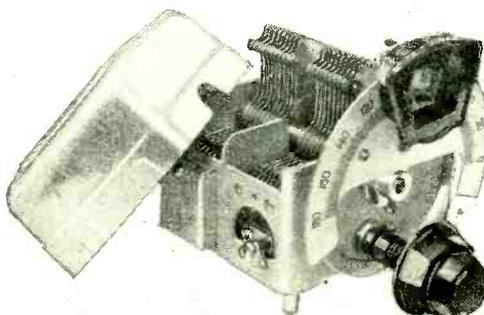
ITONIA. (216)

In addition to a comprehensive range of proprietary receivers, radio-gramophones, and accessories, this firm is featuring a compact valve-testing panel designed for dealer's use, and the price is 10 guineas assembled, or 8 guineas in kit form.

Itonia, Ltd., 58, City Road, E.C.1.

J.B. (204)

The latest J.B. condensers are the "Nugang" semi- and fully-screened models



J.B. Type A. "Nugang" condenser.

with from 2 to 4 sections matched to 1/2 mmfd. within 1/2 per cent. The new "Unitune" model is a two-gang condenser with a concentric trimming control for the front section, and is sold for 27s.

The special short-wave condenser has been redesigned and is now fitted with insulated bearings to eliminate contact noises and a screened pigtail to avoid closed loop

effects. There is a choice of five capacities and the price is 5s. 9d.

Jackson Bros., 72, St. Thomas Street, S.E.1.

JACKSON-BELL. (11)

This firm is showing a two-valve A.C. mains receiver in which a screen grid valve is used as a detector. A pentode output valve, delivering some 2 watts to the loud speaker, is employed and electrolytic condensers are used in the smoothing circuit. The price is 12 guineas. A similar set is also available as a radio-gramophone.

Jackson-Bell Distributors, Ltd., 68, Victoria Street, S.W.1.

JUNIT. (39)

Electric clocks occupy a prominent position on this stand, and are available in a number of different styles. Radio components are also shown, and a feature is made of the H.T.9 rectifier transformer for the "Wireless World" Baby Superhet.

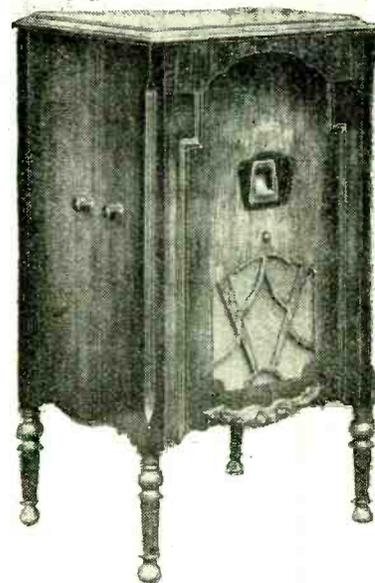
Junit Manufacturing Co., Ltd., Junit Works, Steele Road, W.3.

KABILOK. (101)

This firm's activities are restricted entirely to the production of cabinets for loud speakers, receivers, and radio-gramophones. The "Super Magna-Four" and the "Magna-Gram" have been specially designed to take the Osram "Music-Magnet" kit, together with batteries and loud speaker, either as a receiver only or with gramophone motor and pick-up added.

In addition to the many standard lines, cabinets can be built for any special purposes on request.

W. and T. Lock, Ltd., St. Peter's Works, Bath.



"Magna-Gram" radio-gramophone cabinet by Kabilok.

KALISKY. (236)

This firm offers a bead hydrometer at 6d., and is featuring its "Sopranist" high-tension battery (standard size only).

Apart from these lines the stand is given over to a comprehensive display of sets and components for the convenience of the trader.

S. Kalisky (Aldgate), Ltd., 146, Theobalds Road, W.C.1.

KENWELL. (121)

The principal receiver introduced by Kenwell Radio is an H.F.-det.-L.F. combination for mains operation. An energised

Olympia 1932.—

moving-coil loud speaker, a Westinghouse rectifier, and a two-position tone-control switch for either speech or music are included. The tuning dial, marked on an arbitrary scale, is exceptionally clear, and there is a vernier scale, by means of which very close readings may be made.

Kenwell Radio, Ltd., 200, City Road, E.C.1.

KOLSTER-BRANDES. (54)

Although hardly to be described as spectacular, the new Kolster-Brandes sets are in some ways as interesting a collection as is to be found at Olympia. Almost every circuit



The Kolster-Brandes "all-wave" superheterodyne.

arrangement is represented, and price is uniformly rather below that prevailing for apparatus of similar specification. An examination of the sets shows that this economy has not been effected by cheese-paring, but by the legitimate methods open to a large firm with an efficient design department working in conjunction with a well-organised factory.

There are over a dozen sets, so it is impossible to describe them all. The Model K.-B.321 three-valve A.C. set is a representative example, and embodies two ganged tuned circuits and an H.F.-det.-L.F. arrangement, with a pentode giving about 2½ watts. This set, costing £14 17s. 6d., has the unusual feature of provision for short-wave (25-75 metres) reception in addition to the normal broadcast band. Reception of short waves is effected by plugging in a special short-wave coil, which is joined in shunt with the detector grid coil assembly; the H.F. stage then gives a pass-on effect, but no amplification. A moving-coil loud speaker is, of course, included in this set.

Another typical receiver is the "2H.F." model, No. K.-B.320, which is similar, and in which provision for short-wave reception is made in the same way. This set competes with the normal three-valve band-pass type of set, at about the same price, and should be more sensitive.

The six-valve superheterodyne, which again covers short waves, is the most ambitious Kolster-Brandes set, and at the other

end of the scale there is a little self-contained two-valve battery set at £3 15s. complete.

Kolster-Brandes, Ltd., Cray Works, Sidcup, Kent.

LAMPLUGH. (99)

The "Silver Ghost" permanent-magnet moving-coil loud speaker at 42s. is the star exhibit of this firm. The magnet is of exceptionally generous proportions, and a large-scale model showing the construction occupies a prominent position on the stand. An energised version, known as the Lektro-Mag, at 34s. is also shown. These prices include a three-ratio output transformer, and special matched pairs are available at £3 10s.

Another new model is the "Junior" P.M.M.C. at the competitive price of 29s. 6d., and the Lamplugh inductor chassis is being continued at £2 10s.

S. A. Lamplugh, Ltd., 89, Little Park Street, Coventry.

LAWSON & RAPHAEL. (270)

This stand is devoted exclusively to special pedestals for converting the popular type of self-contained all-electric set to a radio-gramophone. B.T.H. pick-ups and Garrard motors are standardised, and the cabinet work is of high quality. There are three main types, the Table model at £8 15s., the Standard model at 10 guineas, and the Cabriole at 13 guineas. The latter, with the



Lawson & Raphael cabriole model Bureau-Gram.

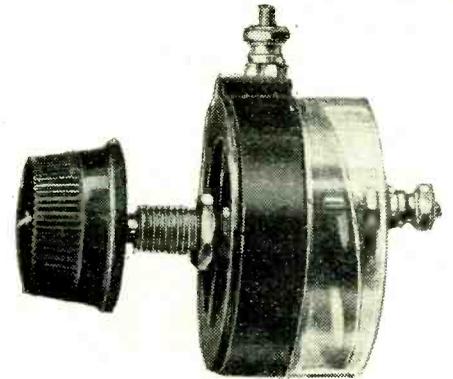
Garrard record-changer, costs 22 guineas, and for 6 guineas extra may be fitted with a cocktail set of good English glass.

Lawson and Raphael, 137, Regent Street, W.1.

LEWCOS. (153)

An extremely interesting new product on this stand is a wire-wound potentiometer, with an ingenious eccentric rocking plate action, in which no sliding contact on the resistance element is made. As a result absolute silence in operation is claimed, and the wear is negligible. This component is made in values of 100,000, 150,000, 200,000, and 250,000 ohms, and sells at 4s. 6d., with a track of constant increment, whilst the log. law type costs 5s. 6d. On all models there is a fireproof transparent dust cover, and much credit is due to the manufacturers for having wound 500 feet of wire (in the case of the 250,000-ohm model) in so small a space. This is the first wire-wound potentiometer of ¼ megohm placed on the wireless market.

There is a new type of high-voltage Glazite wire subjected to a 15,000-volt test. It will not burn or discolour when subjected to high



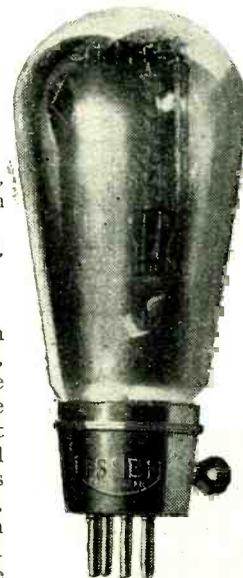
Lewcos potentiometer with rocking plate contact.

temperatures. There are also two new low-frequency transformers of 6 to 1 and 4 to 1 ratios.

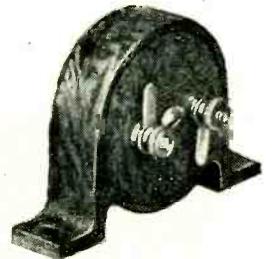
London Electric Wire Co. and Smiths, Ltd., Church Road, Leyton, E.10.

LISSEN. (59)

So large is the range of components shown by this firm that mention can only be made of a few outstanding new products. The anti-break-through choke should be found extremely valuable in the more modest type of receiver installed close to a powerful transmitter. Interference is often experienced on the long-wave range from medium-wave stations, but by interposing the choke in series with the aerial no such trouble is met. The break-through choke must be short-circuited on the medium waveband. There is available this season a centre-tapped output feed choke selling at the modest price of 7s. 6d. for coupling pentode and triode valves to medium-impedance loud speakers; it can also be used for push-pull. Other components of interest are two-ganged and three-ganged shielded coils, complete with wave-change switches. There are a number of new Lissen receivers, and one which should prove popular at 17 guineas is the Band-Pass Mains Three, with moving-coil loud speaker and a power pentode in the output stage.



Lissen AC/PT and anti-break-through choke.



The new Lissen valves include variable-mu models for both A.C. mains and batteries. A three-valve kit called the Skyscraper Three is being exhibited, and sells at 89s. 6d., complete with valves.

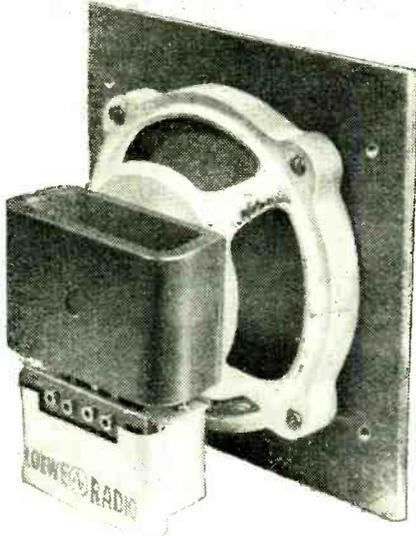
Lissen, Ltd., Worple Road, Isleworth, Middlesex.

Olympia 1932.—

LOEWE. (223)

A complete range of the high-vacuum type resistances which have for long been linked with the name Loewe are shown in addition to two new loud speakers. The PML200 is a permanent-magnet type, fitted with a 6½in. diaphragm, and embodies a three-ratio transformer. In chassis form the price is 47s. 6d.

The other model is described as the "Varitone," for it offers the choice of three different impedance values. Fitted with a reed-type movement and a three-position



Loewe P.M.L. 200 loud speaker chassis.

switch to afford quick changes in the coil impedance, the price is 39s. 6d. in a cabinet.

Loewe Radio Co., Ltd., 4, Fountayne Road, Tottenham, N.15.



Lissen band pass three mains set.

LOTUS. (64)

This firm is showing the Lotus four-valve de Luxe set, which has two variable- μ H.F. stages with three tuned circuits, detector, and pentode output. A metal rectifier is used for the H.T. supply, and electrolytic condensers are employed in the smoothing circuits. A moving-coil loud speaker and a tone control are fitted, and separate dial lights are used for the two wavebands, both coming into action when the switch is set for gramophone. The price is 20 guineas.

A battery three-valve set at 14 guineas includes a moving-coil speaker and the dual dial-lighting feature, while a two-valve mains set is available at 10 guineas, again with M.C. speaker.

A wide range of components is on view, and the completely screened gang condensers, the three-gang model of which sells



The Lotus four valve de luxe receiver.

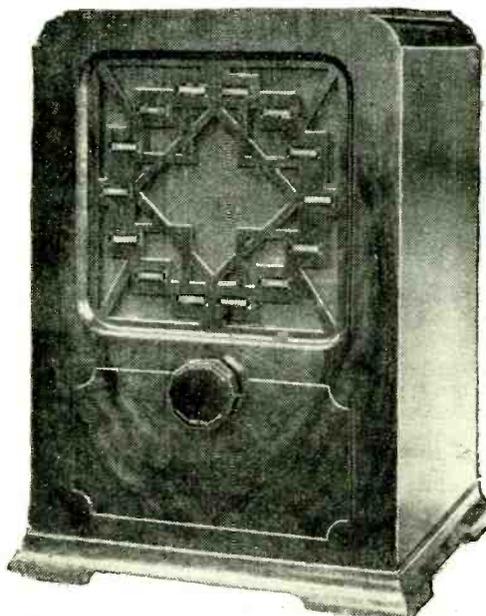
for 29s. 6d., including disc dial, should not be overlooked.

Lotus Radio, Ltd., Mill Lane, Old Swan, Liverpool.

M.P.A. (95)

As illustrative of a tendency that is bound to become more pronounced in the course of time, the M.P.A. Ethatropé is in some respects one of the most interesting sets at Olympia. The basic circuit arrangement may be dismissed in a word by saying that it is a fairly conventional H.F.-det.-2-L.F. arrangement, with an S.G. detector and band-pass input. Interest centres around the tuning system, which is controlled by a multiple switch, reminiscent of automatic telephone practice, which throws across each tuned circuit the appropriate amount of capacity required for any one of twelve predetermined wavelengths. The condenser, of the air-dielectric type, is tapped, and there is no relative movement of its vanes during the process of selecting a station.

But this is only half the story. The knob which controls the switch, when once set to close the appropriate set of contacts for a desired wavelength, may be rotated to a limited extent in either direction to con-



Automatic station selection: the M.P.A. Ethatropé.

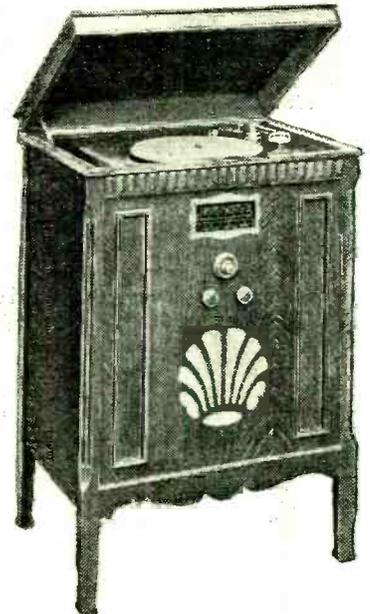
trol volume by altering bias; as clockwise rotation is further increased, reaction comes into play. In fact, every operation is effected by this single knob, which also combines the functions of an on-off, radio-gramophone, and wave-range switch.

M.P.A. Wireless (1930), Ltd., 62, Conduit Street, W.1.

M.R.G. (102)

The range of receivers offered on this stand is based entirely upon two chassis, one using three valves and one using four, both being mains-driven. The three-valve chassis has a variable- μ H.F. stage, controlled by a twin-gang condenser, followed by a power detector resistance-coupled to a pentode. A trimmer is provided on the back of the set for adjusting the aerial capacity to that required for correct ganging.

In the four-valve chassis there is a band-pass input, followed by two variable- μ stages, power detector, and pentode, the whole making a powerful and sensitive receiver.



M.R.G. "Console-Three" radio-gramophone.

As table models, the sets are priced at 14 and 22 guineas respectively, but are also available as radio-gramophones or with an electric or ordinary clock in a vertical cabinet of "grandfather" type. The 4-valve set is made for D.C. or A.C. mains.

Mains Radio Gramophones, Ltd., Vaughan Street, Bradford.

McMICHAEL. (58)

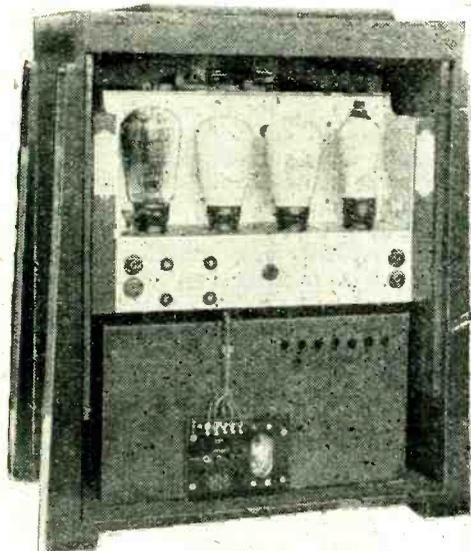
All the new McMichael sets are fitted with the Duplex type of radial tuning scale calibrated in wavelengths. The indicating pointer is coupled to the wave-range switch, and is automatically lifted to the appropriate scale when the switch is operated.

The latest addition to the Duplex range is the "Mains Transportable Four." This receiver has two H.F. stages, the first a tuned screen-grid and the second an aperiodic triode followed by a detector and pentode output valve. The cabinet is of modern design, and is fitted with a frame aerial and a ball-bearing turntable in the base. The loud speaker is of the energised moving-coil type, and the price is 22 guineas.

The enviable reputation enjoyed by this firm for the production of high-grade portables will be upheld by the suitcase and cabinet type Duplex portables which now incorporate automatic grid bias, and are both priced at 17 guineas.

Olympia 1932.—

The latest McMichael radio-gramophone is fitted with a synchronous motor and Magnavox dual loud speakers; the price is 48 guineas.



McMichael Duplex Mains Four.

For D.C. mains the McMichael Mains Three is being continued, and may be obtained with moving-coil loud speaker for 24 guineas, or without for 20 guineas. The "Battery Three" will also be available at 14 guineas, and the Colonial Supersonic short-wave set with interchangeable coils is continued at £15.

All the above sets are notable for the clean appearance of the interior, and the standard of workmanship is better than ever.

The only component on view is the binocular H.F. choke at 4s.

L. McMichael, Ltd., Wexham Road, Slough, Bucks.



McMichael Type C cabinet portable.

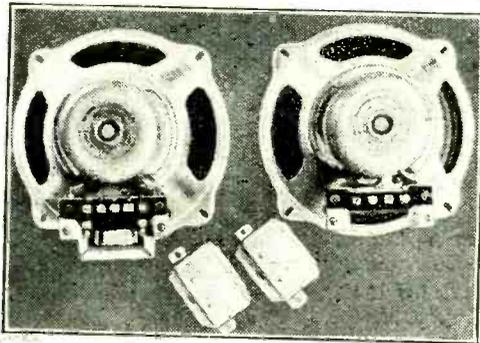
MAGNAVOX. (24)

The outstanding exhibit is the dual-compensated speaker assembly, which is undoubtedly an important contribution to the technique of faithful reproduction. The advantages of mounting two loud speakers of slightly dissimilar characteristics close together on the same baffle board are manifold, the most important of which are as follows: There is an increased efficiency in bass and middle registers; better quality results from levelling the peaks and valleys in the upper register, and an improved power-handling capacity is achieved due to the mutual shunting of speech coils in

parallel. The dual assembly containing two DC144 speakers sells, complete with transformer, at the modest price of £3 12s. 6d., and is capable of handling without distress up to 12 watts A.C.

There are a number of single speakers being shown, notably the DC142 type L with a field resistance of 2,500 ohms, selling at £2 15s. A slightly smaller speaker with a 7in. cone, called the DC144, retails at £2 10s., with a field winding of 2,500 ohms, while the price of the 7,500-ohm model is priced at £2 12s. 6d. All Magnavox loud speakers are supplied with a hum-bucking coil wired in series with the speech coil.

Magnavox (G.B.), Ltd., 89, Kingsway, W.C.2.



Magnavox dual-compensated speakers.

MANUFACTURERS' ACCESSORIES CO. (237)

The "Maco" dry-charged accumulator cells, of 20- and 45-ampere-hour capacity (intermittent rate) are offered here at 3s. 4d. and 6s. 6d. respectively with metal carriers. "Standard" capacity H.T. batteries are also offered at attractive prices.

The firm is primarily a wholesaler, and shows a wide range of sets and components by all makers.

Manufacturers' Accessories Co. (1928), Ltd., 85, Great Eastern Street, E.C.2.

MARCONIPHONE. (74)

Although some of last year's sets are retained, the Marconiphone exhibit for this season may be regarded as almost entirely new. The three-valve general-purpose A.C. set, for instance, bears little resemblance to its earlier prototype, and it is stated that the performance has been greatly improved; this is probably due to the use of more efficient coils. The set has band-pass input, and is of the popular self-contained type with a moving-coil speaker and an MPT.4 pentode output valve. An indicating pointer is automatically transferred to the appropriate section of the illuminated wavelength scale by operation of the change-over switch.

The superheterodyne portable is an entirely self-contained set with a frame aerial and a built-in balanced armature loud speaker. The six valves function as: signal frequency H.F. amplifiers; first detector; oscillator; I.F. amplifier; second detector; output. The last-mentioned valve is a P.T.2 high-efficiency pentode, which accounts for the low total anode consumption of 10 mA. There is automatic bias and complete decoupling, with the result that the set is said to be capable of continuing to function stably, but at reduced volume, even when the H.T. battery voltage has dropped to less than half its initial value.

Another interesting battery set, which

should do much to appease those without mains who claim that they have been neglected, is the new three-valve battery set with an H.F.-det.-L.F. circuit with band-pass gauged tuning.

The most ambitious Marconiphone chassis, a six-valve superheterodyne, is available either as a cabinet set or in radio-gramophone form, with automatic record changing. In the order given, the valves are: variable-mu H.F. amplifier; screen grid detector; triode oscillator; variable-mu I.F. amplifier; triode second detector; triode (P.X.4) output. A variable tone control operates by attenuating the upper register, and so is particularly suited for the elimination of heterodyne interference or needle scratch. The record changer has been improved since last year, and now plays any number of records up to the maximum of eight without an initial setting.

The Marconiphone pick-up is sensibly as before, but screened connecting leads have wisely been substituted in place of the original terminals.



Marconiphone table model superheterodyne.

Marconi valves have been generally improved to give greater consistency, and in some cases higher efficiency. New valves comprise the V.S.2, a 2-volt battery-fed variable-mu H.F. valve; the P.X.25, a high-power output valve with a 2 amp. 4-volt filament for direct heating, an anode dissipation of 25 watts, and a mutual conductance of 7.5; lastly, there is a new high-power pentode of corresponding type.

Marconiphone Co., Ltd., 210-212, Tottenham Court Road, W.1.



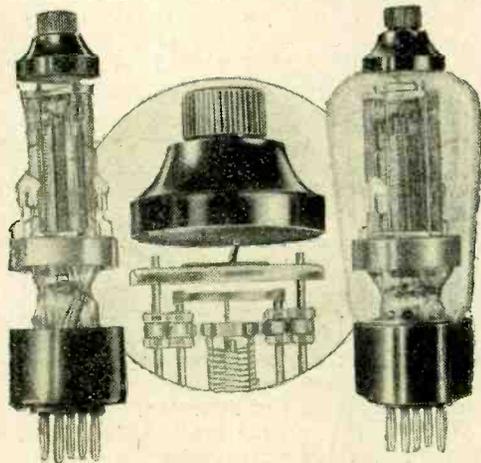
Marconiphone automatic radio-gramophone.

Olympia 1932.—

MULLARD. (79 & 248)

This stand is entirely devoted to valves, the large range of which has been added to this season. Research has been directed towards the elimination of all microphonic noise by a form of rigid unit construction now being embodied in nearly all the valves manufactured. There are a number of large-scale models of electrode assemblies being shown which clearly demonstrate the ingenious bonding of anode, grid and filament.

A new screen grid valve styled the P.M.12A has been developed especially for portable sets where the size of the H.T. battery is perforce somewhat limited. This valve will give a satisfactory account of itself with an anode voltage of 100, a screen voltage of 70, and zero grid bias. The PM1.HL, which has gained for itself a high reputation as a detector, has been redesigned, and is capable of giving a good rectified output with only 20 volts H.T. The Mullard Radio Valve Company were early in the field with variable-mu valves; interest therefore attaches to the VM4V—a newcomer in this class with a mutual conductance of 1.2 mA/volt. There is another valve of this type designated the MM4V, which has a considerably higher slope and is especially useful in receivers with only one stage of H.F. amplification. A low consumption pentode—the PM22A—makes its appearance this season, and should put up an excellent performance in portable and other receivers where only 100 volts H.T. is available. It is capable of giving a large undistorted output when the anode current is but 4½ mA. The keen student of design will welcome the new 904V, which has lately been reviewed in *The Wireless World*. As a detector it imposes a negligible low load on the preceding tuned circuit owing to the exceptionally low interelectrode capacity between anode and grid. Another valve which is already being adopted as standard by a number of set manufacturers is the directly heated pentode called the PM24M. A voltage of 250 can be applied to both anode and screen, and the satisfactory output of 3 watts A.C. for 7½ watts D.C. anode dissipation is



Showing the new rigid unit construction of Mullard valves.

obtainable. There is a new battery variable-mu valve for 2-volt sets called the PM12V, which should provide an efficient form of volume control with economy of components.

Mullard Wireless Service Co., Ltd., Mullard House, Charing Cross Road, W.C.2.

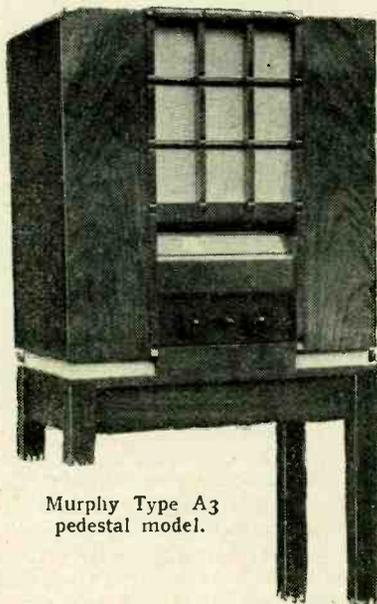
MURPHY. (28)

In accordance with the conservative policy of this firm the existing A3 all-electric

receiver and the type B4 battery portable are being continued with minor modifications. The portable costs 15 guineas, and is now supplied in a cabinet of more modern design, while the standard A3 has been reduced in price to 17 guineas.

A de luxe version of the A3, to be known as the Pedestal A3, is supplied with a wider cabinet and a neat pedestal stand. The chassis in this model has been improved in detail—notably in the design of the band-pass tuning circuits—and the price is 19 guineas.

The new type A8 superheterodyne completes the range of Murphy receivers. It is housed in a modern cabinet of pleasing proportions, with the controls at the front and the tuning scale window let into the top of the cabinet. The circuit comprises eight valves, plus a rectifier, and there are no less



Murphy Type A3 pedestal model.

than ten tuned circuits. An outstanding feature is the employment of a double-diode second detector in conjunction with automatic volume control. The circuit is arranged as follows: S.G. pre-detector H.F.—S.G. first det.—two S.G. I.F. stages, with band-pass coupling—double-diode second detector, with volume control to pre-detector H.F. and I.F. stages—S.G. first L.F.—power pentode output. Variable-mu type valves are used in all S.G. stages. The mounting of the gang condenser on rubber to prevent microphonic effects is typical of the thought which has been put into the development of this set. The price will be 30 guineas.

Murphy Radio, Ltd., Broadwater Road, Welwyn Garden City, Herts.

NATIONAL RADIO SERVICE. (200)

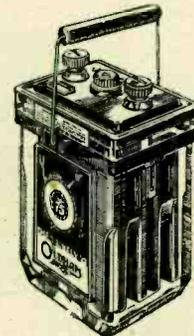
This is a specially organised central repair depot, the scope of operations of which will be confined to the repair or reconstruction of all types of receivers and radio-gramophones, to the assembly of kits of parts which have been purchased by private individuals, and to the giving of technical advice. Repairs to loud speakers, meters, and pick-ups, as well as other delicate instruments, are undertaken.

National Radio Service Co., 15-16, Alfred Place, W.C.1.

OLDHAM. (85)

Slight changes have been effected in the design of the "Lively O" series of L.T. cells. A new moulded lid is now fitted, on which is provided a card for the owner's

name as an aid to identification at the charging station. The inclusion of a small captive float is a useful feature, since this gives visual indication of the state of charge in the cell.



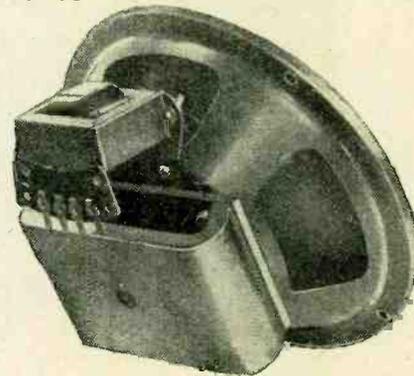
Oldham slow discharge cell embodying a small captive float.

H.T. accumulators form an attractive source of anode current when there are facilities for charging, and as an alternative there is, of course, the "Lively O" dry cell.

Oldham and Son, Ltd., Denton, Manchester.

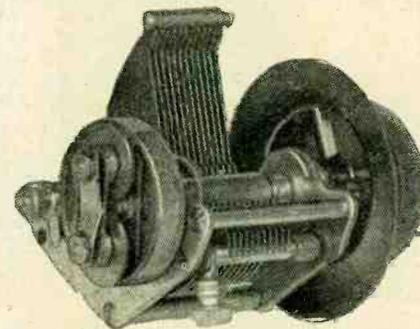
ORMOND. (87)

A range of components covering a large proportion of the needs of the set-builder is on view at this stand. The logging drum dial illustrated in last week's issue, with which station names can be written as found in a space at the side of the scale, is likely to find many users. Tuning condensers of many types are offered, among which is an



Ormond permanent-magnet moving-coil speaker Model R/475.

improved model of the No. 6 multi-gang condenser and a small brass-vane condenser bearing a slow-motion drive, of ratio 55 to 1, of the type formerly used on this firm's well-known square-law condenser introduced some half-dozen years ago. This sells at the modest price of 7s. 6d. complete with dial, or without slow-motion drive at 4s.



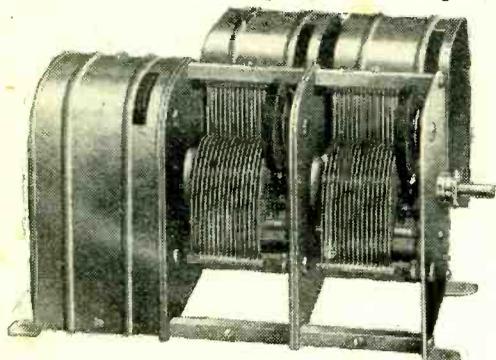
New Ormond condenser with 55 to 1 reduction gear.

Several moving-iron speaker units can be had, and attention is especially drawn to Model R/450 Z, which is wound to match the modern low-consumption high-efficiency pentode. This at 12s. 6d., with a cone and chassis at 5s. or 9s. added, makes a very

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satisfactory instrument at a very moderate price.

Small moving-coil speakers are also offered, there being a permanent-magnet model at 38s. 6d., and an energised model at 30s.,



Ormond No. 6 three-gang condenser.

the price in both cases including input transformer.

Solid-dielectric condensers of all capacities, with both semi-circular and long-lam vanes, can be had for less than half-a-crown each, while for circuits in which critical control of reaction is required there is a differential condenser of solid dielectric type to which is fitted a slow-motion drive of ratio 9 to 1.

Ormond Engineering Co., Ltd., Ormond House, Rosebery Avenue, E.C.1.

OSBORN. (32)

All the cabinets made by this firm are supplied either machined ready to assemble, assembled ready to finish, or assembled and polished. Part of the stand is set off as a cabinet-maker's shop to demonstrate the ease with which the machined parts can be put together by the amateur.

Chas. A. Osborn, The Regent Works, Arlington Street, N.1.

OVERSEAS TRADING CORPORATION. (291)

The chief exhibit on this stand is a playing desk called the "Adapt-o-Gram," which consists of an electric gramophone motor with pick-up suitably housed in a cabinet. The instrument affords a means of converting an A.C. mains receiver to a radio-gramophone without any constructional alteration, and the price is 8 guineas, or, in a more ambitious form to hold a number of records, 10 guineas.

This company also acts as sole wireless distributors of Young accumulators.

Overseas Trading Corporation, 18, Ganton Street, W.1.

PAREX. (238)

A wide range of screens and screening-boxes for all purposes is shown on this stand. In addition the "Nuvolion" energised moving-coil speaker is on view, a special feature of this being that the speech coil and the cone are moulded in one piece.

A range of three 2-volt valves, made by the "All-British Valve Company," and offered at 5s. 6d. in H.F., L.F., and power types, can also be seen here.

E. Paroussi, 10, Featherstone Buildings, W.C.1.

PARMEKO. (67)

"From watts to kilowatts" is the easiest way to describe the comprehensive exhibit of power transformers which are produced by this firm. A study of the list issued shows that almost every conceivable requirement of the wireless and allied trades, as well

as of the radio amateur, is adequately met. Nor must we forget L.F. chokes; although the name of Parmeko is perhaps best known in connection with heavy-duty types, small components for the less-ambitious receiver are also made.

A kit of parts for a two-stage 5-watt amplifier (25 watts dissipation) has recently been introduced. The output stage includes a P.P.5/400 valve, which is coupled by means of a transformer.

Another amplifier, supplied only as a complete unit, which strikes one as particularly serviceable and workmanlike, is the 50-watt type, with four stages, which is suitable for dance halls or cinemas. Suitable public address loud speakers for these amplifiers, including a moving-coil horn model, are now available.

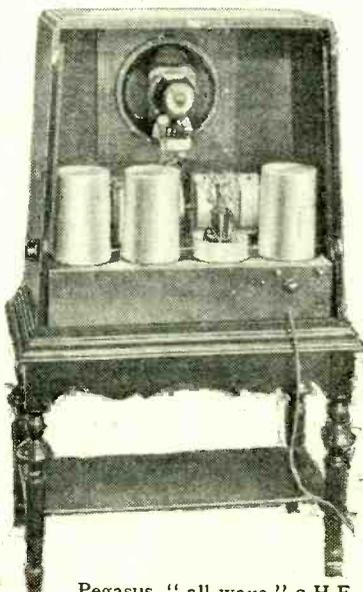
Partridge and Mee, Ltd., 74, New Oxford Street, W.C.1.



Parmeko amplifier kit assembled.

PEGASUS. (94)

Provision for short-wave reception, combined with a thoroughly up-to-date circuit arrangement, makes the Pegasus four-valve A.C. model an exceptionally interesting set. Including the band-pass input filter, there are four ganged tuned circuits, two variable-mu H.F. valves, a power grid detector, and a pentode output valve. The set, of the



Pegasus "all-wave" 2 H.F. set.

self-contained type, covers wave-ranges of 15-50, 200-600, and 750-2,000 metres, and embodies a Westinghouse rectifier and moving-coil speaker.

Pegasus, Ltd., Low Mills, Lower Wortley, Leeds.

PERTRIX. (126)

Several new lines have been added to the already extensive range of dry batteries made by this firm, among them being a 99-

volt and a 108-volt standard capacity (7 to 10 milliamps) battery in the "Yellow Carton" series; these are priced at 9s. and



Petrix accumulator with ball-type charge indicator.

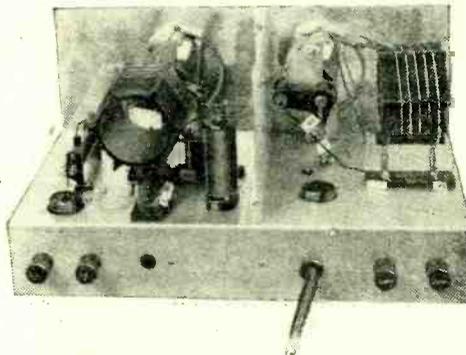
10s. respectively. Prices of older lines have in one or two cases been reduced.

The range of accumulator cells, some of which include a charge indicator, has been extended.

Britannia Batteries, Ltd., 233, Shaftesbury Avenue, W.C.2.

PETO-SCOTT. (247)

It is hardly necessary to record the fact that this firm are specialists in the supply



Peto-Scott 3-valve short-wave kit.

of kits of parts for receivers described in the technical press. A prominent feature is the new "Wireless World" Baby Superhet, which is being shown in course of construction.

Besides these sets, a series of short-wave receiver kits is being sponsored by the Peto Scott firm. Four models, ranging from a simple detector-L.F. combination to an H.F.-det.-L.F. set, are fully described in a booklet available on the stand. In view of the imminent inauguration of the new B.B.C. short-wave service, these sets should attract a great deal of attention.

With regard to the normal broadcast wavebands, three constructional envelopes (and kits of parts) are issued. What will probably be the most popular model is an H.F.-det.-L.F. three-valve set for mains operation, with a moving-coil loud speaker and a horizontal tuning scale.

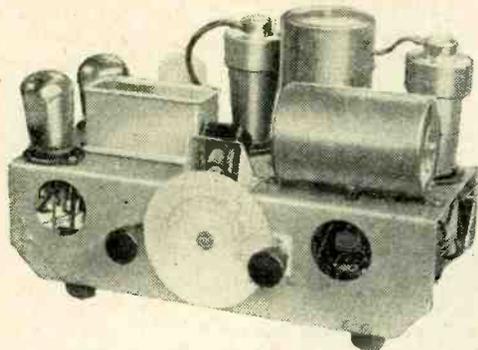
Peto-Scott Co., Ltd., 77, City Road, E.C.1.

PHILIPS. (104)

There are many features of outstanding interest in the Philips sets introduced this season. In all models a new type of screened coil known as a Super-inductance is em-

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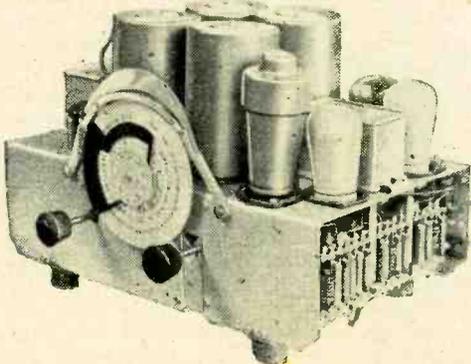
bodied, comprising a glass former having a winding of wire containing fifteen strands. These inductances are tuned by a ganged condenser of diminutive proportions in which each unit is no larger than a match box and the air gap between rotor and stator vanes is only one-fifth of a millimeter. It is claimed that the dynamic resistance of 500,000 ohms is so high that the selectivity equals that of a superheterodyne. The range of receivers includes a series known as 830, with a model for A.C., D.C., and batteries; there is also a radio-gramophone for A.C. mains, using the 830 chassis, called the 870A. The battery receiver has an entirely new feature which should make for strict economy in H.T. current. There are



Philips 830A receiver chassis for A.C. mains.

four valves functioning in the normal way in the receiver and a fifth—acting as a diode detector across the speaker—so biases the pentode output valve that when no modulation of the carrier wave is taking place the current is limited to 5 mA. With deep modulation the current may rise momentarily to 15 mA.

A remarkable performance, as regards selectivity and sensitivity, is claimed for the 630A receiver, for not only is the aerial coupled to the first screen-grid valve by band-pass filter, but also the same type of coupling is used to the second screen-grid valve. The third coupling, which directly precedes the detector, is semi-aperiodic, and arranged to peak at 600 metres and 2,000 metres on the medium and long waves respectively. By this means a compensation is effected for the natural drop in dynamic resistance which takes place at the upper end of the waveband. An extremely ingenious tuning control has been devised for this receiver. There is an illuminated micrometer dial with two separate scales; one is calibrated in wavelengths and is sub-divided into ten equal divisions, each indicated by a separate letter. A second scale is sub-divided into 100 equal parts and is so geared that the wavelength scale is virtually divided into a thousand parts, with the result that the tuning dial has an equivalent length of 5 feet. On this dial the trans-



Philips 630A chassis showing micrometer dial.

missions of London Regional and Mühlacker become tuned no fewer than 10° apart. The waveband change is effected by pulling out the tuning dial and a shutter is arranged to obscure the band not in use. This set, which should prove one of the most interesting at the Show, is self-contained with moving-coil loud speaker, and retails at 23 guineas.

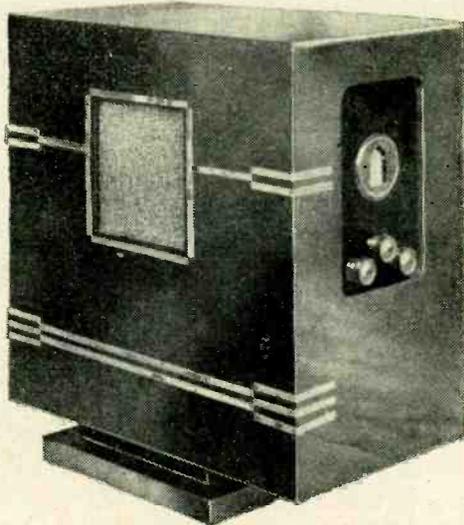
A comprehensive range of mains rectifying valves is being exhibited.

Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.

PHILOMEL. (279)

This firm exhibits a three-valve chassis, available as a simple set in either of two types of cabinet, or as a radio-gramophone. The circuit is of the screen-grid-detector-pentode type, tuning being carried out by a twin-gang condenser. In the radio-gramophone the screen-volts control is ganged to a potentiometer across the pick-up, so that the same knob serves as volume control both for radio and gramophone.

Philomel Radio Equipment, Pickering Street, Loose, Maidstone.



Philomel three-valve set in modern type of cabinet.

PIX. (43)

A range of valves, both battery and mains types, will be found on this stand, in addition to a number of components. One of the most useful of the latter is the Invisible Aerial for indoor use.

The Pix-Crossley seven-valve superheterodyne is also being shown, and is listed at 20 guineas.

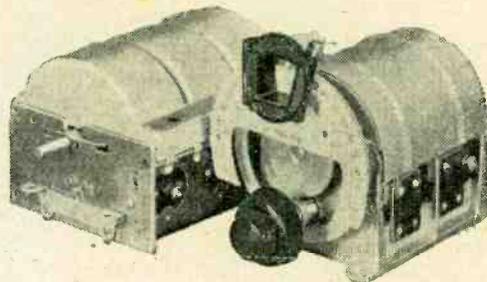
British Pix Co., Ltd., 118, Southwark Street, S.E.1.

POLAR. (129)

The Uniknob two-gang condenser introduced on this occasion last year has been slightly modified, and in its new form is fitted with a dust cover and a mica dielectric trimming condenser across the front section, this being adjusted from the panel as before. The price has been reduced, and is now 19s.

A new range, known as the "Star" series, makes its appearance for the first time. These are assembled in cadmium-plated steel frames with each section fully screened and fitted with a separate cover. The small trimmers are mounted so that adjustments can be made from the top, and the individual sections are matched to within very close limits. Fitted with three 0.0005 mfd. condensers, the price is 25s. 6d., and a four-gang model costs 34s.

The "Star" series includes also a superheterodyne model in which the stator of one section is fitted with plates shaped to give correct tracking with the pre-selector circuits when used with a 110 kc. I.F. amplifier. The price of this model is 27s. 6d.



Polar Star three-gang condenser and Uniknob fitted with dust cover.

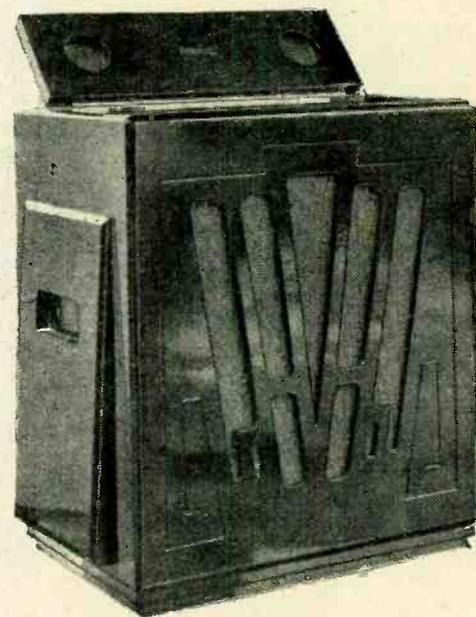
It will be noticed that a new drum drive fitted with a moulded escutcheon and a small lamp bracket is now available at the price of 7s. 6d., and that certain models in the Polar range have been omitted this year. But the more popular types are continued without change.

Wingrove and Rogers, Ltd., Mill Lane, Old Swan, Liverpool.

PORTADYNE. (56)

This firm is concentrating on three cabinet-type self-contained receivers and a suitcase portable. The latter is known as the "Atlantic," and employs a four-valve circuit with one S.G. H.F. stage, the price being 12 guineas.

The model A.C.3 mains receiver with a straightforward S.G.-det.-pentode circuit and energised moving-coil loud speaker costs 17 guineas. The "Challenger" and Model B.M.C. receivers are battery-operated and are priced at £12 17s. 6d. and 14 guineas respectively. Both employ S.G.-det. 2 L.F. circuits, but the B.M.C. is fitted with a pentode output valve and moving-coil loud speaker.



Portadyne model B.M.C. battery receiver.

All the above models are fitted with the Portadyne instantaneous tuning device.

Portadyne Radio, Ltd., Gorst Road, North Acton, N.W.10.

POWERTONE PRODUCTS. (229)

Two well-finished suitcase portables—the Powertone Screen Grid Four at 8 guineas

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and the Super Selective Five at £6 19s. 6d. are the principal products of this firm. A portable gramophone-playing desk with Garrard spring motor and Harlie pick-up at £3 19s. 6d. is also shown.

Powertone Products, 88, Cromer Street, W.C.1.

PRIMUSTATIC. (15)

In addition to the well-known standard Primustatic loud speaker, a new "Super" model also working on the electrostatic principle is shown, the price being 3 guineas. The foil electrode is divided into two halves, and in one type, provided with uniform holes, the loud speaker may be used after a push-pull output.

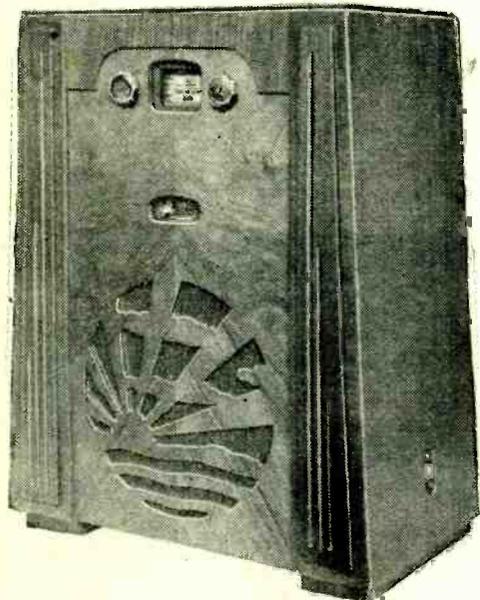
The "Dynamostatic" loud speaker mentioned in the forecast is not yet ready, but information regarding the combination of the Primustatic with existing moving coils is available.

The remainder of the stand is devoted to a display of Koh-i-Noor H.T. batteries.

Primus Manufacturing Co., Primus House, Willow Street, E.C.2.

PYE. (80)

In addition to the Model G receiver, anent some details were given in our Olympia Show Guide last week, there are three other new receivers now included in the Pye range. One is a six-valve superheterodyne, in which the screen grid first detector is preceded by an H.F. stage, and an inductively coupled band-pass input filter. Variable-mu valves are used in the predetector H.F., as well as in the I.F. amplifier, and a pentode valve provides a



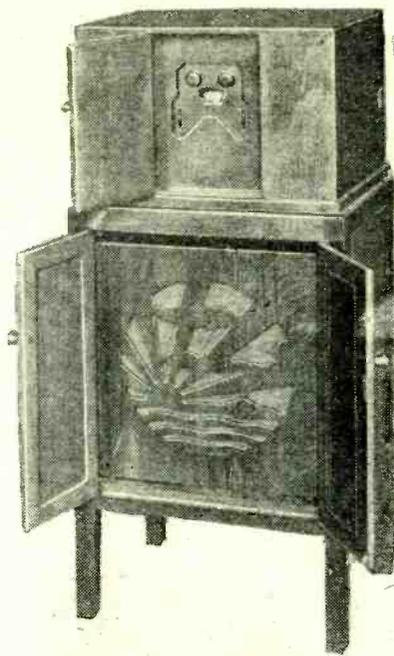
Pye six-valve superheterodyne for A.C. mains operation.

generous output for the built-in moving-coil loud speaker. Compensation is applied to the L.F. amplifier.

The controls are neatly arranged and few in number, while tuning is facilitated by calibrating the dial in wavelengths as well as with the names of the principal broadcasting stations. Provision is made for using a gramophone pick-up, and, housed in a cabinet designed and finished in the manner distinctive to all Pye products, the price is 27 guineas.

A particularly useful feature of the "Schools Receiver" is that it can be closed and locked to prevent unauthorised persons tampering with the controls or obtaining access to any part of the set. It is mains

operated and employs four valves, two of which are H.F. amplifiers. The permanent-magnet-type moving-coil loud speaker is mounted in a separate case, housed nor-



Pye "Schools Receiver," in which the loud speaker is a separate unit.

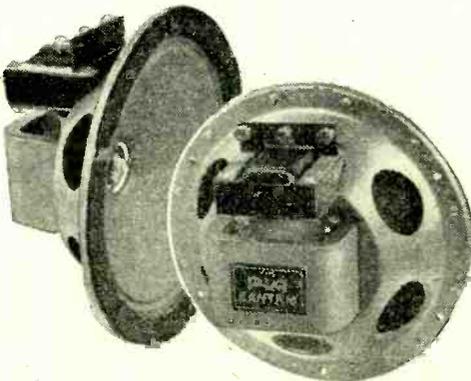
mally in a special compartment in the lower portion of the cabinet, so that it can be removed and placed in a more convenient position if necessary. The price of this model is £37 10s.

There is a compact two-valve A.C. mains set, the Model K, embodying a det.-L.F. circuit, and costing 12 guineas complete. It is quite up to date in design and includes a band-pass filter.

Pye Radio, Ltd., Paris House, Oxford Circus, W.1.

R. & A. (69)

Two new permanent-magnet moving coils are shown by this firm. The "Victor" is a de Luxe model of unusually rigid construction, fitted with a double frame and an artistic protective metal grille. An unusually wide range of matching is provided by the six-ratio transformer, which gives effective loads from 850 to 15,000 ohms. The price is 70s.



R. & A. "Bantam" P.M. moving coil.

The new "Bantam" is a competitive model which sells at 27s. 6d. complete with three-ratio transformer.

The well-known "Challenger" moving coil and the type 40 and 50 differential armature reproducers are continued.

Reproducers and Amplifiers, Ltd., Frederick Street, Wolverhampton.

R.C. RADIO-ELECTRIC. (222)

A new hand-type microphone, with an adjustment for sensitivity, is the most recent addition to this firm's range of useful accessories. Other items of interest comprise electric soldering irons and cage aerials.

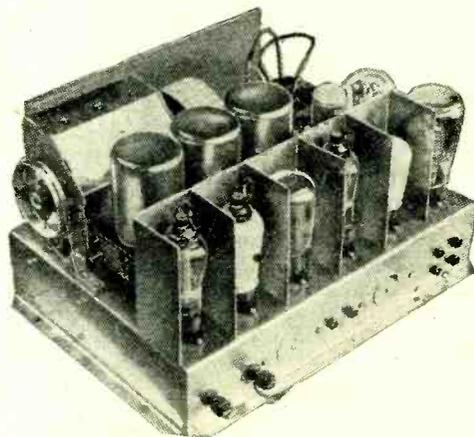
R.C. Radio-Electric, Ltd., 51, Whitcombe Street, W.C.2.

R.G.D. (92)

Although the R.G.D. sets retain their individuality from year to year, subtle changes and minor improvements are always being introduced, with the result that we have come to expect, almost as a right, new features of outstanding merit.

The new Type 701 chassis seems to be even more intriguing than its more ambitious companion; excluding the rectifier, there are a total of six valves, arranged as follows: variable-mu signal-frequency amplifier; S.G. first detector; oscillator; variable-mu I.F. amplifier; anode bend second detector; output valve. On the radio side, the volume control functions by changing the bias of H.F. and I.F. valves simultaneously.

This instrument, unlike the model 901, functions with a single loud speaker, and here we come to the most interesting feature of the design: tone correction for the inevitable falling-off, even in the best of



Chassis of the R.G.D. Model 701.

loud speakers, at each end of the frequency scale. To compensate for this the upper register is "boosted" by the insertion of an air-cored choke in series with the resistance which serves to couple the second detector to the output valve. Similarly, accentuation of the bass is provided by using an iron-cored choke in place of a grid leak for the output valve; this choke is tuned to resonate at a frequency just above the natural periodicity of the cabinet.

The net result of this double correction is an output curve which rises at each end; the extent of the rise is determined to suit the characteristics of the loud speaker. This scheme of correction has nothing in common with the system in which deliberate side-band cutting in the H.F. amplifier is corrected in the L.F. amplifier; it is devised mainly to overcome the natural limitations of loud speakers.

With regard to other details, it may be stated briefly that the oscillator is tuned by a shaped-plate section of the gang condenser, padding being introduced on the long waves. An output of about 3 watts is provided by a P.P.3/250 valve.

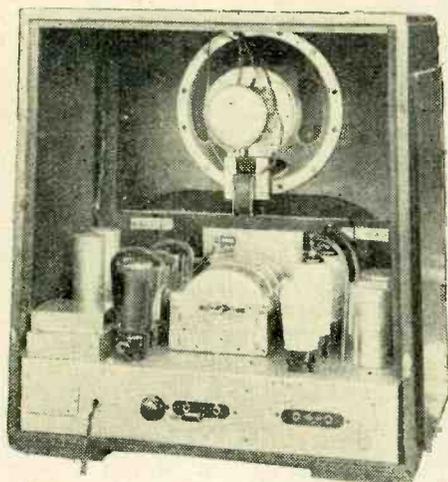
Lack of space prevents a complete description of the Type 901 chassis, of which the push-pull output stage delivers some 6 or 7 watts to a pair of compensated loud

Olympia 1932.

speakers; as the combined characteristics of these two instruments are arranged to avoid the weakness of a single speaker, no correction is needed in the L.F. amplifier. All R.G.D. sets have a manual tone control.

Finally, there is an extraordinarily ambitious 12-valve superheterodyne, which includes the purely "radio" section of the model 701.

Radio Gramophone Development Co., Ltd., 18-20, Frederick Street, Birmingham.



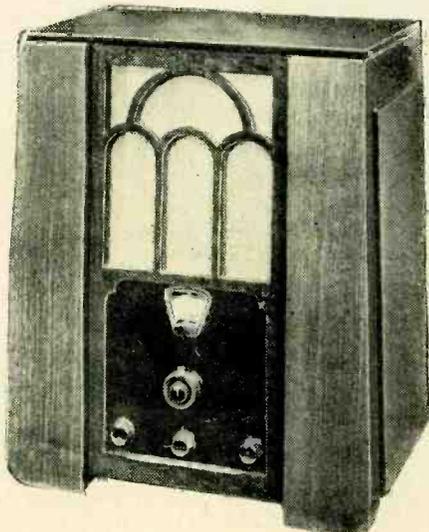
Chassis of the R.I. six-valve superheterodyne.

R.I. (90)

Prominent on this stand is a five-valve superheterodyne, employing a two-valve frequency-changer, one variable- μ I.F. stage, and a triode second detector transformer-coupled to a pentode output valve. A band-pass input circuit is used, and to prevent overloading the second tuned circuit is progressively damped as the bias voltage on the intermediate amplifier is increased. By this means the local station can be received at short distances on a large aerial without deterioration of quality. This receiver sells for 25 guineas complete for connection to A.C. mains.

For 17 guineas can be purchased the Madrigal A.C.3 receiver, which contains one H.F. stage followed by detector and pentode, the coupling between these being parallel-fed transformer. A permanent-magnet moving-coil speaker is used. Tuning is by a twin-gang condenser.

The Anti-nodal short-wave adaptor incorporates several novel features. It consists of a reacting detector circuit, the

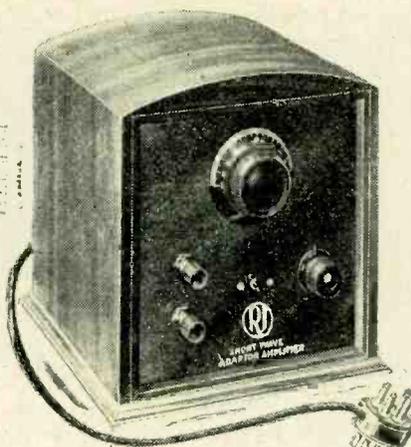


The new R.I. Madrigal receiver.

detector being followed by a parallel-fed transformer, the secondary of which is connected to a special adaptor. This is inserted into the detector valve-holder of the normal set, and the detector valve of that set is then plugged into the adaptor. In this way an extra low-frequency stage is added to the receiver when short waves are being received.

The special short-wave coil used in this adaptor can also be purchased separately; it covers without gaps the range from 12 to 80 metres, and has a special loading coil in the aerial circuit which can be switched in or out as desired. By this means the tuning of the aerial is altered, and the familiar "dead spots" can be avoided.

The "Parafeed" transformer can now be obtained embodied in a complete unit containing also two coupling resistances and a coupling condenser. By making only a minimum of permanent connections within the case the unit has been left adaptable to a large number of different circuit combinations.



Radio Instruments short-wave adaptor-amplifier.

In addition to these novelties, the older components with which the name of R.I. is associated are still available.

Radio Instruments, Ltd., Purley Way, Croydon.

RADIALADDIN. (277)

This firm offers "new sets for old," accepting a second-hand set in part payment for a new one of any make. A small subscription pays for membership of the Radialaddin Club.

Radialaddin, Ltd., 47, Berners Street, W.1.

RADIO SOCIETY OF GT. BRITAIN (242)

On this stand the short-wave enthusiast will find much to interest him, for the latest developments in receiver and transmitter technique are shown. There is a single-valve pentode detector battery set for short waves, also a transmitter with a pentode crystal oscillator giving up to 50 watts and built up entirely of receiver components.

Radio Society of Great Britain, 53, Victoria Street, S.W.1.

RATCLIFF (METALS) LTD. (258)

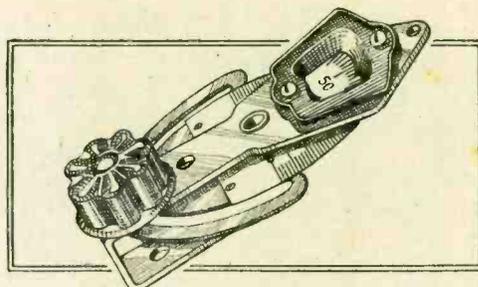
The interest in this stand is confined chiefly to receiver and other manufacturers, since the exhibit consists of a display of metals of all kinds.

J. F. Ratcliff (Metals), Ltd., 21-31, New Summer Street, Birmingham.

READY RADIO. (106)

In addition to an extensive range of small components, of which the new illuminated

disc drive, costing 4s., and an L.F. transformer, priced at 8s. 6d., are especially good examples, this firm is showing two kit sets, the "303" and the "Meteor S.G.3." The "303," priced at 70s., is an exceedingly simple set to build, as there are four components only to assemble, and five wires to connect.



Ready Radio slow-motion condenser drive.

Slightly more ambitious is the Meteor S.G.3 (H.F.-det.-L.F.). Plug-in coils are provided, and it will cover, with suitable coils, the short, medium, and long wavelengths. The constructional work has been simplified by thoughtful design, and the price, complete with valves, is £5 7s. 6d.

Ready Radio, Ltd., Eastnor House, Blackheath, S.E.3.

RED DIAMOND. (97)

A very useful assortment of small turned ebonite fittings are shown on this stand. Among new products are ebonite test prods with metal points and convenient connecting terminals for the test leads; also extension rods for fitting to existing tuning condensers, particularly for short-wave work. Ebonite bushes in a variety of sizes are manufactured, together with lead-in tubes, insulated connectors, and wall plugs.

Jewel Pen Co., Ltd., 21-22, Great Sutton Street, E.C.1.



Red Diamond extension rod, H.F. choke, test prods, and 6-point switch.

REDFERN. (124)

Ebonite in every form is to be seen on this stand. Ribbed coil-formers, slotted or plain, ebonite tubes and rods of all diameters, and slotted formers, complete on bases with terminals, intended for the reception of H.F. choke windings, are the items of most immediate interest to the home constructor and home designer of sets.

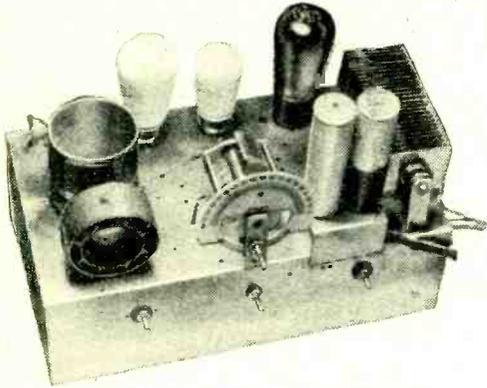
The "Twoside" panel, one side of which is finished in plain glossy black, while the other has a mahogany finish, is a new introduction which should arouse interest, while additions making the total up to twenty have been made to the range of coil-formers.

Redfern's Rubber Works, Ltd., Hyde, Cheshire.

Olympia 1932.—

REGENTONE. (51)

A range of mains receivers is shown on this stand. The Super Three at 16 guineas is a good example of modern design, and the specification includes a variable-mu H.F. stage, detector, and pentode output



The Regentone Straight Three chassis.

to the moving-coil loud speaker. A metal rectifier is used for the H.T. supply, and the whole apparatus is contained in a walnut cabinet. Another three-valve set, the Straight Three, of similar specification, but with the valves arranged as a detector with two L.F. stages, is available at £12. Both sets include provision for using the mains as an aerial. A simple two-valve mains set is listed at £6 15s.

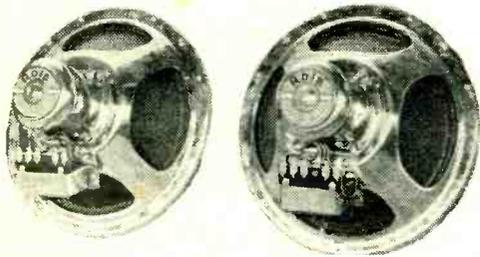
A wide range of mains units is also exhibited, and there are models for both A.C. and D.C. mains. All types have seven voltage tappings, and the output of the model W1A is 150 volts at 30 mA.; it is priced at £3 17s. 6d. A similar unit, but with an L.T. charger supplying ½ ampere at 2, 4, or 6 volts, is available at 5 guineas.

Regentone, Ltd., Regentone Works, Worton Road, Isleworth, Middlesex.

ROBERTS. (272)

Dealers interested in battery charging will find on this stand a new type of unit switch-board, which has many advantages over the conventional type.

John Roberts, 1-3, Bridgwater Viaduct, Knott Mill, Manchester.



British Rola dual matched loud speakers.

ROLA. (45)

A wide range of moving-coil loud speakers is shown on this stand. The type F.5 is fitted with a 6in. cone and priced at 27s. 6d. for the energised models, but at 32s. 6d. for the permanent-magnet type. The F.6 has a 7½in. cone, and is listed at 35s. for the energised types.

A 9in. cone model is now available at 47s. 6d., and 60s. for the permanent-magnet type. All models include a tapped transformer, and the standard field windings have resistances of 8 ohms, 2,000 ohms, 4,700 ohms, and 6,500 ohms.

A special feature is being made of dual matched loud speakers, and these are available in two types. Two matched type F.6

models can be obtained at £3 10s., or a matched pair consisting of one type F.6 and one type F.7 at £4 5s., and greatly improved response is claimed for these.

British Rola Co., Ltd., 179, High Road, Kilburn, N.W.6.

SELFRIDGE. (274)

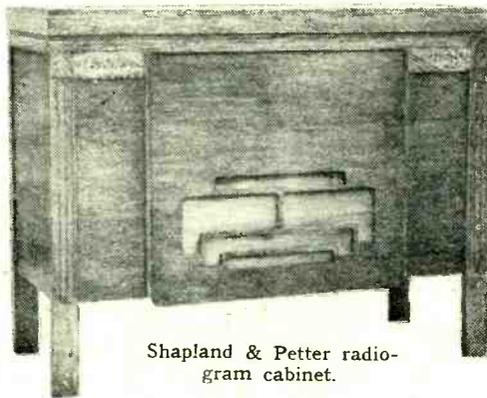
This exhibit exemplifies the service offered to the buying public by the radio department of this well-known store.

Selfridge and Co., Ltd., Oxford Street, W.1.

SHAPLAND & PETTER. (287)

The principal business of this firm is cabinet-making, and the type 167 radio-gramophone cabinet specially designed for dual-unit loud speakers is a very fine example of their work.

The high-grade "Aylesbury-Trouton" moving-iron loud-speaker units are also available for inspection on this stand.



Shapland & Petter radio-gram cabinet.

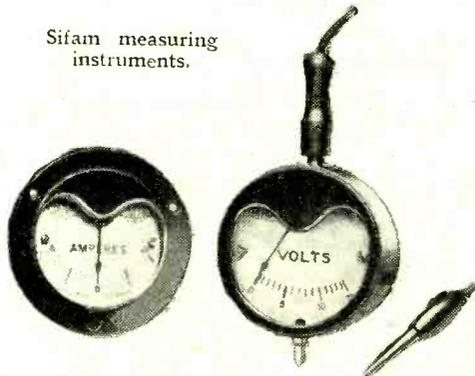
Another attractive exhibit is the type 117 loud speaker incorporating a synchronous clock and a permanent-magnet moving-coil unit.

Shapland and Petter, Ltd., Raleigh Works, Barnstaple.

SIEMENS. (88)

The display on this stand consists almost exclusively of dry batteries and accumulators, the special feature being the "Full-o-Power" H.T. batteries. The construction of this battery is unusual in that the zinc container, which is seamless, has packed into it an exceptionally large amount of the de-

Sifam measuring instruments.



polarising compound on which the life of the battery largely depends.

The "Cadet" and "Standard" batteries are suitable for discharges up to 10 milliamps at most, the "Power" battery may be expected to have a good life when discharged at up to 20 milliamps., while for currents over this and up to 30 milliamps the big "Super-Radio" battery is recommended.

In the latter battery square cells are used so that no space is wasted.

Siemens Electric Lamps and Supplies, Ltd., 38-39, Upper Thames Street, E.C.4.

SIFAM. (289)

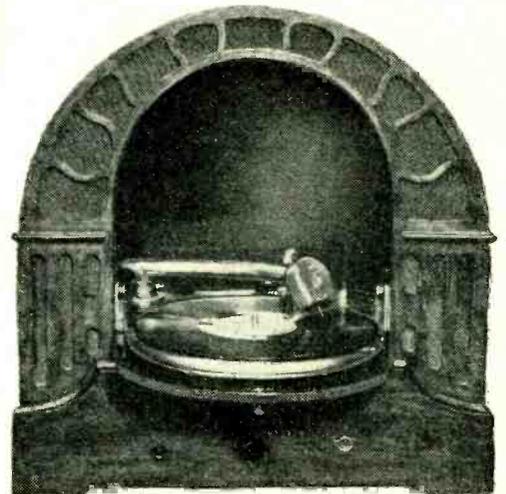
The claim by this firm that they make a meter for every radio-measuring requirement appears to be justified. The portable meters are the most likely to attract the radio enthusiast, for not only are the ranges well chosen, but the prices will undoubtedly suit the slender pocket. For somewhat inaccessible contacts in a receiver an extension testing prod 8in. long with universal connection for any standard plug is being marketed.

There are moving-coil and moving-iron meters for both D.C. and A.C. circuits, and a complete range of fuses, together with single and double-type fuse holders. Various testing sets which are chiefly of interest to the service man are exhibited.

Sifam Electrical Instrument Co., Ltd., York Works, Browning Street, S.E.17.

SIMPSON'S ELECTRICAL. (71)

This stand is devoted almost entirely to the Simpsons Electric Turntable. This is unusual in that the motor is contained within the turntable itself; an extremely compact design of a radio-gramophone is thus possible, for there is nothing to project below



Micro Perophone and Chromogram radio-gramophone cabinet.

the motor board into the cabinet. The turntable is available with either 12in. or 10in. diameter, and the price is 39s. 6d.

The Micro Perophone and Chromogram radio-gramophone cabinet is also shown on this stand. This is of most unusual design, for the gramophone equipment, which includes a Simpsons turntable, is fitted to the drop front.

Simpson's Electrical, Grange Road, Leyton, E.10.

SINCLAIR. (277a)

The outstanding exhibit here is a range of small energised moving-coil speakers, available with four different field windings and with input transformer wound either for a single power valve, for two in push-pull, or for a pentode. All models cost 25s. A permanent-magnet model with input transformer is offered at 39s. 6d.

A three-valve A.C. set, with band-pass input, variable-mu stage, and triode detector coupled to a pentode output valve by a transformer, is priced at £17 17s., including

Olympia 1932—
twin moving-coil speakers and a synchronous electric clock.

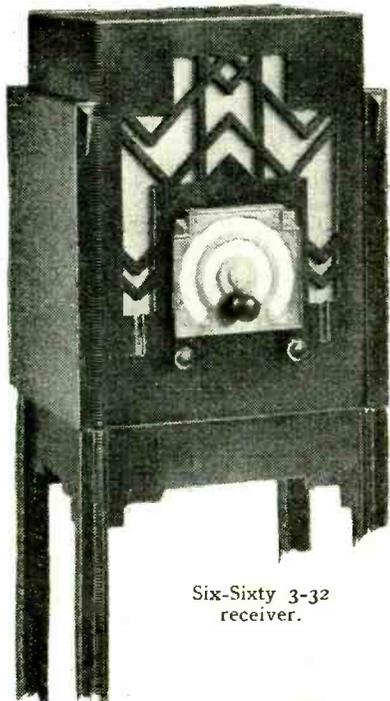
Stafford Sinclair, 21, Kenwyn Drive, N.W.2.



Selections from the range of Stafford Sinclair speakers.

SIX-SIXTY. (52)

A receiver housed in a striking cabinet which at once attracts attention on visiting this stand is the Six-Sixty 3-32 "Chassisset," which is a three-valve battery receiver embodying the latest technique. There is band-pass tuning before the screen-grid valve, which is the new S.S. 218SG. The output valve—the new S.S. 220 Pen, is capable of giving a large undistorted output with quite a small negative bias. An interesting feature is the inclusion of automatic grid bias, which obviates the danger of a damaged output valve when the replacement of a bias battery is forgotten.



Six-Sixty 3-32 receiver.

The volume control is unconventional and comprises a reaction condenser mechanically linked to a variable resistance connected between aerial and earth. The tuning dial is calibrated in stations, wavelengths, and kilocycles, and, instead of a pointer, a narrow beam of light indicates the resonance point.

There is a particularly comprehensive range of Six-Sixty valves on this stand, also

a useful valve tester containing a number of measuring instruments.

Six-Sixty Radio Co., Ltd., 17-18, Rathbone Place, W.1.

SLEKTUN. (205)

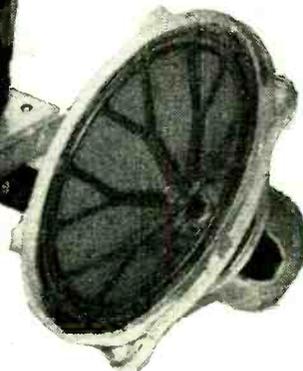
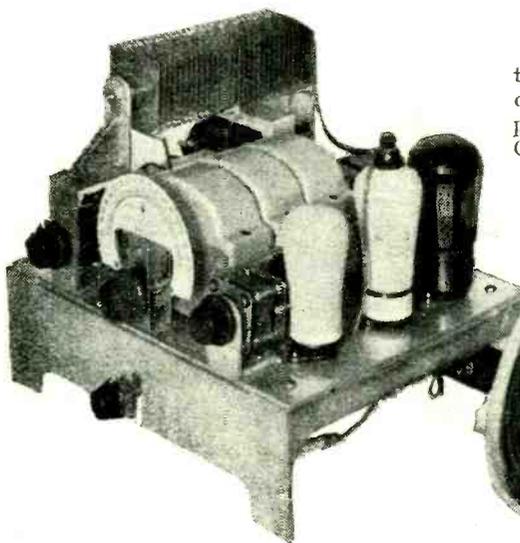
The items of chief interest in the range of components carrying this name are mains transformers, H.F. chokes, and two L.F. transformers at very reasonable prices. The "Super" transformer costs 8s. 6d., and the "Colt" 4s. 9d., and both may be obtained with four alternative ratios.

The recently introduced Hartley-Turner moving-coil loud speaker is also to be seen on this stand.

Slektun Products, 21, Douglas Street, S.W.1.

SMITH RADIO. (251)

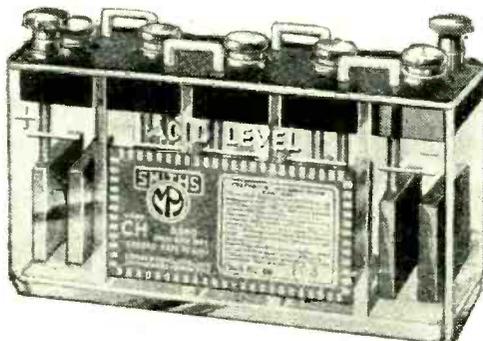
The Loradsa receivers are the feature of this stand, and range from a three-valve straight set to an eight-valve superhetero-



The Smith Radio Loradsa A.C. Three chassis.

dyne. The A.C. Three includes band-pass tuning, power grid detection, and a pentode output of 2½ watts, and is priced at £17 5s. The superheterodyne is of the Stenode type, with variable- μ valves and an output of 5½ watts to the M.C. speaker. An overall frequency response up to 6,000 cycles is claimed, and this Sherborne receiver is priced at 80 guineas.

Arthur Smith (Radio), Ltd., 56, Hazel Road, Kensal Rise, N.W.10.



S. Smith & Sons' 10-volt H.T. unit, type CH.

S. SMITH & SONS. (130)

Although the entry of this firm into the radio field is a recent event, there is a very extensive range of L.T. cells and an adequate selection of H.T. accumulators available. The unspillable range of L.T. cells is particularly interesting, as a special preparation of jelly acid electrolyte is used in conjunction with a novel spray trap. Non-

interchangeable terminals are fitted throughout.

The H.T. batteries are made in 10-volt units, and in 5,000-mA.-hour capacity; known as the CH type, the price of a unit is 6s. 3d.

S. Smith and Sons (Motor Accessories), Ltd., Cricklewood Works, N.W.2.



The Smurthwaite Gramadaptor.

SMURTHWAITE. (22)

This firm specialises in making receivers to special order, and a number of examples of its work are exhibited. A small gramophone record playing desk, known as the Gramadaptor and priced at £6 15s., is shown,

and is of particular interest on account of its very small dimensions.

The Howe box baffle for loud speakers is also on view.

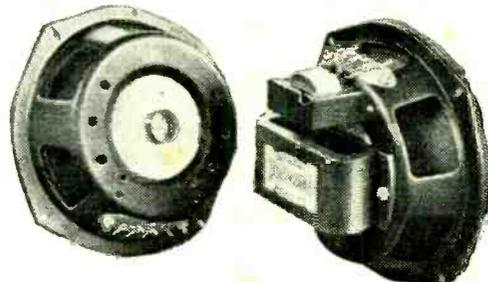
F. W. Smurthwaite, 15a, Onslow Gardens, Wallington, Surrey.

SONOCHORDE. (262)

The moving-coil loud speakers shown on this stand are fitted with an ingenious centring device consisting of a flexible corrugated diaphragm mounted behind the cone apex. Permanent-magnet and energised models are available, and dual-matched speakers of both types.

Other exhibits which will make a visit to this stand worth while are the vertical electric clock cabinets incorporating dual-unit loud speakers and a record changer unit which plays through a set of records on one side, turns them over and then plays the opposite sides in the reverse sequence.

Sonochorde Reproducers, Ltd., 1, Willesden Lane, N.W.10.



Sonochorde permanent-magnet moving coil.

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SOVEREIGN. (152)

The chief new component offered here is the "Vario-Choke," which consist of an H.F. choke with a pre-set condenser in series with it. Many applications of this combination are suggested.



The Sovereign "Doric" three-valve battery receiver.

The receivers are all intended for battery operation, the "Doric," a screen-grid detector pentode combination with permanent-magnet moving-coil speaker, being offered at 10 guineas. The other receivers are of the detector-L.F.-output type.

Sovereign Products, Ltd., 52-54, Rosebery Avenue, E.C.1.

SPENCER RADIO. (14)

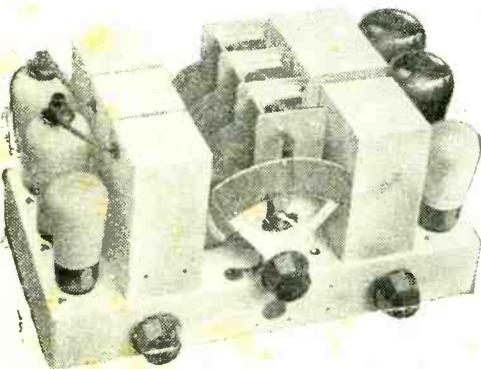
Portable receivers form the chief exhibit on this stand, and the Screen-Grid IV Midget Portable has its valves arranged as an H.F. stage, detector, and two L.F. amplifiers. It is of the suitcase type, and priced at 11½ guineas. A four-valve A.C. set, with a built-in electric clock, is also shown.

Spencer Radio, Ltd., 136, Clerkenwell Road, E.C.1.

STANDARD BATTERY. (26)

In addition to a range of wet H.T. batteries, this firm is showing the Futura 6, a five-valve receiver for A.C. or D.C. mains. Two variable-mu H.F. stages are fitted with three tuned circuits, power detector, and two L.F. stages, and the chassis is characterised by a particularly clean layout.

Rotary converters are shown, the 80 watts model being priced at £11, and the 180 watts at £13 5s., especial stress being laid upon



The Standard Battery Co. Futura 6 chassis.

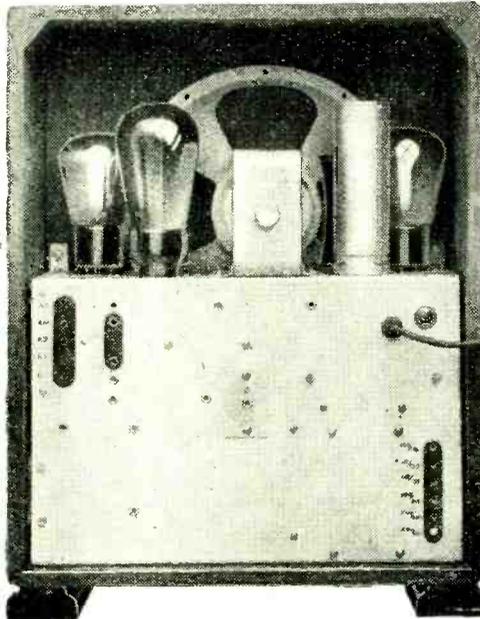
their silence in operation. The well-known Wates meters are to be seen, and a moving-

iron type milliammeter can be obtained for as little as 7s.

Standard Battery Co., 184-188, Shaftesbury Avenue, W.C.2.

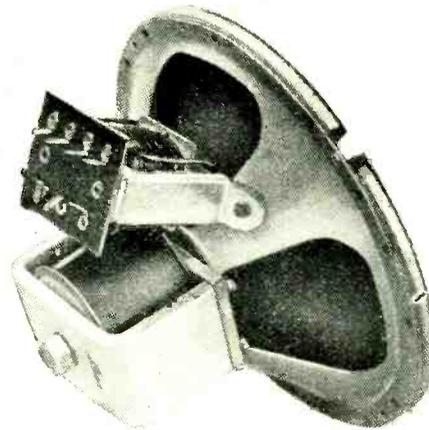
STANDARD TELEPHONES & CABLES. (107)

More than usual interest attaches to the exhibit of this firm in view of their long association with the radio industry. The programme as arranged at present allows for the introduction of four receivers, of which three are available for inspection, a range of moving-coil loud speakers, and the new Micromesh valves.



Chassis of Standard Telephones and Cables' 2-valve A.C. receiver.

The main feature of the two-valve A.C. model is that it covers short, medium, and long broadcast wavebands, but for the short waves a special plug-in coil is required. This can be obtained at a small extra charge.



Standard Telephones and Cables' electromagnetic moving-coil loud speaker chassis.

The circuit employed is a det.-L.F. combination with a pentode in the output stage. H.T. is derived from a full-wave valve rectifier, a moving-coil loud speaker is embodied, and provision is made for gramophone reproduction. It is chassis-built, and the price is £9 10s. complete in a well-made cabinet of pleasing design.

The permanent-magnet loud speaker costs 41s. 6d., and embodies a three-ratio input transformer. Built as an energised model it is available with field windings suitable for 6-volt, 100-150-volt, and 200-250-volt

supplies. The last mentioned costs 37s. 6d.

Micromesh valves are characterised by their exceptionally good mutual conductance values, obtained by very close spacing between the electrodes and the nature of the assembly in general. Detector, power, and mains rectifier types are shown. Attention is directed to the short time taken for the cathode to attain the normal operating temperature, for fifteen seconds only elapse after switching on, and not fifty as stated in error recently in these pages.

Standard Telephones and Cables, Ltd., St. Chad's Place, 364, Gray's Inn Road, W.C.1.

STENIBAC. (256)

This firm is showing a range of cabinets for all wireless purposes. Of particular interest is a radio-gramophone cabinet of by no means small dimensions at the price of only £5; the wood employed is walnut.

Stenibac, Ltd., 303, Essex Road, Islington, N.1.

SUNCO. (231)

Wholesale suppliers to the trade who are showing, in addition to all the well-known receivers, the "Radio-Aid" acoustic amplifier for the deaf.

Sun Electrical Co., Ltd., 118-120, Churing Cross Road, W.C.2.

SWIFT-LEVICK. (112)

A comprehensive exhibit of permanent magnets for moving-iron and coil-drive speakers is shown on this stand. All sizes of magnet, from the large ones that first made the reputation of the permanent-magnet moving-coil speaker down to the tiny magnets that appear to be favoured by most manufacturers to-day can be inspected. In addition, a monster magnet weighing 60 lb. and having 225,000 total lines in the gap is shown, not for sale, but as a technical achievement.

Swift-Levick and Sons, Ltd., Clarence Steel Works, Sheffield.

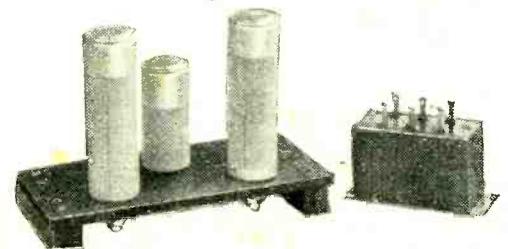
SYLVEX. (260)

A special display is made here of a range of Clarion A.C.-operated receivers and radio-gramophones. The same four-valve chassis, which includes two variable-mu H.F. amplifiers, a screen grid detector and a pentode output stage, is used throughout. Other items in the equipment comprise an energised moving-coil loud speaker, a novel style of illuminated dial, and in the case of one radio-gramophone there is an automatic record changer. The price of this model is 40 guineas.

Sylvex, Ltd., 144, Theobald's Road, W.C.1.

T.C.C. (53)

Sub-divided block condensers which have hitherto only been available to manufacturers are for the first time being marketed



T.C.C. aqueous electrolytic and block condensers.

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generally by this firm. These condensers effect an economy of space and also considerably simplify the wiring in a mains unit. One model contains 12 mfd. sub-divided into 1 mfd., and a smaller capacity of 0.01 mfd. plus 0.01 mfd., the latter combination being suitable for the elimination of modulation hum.

Every conceivable type and capacity-value of condenser is being shown, and particular interest attaches to the dry and aqueous types of electrolytic condenser. One example of the dry type, for instance, with a capacity of 8 mfd., which may be mounted in any position, has a working voltage of 500 V.D.C. and a peak voltage of 600, whilst the leakage current is less than 0.25 mA. The price is 9s. Extreme compactness and low cost are the chief features of the "M" or "Postage Stamp" type of small mica condenser, which is primarily intended to be suspended in the wiring. This series of condensers has had a well-deserved popularity during the past season, and the capacities available range from 0.0005 mfd. to 0.01 mfd., and the price of the smaller values is 1s.

Telegraph Condenser Co., Ltd., Wales Farm Road, N. Acton, W.3.

TANNOY. (44)

The Standard Radiogram employs a super-heterodyne chassis, with variable-mu H.F. and I.F. valves and band-pass tuning, and is priced at 45 guineas.



The Tannoy G.A.60 amplifier.

The Senior Superheterodyne Radio-Gramophone is a ten-valve instrument, with nine tuned circuits. Three wavelength ranges are included, namely, 15/70 metres, 200/600 metres, and 800/2,000 metres, and automatic volume control is fitted in an endeavour to overcome fading. Dual loud speakers are employed and fitted in a compartment specially designed to avoid box resonance, and on the gramophone side an automatic record changer can be fitted if desired. The prices range from 60 guineas.

A range of high-power amplifiers for gramophone and other work is also on view.

Tannoy Products, 1-7, Dalton Street, S.E.27.

TECALEMIT RADIO. (263)

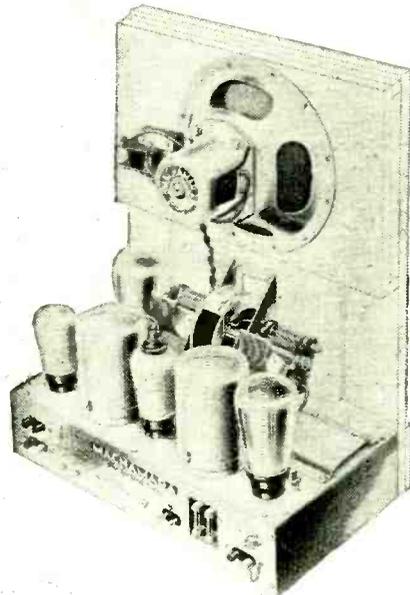
The resources of this firm are devoted to the production of a single model A.C. receiver. The three-valve circuit includes one H.F. amplifying stage, which is preceded by a single tuned input circuit provided with a variable aerial coupling, in the form of a swinging coil, which is controlled from the panel. It is chassis-built, embodies an

energised moving-coil loud speaker, and the price is 16 guineas.

Tecalemit Radio Co., Great West Road, Brentford, Middlesex.

TELSEN. (66)

This firm is showing a range of receivers, including the Macnamara Golden Voice Electric Radio. The model S.91, however, is interesting as an example of unusual design,



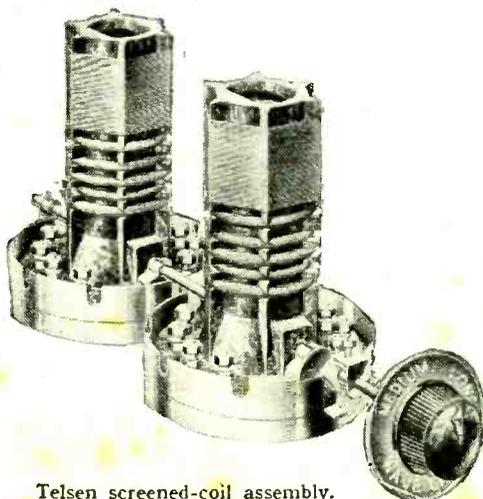
The Telsen Macnamara Golden Voice receiver.

for the controls are grouped round the centrally disposed loud speaker. It is a three-valve battery set, and all batteries are housed within the moulded bakelite cabinet. At first glance there appear to be two tuning controls, but an investigation reveals that one is a volume control. The price is 5 guineas.

Components of all types are shown, including a new range of screened coils with built-in waveband switching. The windings are carried on ribbed formers, and they are available in matched ganged assemblies. A new drum dial at 8s. 6d. is characterised by very smooth operation. A cord drive is used and a small knob arranged concentrically with the main control permits the stator of a condenser fitted to one side of the dial to be rocked over a few degrees. A high order of precision in circuit matching is thus unnecessary.

Midget fixed condensers, grid leaks, transformers, R.C. coupling units, dials, and variable condensers represent only a few of the varied assortment of components displayed.

Telsen Electric Co., Ltd., Aston, Birmingham.



Telsen screened-coil assembly.

TERRYTONE. (268)

Designed on quite up-to-date lines and embodying in some cases such modern features as band-pass tuning and variable-mu H.F. amplifiers, these receivers and radio-gramophones form a most attractive display. The Model B.P. 3004 is an excellent example of condensing a complete A.C.-operated radio-gramophone into a table-type cabinet of reasonable dimensions.

Terrytone Radio Products Co., Ltd., 33, Crouch Hill, N.4.

THOMPSON, DIAMOND & BUTCHER (207)

The activities of this wholesale firm are mainly concerned with the distribution of well-known products, but it also markets its own apparatus, under the trade name of "National Band." Two inexpensive cabinet-type moving-iron loud speakers are shown, and there is also a permanent-magnet moving-coil model.

Gramophone adaptor units, both with spring-driven and electric motors, are leading exhibits. One of the most interesting models—a portable—combines provision for acoustic and electrical reproduction of records.

Thompson, Diamond and Butcher, 34, Farringdon Road, E.C.1.

TRIX. (262a)

This firm has for long specialised in the production of power amplifiers, mains transformers, and L.F. chokes, so that these com-



Trix model T110 A.C. power amplifier.

stitute the main feature of their exhibit. There has been introduced this year a neat all-mains two-valve receiver, A.C. and D.C. models of which are shown, and the price is 9 guineas in each case. An energised moving-coil loud speaker is included, also a valve rectifier for the H.T. supply.

There is a range of small components, which include wire-wound volume controls and a very neat H.F. choke priced at 2s., the whole forming a most attractive display.

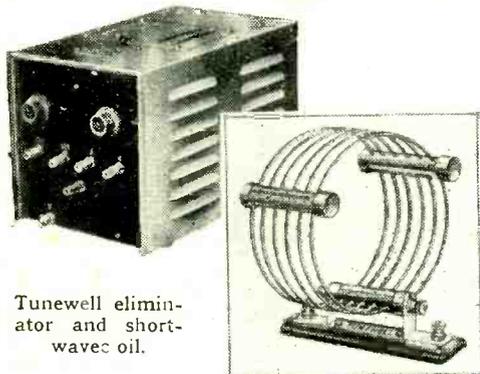
Eric J. Lever (Trix), Ltd., 8-9, Clerkenwell Green, E.C.1.

TUNEWELL. (96)

For this year's show the leading exhibit of Tunewell Radio is a three-valve A.C. radio-gramophone with an H.F.-det.-L.F. circuit arrangement. The input H.F. filter elements are coupled by the double-capacity

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method in order to obtain sensibly constant band-width and an output of over 2½ watts is obtained by the use of one of the new P.M.24M. pentodes. It is stated that



Tunewell eliminator and short-wave coil.

output in the upper register is well maintained even up to 10,000 cycles, but a manual tone control is provided so that heterodyne whistles—and needle scratch—may be eliminated when necessary by sacrificing a certain amount of brilliancy. Considering the generous specification of this instrument, its price (27 guineas) is as low as that of anything in the exhibition.



Tunewell receiver chassis and power unit.

Among the new Tunewell components, the screened band-pass coils, which were recently so favourably reviewed in these pages, will probably be considered the most interesting exhibits. Although rather larger than is strictly fashionable nowadays, the coils are not cumbersome and are distinctly above the average in efficiency.

Tunewell Radio, Ltd., 54, Station Road, New Southgate, N.11.

TYRELA. (283)

There are two types of receiver chassis being manufactured by this firm. Each is shown housed in a range of highly attractive and somewhat unorthodox cabinets. The superheterodyne set for the new season contains six valves, including a variable- μ amplifier and a power pentode output valve. Interesting refinements are the inclusion of a local-distance switch, mains aerial, illuminated dual wave track with station indicator, line voltage regulator, and an energised moving-coil speaker.

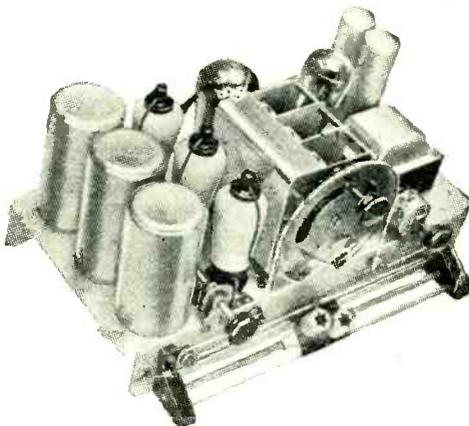
Of the many cabinets shown, the "Radio Chest" appeals as something quite new in radio furniture, and sells complete with the superhet. chassis at 22 guineas.

The second receiver chassis contains straight tuned radio frequency circuits.

Tyrela Electric, Ltd., 21, East Road, N.1.

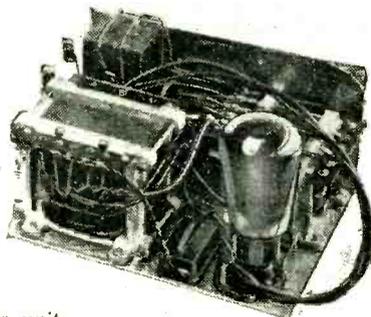
ULTRA. (73)

The four-valve "Panther" mains-operated chassis, available in several types of cabinet, is a good example of clean, modern design, plus several exclusive features of its own. The basic circuit arrangement comprises 2 H.F. stages and a



Ultra four-valve Panther chassis.

screen-grid detector valve, resistance-coupled to a pentode. There are three ganged tuned circuits. With regard to the



detector, it will be recalled that this firm adopted a screen-grid valve several years ago, long before it became common practice.

The station-calibrated indicator scale, mounted horizontally, and of exceptional length, is particularly interesting and, apparently, highly effective. Instead of the usual cursor, the scale is traversed by a narrow beam of light derived from moving pilot lamps. This beam appears on the scale in the centre of a coloured star which identifies the waveband for which the set is switched; red for medium waves and green for long waves.

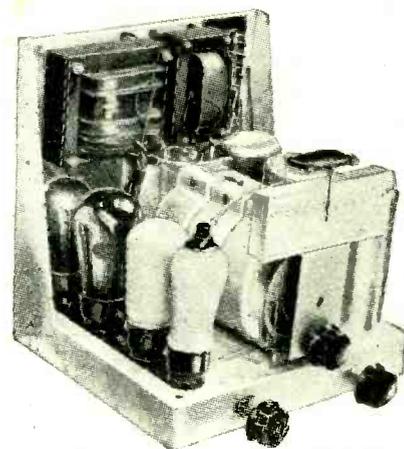
Another chassis, built on somewhat similar lines, is the "Tiger" model, with one H.F. stage, but, as an input filter is included, with the same number of tuned circuits. Both these sets are fitted with Ultra moving-coil loud speakers, which, in both permanent-magnet and energised types, are sold separately as accessories.

Ultra Electric, Ltd., Erskine Road, Chalk Farm, N.W.3.

UMELLO. (125)

One chassis, of band-pass three-valve type, in which a parallel-fed high-ratio transformer feeds the pentode output valve,

is used in both models of this firm's set. An unusual feature of the smaller set is the arrangement of the moving-coil speaker,



Umello three-valve chassis.

which faces upwards through a grille on the top of the cabinet. This prevents the microphonic trouble which is otherwise liable to arise in so small and compact a receiver.

The "Paratrap" is an absorption wave-meter intended for use with portable sets, to which it is "connected" merely by being placed near the frame.

Umello, Ltd., 55, Great Marlborough Street, W.1.

UNICFON. (250)

This firm is showing a four-valve radio-gramophone which is designed for use on either A.C. or D.C. mains supplies; the price for either instrument is 16 guineas. A four-valve A.C. set is available at 10 guineas, and there is a three-valve set at only 8 guineas.

Unicfon, Ltd., 23, City Road, E.C.1.

UNITED RADIO MANUFACTURERS (155)

A number of "Radio for the Million" kit sets are on view, notably the "Master Super," comprising a superheterodyne circuit with five valves for A.C. mains working. There is a separate oscillator valve, and the



Radio for the Million mains Stationmaster three receiver. (United Radio Manufacturers.)

second detector works on the anode-bend principle, otherwise the circuit conforms to modern practice. Another set which is

Olympia 1932.—

somewhat less ambitious is the Station-master Three—battery model—built on to a cadmium-plated steel chassis. The circuit consists of a screened-grid H.F. amplifier coupled by tapped tuned anode to a regenerative grid detector, which in turn is followed by a transformer-coupled triode. There is also a three-valve set for A.C. mains.

United Radio Manufacturers, Ltd., 63, Lincoln's Inn Fields, W.C.1.

UNIVOLT. (115)

The device sold under this trade-name may be described as a complete record-playing unit for connection to an existing radio receiver. An induction motor is built into a moulded bakelite base, on an ex-



Univolt radio-gramophone adaptor.

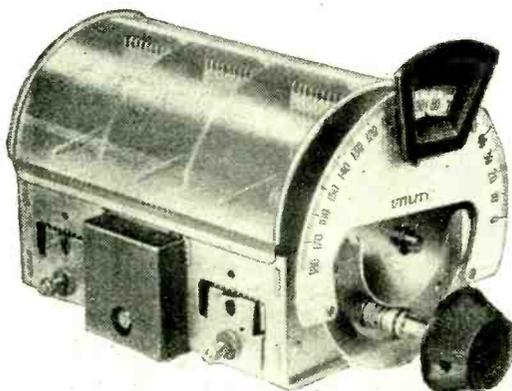
tension of which is mounted a pick-up arm with terminals, automatic stop gear, and a volume control. The whole is exceptionally compact, neat, and workmanlike.

Published characteristics relating to the Univolt pick-up, which is included in this gramophone adaptor, show a rather unusual "droop" in the middle register, which would be an advantage with the average receiver. There is a fairly early cut-off at the upper end of the frequency range.

Univolt Electric, Ltd., 119, Finsbury Pavement, E.C.2.

UTILITY. (118)

Although the earlier Utility ganged condenser was not lacking in robustness, the present model is even more rigid, being now



Steel-framed Utility condenser.

assembled in a frame of heavy-gauge pressed steel. Not only should it be possible to ensure accurate matching of units in the first instance, but adjustments should be maintained indefinitely. The spindle, which rotates in ball bearings, is exceptionally heavy, and all the desirable modern features, such as inter-unit earthing connectors and easily adjusted trimmers, are included. External finish, too, has been improved by the use of lacquered cadmium

plating, and alternative methods of mounting are provided. Two-, three-, and four-unit condensers are being produced.

A conventional semi-circular dial is available, but there is also a new straight-line horizontal scale which lends itself particularly well to direct calibration. This latter scale is, of course, illuminated, the lamp being enclosed in a reflector box.

Most of the other well-known Utility components are retained for the present season, some of them having been slightly modified. Variable condensers naturally head the list, but we must not forget the low-capacity switches and slow-motion dials, which are particularly adapted for short-wave work.

Wilkins and Wright, Ltd., Utility Works, Holyhead Road, Birmingham.

VARLEY. (160)

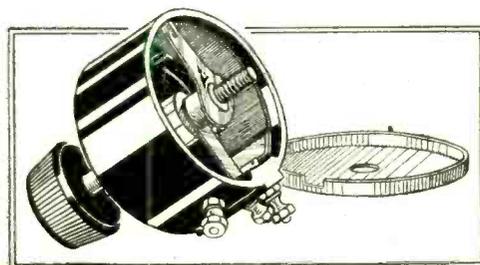
This firm is showing a transformer specially designed for use in tone-correction circuits; it is known as the Rectatone, and is priced at 15s. It is claimed that a flat characteristic is obtained for frequencies up to 1,000 cycles, after which the response curve rises rapidly to a maximum at 4,500 cycles. It consists of a 7-1 ratio transformer and a 0.13H. choke, and the exact characteristic obtained can be controlled by the addition of an external resistance.



Varley I.F. transformer.

Another new component is a screened intermediate-frequency transformer peaking at 110 kc. It is of the band-pass type, and the adjustment of both trimmers and the coupling can be carried out without removing the can. It is priced at 9s. 6d. Other superheterodyne components include pre-selector and oscillator coil assemblies with built-in waveband switching.

The well-known range of resistances and potentiometers is on view, and has been extended by the addition of a wire-wound volume-control potentiometer. This has a tapered resistance element, and is rated for 3 watts; it is totally enclosed, and the



Varley wire wound volume control.

spindle extends at the rear for easy ganging.

Low-frequency transformers, push-pull transformers, chokes, and mains transformers for every purpose are to be seen, while H.F. chokes, R.C. coupling units, and a gramophone pick-up represent the chief of the remaining components.



Varley superheterodyne Model A.P. 40.

Among receivers, a five-valve superheterodyne makes its appearance, and it is of an exceptionally compact type. Two valves are used as a frequency changer, and are preceded by a band-pass pre-selector; a variable-mu I.F. stage is employed and functions at 110 kc., the remaining valves being completed by the detector and output stages. A moving-coil speaker is fitted, and electrolytic condensers are used for smoothing. It is priced at 26 guineas, or as a radio-gramophone at 48 guineas.

The Square Peak Three, which was recently reviewed, is also shown. The cabinet styles are very similar, but the valves are arranged as a screen-grid H.F. stage, detector, and pentode output to a moving-coil loud speaker. There are three tuned circuits with single control operation, and electrolytic condensers are used for smoothing. Valve rectification is employed for the H.T. supply. The price is 17 guineas.

Varley (Oliver Pell Control, Ltd.), 103, Kingsway, W.C.2.

WADE. (276a)

The three-valve "Decee-Acee" mains receiver has been designed to work indiscriminately off D.C. or A.C. supplies. No adjustments whatever are necessary should the supply be changed. On A.C. the filaments are supplied through a voltage-dropping resistance, and H.T. is derived through a half-wave Westinghouse rectifier in series with the anode supply. The rectifier offers a low series resistance to D.C. when connected with the correct polarity, and a very high resistance if reversed, thus affording protection for the electrolytic smoothing condensers. The current consumption is 55 watts.

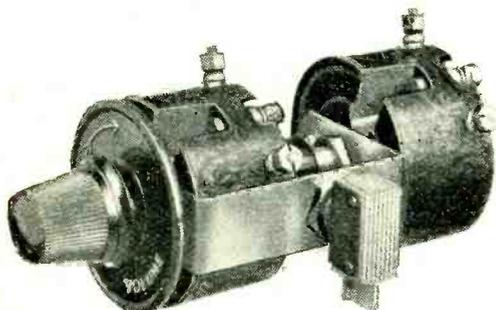
The radio circuit is of the S.G.-det.-pentode type, and includes band-pass tuning. An energised moving coil is standard, and the price is 18 guineas.

A. Wade and Co., 9, Carlton Road, Burnley, Lancs.

Olympia 1932.—

WATMEL. (273)

The resources of this firm are now concentrated principally on the production of wire-wound potentiometers and variable resistances in moulded cases. Type No. 1, which is a straight resistance, costs 5s. 6d., and is available in stock values ranging from 1,000 to 50,000 ohms. A mains switch is fitted to either type for 2s. extra.



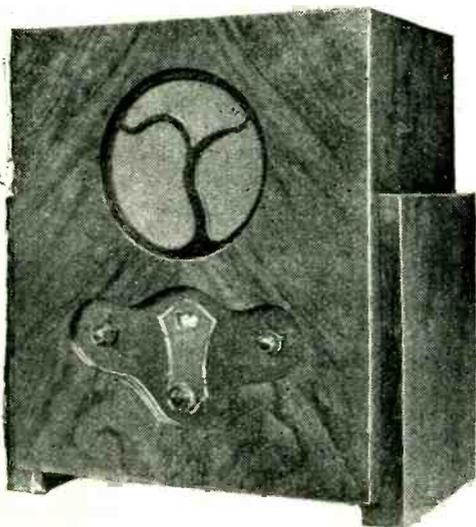
Watzmel MS5 dual potentiometer.

Type No. 3 has a high resistance element with embedded wire contact, and is obtainable in values from 10,000 ohms to 5 megohms for 4s. 6d. Ganged volume controls are also a speciality.

Watzmel Wireless Co., Ltd., Imperial Works, High Street, Edgware, Middlesex.

W.B. (108)

The new W.B. three-valve battery kit set is probably unique, for there are three units only to assemble and five connections to make, and the result is a complete det.-zL.F. receiver with self-contained P.M. moving-coil loud speaker mounted in a cabinet of pleasing design. The price is 7 guineas, which includes a well-made walnut cabinet.



W.B. three-valve kit set.

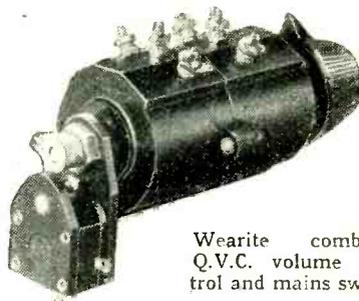
There are two models of permanent-magnet loud speaker. The P.M.4 chassis costs 42s., which includes an input transformer, and the other model is described as the Mansfield Junior, and in chassis form it can be purchased for 27s. 6d. with a transformer.

Whiteley Electrical Radio Co., Ltd., Nottingham Road, Mansfield.

WEARITE. (82)

One of the most interesting of the many new components now included in the Wearite

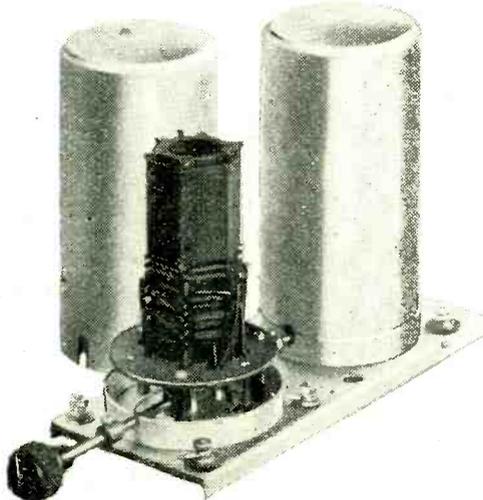
range is the Q.V.C. wire-wound series of volume controls. In addition to adopting a mechanical movement which imposes very little stress on the fine resistance wire, these



Wearite combined Q.V.C. volume control and mains switch.

models assemble into very compact ganged units in which can be included a mains switch if required. A three-member assembly, comprising any two Q.V.C. volume controls not exceeding 50,000 ohms each and a mains switch, costs 9s. 6d., but if one is over 50,000 ohms the price is slightly higher.

There is now a new range of screened coils with wave-band switches built in. They are supplied either as complete ganged units



Wearite dual-range screened coils.

mounted on an aluminium base in sets of two or three or as separate units; a set of three coils costs 25s. There are two models of screened H.F. chokes, a new 110 kc. band-pass I.F. transformer, and a host of small items in the form of resistances, switches, and the like.

The opportunity should be taken to examine the range of mains transformers and L.F. chokes, as there are many interesting models.

Wright and Weaire, Ltd., 740, High Road, Tottenham, N.17.

WEGO. (284)

This firm specialises in rolled-foil paper condensers, which are available in a range to suit all purposes. Attention is specially drawn to the very convenient tubular condensers with wire ends, which can be supported in a set by the connecting wires, and also to the HV and HS ranges of extremely compact condensers rated at 500 and 600 volts D.C. working.

In addition to these, condensers with terminals in bakelite cases are also offered, and there are high-voltage smoothing condensers useful for transmitters and for builders of the more ambitious type of powerful receiver.

Wego Condenser Co., Ltd., Spencer House, South Place, E.C.1.

WESTINGHOUSE. (89)

As one would anticipate, the main feature of this company's display is a very full range of metal rectifiers for both high- and low-tension use. There is a new series of low-tension rectifiers suitable for use in battery chargers or for the field-supply to moving-coil speakers, the smallest delivering $\frac{1}{2}$ amp. at 6 volts and the largest 1 amp. at 12 volts, the prices ranging from 10s. 6d. to 15s. New H.T. units include the HT9, giving 60 milliamps at 300 volts and priced at 21s., and the HT10, giving 100 milliamps at 200 volts at the same price. For larger sets the HT11 at 35s. delivers 120 milliamps at 500 volts or 150 milliamps at 400 volts.



Westinghouse metal rectifiers and photoelectric cell.

For the trader who undertakes the charging of accumulators there are available complete battery chargers in a number of patterns suitable for all normal needs. The larger chargers have several circuits, so that several different currents may be supplied at one time to different banks of cells, these being sorted out according to their correct charging rates. The necessary rectification is in all cases carried out by Westinghouse metal rectifiers.

In addition to their more obvious wireless uses, metal rectifiers are employed in bridge form in connection with meters reading alternating current. Small rectifier assemblies of this type are exhibited.

A further application of the copper oxide disc is found in the manufacture of photoelectric cells. One of these is arranged in



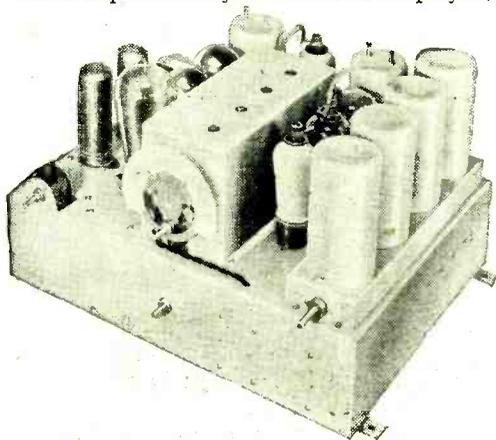
Westinghouse three-circuit battery-charger using metal rectifiers.

an apparatus which delivers a catalogue into the hand when this is placed in such a position as to interrupt a beam light.

Westinghouse Brake and Saxby Signal Co., Ltd., 82, York Road, King's Cross, N.1.

WHITELEYS. (267)

The outstanding feature here is a very fine example of an A.C.-operated "Stenode" radio-gramophone. A seven-valve superheterodyne circuit is employed,



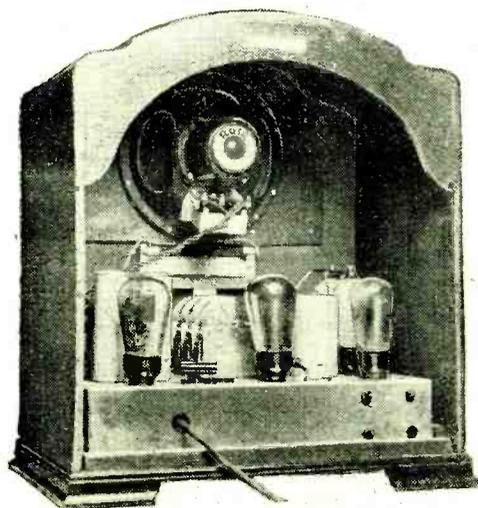
Whiteley's "Stenode" radio-gramophone superheterodyne chassis.

and the I.F. amplifier is adjusted to provide a very high order of selectivity, while a corrected L.F. amplifier restores the quality. In the present case the band width of the sharply tuned circuits is such that stations with a separation of but 5 kc. can be received free from mutual interference. Housed in a handsome pedestal cabinet, the price is £93.

Wm. Whiteley, Ltd., Westbourne Grove, W.2.

YAGERPHONE. (286)

A three-valve battery set and a four-valve mains set are offered on this stand, each being made either as a simple set or as a complete radio-gramophone.



Yagerphone four-valve A.C. receiver.

The battery set, which has a conventional type of circuit, is sold at 12 guineas with moving-coil speaker, or 17 guineas as radio-gramophone.

The mains set has two variable-mu stages, detector, and pentode output, and sells at 18 guineas as a set only. In radio-gramophone form, with dual compensated moving-coil speakers, it costs 28 guineas.

Yagerphone, Ltd., Charlotte Cabinet Works, Ponders End, Middlesex.

"THE WIRELESS WORLD." (5)

In addition to "The Wireless World" and "The Wireless Engineer," technical wireless books of all kinds can be seen on this stand. "The Wireless World" is also showing sets

for home construction which have been described recently, including "The Monodial A.C. Super," "The Modern Straight Five," "The Autotone Portable," and the new "Baby Superhet."

Iliffe and Sons Ltd., Dorset House, Tudor Street, E.C.4.

ZEITLIN. (275)

The speciality of this firm of factors is the handling of clearance lines of manufacturers' samples and obsolete receivers and components.

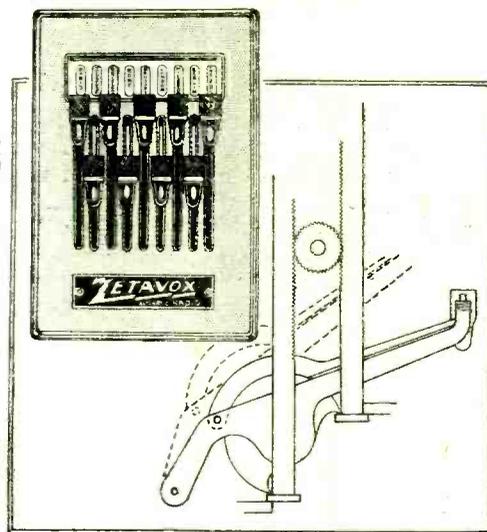
V. Zeillin and Sons, Ltd., 54, Lamb's Conduit Street, W.C.1.

ZETAVOX. (103)

Automatic press-button tuning is the novelty which is attracting the greatest interest on this stand. The control is mechanical, and operates by rotating the tuning condenser to a predetermined point. The stations to be tuned-in in this way are found by tuning on the dial in the ordinary way, after which the knob on the end of one of the nine setting levers is unscrewed, the lever is depressed as far as it will go, and the knob tightened again. Depression of that lever will now always turn the tuning condenser back to its original setting, though the ordinary manual tuning is also available at all times.

This automatic tuning is applied to two chassis, which form the basis of all sets and radio-gramophones. The first of these

is a straight receiver with two variable-mu stages and a pentode output valve, while the second is a superheterodyne. This more elaborate receiver has a band-pass input to its preliminary H.F. stage, and uses a screen-grid valve (anode bend) as second detector. An automatic volume-control valve is used, controlling the bias to the variable-mu H.F. and I.F. valves. In addition, there is a manual volume control on

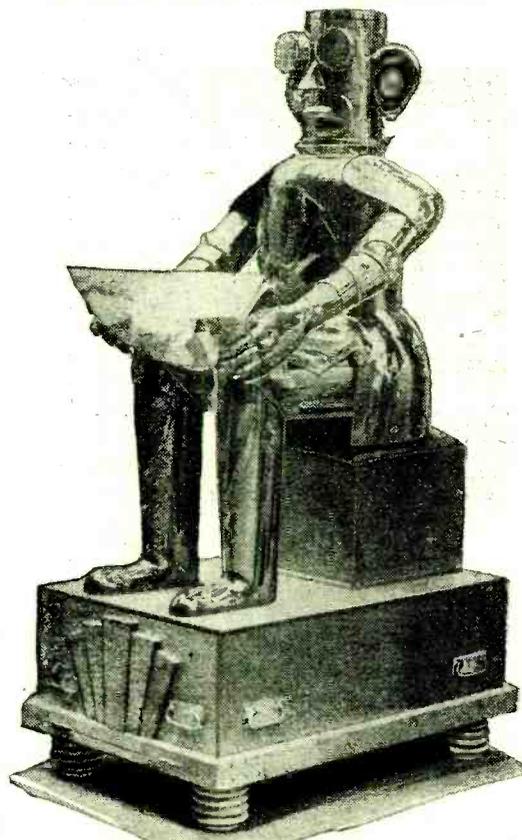


Zetavox automatic tuning mechanism, with tuning panel inset.

the L.F. side. Prices range from 19 guineas for the straight set and 25 guineas for the superheterodyne in their simplest form, without automatic tuning.

Zetavox Radio and Television, Ltd., Coles Green Road, Cricklewood, N.W.2.

A TWO-TON FRANKENSTEIN.



This steel Robot is "at home" on the Mullard Stand, No. 248, and is one of the most important personalities at Olympia. Operating by means of photo-electric cells scanning a sound record, he can "read" and tell the time. A newspaper thrust into his hands adds a touch of verisimilitude.

NEXT WEEK'S ISSUE

The Trend of Progress.

A carefully considered commentary on the general trend of technical progress as exemplified in the exhibits at Olympia. This account, which will be fully illustrated, is now being prepared by the technical staff of "The Wireless World."

The "Baby" Superhet.

Constructional details and final instructions for building this new four-valve superheterodyne receiver, the description of which was commenced in our last issue.

An Oscillator for Ganging.

Description of how to construct and use a simple oscillator for the purpose of correct ganging of modern selective receivers.

MANY OTHER SPECIAL FEATURES.

ON SALE FRIDAY, SEPT. 2

WIRELESS ENCYCLOPEDIA. No. 24.

MAGNETISM may be divided into two categories, namely, *permanent magnetism* and *electromagnetism*.

The former is produced by a permanent magnet, such as a magnetised steel bar and the latter by a current of electricity flowing in a suitable circuit, in particular a coil or solenoid.

The simplest artificial permanent magnet consists of a straight bar of special steel or steel alloy. If such a magnet is laid flat on a piece of paper, lines of magnetic force can be detected and traced out with the aid of a miniature magnetic compass of the type once fashionably worn on watch-chains. The lines of force are found to issue from one end of the magnet and enter at the other in the manner shown by Fig. 1. The points at the two ends of the magnet, from which the lines of magnetic influence emanate and converge, are called the "poles" of the magnet and are designated "north" and "south" respectively, the two poles exhibiting different characteristics. For instance, if there are two magnets the N pole of one is found to attract the S pole of the other, whereas the two N poles repel each other and so do the S poles. A brief explanation of this is given below.

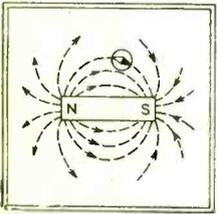


Fig. 1.—Showing the nature of the field surrounding a simple bar magnet.

The earth itself is a large permanent magnet whose field extends over the whole surface of the globe and whose magnetic poles are near the geographical poles. The so-called north pole of each permanent magnet is attracted towards the earth's north pole, and the south pole of every magnet is attracted towards the south pole of the earth. So, to be strictly accurate, the poles of a magnet should be called the "north-seeking pole" and the "south-seeking pole" respectively. The terms "north" and "south" are used for brevity.

The Pole of Unit Strength.

The force of attraction or repulsion between two magnetic poles is proportional to the strength of each and inversely proportional to the square of the distance between them. For instance, if m_1 and m_2 are the strengths of the two poles expressed in arbitrary units, and r is the distance apart, the force acting between them is proportional to $\frac{m_1 m_2}{r^2}$. Now in the C.G.S. (Centimetre, Gram, Second) system of electromagnetic units a pole of unit strength is defined as that which would exert a force of one dyne (the unit of force) on an equal pole placed one centimetre away. [One dyne is that force which, applied to a mass of one gram, causes its velocity to increase by one centimetre per second every second.

Brief Definitions with Expanded Explanations.

MAGNETIC FIELD. *The region (usually in the vicinity of a magnet or a coil carrying a current of electricity) where magnetic forces can be detected, that is, where lines of magnetic force are present.*

MAGNETIC FIELD STRENGTH. *The intensity of a magnetic field at any point, being defined numerically as the force in dynes exerted on a unit magnetic pole placed at that point, the C.G.S. unit of field strength being the gauss.*

A gram weight at the earth's surface is attracted by a gravitational force of 981 dynes.] The C.G.S. unit of pole strength is called the *weber*.

Field Strength.

The intensity or strength of a magnetic field at any given point is defined as the force in dynes which would be exerted on a unit magnetic pole if placed at that point. The field strength is not usually expressed in dynes but in *gauss*. The field may exist whether the imaginary unit pole cited for the purpose of our definition is present or not, and so the unit of force is not entirely satisfactory as a unit of field strength. The field strength is very frequently expressed by engineers in "lines per square centimetre." This is a very convenient expression, used before the name "gauss" was adopted, and possesses the advantage of conveying an idea of the nature of the quantity whose numerical value it represents.

It is, of course, impossible in practice to obtain an isolated magnetic pole, either north or south—they always occur in pairs of one N and one S. However, with a long magnet, such as a magnetised steel knitting needle, the poles are sufficiently separated to enable experiments to be made on one of them without undue influence from the other. If a pole could be isolated the lines of force would emanate from it radially and uniformly in all directions.

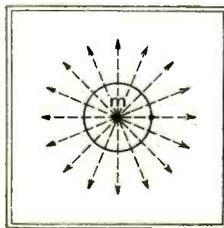


Fig. 2.—Diagram showing that $4\pi m$ maxwells or lines of force emanate from a north pole of strength m webers.

Imagine a pole of strength m webers to be situated at the centre of a spherical shell of r centimetre radius as shown in Fig. 2. Then if a pole of unit strength (one weber) were to be placed on the surface of the sphere, the force exerted on it would be,

according to the above formula, $f = \frac{m \times 1}{r^2} = m$

dynes; and so the field strength at the surface of the sphere is m gauss (or lines per sq. cm.). But the surface of a sphere r cm. in radius is $4\pi r^2$ sq. cms. (the area of a sphere being $4\pi r^2$ sq. cms.) and so the total number of lines of force, expressed in *maxwells*, issuing from the pole m at the centre, must be $4\pi m$. Thus the total *magnetic flux* emanating from a unit pole is 4π maxwells. This quantity 4π occurs very frequently in electromagnetic theory and this is its origin.

A line of force in a magnetic field may be conceived as the path a north pole would take if it were free always to move in the direction of the force acting upon it. It would move round a closed loop, arriving again at the point from which it started. So every line of magnetic force is a closed loop, and its nature is such that it is apparently in a state of tension, trying to contract to a point and vanish. The loops of magnetic force in a field are maintained by what is termed the *magnetomotive force* of the

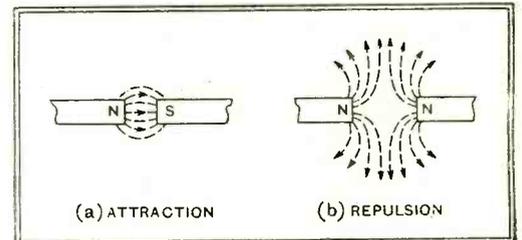


Fig. 3.—(a) Attraction between dissimilar poles and (b) repulsion between similar poles.

magnet or coil responsible for the field. When the magnetomotive force is removed the loops of force comprising the field contract on themselves and vanish. The conclusion is that every line of force is in a state of tension and so any lines of force extending between the north pole of one magnet and the south pole of another tend to draw those poles together, the effect being shown in Fig. 3 (a).

Property of Magnetic Field.

Another important property of a magnetic field is that the lines of force comprising it repel each other and so tend to spread the field out to occupy as large a space as possible. This property is in keeping with the fact that two similar poles repel each other. The nature of the field between two similar poles is indicated in Fig. 3 (b).

A uniform field is one in which all the lines of force are parallel. A piece of iron placed in a uniform field does not experience any force, but in a non-uniform field the iron is attracted towards the point where the field is most intense, for example, towards the pole of a magnet or the centre of a solenoid.

Next Week's Set Review:

THE STENODE

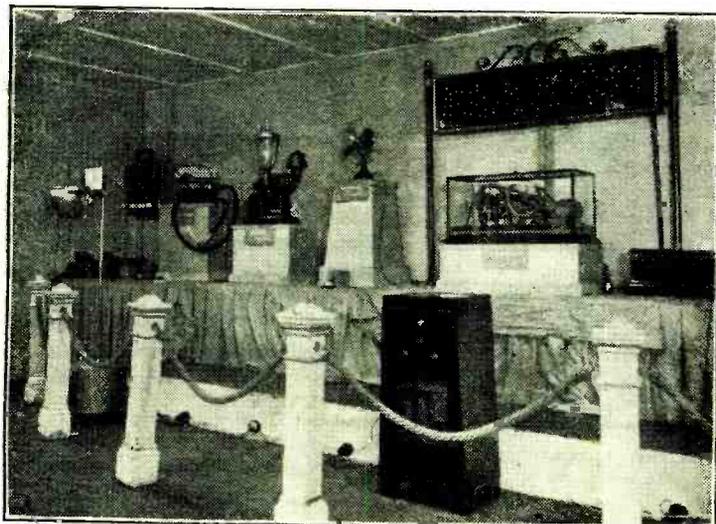
A commercial Radio-Gramophone embodying the new "Stenode Principle."

ROUND THE DEMONSTRATION ROOMS.

Triumphs of Showmanship at Olympia.

THE old reproach, which dogged exhibitors of ten years ago, that radio is an unpromising subject for display—too "dead," in fact, to appeal to a public that demands to see the wheels go round—was never more effectually disposed of than at Olympia to-day. And the reason is not far to seek. The radio industry, besides setting practically all other industries in the shade in the matter of vigorous, progressive research, and its practical application to the needs of the consumer, has taught itself the art of showmanship. The visitor to the 1932 Show, threading his way through the maze of glittering stands, might well be excused for asking whether this radio of to-day really is of the same root and branch as the unsophisticated pastime which sought, almost timidly, for public approbation in 1922. While "good wine needs no bush," it gains nothing from false modesty, and we may well rejoice that the British radio trade has made Olympia, 1932, the occasion for consummate showmanship. This probably finds its peak in the demonstration rooms in the annexe, though we must not forget that trump card, the Mullard Robot, in the gallery.

One of the most attractive displays in the annexe is that of E. K. Cole, Ltd., who are making the daring experiment of permitting the public to compare Ekco reproduction with the performance of the living artist. Visitors first hear popular records on an Ekco radiogram. Next the celebrities step out from the wax, as it were, and are heard "by radio," being seen simultaneously at the microphone in a sound-proof studio. To complete the feature, the artists walk out from the studio and give an extra turn on



The Post Office campaign against man-made static is effectively illustrated at Olympia. Some notable offenders are seen together with the radio receiver on which the P.O. interference eliminators are demonstrated.

the platform. The whole display is extraordinarily effective, and, needless to say, the Ekco apparatus survives the test. Among the artists "billed" are Elsie and Doris Waters, Tommy Handley, Clapham and

Dwyer, and Rudy Starita.

At least three exhibitors show their faith in the technical intelligence of the public by displaying films descriptive of manufacturing processes. The Gramophone Company, in association with New Era Productions, Ltd., have produced an impressionistic reel entitled "The Voice of the World," in which the manufacture and testing of radio-gramophones at the Hayes factory is palatably presented along with brief glimpses of celebrated recording and broadcasting artistes—Peter Dawson, Mabel Constanduros, Ambrose and his Orchestra, and others—actually performing at the microphone. With a few clever and humorous touches we are also shown various types of listener tuning in these celebrities on their own H.M.V. receivers, in some cases with startling reactions.

Two other firms, Ultra Electric, Ltd., and Varley (Oliver Pell Control Ltd.) give film displays which no visitor should miss.

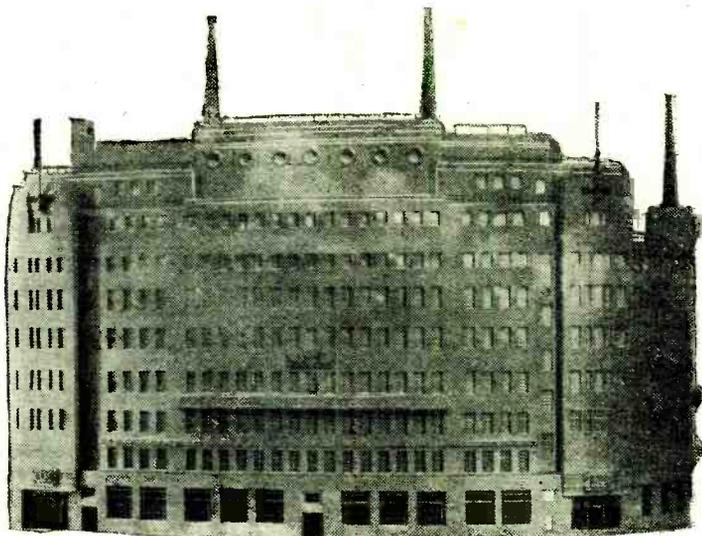
Legitimate Eavesdropping.

As might be expected, the Marconiphone Company provides an original entertainment this year in the form of legitimate eavesdropping. The listener overhears a seemingly impromptu outbreak of music and fun in a country cottage. Need it be added that Marconiphone reproduction is responsible for some happy deception.

Mr. John Macdonell, of B.B.C. "Surprise Item" fame, is among a distinguished company sponsoring the demonstration in the Columbia Graphophone theatre. On a miniature stage equipped with coloured lighting effects, the De Luxe 640 and other radiograms are giving complete concerts covering every class of music. An interesting feature is the new "introductory" record, intended to assist dealers and prospective purchasers of records. In the space of three or four minutes the record gives excerpts from

the month's releases, each selection being faded into the next with a few explanatory remarks by an announcer.

The miniature stage method of presentation is also effectively adopted by Lotus



The £500 model of Broadcasting House which is being shown on the B.B.C. stand in the mezzanine gallery. The scale is 1/4 in. to the foot.

Radio, Ltd., for demonstrating their new Band Pass Three.

To help visitors in the choice of loud speaker the Celestion Company range their models side by side in a step-like formation, linking them up to a common output. By means of a switching arrangement each speaker is connected in turn and is illuminated at the moment of playing.

Chromium-plated exhibition models with rotatable chassis mounted in glass make an original and pleasing display in the Cosser demonstration room.

The tableau method has been effectively exploited by the General Electric Company. Round the demonstration room practically every G.E.C. receiver, from the home constructor's kit set to the most elaborate A.C. cabinet instrument, is to be found in an appropriate setting. The display shows more than any other in the Show how far the modern radio receiver has progressed as a tasteful article of furniture.

Among manufacturers who consider that the radio receiver is best demonstrated in a comfortable lounge are McMichael, Ltd., Lissen, Ltd., and the Radio Gramophone Development Company. The Kolster Brandes' display is, in effect, an enclosed exhibition stand, at which all models are on view and can be demonstrated without the restrictions imposed (fortunately!) on the stands in the main hall.

Baffles.

The British Blue Spot Company's demonstration room is a paradise for the loud-speaker enthusiast, who can literally look at the question from all angles and hear the effect of large and small baffles. He will also be attracted to the Lamplugh demonstration room, where the Silver Ghost dynamic speaker is enthroned in baffles of a startling hue. F. W. Smurthwaite effectively demonstrates the "Howe" baffle.

A word of advice to the Olympia visitor. Do not let the hours slip by in the Main Hall before you visit the annexe. First make sure that you can secure admission to the demonstration rooms. In some cases a ticket must first be obtained from the demonstrator's stand in the Show; in practically every case a queue waits.

READERS' PROBLEMS.

THESE columns are reserved for the publication of matter of general interest arising out of problems submitted by our readers. Readers requiring an individual reply to their technical questions by post are referred to "The Wireless World" Information Bureau, of which particulars, with the fee charged, are to be found on page 184.

Decoupling Anode Bend Detectors.

IN many popular sets of three or four years ago, an anode bend detector, coupled to the succeeding L.F. stage by a resistance of 250,000 ohms or so, was employed. When an attempt is made to operate receivers of this type from an eliminator, there is occasionally a tendency towards "motor-boating," and so the present-day precaution of inserting anode-circuit decoupling resistance and by-pass condensers should be adopted.

Generally speaking, the sets that we have in mind provided greater overall L.F. magnification than that of a modern receiver, and so conventional values of decoupling components are not always effective. This seems to account for the failure of a reader to obtain entire freedom from L.F. instability with a set that has been converted for use with an H.T. eliminator. We suggest that a decoupling resistance of at least 50,000 ohms should be employed for the detector anode circuit; as the current consumed in this circuit amounts to microamps. rather than milliamps., the loss of voltage will be small.

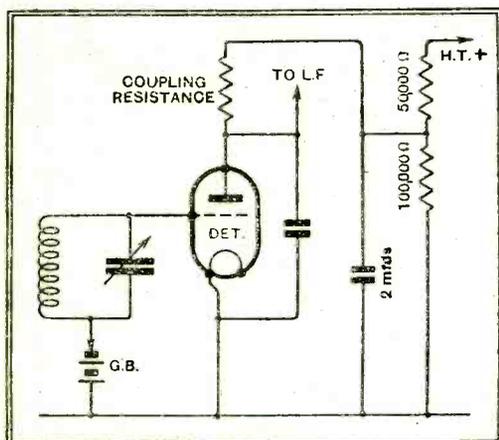


Fig. 1.—Decoupling and feed potentiometer combined: an arrangement specially suitable for an anode bend detector.

The only drawback to the use of a high value of decoupling resistance is associated with the fact that the applied voltage supply will not be well regulated, and so, if possible, we recommend the use of a potentiometer arranged as shown in Fig. 1. The values assigned to the two limbs of the potentiometer should be about right for an H.T. supply of 200 volts.

A Specialised "Monodial."

A READER who has the handicap of living within about two miles of a twin regional station asks whether the "Monodial Superheterodyne" would be likely to put up a satisfactory performance under his rather adverse receiving conditions, and also whether we would recommend any alterations to the original circuit arrangement in order to obtain greater immunity from interference than is necessary in more favourable circumstances.

It is undeniable that in spite of the high selectivity of the "Monodial," our correspondent will be able to receive fewer stations than if he

were more favourably situated, although we do not anticipate any very serious restriction in his choice of programmes.

Those stations which operate in the frequency channels immediately adjacent to the local transmitter will certainly suffer from interference, and it is just possible that a little interference on the long-wave band will be brought about by the frequency difference between the local stations. There is a further possibility that a slight amount of interference, in the form of a whistle, might be found on wavelengths spaced by 110 and 55 kilocycles on either side of the local stations.

The selectivity of the "Monodial" receiver is already so high that it could not be improved without introducing great complications, but we think that extra special care should be taken to ensure accurate ganging, and also to avoid direct signal pick-up by the internal wiring. Provision might also be made for optional reduction of efficiency of the aerial (by fitting a series condenser) and, as a refinement, an accessible trimming control for the input circuit might be provided. We suggest this in order that full use may be made of an efficient aerial at times and on wavelengths where local interference is not prevalent.

More Rectified Current.

A READER, who proposes to alter his set by fitting a push-pull output stage, enquires whether it would be possible to obtain extra anode current (which will be made necessary by this alteration) by fitting a second rectifying valve of the same type as that in use at present. The additional valve would of course be wired in parallel, and it is hoped that the output will be doubled.

If it were possible to ensure that the A.C. voltage applied to the rectifier were maintained at a constant value, all would be well. But, unless the power transformer happens to be exceptionally well-regulated, there will be a considerable voltage drop in its H.T. secondary; as a result, the rectified output would not be increased to the extent anticipated. There is the further possibility that the winding will be overheated.

Without full details of the power transformer, we can hardly assume the responsibility of recommending this scheme and suggest that our correspondent should consult the transformer makers before trying it.

Free Current for an Extra Speaker.

A QUERIST who wishes to operate two moving-coil loud speakers from the "Modern Straight Five" receiver asks for suggestions as to how field current for the second instrument might be derived from the power supply circuits.

It happens that, so far as this particular receiver is concerned, there is the simplest possible solution to the problem. The circuit diagram published with the description of the set shows that a voltage-absorbing resistance (R_{22}) of 2,500 ohms is in series with the existing loud speaker field winding; all that need be done is to replace this resistance by the field

winding of the second loud speaker, which must, of course, have the same ohmic value. The voltage distribution throughout the receiver will obviously not be affected in any way, and, indeed, this is one of the few cases where we can get "something for nothing."

Given field windings of the correct resistance—2,500 ohms each—this simple arrangement should also satisfy the requirements of another querist who intends to use Magnavox "Dual Compensated" loud speakers with the "Modern Straight Five." He should omit the limiting resistance and connect the two fields in series.

Short-lived Rectifiers.

A READER who has been unfortunate enough to have to replace his rectifying valve twice in rapid succession, asks us to examine the diagram which he submits, and to say whether there is anything in his circuit arrangement which would account for this un-

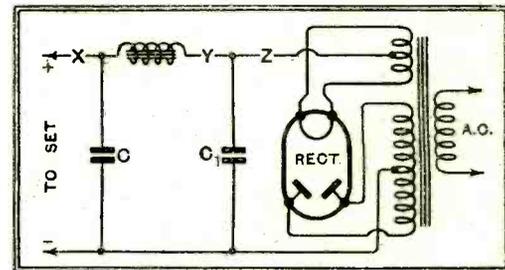


Fig. 2.—Testing for a partial short-circuit: positions in which a milliammeter may be connected.

satisfactory state of affairs. It is stated that the total current consumed by the set is well under the maximum that might be anticipated. Further, the various A.C. voltages across the secondaries of the power transformer have been carefully checked.

The circuit is normal, and so it is logical to suspect that the trouble here is probably due to a partial short-circuit across the rectifier output; the most obvious place for it is in one of the smoothing condensers.

We suggest that current readings should be taken at points X, Y, and Z, as shown in Fig. 2, which represents the conventional rectifier-smoothing circuit. If current is appreciably greater at Y than at X, it is to be concluded that the condenser C is leaky; if greater at Y than at Z, the reservoir condenser C_1 will be defective in a similar way.

FOREIGN BROADCAST GUIDE.

BELGRADE

(Yugoslavia).

Geographical position: 44° 48' N.; 20° 37' E.

Approximate air line from London: 1,055 miles.

Wavelength: 430.4 m. Frequency: 697 kcs. Power: 2.5 kw.

Time: Central European (coincides with B.S.T.).

Standard Daily Transmissions.

09.00 B.S.T.; Sacred service (Sun.); 12.00, gramophone records, news, etc.; 19.25, talks; 20.00, main evening entertainment; 22.00, final news bulletin; relay of concert or dance music (outside broadcast).

(Belgrade frequently relays Vienna and the International European concerts transmitted by Germany, Hungary, Czecho-Slovakia, and Poland. Also exchanges programmes with Ljubljana and Zagreb.)

Woman announcer.

Call: *Ovde Radio Beograd.*

Interval Signal: Metronome (one beat per second).

Closes down with full call and the words: *Zeliszvimajim slusaoima laku noc* (Radio Belgrade wishes a good night to all its listeners) *Ne zaboravite da spojite antenu sa Zemljom.* (Do not forget to earth your aerial), followed by the National Anthem (gramophone record).