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PRACTICAL WIRELESS
AND PRACTICAL TELEVISION
EDITED BY F.J. CAMM

Progress in
TUNING DIALS

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357 FRAC. 18/34
MODERN FREQUENCY CHANGERS

For Cricket Enthusiasts
IN the evening of August 11 Henry Grierson, of Northampton, who, by the way, was the B.B.C.'s first Rugby commentator, will give his impressions of the first day's play in the Trent Bridge match—Australia v. Notts. He gave an eye-witness account of the Australians' match against Leicestershire early in the season, and his interview of Valentine Bridge—present "The Black Notes," relayed from the Gray Nook Theatre, Newquay.

Band Music
BAND programmes including the relaying of the Welsh Guards Band, Major Harris conducting, from the Arboretum, Derby, on August 7, and Cresswell Colliery Band (from a Midland Regional studio), David Aspinall conducting, will take place on August 10.

West Regional Items
A RELAY will be taken of the opening ceremony of the Royal National Eisteddfod from Neath on August 6, for West Regional listeners. The Eisteddfod Choir will sing a chorus specially written for the Neath Festival—namely, "Can yr Eisteddfod" ("The Eisteddfod Song"), composed by Mathew Davies, words by Wil Ifan. The speakers taking part include D. M. Evans Bevan, J. P. (Chairman of the Eisteddfod), E. J. Hopes (Mayor of Neath and Vice-Chairman of the Eisteddfod), Philip Thomas, J. P. (Chairman of the Executive Committee), and the Archdruid Gwili. Many members of the Gorsedd will be present.

Singing Competitions
ON August 16th, a relay will be taken from the Pavilion of the concert in which the winners in the soprano, mezzo-soprano, contralto, tenor, baritone and bass solo competitions will sing. Adjudicators will sit in judgment upon their singing at that concert and will award a special medal. The rest of the concert will be devoted to the works of Welsh composers and listeners will hear a number of first performances. The items include solo, chorus and orchestral works and a relay will be taken for one of the few twelve bell-peals in the country cast as one family. The second of the Bank Holiday diversions comes from the seaside when Simrose and Watney, Ltd., present "The Black Notes," relayed from the Gray Nook Theatre, Newquay.

Ice-cream News
A "HOLIDAY HUSTLE" talk about the ice-cream business will be broadcast to North Regional listeners on August 4 by Mr. J. Laurance Brown, a Sales Manager. The "season" so far as Mr. Brown is concerned, lasts from Easter to September; during that period his organization employs 1,100 cyclists in the Northern area, extending from Sheffield to Newcastle. In the winter many of these have to find other jobs. Curiously Mr. Brown's first job was in a brick-works in Scotland.

"A Bucket of Brass"
THAT "all that glitters is not gold" will be shown when Edwin Lewis's comedy sketch "A Bucket of Brass" is broadcast to the North Region on August 4th. In this, the fourth of the "Conversations in Owdham," listeners will be able to study the reactions of Polly Ann Bleakinsop (played by Mary Eastwood) to a legacy left her by an uncle, and to enjoy the philosophic reflections of Mrs. Bill Brown (played by Lucia Rogers).

From Belfast
THE very appropriate date August 3rd has been chosen for the broadcast of Roger McDougal's play "The Thrush." The play deals with the subject of war and is one that may be truly described as "unusual." Listeners may remember that a revival by this young author entitled "April Foolery" was produced in the Belfast studio some time ago.

Sporting Events
ULSTER abounds in sporting events which provide eye-witnesses with exciting material for their accounts to listeners. Next on the list is the Llanrhub and District Grass Track Motor Cycle Championships. This event takes place on the Maze racecourse and an eye-witness account will be given on August 4th.
**Round the World of Wireless (Continued)**

Broadcast Dramas

Radio drama for the autumn will include: The Drury Lane, by Denison, Florence, and B.C.; The Great Adventure, by Arnold Bennett; The Last of the Mohicans, by Fenimore Cooper; The Elephant and Castle Theatre, by Sarah Wedderburn; and The Great Adventure, by Arnold Bennett. The Drury Lane play will be broadcast on August 14th, 16th, 17th, and 18th. The other plays will be heard on August 21st, 23rd, and 25th.

"Wild Decembers"

'This is the title of Clemence Dane's tragically pathetic story about the Bronte family, which is being broadcast on the National wavelength. The play was last broadcast in January this year, when Gordon Gildard was producer; next month, Howard Rose will be producer.

Vienna Philharmonic Orchestra

This famous orchestra will be conducted by Toscanini when their concert is relayed from the Festspielhaus, Salzburg, to National programme listeners on August 23rd. The concert will consist of Symphony in D major (Mozart), Variations on "La Follia" (Haydn), Brahms's Symphony in A, No. 7 (Beethoven). The relay will be carried out in co-operation with the Austrian Broadcasting Company.

Promenade Concerts

All forty-nine Promenade Concerts are to be broadcast from Queen's Hall this year, as usual. The first concert takes place on August 11th, and will be heard on the National wavelength. Other Promenade concerts for National programme listeners during the month are those of August 13th, 15th, 18th, 20th, 21st, 22nd, 23rd, 25th, and 26th, and they include such eminent soloists as Maggie Teyte, Conchita Supervia, Mary Jarrold, Isobel Baillie, Elsie Suddaby, Gladys Cole, Teyte, and Conchita Supervia. The earliest date for a return visit to the broadcasting studio will be some time in December.

Variety Shows at Wireless Exhibition

During the Wireless Exhibition at Olympia, August 16th to 25th, the B.B.C. is co-operating by putting on three variety shows a day. Some of which will be broadcast, starting with the first on August 16th, which will be included in the National programme. The theatre itself will be even larger than that of last year. The B.B.C. will be doing the amplification for the various stands, as in previous years, as well as the amplification in the auditorium and the theatre. The B.B.C. Dance Orchestra, directed by Sydney Coghill, will be the main attraction of the shows. Unfortunately a number of regular broadcasting artists, whom listeners might expect to see at Radiodromes, will not be available this year owing to other engagements.

Cabaret Entertainment from Stratford-on-Avon

During the evening of August 9th Orlando and his Band will give a cabaret entertainment from the Welcombe Hotel, Stratford-upon-Avon, in the property of the late Sir George Trevelyan. Orlando succeeded Henry Hall in charge of the music at the L.M.S. hotels, after five years at the Embassy Club, London. The band for the cabaret contains no brass; the music will be of the sweet and melodious type, not "hot." Band vocalists include Pat Hyde, Dennis Bland, and The Three Saxes; and at each of the broadcasts—three have been arranged so far—guest artists will provide a surprise item.

Talk for Swimmers

On August 7th Midland Regional listeners will hear a talk entitled "Mainly for Swimmers," given by Percival H. Hardidge, president of the Midland Swimming Association last year and now Education and Coaching Secretary (Honorary) for that body. He is in his tenth year as president of the Birmingham Association of Swimming Clubs, and is a national water-polo referee. Mr. Hardidge was a boy of nine when he won his first club championship, beating a giant of six foot six in height.
**PROGRESS IN TUNING DIALS**

A Brief Resume of the Stages Through Which the Development of the Tuning Indicator Has Passed.

During the past year great progress has been made in the development of the valve, and also in the design of other components used in the construction of a complete broadcast receiver, but the tuning indicator has not changed to a very great extent. It is obvious that as a receiver is capable of tuning to a number of different stations it is essential that some form of indicator be provided to enable the operator to identify the setting of the tuning control and thus enable him to know to which station he is tuned. It might be stated, therefore, that this part of the operating mechanism is the most vital, and it would appear that more attention should be paid to its design and operation.

**The Earliest Indicator**

In the very early days of wireless receiver construction a plain operating shaft was fitted to the principal condenser, and to the end of this a small ebonite knob was screwed. Attached at right angles to the shaft was a short arm of metal, flattened at the tip to provide a narrow pointer, and the control panel over which this rotated was engraved with a semi-circular scale. Generally a straight-line scale fitted with an ingenious mechanism controlling the pointer.

A straight-line scale fitted with an ingenious mechanism controlling the pointer.

The dial could, however, be locked in any position relative to the condenser plates themselves, and thus, should the dial be removed at any time, it became difficult to re-attach it in its original relative position.

**Station Calibrations**

As time went on it became increasingly evident that a mere set of numbers was not adequate for the listener, and therefore station names became customary. To accommodate even a few names, the curved dial was found cumbersome, and therefore a straight strip of material was used to carry the names, and various ingenious schemes were devised to enable a pointer to move across the straight dial. This type of dial is probably the most popular at the present time, and our cover this week carries two commercial examples of this type of dial. Generally speaking the pointer is not attached to the rotating condenser spindle, but is operated on a separate mechanism, either through cam drives or by means of cords. The H.M.V. instrument, which has a medium wave scale on one side and a long wave scale on the other, employs a length of cord running over pulleys, and has the small travelling pointer clamped to the cord. It is thus a simple matter to re-set the pointer after dismantling, as it only becomes necessary to tune to a station and clamp the pointer to the cord. Both pointers move at the same time, but only one scale is illuminated at a time, the illumination being controlled by the wave-change switch. This avoids another defect of the average tuning scale, namely, the actual range which is being covered. One scheme which has been tried with success is the provision of red and green lights behind the scale and the printing of the station names in those two colours. The wave-change switch operates the lights and so provides a ready indication as to the range, in some cases the light preventing the reading of the names on the opposite range. Whilst this straight-line type of dial is very successful and fairly neat in appearance, it still leaves the receiver with the appearance of some scientific instrument or laboratory type of apparatus and prevents the complete apparatus from taking its place as an article of furniture in keeping with other domestic furnishings.

**Clock-Type Dials**

Where the receiver is of the small consolette type the general appearance of the receiver is not unlike that of a clock, and therefore one or two manufacturers have introduced a tuning dial taking the shape of a
TUNING DIALS
(Continued from previous page)

one such "obscured," pattern. A small hole is cut in the cabinet front and a powerful magnifying lens is fitted to this. Behind the lens is the rotating scale, engraved with the names of the stations, and this has the merit of removing any possibility of doubt as to which station is being received. The lens magnifies the printing and avoids the necessity of peering close at a scale and also ensures that the condenser setting is exactly correct, as the moving pointer is dispensed with. The only drawback to this device is, as mentioned earlier, that the listener is in some doubt, until thoroughly accustomed to the receiver, as to which way to turn the control to tune to a certain station. There is still great scope for designers to introduce a dial which will remove the scientific appearance from the receiver and enable it to be built more in keeping with the furnishing, and yet avoid the defects above mentioned. Visitors to last year's Radio Exhibition will remember the Marconi exhibit wherein one called out the name of the station it was desired to hear, and the receiver automatically tuned itself to the correct point. This is rather a futuristic hope, but no doubt some equally simple device will be introduced before long to assist in operating the broadcast receiver.

AUTOMATIC TONE CONTROL
An Experimental Circuit Designed to Provide an Automatic Control of the Tone of Reproduction. By "LAMBDA"

WE often become accustomed to the sounds we hear and this is particularly true of radio receivers. The reproduction we obtain from our particular set is bound to develop, so we think. In our opinion the performance is excellent, but it is only after comparison with other high-quality receivers that its excellent, quality or defects become really apparent. In many cases we are disappointed with the results of this comparison, and we are naturally anxious to obtain more realistic reproduction.

Many receivers are fitted with a tone-control device which in some cases operates by cutting the higher frequencies. A mellow tone may be obtained by this method, but it certainly does not approach realism in reproduction.

Automatic tone control is being devised to maintain high quality on the local station, only operating on the distant station where it also acts as an interference noise suppressor. So far as the writer is aware, this system has not been employed in receivers manufactured in this country, but it offers possibilities, and constructors may be interested in the circuit described which offers scope for experiment.

Before the introduction of A.V.C. all volume controls were manual, and it was not until the introduction of the variable mu valve that the possibility of a really satisfactory A.V.C. system was considered practicable.

In the earlier types of receivers employing a screen-grid valve, the volume control was usually arranged to precede the first H.F. stage, being employed in either the grid circuit of the valve or in parallel with the first tuned circuit. By these methods the input to the first valve was reduced. Now that the diode is being widely used as the input to the first valve was reduced. By these methods the input to the first tuned circuit. By these methods the input to the first valve was reduced.

The Circuit Described

The automatic tone control circuit is the outcome of A.V.C. circuits and depends upon automatic volume control for its operation. The circuit arrangement shown below illustrates a double-diode triode for A.V.C. and a variable mu valve for automatic tone control. Connected to the negative end of the diode is a simple device will be introduced beforehand long to assist in operating the broadcast receiver.

functioning of the tone control depends upon the fact that the input of a variable mu valve will vary with its mutual conductance, which is governed by its grid-plate capacity. In the circuit shown this capacity is supplemented by an additional fixed capacity connected in parallel with the valve capacity, i.e., between grid and plate. By this method a relatively large capacity can be obtained, for we know that the resultant capacity of two condensers connected in parallel is equal to the sum of the two individual capacities.

Thus we have a variable capacity connected across the output circuit of the diode, and this capacity will increase with a decrease in signal. When a strong signal is received the total capacity is the capacity of the condenser C plus the inter-electrode capacity of the tone control value. This total capacity is about average for the diode load resistance shunt, so that there is no apparent attenuation of the frequency band in this part of the circuit. The high frequency, however, may be attenuated in receiving a weak signal. In this case the static value of the capacity will increase very considerably although quite a moderate value of fixed capacity has been used.

PRACTICAL WIRELESS
August 4th, 1934
THE modern superheterodyne receiver resembles very little its earlier prototype of about ten years ago. Although the fundamental principle remains the same, the process of evolution has been so rapid that there is no comparison between a modern superhet and one of the early types; either in quality of reproduction, performance, and last but not by any means least, the initial cost. For some years the superhet appeared to be moribund, but with the introduction of the screen grid valve, it showed signs of recovery. As a matter of fact, the progress in valve design has been primarily responsible for the remarkable recovery of the superhet. Ganged tuning condensers and matched coils have also played their part in making the superhet a universal set. There has been a gradual diminution in the number of valves employed and it is highly probable that at the forthcoming Radio Exhibition at Olympia three-valve superhets will be in evidence; the four-valve receiver is already quite common.

Multi-electrode Valves

What has made this type of set possible? Valves! Not more, but less! A lesser number, but greater efficiency.

The principle of employing one valve to do two jobs has previously been utilised, but where economy in valves is desired, the single valve frequency changer has been introduced. There are now single valve frequency changers available which are really efficient.

The H.F. Pentode

If the H.F. pentode be substituted for an ordinary screen grid valve in a receiver there should be some improvements in sensitivity. The impedance of the H.F. pentode is much greater than that of the tetrode and consequently, if it is desired to increase the sensitivity to any great extent, the dynamic resistance of the tuned circuit must be increased. In other words, the advantage to be obtained from an H.F. pentode can only be realized by employing really efficient tuned circuits. This valve has been employed fairly successfully as a single valve frequency changer particularly in mains receivers; a circuit employing it was the "Luxus A.C. Super," described in PRACTICAL WIRELESS, October 14th, 1933. One of the advantages of employing this valve as a frequency changer was that cathode coupling could be employed. This allows a simplification of the oscillator coil as the additional coupling winding can be dispensed with, the reaction winding being placed in series with the cathode circuit of the valve.

Fig. 2.—The frequency changer circuit of the Luxus A.C. Super.

(Continued overleaf)
The Pentagrid

Here at last was a valve really designed to carry out what was intended for it—namely, a single valve frequency changer. The theoretical circuit is shown in Fig. 3. Actually it consists of two valves, a tetrode and a triode oscillator contained in one glass envelope. Mixing occurs within the valve. First of all we have the oscillator portion consisting of a grid of electrons which are located between the first screening grid and the detector control grid. Next, we have these grids consisting of the second screening grid and the anode; these constitute an ordinary variable mu screen grid valve.

Apart from the other advantages of this valve, the tetrode portion has variable mu characteristics, consequently automatic volume control is capable of being applied to it. A unique feature of this valve is that a loudspeaker circuit will tell whether the coil is O.K. or not. If it is heard in the grid circuit of the valve, and this is arrived at by dividing the change in anode current, namely, 2 m.a., by the change in grid voltage which is 4 volts. This gives 0.5, which is an indication of the valve's slope or goodness.

Conversion conductance is somewhat analogous to mutual conductance, in which the anode current in microamps—not milliamps—divided by the grid input voltage constant over both wave bands.

The oscillator portion possesses a high mutual conductance, enabling anode circuit tuning to be employed with a consequent reduction in harmonics, and the pentode has variable mu characteristics and consequently, as with the pentagrid valve, A.V.C. is possible.

A few details of the valve are shown in Fig. 4. In series with the grid of the oscillator portion is a 1,000-ohm resistance; this is employed to reduce oscillator harmonics.

The triode pentode frequency changing valve operating in conjunction with a well-designed loudspeaker coil appears to have many advantages.

This is one of the latest type of valve for use in superhet receivers. As its name implies, it consists of a pentode triode valve combined within one glass envelope. The oscillator portion possesses a high mutual conductance, enabling anode circuit tuning to be employed with a consequent reduction in harmonics, and the pentode has variable mu characteristics.

You will observe that the decoupling of the anode and screening grid are taken to cathode instead of, as usual, to earth. This would not be taken off in a high-frequency oscillation frequency feedback will occur. Several manufacturers are providing triode pentode valves of 1/2-watt and over, and one instance, a battery version is available.

Useful Tips

HOLDING a key against the centre pole-piece of an energized moving-coil speaker will tell whether the coil is O.K. and it is getting its magnetizing current.

One can start testing a set ether from the speaker inwards or from the detector anode outwards, but it usually saves time to work from the speaker inwards, because getting at the detector circuit of other parts of the low frequency input transformers may make the chassis which may not be necessary, if, for instance, the loud-speaker is the only cause of the trouble.

A simple audition will show where an audible signal can be heard, and it is worth remembering that where high voltages are concerned, such as in the anode circuit of the pentode, it is usually only necessary to put one tag of the head-phones in the circuit hear a signal. Signals, too, can be heard, for instance, across the primary of a transformer without necessarily changing wiring always, by cutting a wire in any set if possible; it is far better to unsolder at an existing soldered joint.

A few high-tension batteries include a grid-bias battery, and many listeners like this idea very much. It is simple, neat, and ensures that the G.B. battery is always in as good a condition as the H.T. battery, and that the current consumption from the latter is kept at a minimum. In using a combined battery of this type the G.B. + plug on the set should be left disconnected because the positive terminal of the grid-battery is internally connected to H.T.

Combined H.T. and G.B. Batteries

A few high-tension batteries include a grid-bias battery, and many listeners like this idea very much. It is simple, neat, and ensures that the G.B. battery is always in as good a condition as the H.T., and that the current consumption from the latter is kept at a minimum. In using a combined battery of this type the G.B.+ plug on the set should be left disconnected because the positive terminal of the grid-battery is internally connected to H.T.

Capacity of G.B. Battery

For most purposes there is no point in using a super-capacity grid-bias battery, because, as previously explained, no current is drawn from it.
A FULL-RANGE TONE CONTROL

A Useful Accessory for the Keen Listener.

In these days of high-quality transmissions from stations at home and abroad a very high standard of reproduction is called for, and this can only be obtained if a really efficient form of tone control is employed. A study of the diagram will show that the unit is composed of a tapped choke, four condensers, and a potentiometer, \( \text{P} \), the choke, potentiometer and condenser No. 4 being connected across the speaker windings whilst condensers 1, 2 and 3 are inserted in the leads to the speaker. The arrangement is very simple and at the same time very effective, allowing the output required to be selected at will. The most important item for construction is the choke, and this must be to the specification given or the results are quite likely to fall very much below the standard required.

The Choke

The original design was made up by using two chokes connected in series, but experiment proved that a single-tapped choke might be used if the correct point of tapping was found, and it is proposed to use one choke on grounds of both expense and space. For the purpose of winding we will call the windings one and two, each part being dealt with as a separate choke until the finish. Commencing with choke 1, a hole must be drilled on one side of bobbin cheek low down near the tunnel for the commencement of the winding. Pass a short length of flex, with the outer braid covering stripped off, through the hole, clean off the insulation, and solder the end of the 36 S.W.G. enamelled wire to it. Insulate the joint with a small piece of ordinary insulating tape and all is ready for winding.

Wind on to the bobbin as evenly as possible 1,620 turns, and finish off by soldering on a length of flex as for the commencement, and passing through a hole drilled in the same cheek. This hole may be made slightly larger than the hole for the commencement, as we shall pass the lead for the next winding through this, making two leads in one hole. Having completed the winding and made fast the finishing lead, put two layers of greaseproof paper over the winding, followed by a layer of good quality insulating tape, and choke 1 is finished. Choke 2 is wound in exactly the same manner as choke 1, the lead for the commencement being pushed through the finishing hole of choke 1, and the wire for the winding soldered to it. For choke 2, 3,240 turns are needed, and in winding this amount of wire the windings are apt to get very uneven. Therefore, at the end of every 500 turns cover the winding with a layer of paper as used for the finish of choke 1. Finish as for choke 1, securing the whole of the windings with an extra layer of insulating tape and all is ready for winding.

Connections to Receiver

Terminal No. 1 to L.S. and earth.
Terminal No. 2 to L.S.
Terminal No. 3 to H.T.
Terminal No. 4 to anode of output valve.

LIST OF COMPONENTS.

Seventy-two No. 30 Laminations.
One Bobbin to fit.
Four 0.02 \( \text{mfd.} \) Fixed Condensers.
One Set of Feet and Bolts.
One Panel, 6lin. by 3lin. by 1lin.
One 25,000 ohms Potentiometer—Colvern.
One 0.04 \( \text{mfd.} \) Fixed Condenser.
One 0.02 \( \text{mfd.} \) Fixed Condenser.
One Panel, 6lin. by 3lin. by 1lin.
One 4 B.A. Terminals; 20 S.W.G. Tinned Copper Wire.
One and a half dozen Small Screws.

August 4th, 1934
The complete receiver ready for insertion in the cabinet.

The circuit will show that the negative side of the mains (on D.C.) must be joined to the common earth line and, therefore, the plug must be connected to the mains socket so that the requirement is carried out. Unfortunately, the mains sockets in our houses bear no marking to indicate positive and negative as with normal lights, etc., the polarity is not of importance. Therefore, by scratching or otherwise making a sign on the Bulgin plug fitted to the Ubique it is possible to identify the correct position of the plug in the mains socket and no time will be wasted in waiting for signals. The Universal valves take some time to attain maximum temperature, and until this has been reached no sound of any kind will be heard from the loud-speaker. If the plug is inserted in the mains socket so that the positive side is joined to the common earth line no signals will ever be heard, and it is for this reason that the marking is required. If, therefore, after inserting the plug in a D.C. mains socket, no signals or noises can be heard at the expiration of one minute, reverse the mains plug and all should be well. On A.C. mains this is not required, as the rectifier takes care of the polarity after the alternating current has been rectified.

Adjusting Volume

Set the lower knob about half-way round the control, turn the left-hand control to the right and connect to the aerial, earth and mains. At the expiration of forty-five seconds a faint hum and rushing noise should be heard from the speaker. If the right-hand control is now rotated in a clockwise direction, oscillation should be heard and you may proceed to tune-in a signal. If no oscillations can be obtained, switch off and examine the wiring to make certain that all is correct. Note particularly that the reaction condenser is insulated from the mounting bracket, and see that the fixing bush is not making contact at the side. If suitable insulating bush have been fitted there will be no risk of this, but if large washers are employed there will still be a possibility of the condenser shifting sideways and a short being introduced. If reaction operation is satisfactory and a howl can be obtained, turn the control back to zero and carefully rotate the main tuning knob until the local station is heard. With the volume control in a midway position, the volume should be about right for normal reception, provided the station is not too far away and that the aerial and earth system is efficient.

When the tuning point has been found, slacken off the volume control until the station is practically inaudible, and then carefully turn the star wheel at the rear of the gang condenser until the volume is brought to a maximum. Whilst carrying out this adjustment bear in mind that the reaction condenser is on the main tuning control to a midway position. As volume increases, slacken off the volume control to keep the signal always at its weakest, as you are thereby enabled more accurately to judge the alteration of the tuning setting. When this adjustment has been satisfactorily obtained on the local, turn the dial to a position at the opposite end of the scale and turn up the volume control and endeavour to locate somewhere in this part of the scale. It may be necessary to apply a little reaction, but try to keep to the extreme end of the scale. Now see if any modification of the star wheel will increase signals, and if so, use the concentric trimming knob to reduce this alteration to the smallest value. The setting should be made so that the star wheel takes care of the maximum trimming error from 0 to 180 on the scale, and then any station can be tuned in by simply rotating the small central trimming knob. It is not difficult to carry out this part of the trimming, although it takes rather a lot of space to explain. The whole operation should be carried out in five minutes.

Wave-change Switch

The left-hand control will enable you to change over from medium to long waves, and no further alteration of the star wheel should be necessary on long waves. The volume control will give a smooth and gradual control of volume, reducing to complete inaudibility in its minimum position. If it is preferred to have this to operate in a clockwise direction for signal increase, the leads connected to its two outside terminals should be changed round. The central connection should be left as it is. Reaction should only be necessary when listening to a very distant station, and for the majority of British broadcasting programmes it will not be required. This comprises all the adjustments which are required in this particular receiver, and, therefore, it may be handled by the novice with complete confidence.

LIST OF COMPONENTS

- One pair B.P.31 tuning coils (Varley).
- One two-gang .0005 variable condenser and dial (J.B.).
- One .0001 mfd. reaction condenser (Polar).
- Five Universal chassis-mounting valve-holders (W. B.).
- Two .01 mfd. fixed condensers, type 80 (T.C.C.).
- One .02 mfd. fixed condenser, type 12 (T.C.C.).
- Two .1 mfd. ditto, type 50 (T.C.C.).
- One .0001 mfd. ditto, type S (T.C.C.).
- One .0005 mfd. ditto, type 40 (T.C.C.).
- One 1.0 mfd. ditto, type 111 (T.C.C.).
- One 2.5 mfd. ditto, type 311 (electrolytic) (T.C.C.).
- Two 8 mfd. ditto, type 562 (electrolytic) (T.C.C.).
- One 20,000-ohm Ohmite resistance (Graham Farish).
- One 100,000-ohm Ohmite resistance (Graham Farish).
- One .13 mfd. ditto (electrolytic) (T.C.C.).
- One .1 mfd. ditto (electrolytic) (T.C.C.).
- One 1.0 mfd. ditto (electrolytic) (T.C.C.).
- One 25 mfd. ditto, type 51 (electrolytic) (T.C.C.).
- One Peto-Scott Kompact Consolette Cabinet.
- One 10,000-ohm Ohmite resistance (Graham Farish).
- One 50,000-ohm Ohmite resistance (Graham Farish).
- One 250,000-ditto (Graham Farish).
- One S.P.13 ditto (Mullard). One S.P.14 ditto (Mullard). One S.P.15 ditto (Mullard).
- One Universal valve (Lampl.)
- One 752 British Radiogram component (Faraday). One Peto-Scott Kompact Consolette Cabinet.
- One Peto-Scott Kompact Consolette Cabinet.
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The author has adopted a classification employed by all the big reference libraries. The complete system has the name "The Decimal Classification of Dewey," and is of course far too extensive for ordinary use. However, the section in which one is interested may be extracted and modified to suit personal needs. In this case the original numbering has been adhered to as closely as possible, but extensions have been made just where and where desirable. The system itself will first be described, and then its application to books, cuttings, and notes will be explained.

The subject is, of course, Wireless and is represented by a code of three numbers. The complete system has the name "The Decimal Classification of Dewey," and is employed by all the big reference libraries. The subject is, of course, Wireless and is represented by a code of three numbers. The complete system has the name "The Decimal Classification of Dewey," and is employed by all the big reference libraries.

How to Keep an Accurate and Simple Reference to all Your Cuttings, Catalogues, etc.

DECIMAL CLASSIFICATION

200 MEASUREMENTS.
210 Frequency and wavelength.
220 Capacity.
230 Inductance.
240 Resistance and damping.
250 Current.
260 Voltage.
270 Field strength.
280 Properties of materials.
290 Miscellaneous.
300 APPLIQUES AND EQUIPMENT.
310 Aerials and earth design.
330 Valve practical design.
340 Valve apparatus.
350 H.F. Generators — not valve generators.
360 Receiving apparatus other than valves-crystals, recorders.
380 COMPONENTS & ACCESORIES.
381 Condensers.
382 Coils.
383 Resistances.
385 Wavemeters.
386 Keys, buzzers, and microphones.
388 Filters.
387 Insulators.
389
390
400 SYSTEMS OF WORKING.
410 Damped and modulated waves.
420 Continuous wave systems.
430 Atmospherics.
440
450
460 Duplex and multiplex.
470 Wired wireless.
480
490
500 APPLICATIONS AND USES.
510 Navigation aids.
520 Aviation.
530 Commercial working.
540 Amateurs.
550 Broadcast transmission.
560 Military and naval.
570 Remote control of machinery.
580
590
600 STATIONS, DESIGN, OPERA-
TION AND MANAGEMENT.
610 Description of stations.
620
700 MANUFACTURING PROCESSES.
800 NON-RADIO SUBJECTS.
900 MISCELLANEOUS.

THE WIRELESS CONSTRUCTOR’S ENCYCLOPÆDIA

By F. J. CAMM

(2nd Edition)

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**An A.C. Voltmeter**

The simple meter illustrated is useful for measuring A.C. voltages and is easily constructed. A curved solenoid (A) is wound with 200 yards No. 48 B.W.G. S.S.C. Eureka resistance wire; B is a piece of hard steel on which the knife-edge (D) rests; C is a piece of soft iron with the same radius of curvature as the centre of A, while P and W are the drawn-glass pointer and adjustable balance weight respectively.

Thus, when a current is passed through A, it attracts C, pulling against the weight (W). The meter is best calibrated as follows: a resistable (capable of carrying about 1 amp—an electric iron whose exact resistance is known is suitable) is placed in series with a resistance of 1/100 of its value, and the meter is connected across the small resistance. The whole is then connected across mains of known voltage and the reading noted; if the mains are, say, 250v., then the meter is then reading 2.5v.

**An Extension Spindle**

The accompanying sketch shows a neat extension spindle which I fitted to a recent model of A.C. voltmeter. The whole is then connected across the mains of known voltage and the reading noted; if the mains are, say, 250v., then the meter is then reading 2.5v.

**A Combined Wave-change and L.T. Switch**

The combined wave-change and L.T. on-off switch shown in the sketch, has proved very successful and was made entirely from material taken from the junk box, with a minimum of tools. The materials required are: 12in. long steel box slit by 1/16in., lead-in tube and rod, condenser vanes, rheostat brackets (2), panel bushes (2), nuts and terminals, and a piece of clock spring.

**A Novel Needle Indicator**

Recently I took to using a pick-up needle that lasted for ten records, but I found it very hard to listen and keep the figure in mind. I therefore constructed the indicator shown in the sketch. Underneath the arm I fitted a catch (as used on shop bells) which was rigid when the tone arm moved on to the record but hung limply on returning. This engaged a ten-toothed wheel, arranged as shown in the sketch and numbered 1 to 10, and when the numeral "10" is indicated, the needle is changed. The indicator is made out of a disc of plywood, ten small uprights (which engage the catch) glued to it. A little care is necessary to arrange the disc so that the catch engages correctly at each playing.—P. Bingley (Esher).
OPERATING A BATTERY SET FROM D.C. MAINS

How to Adapt a Battery Receiver so that Batteries may be Dispensed With.

THERE are still many readers who are not fortunate to have A.C. mains in the house and are compelled to make the best of a battery-operated receiver. But those with D.C. mains available may, for a very small outlay, convert their battery sets to work from the mains, knowing that when a change to A.C. is made, the additional components will be equally suitable.

A comparison of the circuits in Figs. 1 and 2 will show that no alteration to the wiring of the actual receiver is necessary. The alterations commence at the output end with revised loud-speaker arrangements (unless a transformer or choke-capacity output is already incorporated either in the set or with the speaker). A choke-capacity coupled output is illustrated although a transformer would be equally suitable; the object being to isolate the filament supply voltage from the mains voltage.

The only potential remaining to be supplied from a battery is the grid bias across the mains must be used. If such is the case, a 60-watt lamp designed for 240-volts working is the correct one to use. In making the calculation the formula is

\[ \text{current (amps)} = \frac{\text{voltage (volts)}}{\text{watts}} \]

The total current required by the valve filaments. If it is known that two valves together take 0.25 amp, then a lamp which will pass exactly this current when joined to the positive main to the set. The correct choice of lamp resistance is most important as incorrect values may allow excessive filament current to pass through the valves. If the exact lamp resistance is not available use a lower wattage, but never a higher power lamp. For example, if it is calculated that an 80-watt lamp is suitable, two 40-watt lamps may be joined in parallel, but, failing this, a 75-watt lamp would serve the purpose. Most valves specified to work with, say, 0.1 amp, are quite efficient with as little as 0.08 amp.

As this lamp wattage is so important the following table is given covering four possible current values and the lamp required.

<table>
<thead>
<tr>
<th>Type</th>
<th>Current (amps)</th>
<th>Wattage (watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.15</td>
<td>60</td>
</tr>
<tr>
<td>B</td>
<td>0.15</td>
<td>40</td>
</tr>
<tr>
<td>C</td>
<td>0.15</td>
<td>30</td>
</tr>
<tr>
<td>D</td>
<td>0.15</td>
<td>25</td>
</tr>
</tbody>
</table>

While this could certainly be arranged, the life of a bias battery is so long that the additional complications are not merited by the indefinite time for which the set may be used before a change is made to all-mains valves. There are no complications in supplying the filament voltage and the H.T. supply is very simply arranged.

Ascertaining the Wattage

The filament current is supplied through an ordinary electric lamp, as this is the most convenient and certain means of securing the correct resistance for “dropping” the mains voltage down to that of the valve filaments. As 2-volt valves are in general use, it will be assumed that we require two volts to heat the filaments. If 4-volt valves are in use, exactly the same lamp values may be taken, as the difference when compared with the mains voltages is very slight. Theoretically we require to drop 240–2 volts across a resistance. Now 238 volts is so nearly the same, in practice, as 240 volts, that our consideration must be

- Fig. 1.—Circuit diagram of a 2-valve battery set before conversion.
- Fig. 2.—Circuit diagram of a 2-valve battery set after conversion.
- Fig. 3.—Theoretical circuit diagram of an S.G.-3 battery valve set for D.C. mains.
Obtaining the Correct H.T.
The plate resistance values will depend entirely upon the type of valves employed. Consider the particular type first so as to determine the value of $R_1$ in Figs. 2 or 3. The maximum permissible voltage to a battery valve must not be more than 150 volts, and the safe side is that if you assume that 140 volts may be applied, hence we must arrange for a drop of 240 - 140 = 100 volts across $R_1$. Determining from the valve specification or curves the current passed at maximum volts and the resistance will be calculated from

$$R_1 = \frac{100}{\text{current}} \times 10,000 \text{ ohms}.$$

A Cosser 216P passes 10 mA. with the grid bias at 7.5 volts. Then

$$R_1 = \frac{10 \times 10,000}{10} = 1,000 \text{ ohms}.$$

If this is not more, say 1 mA., then the total plate resistance should be 140,000 ohms. Hence $R_2$ should be 40,000 ohms. If the valve used as detector passes, say, 1 mA., then the total plate resistance should be 140,000 ohms.

In the circuit of Fig. 3, make $R_4$ 100,000 ohms or more, as used as detector passes, say, 1 mA., then the total plate resistance should be 140,000 ohms.

If $R_2$ should be 40,000 ohms. If the valve used as detector passes less than 1 mA., then $R_4$ may be increased accordingly.

The plate current passed by the S.G. valve must be 2 mA., and five if an S.G. Three is to be converted. In the latter case a 0.1 mfd. will be needed from the screen to earth if not already incorporated in the battery circuit. Another 2-mfd. condenser must be used in the choke-capacity output to the speaker as previously mentioned. The condenser in the earth lead is absolutely essential if an earth connection is made to the set, but this is, in many cases, not necessary as one side of the D.C. mains may be earthed at the supply.

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Although a switch is simply a device for breaking and making a circuit, there are several principles which have to be considered both in the design and in the use to which the particular switch is to be put. For instance, in the illustration on the right a number of different types of switch are shown, ranging from a single-pole change-over switch to a quick make-and-break switch of the toggle type. Both will carry out the same ultimate aim, but they are by no means interchangeable. Apart from a study of the purpose for which a switch has to be chosen it is absolutely essential to ascertain the potential which is applied to the leads which are joined to the switch. When the circuit is broken current will cease to flow, but if the applied potential is not removed as the broken ends of the circuit are brought together a distance will be reached (no matter how small) where the current will jump across the remaining gap in order to complete the circuit, and the greater the current the bigger the gap. For this reason for potentials of any appreciable extent a Q.M.B. type of switch must be employed, as the connecting arm jumps from one position to another under the influence of a spring and arcing cannot take place owing to the rapid making and breaking of the circuit. The lower illustrations in the right-hand corner show a switch of this nature in section and in elevation.

High Frequency Circuits
When dealing with high frequency circuits it is essential to take every precaution to prevent the rapidly flowing impulses from taking a quick path to earth, and therefore it is necessary in this case to ensure that the contacts of the switch are either well spaced, or that the intervening space is filled with a very good insulator. The old pattern plug and jack was a good example of this design, and may be seen in the lower left-hand corner of the illustration. It will be seen that the framework of the jack forms one contact, and the small arm at the upper surface is the other contact, layers of insulating material at the end serving to keep them apart.

Filament Circuits
The switch which is employed for switching on and off the filaments of a battery-operated receiver has to be of very good design if noises are to be avoided. The filaments of this type of receiver heat fairly rapidly, and therefore the moment the circuit is completed the valves will start to emit, and if the connection is immediately broken some slight noise will have been heard in the phones or loud-speaker. Obviously, therefore, if the contact in the switch is of an intermittent type, noises will be heard and the signal will be interrupted. For this reason a very strong spring is required and cleanliness is absolutely essential. In the illustrations at the upper part of the picture may be seen two typical push-pull switches such as are employed for filament switching, and it is necessary always to make certain that the contacts are clean. By rotating the operating knob a cleaning action will take place, but when the springs become weak, as is evidenced by noises as the knob is turned, a new switch should be obtained.

A Typical Example
All the points enumerated are shown in the circuit diagram in the centre of the illustration where the various switches are shown in theoretical form, and the number at the side of the switch relates to the actual illustration surrounding the circuit.

Various types of switches and how they are used in a modern receiver.
Section Reporting on Amateur Transmissions

How to Inform a Station of Your Reception so as to give Useful Assistance to the Transmitter.

A

T some time or another every listener on short waves picks up transmissions from amateur stations, either in this country or from abroad, and he is almost certain to want to let the transmitter know that he has heard his signal. For this purpose, partly with the idea that such reports are useful to the transmitter, and partly to confirm the reception. Such reports may be valuable to the transmitter even if they are reasonably detailed and sent with discrimination. In the first place it must be realized that every card acknowledging a report sent out by an amateur transmitter costs him money, both for postage and printing. Since each contact made is confirmed by card, the amateur will have quite a large postage hill, without any additional expense in acknowledging reports of reception from listeners, and this will make the reports of real value if they are to be worth a reply. It therefore behoves the listener to think twice before sending a report, and to use judgment in the matter. There are three points that should be borne in mind. (1) How far off is the transmitter? (2) What is his wavelength? (3) Who is he working?

What Stations to Report

Obviously if the amateur is in the same town as the listener it is very unlikely that a report will be useful, unless it describes some abnormality that might not be noticeable at a greater distance; what is not so obvious is that there are occasions when a station so far away as 300 or 400 miles from a station a few miles away may be quite useful to the transmitter, and even more so if he is in that region. There is, however, one other factor which may modify all that I have said, and that is the time of day; although this will mostly affect the longer wave stations, it may also be of interest to confirm the reception of shorter waves.

British Summer Time (B.S.T.) or Greenwich Mean Time (G.M.T.). Then should come the report of medium length, in terms of the so-called R code, which is as follows:

R1 Faint signs, only just audible and quite unreadable.
R2 Weak signs, barely readable.
R3 Weak signs, but can be read when atmospherics and interference permit.
R4 Fair signs, readable easily.
R5 Moderately strong signs.
R6 Strong signs, readable at quite a distance.
R7 Strong signs, readable through atmospherics and interference.
R8 Very strong signs, audible several feet from the headphones.
R9 Loud-speaker signals.

The accuracy of a report given in this code cannot be great, but there is sufficient consistency between the individual opinions of good operators as to what constitutes a certain R strength to make it workable. In addition to the R strength there is the QSA readability code, which attempts to define the readability of a transmission as distinct from the audibility or loudness. This is a more difficult problem, and one of the transmitter's thought will be that the two terms are not necessarily interchangeable; one may have a R8 signal that is so badly cut-off and is so full of atmospherics that it is only 60 per cent. readable, whereas a good-quality R3 signal that is free from interference is 100 per cent. readable. The QSA code is:

QSA 1 Hardly perceptible; unreadable.
QSA 2 Weak; readable now and then.
QSA 3 Fairly good; readable with effort.
QSA 4 Good readable signals.
QSA 5 Very good; perfectly readable.

Having settled the signal strength and readability, the next thing that requires comment, if the transmission is in telephony, is the speech quality; and in this connection there are several points to notice. Quality is a self-explanatory term; good speech is a good reproduction of the human voice; bad quality may sound as if the speaker was gargling! Before condemning any failing in a transmission the listener must make sure that the distortion is not due to his own receiver being on the verge of oscillation, or to a heterodyne with a nearby amateur transmitter. If it is decided that the transmission is bad, an attempt should be made to explain the cause. Does speech blast, due either to an overloaded microphone or amplifier? Is there too much hum in the carrier wave due to insufficiently filtered H.T. supply? Is there a bad cut-off of either upper or lower notes? In connection with this last point it must be remembered that few amateurs aim to retain the extreme top of the scale, but tend to cut off at about 3,000 cycles; this will permit the speech to be perfectly intelligible. If all is well, and at the same time considerably reduced interference with neighbouring stations, an important consideration in the restricted amateur bands of wavelengths.

Depth of Modulation

The next thing to report on in a speech transmission is the amount of modulation. This is measured in terms of the ratio of the amplitude of the low-frequency speech current to the amplitude of the high-frequency carrier wave. The ratio being multiplied by a hundred and expressed as a percentage. Thus, if the L.F. current amplitude is the same as the carrier the...
transmission will be 100 per cent. modulated; if the ratio is less than one the percentage modulation is less and that while a ratio greater than one gives more than 100 per cent., but in this case the transmission will be very bad quality and practically unintelligible, blasting horribly.

It is only possible to estimate the stability of the carrier wave (heard when the receiver oscillates) with the strength of the actual speech; the higher the percentage modulation up to 100 per cent. the less difference between the two and the louder will be the actual speech. Most ordinary broadcasting stations on the medium-wave band use quite a low percentage of modulation, about 30 to 40, but for amateur work an effort is generally made to get near to the 100 per cent. mark. After a little experience, quite a close estimate of the modulation percentage can be made.

That covers the requirements of a report on speech transmissions; when the transmission is continuous without breaks, a more elaborate report is possible. In this case, the chief point to notice is the quality of the note, whether it is a pure tone or modulated by ripple in the H.T. supply, or whether it is very rough owing to the use of unrectified A.C.

It is possible to make a rough estimate of the modulation percentage by noting how steady the emitted wave is and whether it is free from "chirps" on keying. In order to facilitate such reports the Table C code has been devised as below—

T1 Poor 25 or 50 cycle A.C. tone.
T2 Rough 50 cycle A.C. tone.
T3 Better 50 cycle A.C.; not filtered.
T4 Fair, rectified A.C. tone; small filter.
T5 Nearly D.C. tone; good filter but with key clicks, chirp, etc.
T6 Nearly D.C. tone; very good filter.
T7 Pure D.C., but with key clicks.
T8 Pure D.C.; not quite as good as T9.
T9 Best, steady crystal-controlled D.C. tone.

With either speech or music transmissions mention should be made of fading, although in the latter case the listener must be certain that the unsteadiness is not in his own receiver or due to a swinging aerial. Two imaginary reports will serve as examples to illustrate my remarks:

(a) To radio G5EF; your 180-metre speech transmission was heard here QSA5 at 11.35 B.S.T. on 13th August, 1933, calling test. Modulation about 70 per cent. Quality very good.

(b) To radio WTPQR; your 40-metre C.W. signals were heard here QSA3 at 12.17 B.S.T. and at 04.30 G.M.T. on 13th August, 1933, calling W6STU.

Notes 78.

In insufficiently detailed reports sent out indiscriminately are only a nuisance to the recipients and will often go unacknowledged; listeners who send such reports should therefore condemn all amateur transmitters as an ill-mannered crowd because they get no answer to their cards, but rather should try to make their reports useful along the lines suggested above, when they may expect an entirely satisfying number of QSL cards in reply.

NOTES AND NOTIONS

Literary Tours

A SHORT series of Literary Tours in the Midlands, in which various parts of the region will be portrayed through scenes in fiction and passages from poetry, will begin with Nottingham district on August 8th. The programme will include Alan-a-Dale's wedding ride from the Robin Hood ballad literature, the journey to the Hemlock Stone in D. H. Lawrence's "Son and Lovers," Maggie Tulliver's boating trip down Trent in "The Mill on the Floss" (George Eliot), Childe Harold's departure from Newstead (Byron), scenes from James Prior's work "Forest Folk," and Inigo Jollifant's Nottingham experiences from "The Good Companions" (J. B. Priestley). It will be given by different voices, with musical interludes and effects, and produced by Owen Reed, who was recently appointed assistant for special programmes in the Midlands.

Bank Holiday Entertainment

"COSTER CARNIVAL," the Bank Holiday reminiscence written and arranged by Cyril Nash, which is to be broadcast in the National programme on August 6th, is to be a show in the real Bank Holiday spirit. Two or three artists have yet to be chosen for principal parts; but names of members of the cast already booked give promise of a lively hour's entertainment. They include Eric Lang, Ivan Samson, Eric Anderson, Laurie Lane, Pascoe Thornton, Ray Wallace, Maurice Soutter, and Bertha Willmott, with Cyril Nash, the author, and Ernest Shannon. Other Bank Holiday programmes, which will be given from the Midland Regional, include two outside broadcasts of interest.

First comes a relay from the De Montfort Gardens, Leicester, of the Kit-Kat Boys' Band, which arrived in this country in the middle of July for a six weeks' tour.

A Useful Hint

It is often desirable to reduce the G.B. voltage as the high-tension battery runs down. This is because the G.B. and H.T. voltages should bear a definite relationship to each other, and consequently, as the latter falls the former should be adjusted to correspond. If this is not done, the quality will suffer and the great drop in volume level might lead one to suspect that the high-tension battery is completely exhausted, whereas it is probably good for several more weeks' use.

The Grosvenor House band, directed by Sydney Lipton, are also in the above Company's lists for this month on Sterno 1456. They play two popular tunes in Goodnight, lovely little lady and May I, both tunes being from the film "We're meeting for the first time together.

Light Music

Tangos played by Mantovani's Orchestra are always worth listening to, and this month they give a splendid performance on Sterno 1458. "Triangola" and "Amorpra" are two modulated recordings of the sweet Spanish music of Southern Europe, and the orchestra give a perfect recording.

Reginald Bull and his Orchestra, whose appearance in the above Company's lists are all too few, plays a pair of delightful tunes this month in One life, one love and "The Frolicsome Waltz." The prowess of the conductor as a pianist is particularly brilliant in the Frolicsome Waltz.

Undoubtedly this is a fine double-sided disc.

Poem d'Amour and Caliph of Bagdad, played by Joseph Lewis and his Orchestra, on Sterno 5019, is another particularly fine record. The first tune is one of the world-renowned waltzes of master of the ballroom—Strauss, and the other an overture—all too seldom played. Joseph Lewis and his Orchestra have never done anything better.

PRACTICAL WIRELESS
HAVING occasion to carry out some television investigations recently in connection with different methods of scanning, I was both intrigued and impressed with the large number of schemes which have been proposed and actually tried. Many of these lend themselves to experiments which can be carried out readily by readers of these notes, and the following brief details will act as a basis for this work. Many of the ideas are applicable to an image dissection exceeding the present thirty-line service, but several were abandoned owing to the difficulty of synchronizing. With the increased knowledge now available on this side of the science, however, there is no outstanding reason why some of the ideas should not find favour once more.

First of all, it must be remembered that there is both a vertical and horizontal analysis, and with the present B.B.C. service this can be regarded as the primary and secondary synthesis respectively. With horizontal scanning these primary and secondary analyses are reversed, but in either case the frequencies of the repetitive action are different.

In Fig. 1 is shown a very simple arrangement consisting of two oscillating bars or members having narrow slots at right angles to one another. According to the rates of motion of these bars, so that the parallel shaded area will move over the scene to be analysed in a definite manner. If an oscillatory motion is difficult to reproduce, then the idea can be modified to that of Fig. 2, where two continuously moving endless bands, having slots cut as shown, are moved across one another at right angles.

Yet another arrangement is two discs having radial slots as shown in Fig. 3. The two discs are so mounted that the slit movement in one disc is at right angles to the slit movement in the other, although the direction of rotation of the two discs are the same. At any one instant two of the slits overlap leaving a small area of "observation." Then, again, there is the continuously moving endless band with small square apertures set at regular intervals in its length as indicated in Fig. 4. By “stepping” these apertures it is possible to scan completely the area required, this idea being applicable specially to receivers using a flat plate neon lamp.

Mirror Devices

Coming now to scanning methods whereby the source of modulated light is actually reflected on to a viewing screen (back projection is nearly always used here), the mirror-drum component is an outstanding and popular example. Several other devices can be used, however, and amongst these there is shown in Fig. 5 a method for employing an oscillating mirror. The

Cases arise where two totally reflecting prisms can be employed to give the light beam motion. An arrangement of this character is indicated in Fig. 6. Here the top prism is stationary while the lower prism is rocked through a small angle by a cam device (not shown). As in the case of Fig. 5 a duplicate of this scheme is necessary in order to provide the double motion essential for a complete analysis. If preferred, polyhedron mirrors can be mounted so that they rotate on axes at right angles to one another as shown in Fig. 7. When a beam of modulated light is focused on to one of these rotary devices, the ray is reflected as a line on to the second set of mirrors, and finally thrown on to a screen at the front.

As an outstanding example of scanning methods having no actual moving parts in the sense of those just described, the cathode-ray tube can be cited. Speaking generally, the diagram of Fig. 8 gives the essentials for the standard tube, although it is known that in many television schemes using cathode-ray tubes at the receiving end, the cathode assembly is modified considerably to make it especially suitable for the production of the best television images. First of all, there is the cathode or filament acting as the source of electrons
or cathode rays. Surrounding this is a shield or cylinder (known generally as the Wehnelt cylinder) whose function is to modulate the electron beam, and which is given an initial negative bias for focusing purposes. Next in order is the anode—a circular plate with a very small orifice at its centre. This is furnished with a high positive potential in order to accelerate the electrons towards the front screen.

Last of all in the electrode assembly are the two pairs of "condenser" plates which serve to deflect the beam from its normal straight path. By varying the frequency, phase, and form of the voltages applied to these distinct pairs of plates almost any desired motion can be imparted to the beam. After passing the plates the beam finally impinges on the front portion of the belted-out tube, this plate or screen being coated with a fluorescent material, that is, a substance which glows brightly at the area struck by the end of the electron beam.

The cathode-ray tube has certainly passed through many vicissitudes since its use for television was first suggested by Campbell Swinton and Boris Rosing simultaneously, but with high definition working it has many points in its favour. Is there any future application, however, to a scanning method with no moving parts proposed by an inventor named Skapy? His method is shown in simple form in Fig. 9, and consisted of a glass vessel having parallel walls and filled with nitro-benzine. The two end plates of this vessel were connected to an alternating source of voltage. With the variations in electrical pressure the refractive index of the fluid alters in a proportional manner. If a beam of light is therefore focused on to the glass vessel these external changes cause it to move over a screen placed in its path. Two of these devices suitably arranged with respect to one another, one excited from a high-frequency source of voltage and a second from a low-frequency source of voltage, can be made to produce the desired primary and secondary television motions.

### HOW OLD IS TELEVISION?

The other day I came across an article purporting to deal with the subject of television in which the writer recalled the fact achieved in 1920, when some black ink smeared on a card was viewed from a distance of 20,000 miles through the medium of television. This was hailed as being effected on the eighty-seventh birthday of television, and on looking further into the matter it was discovered that the first man to achieve television was given as Alexander Bain, in the year 1843. This scientist sent designs or words by means of an electro-chemical telegraph, and brief details of the apparatus are furnished in Fig. 10.

#### A Chemical Process

The message to be transmitted was set up with metallic type in a composer's composing stick. Five metallic brushes connected to as many line wires were mounted in a brush carriage, BC, and the composing stick with its type was drawn past these at a regular speed, so that the brushes swept over the faces of the type, currents being sent over the line from an earthed battery B. At the receiving end the lines terminated on a similar set of brushes, which were made to bear on a paper tape, PT, drawn regularly over a metallic platform, P, also connected to earth. The tape, which had previously been soaked in a solution of six parts of water, one part of sulphuric acid, and two parts of a saturated solution of yellow prussiate of potash, permitted the line current to pass through it to earth and a discoloration took place where this occurred. The receiver thus produced a more or less faithful copy of the matter at the originating end.

This was a remarkable achievement, but without in any way detracting from this early work of Bain, surely this process is worthy of the application, for this occasion. The trains are composed of restaurant cars, and loud-speakers are fitted all along the cars, providing music and explaining all that is seen along the track: castles, villages, war sites, and other interesting places.

#### Round the World of Wireless

(Continued from page 542)

British Transformers for the Belgian State Railways

It is interesting to note that the radio equipments on the Surprise Trains of the Belgian State railways have been fitted with Ferranti audio-transformers. These trains run on Sundays in the most picturesque parts of Belgium, the itinerary being unknown to the passengers. The trains are composed of restaurant cars, and loud-speakers are fitted all along the
Radio Exhibition

With the approach of the Radio Exhibition at Olympia, many components of the wireless industry are issued with special new lines. Information is already to hand concerning many of these components, but this description of the items shown on this page will be found some details relative to these new lines. We would consequently remind readers that some little difficulty may be experienced in obtaining these items from their local suppliers, owing to the fact that full supplies are not yet available, and, therefore, unless such items are urgently required, their orders should be postponed until the exhibition is well under way. In the case of an urgent order, the manufacturers themselves should be approached.

Morse Practice Accessories

A very large number of our readers are desirous of attaining proficiency in Morse sending and receiving, and many letters received by our queries department are in connection with the purchase of such apparatus. Messrs. Leslie Dixon and Co., of Electradix House, 218 Upper Thames Street, E.C.4, have now printed a special Morse Key List which will appeal especially to readers who desire to have some ideas of the prices of this class of apparatus. The list shows keys ranging in price from 4s. 6d. to 30s. For the smaller sum the key is of the “model” practice type. That is to say, it consists of a small moulded base with a stout rocker arm and moulded knob, with terminals for connection at the rear edge. The Morse code is embossed on the base. For 10s. 6d. the same model is obtainable and this has a balanced key, tungsten contacts and bakelite panel, the whole firmly mounted on a metal base which may be screwed to a table. To protect the gap a cast aluminium cover is obtainable for 9d. extra. Other models are obtainable at 8s. 6d., 7s. 6d., 8s. 6d., and 21s. whilst the most expensive model (30s.), of which only a few models are left in stock, consists of the G.P.O. Type A. This has an eight platinum double-arm 4-contact points, with side send-receive switch, brass and bevel glass cover and ebony and teak base. An instrument of this nature is made to sell at a much higher figure than Messrs. Dixon are charging and, therefore, those who are interested should not hesitate to obtain one whilst stocks are available.

Bulgin All-Valve Testing Unit

To test satisfactorily all types of valve now on the market a most elaborate type of adaptor would appear to be necessary. For instance, we have four-pin, five-pin, seven-pin, eight-pin and probably nine-pin bases to valves, and the arrangement of these pins does not permit of the building of a single holder into which any type of valve could be plugged to obtain voltages of the correct type at the proper electrodes. Messrs. Bulgin, who have for some time made various types of adaptor, have, however, satisfactorily solved this problem and the finished tester is known as the All-valve Testing Unit, and a photograph of the complete unit is shown on this page. A special base is provided with a nine-way cable and connecting plug, and the valveholder is used in conjunction with the adaptors shown in the group. Every connection in this useful assembly is “split” and thus enables any type of voltage or current reading to be obtained. This unit is obtainable at 6s. 6d., 7s., 7s. 6d., 8s. 6d. and 21s., and this has a balanced key, tungsten contacts and bakelite panel, the whole firmly mounted on a metal base which may be screwed to a table.

W/B Stentorian Speaker

At last year’s Radio Exhibition we were strongly impressed by the strides made in loud-speaker design by the Whiteley Electrical Radio Company, and their Microkole speaker created intense interest. This year Messrs. Whiteley have progressed even more and their new speaker will no doubt be again a source of much interest and discussion at the forthcoming exhibition. As may be seen from the illustration on this page, the design differs from previous ideas, the stand being made much more robust whilst still retaining the microkole selector principle. An entirely new magnetic alloy is responsible for the modification in design, and this gives nearly double the strength of previous magnetic systems at the same cost of material. The chief advantage of this new magnet strength is, of course, increased sensitivity, and when one is enabled to obtain a really powerful magnetic field one can assume all other matters accordingly and thus obtain better attack, greater signal output and improved response over the entire frequency range. Obviously, too, the air-gap may be increased without detrimental effect, and thus a different type of speech coil may be fitted to the one, the greater power of such a speech coil permitting of an increased size of the diaphragm. All these features will be found in the new Stentorian speaker, which costs 42s. for the Senior model, 32s. 6d. for the Standard model, and 22s. 6d. for the Baby model. A full test report will be published at a later date.

A Timber Demand

While we all know to-day that the wireless industry is one of the biggest industries of the country, only a few have any conception of the vast quantities of material which go to make up the receiving sets manufactured each year. Consider for a moment the timber used for the making of cabinets. One firm, the G.E.C., requires a daily supply of approximately 3,250 square feet of timber for this purpose alone. This figure means that a very large number of trees have to be felled, lopped, sawn and prepared for making cabinets in this company’s extensive works at Coventry in the course of a year. Quite a small forest, in fact!

Dubilier’s Fire

The Dubilier Condenser Co. (1928), Ltd., inform us that the outbreak of fire which recently occurred was confined to a portion of the laboratory at Acton, and fortunately as the result of prompt action by the night staff the damage was not extensive, and therefore production will carry on as usual.

“Choosing Components” — Please Note

On page 509 of our issue dated July 21st we showed a sketch of a wireless receiver of the table type which had been drawn by our artist to illustrate a point regarding the choice of a complete receiver. Messrs. Shalles & Evans have pointed out to us that our illustration bears a striking resemblance to one of their well-known receivers. We wish, therefore, to point out to our readers that no reflection was intended to be cast either upon the cabinet or the components of the receivers manufactured by Messrs. Shalles & Evans, whose products are noted for high-class workmanship and design.
The Future of Home Construction

Sir,—Having been very keenly interested in wireless for more than twelve years, both as an enthusiastic home constructor and as a transmitter, I have come to the fact that serious home construction appears to be on the wane. I believe that a few years ago there were many home-built factory-produced receivers, whereas today I am afraid that the proportion of home-made sets is getting less. Why should this be so? The home-constructor is in a far better position than the purchaser of a ready-made set, firstly because he can effect a considerable saving by modernizing his receiver.

One of the reasons for the decline in home-construction is that there are still many component manufacturers who charge too much for their components. I doubt if the same manufacturers are reluctant to supply "stripped" parts of the kind used by the manufacturers of high-quality home-built receivers.

Yankee Dialect

Sir,—With reference to the discussion about the "Yankee dialect," when I was in the States there were three places in which I gathered that this was objectionable—New York, Chicago, and Los Angeles! In all the rest of the States that I saw, quite a few, the accent was rather subdued and rather "Yankee" in a more pleasant way. Could anyone imagine the English "Blah! Blah," referred to. Personally, however, I do object to being asked, over the radio, if I am "Yankee Dialect".

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL WIRELESS. He has thought, with some justification, that new developments have been brought to his notice.

Is Crystal Reception Dead?

Sir,—As a wireless experimenter since the early days of broadcasting, and a reader of PRACTICAL WIRELESS since the first issue, I have noticed that no mention is ever made in your paper of crystal reception. Surely there must be a number of readers who, like myself, would welcome an article on crystal receivers with present-day high-power broadcasting. In the early days wonderful results were obtainable with a two-valve and crystal reflex set, and there seems to be no reason why equally good results should not be obtainable at the present time, provided that a selective tuning arrangement is used. A periodic tuning, using three basket coils loosely coupled, used to be sufficient for the purpose in the days of 2LO. It would be interesting to know what other readers think on the subject.

R. Davey (Watford)

Cut This Out Each Week

To my know

-THAT the Universal valves are fitted with two different types of valve-base—one of which has a piece of metal to hold the other.
-THAT radio-gram switching cannot satisfactorily be arranged in a d.c. circuit.
-THAT the mixing circuit of a superhet receiver may be arranged in the grid, anode, or cathode circuits, as well as within the valve itself.
-THAT the electrodes of a valve are chemically cleaned before being inserted into the glass bulb, and all handling is carried out with rubber gloves to avoid grease, etc.
-THAT wave-change switching is very disadvantageous in a wave-tune receiver unless very careful design is introduced.
-THAT two- and four-speakers of different types will enable a balanced type of reproduction to be obtained.
-THAT for the above arrangement the speakers should be chosen so that one is responsive to high notes and the other to low notes.

The Editor does not necessarily agree with opinions expressed by his correspondents.

Progress in Component Design

Sir,—As a keen wireless constructor and experimenter, I view with some trepidation the new types of valve holder and valve bases which have recently been exploited. While it is true to say that they are very efficient, as well as being in many ways convenient to use, but what am I to do if I wish to experiment with some of the new valves in one of my existing receivers? I can see no way of making easy comparisons between the valves at present in use and the new ones which I should very much like to try out.

Surely the new holders must act as a deterrent to many constructors who would like to modernize their receivers during the coming autumn and winter. Besides this, I am by no means convinced that the holders and bases previously employed left much to be desired, and I sincerely wonder if the new types can justify their existence.

I have been interested to find that the point which I so often made in favour of the new valves is that the grid, instead of the anode, is taken out to the terminal cap on top of the glass envelope, but this modification does not seem to have been applied to the plug-and-socket valve bases, so that advantage could have been taken of it without the necessity for a completely new design.

Surely even the home constructor is interested in the making of receivers which are far more cheaply, and they would do much to further encourage the making of receivers at home. These "stripped" parts are essential if the home-built set is to compare at home.

Cut This Out Each Week

Local Experts, Please Notice

Sir,—In two articles published in a recent issue of PRACTICAL WIRELESS mention is made of the "Local expert," who was one of his race called in to see some "probably for nothing." I have had this pointed out to me, and these phrases have also appeared, over the radio, if I ask you if you think it is fair that there should be so many of these experts, many of whom have decent jobs in another calling altogether, and that they should poach, as it were, upon the bread and butter of men who lay themselves out, and spend a lot of money and time on tools, etc., to be of service to the general public. I make this appeal to the goodness of these experts, on behalf of all service men. We don't need in the least a man looking after his own set, but we don't like this poaching on our legitimate jobs.—A Strained Receiver (Shields).

Television Systems

Sir,—I gather that a conference was called some little time ago to consider the question of future television programmes, but I am still waiting to learn what decision (if any) was made. Now that the B.B.C. will continue to give us the full exploitation of the present system have been by no means discussed. If only as a subsidiary to one each be given a chance to demonstrate what decision (if any) was made. Now that superhet broadcasting appears to be on the wane I am quite sure that the possibilities of the others.

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PRACTICALLY all modern receivers employ at least one amplifying stage before the detector. Every listener knows that the object of such a stage is to "boost up" the signals received by the aerial, and, by thus bringing weak and distant signals up to workable strength, to increase the range of the receiver. It is a fair question to ask "What can I expect from a stage of high frequency amplification?" and also "How much high frequency amplification should I use in my set?"

The answers to these queries cannot be given in a single plain statement; they require a certain amount of explanation. The stage gain of amplification, usually called the "stage gain," achieved in any amplifier depends upon two things—the valve and the coupling. Of two valves that have the same amplification will give the greater stage gain, provided both are operated under the most suitable conditions.

Inter-valve Coupling
A complete explanation of how the inter-valve coupling affects the stage gain would require mathematical treatment, and it must suffice to say that the coupling must be considered as a load of high impedance in the anode circuit of the valve, and that the stage gain depends upon the relation between the impedance of the coupling and the impedance of the valve. Within certain practical limits, the higher the load impedance the larger the stage gain. Actually, the stage gain can be calculated from the formula: Stage gain = Amplification factor of valve × Re

Re = the impedance of the external load, and Ri = the valve impedance.

The curves shown in the graph have been plotted from figures derived from this formula and show the stage gains obtainable with various typical high-frequency valves over a range of load impedances. Some idea of the stage gains to be expected can be gauged from the fact that to-day a tuned coupling having an impedance of 50,000 ohms would be considered poor, and that an impedance of 100,000 ohms is easily obtainable with average components. A very good radio-frequency coupling might have an impedance as high as 250,000 ohms, and this figure is also easily obtained with high-class I.F. transformers in superhet circuits. On the whole, however, it is better to be conservative and to consider that load impedances of between 100,000 and 250,000 ohms represent the limits which the average constructor may hope to achieve.

Referring once more to the graph, it will be observed that with ordinary battery-operated screen-grid valves, a stage gain of between 100 and 200 may be expected; with a mains screen-grid valve, a gain of between 150 and 250, and with the latest mains H.F. pentodes, a gain of between 200 and 550.

The Load Impedance
It will further be noted that the curves for an ordinary screen-grid valve tend to flatten, which means the impedances over some 200,000, very little increase in output in that actual practice there be gained by improving the coils above this mark when used screen-grid valves.

On the other hand, the curve for a pentode shows a consistent upward which means that valves of this type take full advantage of any and every improvement in coil design. Having obtained some idea of the stage gains likely to be achieved by high-frequency amplifiers of different types, it now remains to translate these figures into practical performance. To begin

with, it is worth remembering that the minimum requirements for satisfactory reception is an output of about 50 milliwatts of audio frequency power with a 30 per cent. modulated signal. With a simple battery set, employing only detector and output pentode, this minimum output can only be obtained from signals having a minimum field strength at the point of reception of about 6,000 micro-volts per metre. But by the use of radio-frequency amplification, stations whose field strengths at the points of reception are much less than the latter figure are easily receivable.

For example, if only one H.F. stage were added to a simple detector-pentode battery-operated combination, and assuming a stage gain of 100, which should be easily obtained by the use of a good high-frequency coupling, field strengths of only 60 micro-volts per metre (6,000 divided by 100) should yield satisfactory reception.

Signal Field Strength
With two such radio-frequency stages it would appear that signals of field strengths down to a fraction of a micro-volt per metre that is required from strong signals, the less powerful programmes may not be satisfactorily received.

Variable Sensitivity
A better plan, therefore, is to retain the pentode output valve, and to use multi-mu valves in the high-frequency stages, the gain of which can then be controlled by applying variable grid-bias, so that the valves, while operating at maximum sensitivity for the reception of weak signals, can be made less sensitive to strong signals. This arrangement not only makes it possible to avoid overloading the detector, and output stages, but also provides a means of obviating distortion due to overloading the H.F. valves themselves.

With mains-operated equipment the question of overloading becomes even more acute owing to the higher sensitivity of mains R.F. valves and H.F. pentodes, as indicated in the graph.

By a process of working backwards from the audio-frequency input voltage necessary to obtain comfortable volume from, say, a mains pentode, it can

(Continued overleaf)
August 4th, 1934

The man who can analyse these curves and understand what they indicate knows his job. But it cannot convey to him perfectly definite information, it would appear that he needs more training than he has had. He is not competent to fill a responsible position.

Radio has developed so rapidly throughout the last ten years that it has now greatly outgrown the supply of technically qualified men required for the better posts. Moreover, it continues to develop with such speed that only by knowing the basic principles can peace be kept with it.

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- WIRELESS OPERATORS

Name
Address

WATERM VOLUME CONTROLS

WATVM offer range of variable resistances and potentiometers is given in a list recently issued by the sales department of the National Wirem Company, Ltd. The varistors are of 5-watt rating suitable for voltage regulation, and there are a number of them, to suit various requirements. They are made with a fine and also a totally enclosed potentiometer with composition element. Two new components consist of isolated enclosed twist-ended wire-wound potentiometers, which are obtainable in various values up to 15,000 ohms. One is rated at 0-10 Ohms, with a secondary resistance of 50,000 ohms, and is available at 200 volts. Various types of these potentiometers, and also a totally enclosed potentiometer with composition element. Two new components consist of isolated enclosed twist-ended wire-wound potentiometers, which are obtainable in various values up to 15,000 ohms. One is rated at 0-10 Ohms, with a secondary resistance of 50,000 ohms, and is available at 200 volts. Various types of these potentiometers, and also a totally enclosed potentiometer with composition element. Two new components consist of isolated enclosed twist-ended wire-wound potentiometers, which are obtainable in various values up to 15,000 ohms. One is rated at 0-10 Ohms, with a secondary resistance of 50,000 ohms, and is available at 200 volts. Various types of these potentiometers, and also a totally enclosed potentiometer with composition element.

WEARITE COMPONENTS

A URFUL range of radio components are described, including several types of the Welding design. MULLARD H.F. PENTODES are described, containing the use of are core. L. H.F. pentodes in their next receiver should obtain a copy of a new book, leaflet on those valves and their applications, which has just been issued. The special properties of the screened pentode are described, and are followed by full operating data and characteristics, with curves of the two Multi-tube types—VP.4 and S.P.4—and practical operating hints for using these valves in modern circuits.
Pick-up Volume

"I have a screen-grid tube 1930 model battery receiver and a pick-up. I have connected one lead of the pick-up to the grid of V3 and the other lead to 11-volt grid bias, but the result is very soft with the volume control in the maximum position. Can you tell me why?"—G. T. (West Croydon).

Soldering Problem

"I have not been long at the wireless experimenting hobby, and have just recently tried soldering. I find great difficulty in carrying out a clean joint like you see in shop-made sets. I either get a large blob of metal all rough in shape, or else I get a dirty black and greasy mess which won't hold the wire at all. What is the actual secret of getting a little shiny joint?"—T. Y. (Brighton).

Apart from cleanliness the only point is the iron temperature. This may be gauged by holding it a few inches from your face. Each time you try the iron, note the distance you hold it, and eventually you will be able to judge almost exactly the correct temperature. The place to be joined must be perfectly clean, and this may be carried out either with a small file or a sharp penknife. Use the iron on a piece of emery before applying the solder. You should then find that a small blob of solder will adhere to the end of the iron and when this is placed on the joint it will run off and make a very neat job. Remember the two essentials—cleanliness and temperature.

Improving the Earth

"I have recently overhauled my aerial and earth, and have found that the earth in my particular case is very dry. I want to improve this point in my equipment and have found that mounting bracket will be connected to earth and thus will be short-circuiting some of the components which are used on the underside, as well as connecting the spindle of the reaction condenser to earth."

...
Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word per column per line, or fraction thereof, and must reach us not later than Tuesday for the Friday's week's issue. Radio Components advertised must be listed at a definite price and all sellers must give manufacturers' guarantees. All communications must be addressed to Advertising Manager, The Practical Wireless, 13, Southwark Street, Strand, London, S.E.1.

PREMIER SUPPLY STORES
Offer the Following Manufacturers' Surplus New Goods at absolute knock-down prices. All goods are guaranteed perfect, varnished paper over; ¼, under ½, undressed ½, and ¾, and already, ½ and extra. Order under ½ must be sent cot.d. Please send name and address for Illustrated Catalogue Post Free.

200-250v., A.C., output 8v.
TUPENDO Purchase of 8ct Manufacturers' Stock, Allectric & Valve (B.G. Det. Pat.) set in Walnut Cabinet with moving-coil speaker 200-350 volt 48-64 cycles, 10 mamps, 14/6.

SPIRAL Offer of S.F. and Energised C.K. Speakers. Purchased from well-known graophone co.

STONEHAM H.T. THAT LASTS YEARS

HOME CHARGING!
Charge your own accumulators at home. This is simple and interesting. Just connect your set or a Heavylite Charger and plug into the mains—in a short time they will be fully charged. More Modern accumulators at 1 amp. PRICE 35/-, MODEL 03 Charges 5, 10, 100, 200, 500 accumulators at 1 amp. Larger models or Kits of Parts for booking your own Charger also supplied. Cut out this add, and send with 5/- stamps for 40 p. booklet describing these Home Battery Chargers.

F. C. HEAYBERG & CO.
10, FINSBURY STREET, LONDON, E.C.2.

There are many GOOD valves but

N O N E B E T T E R T H A N

150w., E.T.T. 25,000 ohms... 1/25... 1/15
150w., E.T.T. 5,000 ohms... 2/30... 2/20
150w., E.T.T. 10,000 ohms... 3/35... 3/20
150w., E.T.T. 1,000 ohms... 3/40... 3/25
150w., E.T.T. 4,000 ohms... 3/45... 3/30
150w., E.T.T. 15,000 ohms... 3/50... 3/35
150w., E.T.T. 100,000 ohms... 3/55... 3/40
150w., E.T.T. 1,000,000 ohms... 3/60... 3/45
150w., E.T.T. 10,000,000 ohms... 3/65... 3/50
150w., E.T.T. 100,000,000 ohms... 3/70... 3/55

A Guide to Modern Homes in
London and the Home Counties

House ownership—the purchase by hundreds of thousands of couples of the homes they occupy—is one of the strongest and most heartening characteristics of the times. "Where to Live" will serve as both a guide and friend in helping you to make a choice with which you will always remain satisfied. Descriptions are given of the districts and best houses, also details of transport facilities, season ticket rates and the general amenities of the particular piece of property concerned.

WHERE TO LIVE

Glimpse at all currentrspostals and booklets, or by post at 25/- each.

LONDON EAST CENTRAL TRAINING GRADUAT ED (not positic at 7/6.

PRACTICAL WIRELESS

August 4th, 1934

(Continued from foot of column one)

80. Stamps

SERVING THE GREATEST RADIO LISTS
S. Stamps

C. -150 milliamps, 49/6.
America's

RADIO GOLD-MINE" at 3d. in the greatest

LONDON POST FREE

(Continued from foot of column one)
SOUTHERN RADIO's Bargains.—Manufacturer's,—sells Wireless.

VARIOUS Condensers.—Lunts, Ab 0.0005.

WIRE: Telegraph, 2-inch, eccentric, knurled. Fully
screened with trimmers, 3-gang, 125/-; 2-gang, 8/6; 1-gang (listed in BARGAINS) 4 black conductors,
(2 x 2 x 2 x 1), 1,000v. D.C. 7/-, F,15/- (4/-).

TRADE LIST now ready. Send for, to 323, Euston Rd., N.W.1.

FLUXITE, Ltd., 4, Sandland Street, L.W.1 (near Warren S., Tube).

FLUXITE, Ltd., 4, Sandland Street, L.W.1 (near Warren St., Tube).

ALL Goods Guaranteed and Sent Carriage Paid.

BARGAIN

UNIVERSAL Transformer, 10/-, 200/-240 volts by Universal adaptor for Kits, components, and valves.

Mains 100/-130 and 200/-240 volts by Universal adaptor for Kits, components, and valves.

ATLAS "LAMBEA" S.G.3—BATTERY SPEAKER SET

PRICE £9 15 0 BARGAIN £5 17 6

VHS another running Battery Set Barnahs., Carryall Plastic, 7/-

WOBURN RADIO CO., 9, Sandland Street, L.W.1.

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2110 from Geo. Newnes, Ltd., 8-11, South-

Obtainable at all Booksellers, or

This coupon is available until August 11th,

Send post card for List

4/8/34.

PRACTICAL WIRELESS, 4/8/34.

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From all Booksellers, Newspapers, etc., or by post Is. 2d. each from the Publishers—

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FLUXITE, LTD. (Dept. W.P.),

DRAGON WORKS, REMONDSEY STREET, S.E.I.

WIRELESS COLLEGE, COLWYN BAY.

SOUTHERN RADIO's Bargains.—Manufacturer's,—sells Wireless.

VARIOUS Condensers.—Lunts, Ab 0.0005.

WIRE: Telegraph, 2-inch, eccentric, knurled. Fully
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FLUXITE, Ltd., 4, Sandland Street, L.W.1 (near Warren S., Tube).

ALL Goods Guaranteed and Sent Carriage Paid.

WIRELESS COLLEGE, COLWYN BAY.

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August 4th, 1934

PRACTICAL WIRELESS

BARGAINS

ATLAS S.G.3 A.C. SET

PRICE £9 17 6

BARGAIN £5 19 6

Refrigerated, 36V. Accounts, 7V. D.C. Speaker for Pick-up and extra Speaker.

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WOBURN RADIO CO., 9, Sandland Street, L.W.1.
AN IMPORTANT ARTICLE

BORING FOR WATER

The August issue of this most modern of monthly magazines contains an authoritative article on methods of boring for water. Interesting illustrations show a complete section of the subsoil and strata of the County of London, and the various methods of finding water are interestingly discussed.

Another specially interesting article is "Twenty Years of Airship Progress." The issue also contains practical articles on Lathe Work, the Automatic Telephone, Mechanics of Side-Show Games, Domestic Refrigerators, Petrol-Driven Motor Aeroplanes, Synchronous Electric Clocks, Making a Radio-gram, How Gramophone Records are made, Mechanics of 2,000 Years Ago, History of Locomotives, Mechanical Drawing, the Diesel Oil Engine, Gas Filled Relays, etc.

On sale at all Newsagents and Bookstalls, or by post 71d from George Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2
ALL ABOUT OUR NEW DESIGNS!

Practical Wireless

AND PRACTICAL TELEVISION

EDITED BY F.J.CAMM

A NEW Course FOR THE Beginner

Published every Wednesday by GEORGE NEWNES LTD.
August 11th, 1934.
Registered at the G.P.O. as a Newspaper.

Find out how it's used exclusively by Mr. F. J. Camm.

THE METALLISED BASEBOARD THAT HAS COME TO STAY.

Refuse Substitutes.

Obtainable from all Good Dealers.

Sole Wholesale Distributors:
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THE EVENT OF THE YEAR....

The NEW Cossor MELODY MAKER

Better than ever—still higher efficiency due to its remarkable new Super-selective Iron Cored Coils. In Model 352 Economy Pentode Output cuts H.T. battery consumption to a minimum. Superb tone—due to its matched Moving Coil Loud Speaker. Save money — use your wireless knowledge — get a better Set for less money. Britain's finest Screened Grid Receiver — at the bare price of the parts.

BATTERY KIT
MODEL 352.

ALL-ELECTRIC
MODEL 352.

£5.19.0 £7.19.0
(exclusive of batteries).

HIRE PURCHASE TERMS
— 1½ deposit and 10 monthly payments of 15s.

SEND COUPON FOR FULL DETAILS

SEND COUPON FOR FULL DETAILS

VARIABLE - MU S.G. CIRCUIT

SUPER SELECTIVE IRON-CORED COILS

MOVING COIL LOUDSPEAKER

HANDSOME WALNUT FINISH CABINET


Please send me full details of the new Cossor Melody Maker.

Name
Address

352 & 357 PREC. TUNES.
EVER since the publication of No. 1 of Practical Wireless my staff and I have resolutely been at work to provide the home constructor with designs for high-class receivers of guaranteed performance, and at a price which made it possible for a first-class receiver to be built at less than the cost of a commercial receiver. A well-built and well-designed home-constructed receiver is always better than an equivalent commercial receiver, for the simple reason that its builder is able to tune and adjust it, and to avail himself, through our Free Advice Bureau, of the services of the designer free of all charge.

He is also able at small cost to bring his receiver entirely up-to-date as new components are produced without having to go to the expense of buying an entirely new kit. It has been my earnest endeavour by means of our policy of specifying only those components used by the designer (no alternatives) and by our Free Advice Bureau, as well as by our guarantee, to give the home constructor as great a degree of confidence in building a receiver as obtains when he purchases one.

Our editorial policy has been resolutely pursued and we have sought to please the readers' hands—by means of the Wireless Constructors' Encyclopaedia, the Practical Wireless Free Gift Data Sheets, the Encyclopaedia of Popular Mechanics, our Free Gift Spanners, and our Presentation Tool Kit—all of which have been supplied on Presentation terms—a complete library of technical information and really useful tools which cannot be bought elsewhere, so that they may enjoy radio at its best.

It is common knowledge among home constructors as well as among leading manufacturers, that Practical Wireless is the leading journal to which all discriminating readers regularly subscribe, in order to keep their knowledge entirely up-to-date. But during the past twelve months the competition of the cheap commercial receiver has been so keen that in many cases it has been found cheaper to buy a receiver than to make one. As all our regular readers know, I took early steps to safeguard the interests of the home constructor by embarking upon the design of our eminently successful Leader series of receivers which were designed down to a price without sacrificing efficiency. To this end I sought the co-operation of leading manufacturers who generously, and at once, designed and made some efficient stripped components at really competitive prices. The manufacturers of cheap commercial receivers made their answer to this policy by producing even cheaper receivers, some of which were not very efficient but appealed because of their low price.

I again got in touch with all the leading manufacturers of components to see what could be done about producing even cheaper components without sacrificing efficiency. As most of these manufacturers pointed out to me, whereas the set manufacturers could purchase stripped components of lower factor of safety at a low price, such components would lose their appeal if sold as separate units to home constructors. They also pointed out that valves represented quite a large proportion of the total cost of the receiver, and that if I could persuade valve manufacturers to reduce their prices, I should have performed yeoman service to home constructors. Accordingly, it is with extreme pleasure that I note that my recent letter to valve manufacturers has borne fruit in that members of the B.V.A. have now reduced the price of their valves as shown in the appended list.

**MAKE A NOTE OF IT!**

**Olympia Radio Show**

**Thursday, Aug. 16th to Saturday, Aug. 25th, 11 a.m. to 10 p.m.**

**OUR STAND No. 8, GROUND FLOOR**

**Two Special Enlarged Numbers of Practical Wireless**

The Leading Wireless Weekly

Next Week's issue will contain a preview of the show in the shape of an A-to-Z list with a guide to the show alphabetically arranged.

**August 23rd issue**

**STAND-TO-STAND SHOW REPORT**

A comprehensive report on each exhibit by our Technical Staff.

**Order These Issues Now!**

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**PRACTICAL WIRELESS** AND THE PRICE QUESTION.

Phenomenal Success of Our Campaign! Component Manufacturers to Supply Stripped Components! Valve Manufacturers Co-operate! By The Editor.

As all our regular readers know, I took...
ROUND the WORLD of WIRELESS (Continued)

B.B.C. Symphony Concerts, 1934-1935

A CCORDING to a recent announcement by the British Broadcasting Corporation, its season of twelve Symphony Concerts at Queen's Hall begins on Wednesday, October 24th, 1894, and will continue until Wednesday, April 10th, 1895, the intermediate dates being Wednesdays, October 24th, November 14th, November 28th, December 12th, January 23rd, February 6th, February 20th, March 5th, March 20th and March 27th.

Light Entertainment from Blackpool

O N August 10th, Blackpool contributes a forty-five minute entertainment to the North Regional programme, this period being equally divided between two concert parties—Tom Jones' Royal Polka, from the Central Pier, and the Arcadian Follies, from the South Pier.

Band of H.M. 11th Hussars

B Y permission of Lieut-Col. D. MacMurrough Kavanagh, the Band of H.M. 11th Hussars will be relayed for West Regional listeners from the Barry Horticultural and Horse Show at Romilly Park, Barry, on August 10th.

Variety from the Midland Regional

O N August 14th variety will be relayed to Midland Regional listeners from the Grand Theatre, Derby—the first outside broadcast from this theatre—and cabaret by Orlando and his Band, with guest artist from the Welcombe Hotel, Stratford-on-Avon, on August 15th. Billy Merrin and his Band will be at Derby.

Autumn Talks

I N the autumn talks this year India will be the main subject, to itself and another series by prominent Americans will be relayed from the U.S.A.; the latter may be used on Sunday evening. Recitations, household talks, technical talks, discussions, short story and poetry readings will be included in the syllabus. Morning talks will start at the beginning of September, early evening talks will start in the third week in September and the rest of the general talks and discussion group talks will start in the first week in October. Announcements will be made from time to time as the arrangements for the various talks are completed.

Across the Channel

A PROGRAMME with the title "Across the Channel" will be broadcast to Northern Ireland listeners on August 9th. This will be a record in programme form of the impressions of an Irishman visiting England, Scotland and Wales.

"Picture People"

A T the end of May last a novel broadcast was given consisting of a complete variety programme taken from the soundtrack of recent film successes and films in piling a second edition for broadcasting on August 8th. None of the artists to be included will be the following—Mac West, who may be heard repeating her popular slogan; Paul Robeson; Florence Daheim; Norma Shearer; Bing Crosby; Sophie Tucker; and Evelyn Laye and Wallace Beery. Leading film companies will again co-operate in the broadcast and, as on the previous occasion, the reproduction will be so perfect that it will be practically impossible to detect that the artists are not speaking direct into the broadcasting studio microphone.

"Arthur's Cave"

A PLAY for Welsh listeners, entitled "Ogof Arthur" ("Arthur's Cave"), by T. Rowland Hughes, will be given in the West Regional programme on August 15th. This play deals with the old tradition about Arthur's Cave. A group of people who are attending the National Eisteddfod wander up the mountainside and by accident discover the cave of Arthur and his knights. One of them summons courage to sound the huge bell which hangs from the roof and its deep boom breaks the long sleep of Arthur and his knights. The hero converges with the visitors and in the cogitation an attempt is made to reveal his character. The complexities of modern civilization are bewildering to him and he returns to his sleep and to his dreams of Camelot.

Variety Entertainment from Belfast

A NON-STOP musical variety programme will be presented in the Belfast studio on August 10th. No less than thirteen acts have been booked to appear in the fifty minutes which the programme will occupy, ranging from a guitar team to a siffleuse. The whole show will be supported by David Curry and his Orchestra.

Two Plays from Midland Regional

T H E New Arts, C. G. Stevens will be acted by the Coventry Repertory Company on August 15th in the Midland Regional programme. A. Gardner Davies will produce plays, which will be relayed from the Opera House. The first, "Sir Herbert is Deeply Touched," concerns a famous actor-manager, and the second, "To Meet the King," is of the mystical type.

Droitwich Spa Orchestra

T HE concerts by the Droitwich Spa Orchestra, composed of the Midland Regional Studio X-mas and some members of the City of Birmingham Orchestra, conducted by Victor Hely-Hutchinson, continue to be an every Saturday evening feature in the Midland programme. On August 12th the principal work in Schubert's Unfinished Symphony, written in 1822, never heard by the composer, and therefore no books have been awarded this week.
August 11th, 1934

PRACTICAL WIRELESS

“PRACTICAL WIRELESS” at RADIOLYMPIA

As our readers will by now be aware, next week will see the opening of the thirty-third London Electrical Exhibition at Olympia, the exact date being August 16th. This year will again see the vast crowds who every year make their way to the Great Hall in this famous London building in order to see the new developments in wireless receiver and component design. For months now the various manufacturers have been hard at work, introducing new models and ideas which annually make their appearance at this time, and which pave the way for receiver modifications for the coming months when radio once again becomes of interest owing to the approach of the radio season.

Radio should, of course, be an all-the-year-round hobby, but the warm days and long nights have a great influence in taking the listener away from his receiver. However, the majority of amateurs want to know what is news in radio and will accordingly make their way to Olympia. A cordial welcome is extended to all our readers, who will find us at the same spot as last year, our Stand No. 8, with the same number of questions which could have occupied all day in answering. This hindered others from obtaining assistance, and prevented many visitors from seeing the various items which we had introduced for their inspection. Will readers kindly, therefore, prepare any questions which they require answered, and jot them down on a piece of paper before coming to the Stand? In this way they will be able to put their problem with the minimum of delay, and be able to pass on and make way for others.

An interesting and instructive part of our show programme is the Free Advice Bureau; last year our staff have answered some thousands of questions. Remember there is no charge for this service, and that everyone is invited and welcomed at our Stand.

PRACTICAL WIRELESS is recognized throughout the country as the leading paper devoted to the interests of the home constructor, and in addition genuine price reductions many new parts have been introduced for the home constructor. In addition, the prices of battery valves have also been reduced and the home constructor is thus placed in a more favourable position than ever before to experiment and test new ideas which are introduced in the reception of the broadcast programmes.

Television will soon be here, and, as with all other developments, PRACTICAL WIRELESS will be the first to present for the home constructor details concerning the construction of suitable receiving apparatus. In addition, No. 1 of our new monthly, Practical Television, will be on sale at Olympia. A special announcement regarding it appears below.

"PRACTICAL TELEVISION" OUR NEW SIXPENNY MONTHLY

THE science of television is on the eve of momentous achievement. Already it has been demonstrated that it has emerged from its development stage and has reached a point where it is commercially practicable, and has excellent entertainment value. Within a few weeks the Television Committee, appointed by the Postmaster-General to report to him as to the present position of television, will issue its findings. As with wireless, so with television, the home constructor will extract the greatest enjoyment from this fascinating yet simple new hobby. It behoves every reader of this journal to make himself au fait with this missing link of complete home radio entertainment.

PRACTICAL TELEVISION, our new 6d. monthly, will be published on August 16th, and copies of it will be on sale at Radiolympia at the popular price of 6d. per month.


PRACTICAL TELEVISION will accurately present reviews and reports of the latest apparatus and television developments, and test reports of receivers and new apparatus will form regular features. Bring your knowledge of the new science right up to date by ordering a copy of PRACTICAL TELEVISION to be delivered to your door every month. Already the entire print of No. 1 has been taken up by the wholesale trade as a matter of delay, and to secure your copy it is necessary to place an order now for this latest addition to our series of practical journals.
THE "SUMMIT" AND THE "ARMADA"

Our New Battery and Mains Receivers. Preliminary Details of Two New Receivers which are designed in accordance with Our Recently-introduced Low-price Campaign. Full Constructonal Details will be Given Next Week.

WITH the introduction of the Leader series of receivers we endeavoured to show that a receiver could be built at home at a price which was really comparable with that of complete receivers, and that it might not have been any very great achievement a few years ago, but in 1934 it is one of the greatest importances, since the production of factory-made receivers has been reduced to a very fine art and such sets can be produced at extremely low prices. The reason is not that the designers of these instruments are cleverer than those who design home-constructor sets, but that their facilities for obtaining components at extremely low prices are greater than those available to the amateur. Furthermore, in many cases the manufacturer of complete receivers also constructs its own components, and is thus relieved of the necessity of obtaining a manufacturer agreeing to the fact. Also no distribution charges have to be added. There is also the point that no elaborate case or trimmings have to be added, and no terminals or other connecting devices need to be fitted. Our campaign also resulted in a great reduction in the prices of components offered to the home constructor, and as our readers will have seen, the price of battery valves has also been reduced. Our receivers have been designed to still further increase the popularity of home construction, and the prices of these receivers will be found fully to demonstrate that the home constructed receiver can vie with its commercially-produced prototype not only in price but in performance.

High Standard of Performance

Considered from the point of view of performance it might even be said that these receivers are capable of even better results than those of factory-produced articles. The reason for this is simple, and is that the constructor can himself in many ways "hot-up" and otherwise adjust the individual receiver so as to obtain the maximum from the parts which are employed. Such adjustments are not possible in the case of the ready-made set which must, in view of the low price at which it is offered, be made entirely by mass-production methods. These latter, of course, completely rob the receiver of that particular individuality which the home constructor and experimenter always values so highly.

In producing these receivers no attempt has been made to introduce what are generally referred to as stunt features, but instead the aim has been throughout to design sets of thoroughly proven type which are not only easy to make but have that nicety of adjustment and control which is peculiar to the instrument of so-called thoroughbred type. One of these receivers is designed for battery operation, and the other for mains operation, so that every reader may choose that particular model which in every way meets his individual requirements. The fundamental design of the battery set is such that radio reception is the prime consideration, although arrangements have been incorporated so that it may, when desired, be employed for the reproduction from gramophone records. On the other hand, the mains apparatus has been designed as a self-contained radio-gramaphone, and it is arranged in a cabinet which contains, in addition to the loud-speaker and wireless apparatus, the gramophone turntable and pick-up. The cabinet is not one of the cumbersome and inelegant pieces of woodwork which have hitherto received the good quality to be passed on to its eventual user. The modern small size radio component has played a large part in the reduction in the overt charge in the overt charge of this particular piece of apparatus, and the battery receiver has also been built to take full advantage of this achievement in design. When the finished receivers are compared with last year's models the great improvement of this size reduction will become apparent.

In both receivers the number of valves employed has been reduced to three—the minimum which will give good, consistent results in these days, and a combination which has been found to give all that is required for normal home entertainment. The latest type of high frequency detector is employed in the preliminary stage in order to ensure that adequate range of reception is secured and that the detector stage is fed with a sufficiently powerful signal from the desired station to enable good quality to be passed on to the output stage. The output stage similarly has been arranged to utilize one of the modern pentodes so that the loud-speaker may be operated at comfortable volume. Since the inauguration of the Lucerne Wave-length Plan we have received countless letters from our readers regarding the reception of foreign stations, and assistance which we have obtained from our large correspondence that, in many cases, greater difficulties have been introduced. All the letters which have been received have been very carefully considered by our technical staff, and the difficulties encountered have been tabulated and carefully considered from every angle. As a result of the investigations made in this way we feel sure that we have exactly gauged the requirements of the majority with regard to the degree of selectivity required. The tuning arrangements of both of the new receivers have been designed to incorporate those principles which have been found after considerable experience to fully satisfy the present-day needs so far as selectivity and signal strength are concerned. Because of this, readers will be able to rest assured that by building either of these receivers they will be able to take advantage of the experience and assistance which we have obtained from the analysis of the requirements of listeners in all parts of the country, and also from our own individual experiments; which have consistently been carried out during the past six months.
**THE OCTODE FREQUENCY CHANGER**

Some Interesting Details of the Latest Type of Multi-electrode Valve

As we have previously pointed out, the superhet fell out of favour not so much on account of bad reproduction, but mainly because of troubles associated with the frequency-changing stage.

The whole process of frequency changing depends upon an oscillator and a "mixer," whether these be two separate valves, or whether both functions are performed by one valve, or by two sets of electrodes enclosed in a single bulb. In all previous systems the coupling between the oscillator and mixer elements has been obtained by inductively coupled coils.

In the "electron coupled" frequency changer, however, the heterodyne frequency is generated in one set of electrodes, and the coupling between the oscillator and mixer section is obtained through the electron stream, thus avoiding the use of external coupling coils.

Six Separate Grids

Of the various types of electron-coupled frequency changer, the latest is the Mullard octode, which is made in two forms, Type F.C.6 for A.C. mains and Type F.C.15 for universal sets. As its name implies, the octode is an eight-electrode valve, having a cathode, anode, a pentode section, and grids Nos. 1, 2, 3, 4, 5 and 6. The operation of the octode can be understood by reference to Fig. 1, which shows the electrode system in diagrammatic form, and Fig. 2, which gives the basic circuit arrangements.

The cathode and grids Nos. 1 and 2 form a triode oscillator, of which grid No. 2 is the anode. Grid No. 3 is a screen, carrying a high-tension voltage of some 85 volts. The potential on grid No. 3 accelerates the electrons emitted by the cathode, and a certain proportion of them pass through grid No. 3. Grid No. 4 is the control grid of the mixer portion, and is negatively biased due to the voltage drop across the resistance "R" in the cathode lead (Fig. 2). Due to this negative bias, the electrons passing grid No. 3 are retarded and a cloud of electrons, or "space charge," pulsating at heterodyne frequency, will occupy the region between grids Nos. 3 and 4, forming what is termed the "virtual cathode" of the mixer portion.

From this "virtual cathode" electrons will be drawn off, due to the high potentials on the auxiliary grid (grid No. 5) and on the anode, and this electron stream, already pulsating at heterodyne frequency, will be modulated by the receiver radio-frequency signal applied to the control grid No. 4. It will be understood, therefore, that the electron stream now carries a double modulation—heterodyne frequency and signal frequency, and that the mixing of the two produces the required intermediate frequency.

The operation of the octode as so far described resembles that of other electron-coupled frequency changers, such as the hexode or pentagrid. In the octode, however, the sixth grid is introduced, and is connected back to the cathode. The mixer portion of the octode acts, therefore, as a pentode mixer instead of as a tetrode, as in the heptode, and thus possesses all the advantages by way of increased amplification combined with stability which characterize the high-frequency pentode as contrasted with the screen-grid valve.

Moreover, the Mullard octode is so designed that the mixer portion has variable-mu characteristics, so that the effectiveness of gain control, whether manual or automatic, is greatly enhanced. As an indication of the improvement effected in this direction, it may be stated that with a grid bias variation of 20 volts, the control is from 1 to 10,000.

A further advantage attaching to the pentode characteristic of the mixer section of the octode is that the auxiliary grid voltage can be obtained by a simple voltage-dropping resistance, thus avoiding the use of an expensive potentiometer for regulating the auxiliary grid voltage.

On the score of re-radiation, the good screening between the oscillator and mixer provided by grid No. 5 prevents the heterodyne oscillation from being superimposed on the control grid, with the result that re-radiation to the aerial is negligible.

**ROUND THE WORLD OF WIRELESS**

*Continued from page 560*

**Bridgewater Band Festival**

The Ynysybwl Workmen's Silver Prize Band, conducted by G. Hall, will be heard by West Regional listeners in a relay from the Bridgewater Band Festival on August 18th.

Concert by Band of H.M. Royal Marines

JACK COLLINGS (the fisherman bass) will be the vocalist in a concert for West Regional listeners by the Band of H.M. Royal Marines, Plymouth Division, on August 18th.

"Roundabouts and Swings"

The Scottish Regional Saturday afternoon talk on August 18th will be given by John R. Allan, the well-known Scottish humorist. His subject is "Roundabouts and Swings." John has tasted the pleasures of every type of entertainment to be found in fairs, and the recital of his experiences should be amusing. He tells us that he takes up residence in Glendevon Castle in September, a castle, by the bye, which originally belonged to Archibald Bell the Cat. Naturally the castle is haunted, Glendevon's principal appurtenance being Green Jean, the daughter of the De'il of Kincardine.

*Continued on page 581*
OUR SECOND COURSE FOR BEGINNERS

INTRODUCING our new course in wireless transmission and reception, written in simple language for the newcomer as well as the old hand.

We have, of course, previously dealt with the principles of wireless in these pages, and this new series of articles is intended to be a refresher and secondary course for the reader who has already acquired a knowledge of the various points involved, whilst it will also enable the newcomer to understand how it is that the speech and music at the broadcast station or the concert hall may be heard in our own homes situated miles away.

The Sciences Involved

Before it is possible to study the subject it is necessary to point out that for a complete understanding of wireless transmission and reception a knowledge of several subjects is required. Thus, in addition to the main item—electricity, it is also necessary to understand such things as magnetism, chemistry, meteorology, etc. It might seem, therefore, that the study of wireless means a lot of hard work, but actually for our purpose we can take a small portion of each of these and leave the complete study until later on. Perhaps, before going any further, it would be as well to point out where these extra items are introduced to our hobby in order to prevent any possible queries. Magnetism is, of course, the main prop of the loud-speaker and the headphone, whilst some types of microphone also employ a mechanism which relies for its function on a magnet. In our low-frequency transformers and smoothing chokes we also find the question of the magnetic property of iron and steel is introduced, and has some influence on the function of these components. Chemistry is introduced in the design of the valve, the insulation of various accessories, and of recent years it has also come into play in the design of various types of earth connection. In addition, the chemist has to be brought in to solve the problem of certain troubles and difficulties which arise in a wireless receiver due to interaction between certain metals or other materials, and he has to order the employment of different substances in order to prevent noises which might be introduced through wires being eaten away or similar difficulties. In order to fully understand the problem of distant reception of low-powered transmitters and the vagaries of short-wave transmissions a knowledge of meteorology must be introduced.

What is Electricity?

Therefore the first subject to receive our attention is electricity, and whole pages would be required to give a thorough explanation of the principles and theories involved. To be brief, however, we may look upon electricity as the movement of particles in a certain direction. To-day everyone knows that all things are composed of atoms or small particles of matter, and these atoms are in themselves composed of smaller particles. These latter particles are of two kinds, known as "electrons" and "protons," and they are best likened to our present solar system. In this we have the sun around which the earth and other planets revolve, and in our atom we have a central nucleus (the sun) which is composed of "protons," and rotating round this nucleus we find what is known as "electrons." An attractive force exists between electrons and protons, and therefore the atom, no matter how many electrons and protons it contains, is held bound together, and in a normal state contains an equal proportion of both electrons and protons, and is therefore in a neutral or uncharged condition. Under certain conditions one or more of the electrons may leave the assembly, and when this happens the atom is left in a "positive" condition owing to the excess of protons which exists. The atom is now in a condition known as "charged," and it will endeavour to attract a negative particle in order to make up its deficiency. Consequently a movement will take place and an attractive force will exist between this positively charged atom and any other normal atom near it, until it is able to restore its original condition.

Our new series is intended to deal with these and similar aspects of radio, and the new reader should carefully study the course as it develops in our pages.
An Interesting Chat About Valve Curves

By H. J. Barton Chapple, Wh.Sch., B.Sc.(Hons.), A.M.I.E.E.

If you examine any page of a valve manufacturer's catalogue you will observe a table giving the "characteristics" of the valve; that is, anode impedance, amplification factor, and mutual conductance. This table will be prefaced by a statement that these are the published characteristics of the valve, taken under some special operating conditions—usually anode volts 100, and grid volts zero. Further, there will be "characteristic curves"—usually one or two showing the relation between anode current and grid voltage for various values of anode voltage.

It is generally understood that these characteristics and curves are what is known as "static" characteristics, that is to say, they are derived from test figures taken in the laboratory, and not as a result of measurements made while the valve is operated under reception conditions. In other words, it is not commonly known that, under practical working conditions, the values of the characteristics are not so high as the "static" figures.

Why not Dynamic?
The reader may, therefore, quite reasonably ask why "static" characteristics and curves are published by valve makers instead of the more practical "dynamic" characteristics. There are two very good reasons. In the first place, the static characteristics are published merely as an indication of the qualities of various valves, and since all the valve makers publish characteristics taken under the same voltage conditions, these figures serve perfectly well as a standard of comparison between various types and makes of valves.

The second reason requires a rather extended explanation. It is that the "dynamic" characteristics are not constant, but depend upon the actual operating conditions, and more particularly upon the nature and impedance of the "load," that is the type of apparatus connected in the anode circuit of the valve.

An Example
This will be made clear by taking a typical example. Fig. 1 shows the published (static) grid volts/anode current characteristic curves of a typical 2-volt general-purpose valve—the type of valve used as a detector or first low-frequency amplifier. Separate curves are given for anode voltages of 75, 100, 125, and 150 volts. Taking the 125-volt curve—the top curve but one, it shows that, if in pressure of 125 volts was applied to the anode of this valve, and the voltage applied to the grid was varied from zero to 7 volts negative, the anode current would vary from about 7.4 milliamps down to zero, the corresponding values of grid voltage and anode current being represented by points on the curve. It is necessary to realize, however, that this curve presupposes that the anode voltage remains constant at 125 volts all the time.

In Practice
Now see what happens in actual practice. To begin with, some piece of apparatus, such as a resistance or a transformer, will be connected in the anode circuit, and if the valve is being employed as a low-frequency amplifier, a negative bias voltage will be applied to the grid. Suppose this negative bias is 3 volts, and that with no signal applied to the grid the actual voltage on the anode is 125. When a signal is applied to the grid, the grid voltage varies above and below the bias value of 3 volts negative. When the grid voltage increases (that is, becomes less negative) the anode current will rise, and when the grid voltage becomes more negative the anode current will decrease.

But when the anode current rises, the voltage drop in the anode load will increase and the actual voltage at the anode will be less than 125. Similarly, during negative half-cycles when the anode current decreases, the voltage drop in the anode load will also decrease, and the actual voltage at the anode will be greater than the nominal figure. Thus, the true values of anode current during positive half-cycles will not be those indicated by the static curve, but will be lower; and the true values of anode current during negative half-cycles will be greater than those found from the static curve.

Practical Effects
In other words, the "dynamic" curve of the valve will be "flatter" than the static curve, as though it has been moved round bodily with the point corresponding to the working grid-bias as the pivot, as indicated in Fig. 2. It is easy to understand from this graph, which shows that the dynamic curve has a less steep slope than the static curve, that the practical effect of using a valve under reception conditions results in a reduction of its mutual conductance below the "static" figure.

Another, and still more interesting way of showing the difference between static and dynamic conditions is to derive a dynamic curve from the anode voltage/anode current characteristics of the valve. This method will appeal to those listeners who like to study radio from the theoretical angle, and should also interest those who, so far, have not come across anode volts/anode current curves.

Deriving Other Curves
Referring again to Fig. 1, we can take readings from the curve, showing the anode voltages for various grid voltages, as for example 0, 1, 2, 3, and so on. The following table has been compiled from the curves in Fig. 1.

(Continued overleaf)
PRACTICAL WIRELESS  
August 11th, 1934

THE WIRE IN “WIRELESS”

Some Interesting Facts Regarding the Manufacture of Fine Instrument Wires

ANY humorous things have been said about the use of the word “wireless” to describe that set of phenomena which is now almost universally termed Radio. It is quite true that the actual signals transmitted to the receiver without conveying wires, but wire plays a most important part in the complete process. For example, on a ship’s transmitting apparatus there are about 300 miles of wire in the transformer. Even in our receiving sets the amount of wire employed is considerable.

Realize the art which is employed in the manufacture of wire. Copper plays, perhaps, the most important part in wire manufacture, but, of course, there are other materials used in the manufacture of special or resistance wires. Copper is shipped in large quantities, principally from America.

Copper

Copper, as we all know, plays its part in the currency, and with gold and silver is recognized as a universal equivalent in our exchange system. The price of copper may vary from day to day and for this reason it has to be kept by the wire manufacturers and electrical firms on this aspect of the case.

Operating Conditions

The operating conditions of the wire will still slide from one curve to another, but along another line, such as X₁ Y₁, which represents a load of just over 10,000 ohms, being given by “resistance equals volts divided by ampere.” The greater the impedance of the load, the less steep will be the slope of X₁ Y₁. For the present we will assume that the line so marked in Fig. 3 represents the actual working conditions.

The Dynamic Curve

The working values of anode current at various instantaneous values of grid voltage will therefore be shown by the points at which the line X₁ Y₁ cuts the various anode volts/anode current curves, and are marked a, b, c, d, etc., on X₁ Y₁ (Fig. 3).

From these values we can now construct a dynamic characteristic curve, as shown at the left-hand side of Fig. 3. In this way the true variations taking place in the valve under actual working conditions can be studied with accuracy.
Over 60,000 hours continuous use at full load and still no sign of any deterioration. Such is the record of the Westinghouse Metal Rectifiers now undergoing a life test. Nearly 30 years life when used 6 hours per day, and still as good as ever. You will get exactly the same performance from the Westinghouse Metal Rectifiers you buy. See that there is one in your new A.C. Mains Set or Eliminator, and ensure a constant high tension supply for ever.

WESTINGHOUSE METAL RECTIFIERS
THE WESTINGHOUSE BRAKE & SAXBY SIGNAL CO., LTD.,
82, YORK ROAD, KING'S CROSS, LONDON, N.1.

A Guide to Modern Homes in
London and the Home Counties

House ownership—the purchase by hundreds of thousands of couples of the homes they occupy—is one of the strongest and most heartening characteristics of the times. "Where to Live" will serve as both a guide and friend in helping you to make a choice with which you will always remain satisfied. Descriptions are given of the districts and best housing estates, also details of transport facilities, season ticket rates, and the general amenities of the particular place concerned.

WHERE TO LIVE
Obtainable at all Newsagents and Bookstalls, or by post 7d. from George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.
A LARGE amount of interest attends the publication of an article relating to test meters of various types and the number of suggestions which are received for the Wrinkles section, and which consist of meter modifications or construction, is proof that this part of the listener’s apparatus affords the greatest scope for “tinkering” or experimentation. We have already explained in these pages how to use a simple milliammeter for the purpose of making practically every test which is required in constructing or testing a receiver, and the Multimeter forms a very good example of this.

MODIFYING A METER

A Useful Hint for the Listener for Improving a Simple Type of Voltmeter. By W. J. Delaney.

Items of Interest
Apart from the value of quickly being able to trace a fault in a circuit there is much to be learnt from an examination of various components under the influence of voltage applications, and from a study of certain parts of a receiver whilst signals are being received. On various occasions we have explained how the majority of wireless components rely for their function on the fact that they possess what is known as resistance, and when a voltage is applied to the ends of such a component a voltage difference exists between the ends. The case of a pure resistance, or a component which is designed to operate by virtue of this feature alone, it is obvious that its value is of paramount importance, and a circuit may be made or marred by its inclusion—dependent upon whether its value is correct or not. It is valuable, therefore, if the listener can measure resistance values, and one object of a multimeter is to carry out this type of measurement.

A Cheap Meter
Practically every user of a battery receiver has in his possession a meter for the purpose of keeping check on the batteries, and in many cases this consists of a simple type of instrument which probably only cost a few shillings, but which serves admirably for the purpose for which it is used. Fortunately, this type of instrument may be used for the measurement of resistance values without in any way damaging or dismantling the meter, and the following modification will add to the utility of such a meter without any additional expense whatsoever. The illustration accompanying this article shows the meter modification which has to be made is the attachment of a strip of paper to the glass front of the meter, and this is calibrated in the following manner so that it will carry out the additional function without trouble. As explained previously, when a voltage is applied to the ends of a component possessing resistance a voltage drop takes place across that resistance. Provided, therefore, we know the resistance of the meter, and the value of the voltage applied when testing, we can quickly work out the value of an unknown resistance which is joined in series with the meter and battery. First of all cut a strip of white paper to follow the same curve as the engravings on the face of the meter. Stick this piece of paper just below the scale, using a good adhesive such as Secotin or Durofix. Whilst this is drying remove the grid bias battery from your receiver, together with two or three resistances having values up to 50,000 ohms. (Unfortunately it is unlikely that the meter will be useful for values higher than this figure.) Connect the meter, one of the resistances and the grid bias battery in series, using the 6 volt or the 7.5 volt tapping on the meter. Under these conditions the pointer of the meter will swing over and will actually be recording the current which is flowing, but ignoring this point make a neat, small line on the paper scale directly above the pointer.

Calibrating the Device
On this line write the value of the resistance which you are using in the test, and then replace the resistance by another of different value. Again make a line above the pointer and write on the value, and proceed in this way with as many resistances as you can obtain. To check the value of the markings, connect various resistances in parallel and series to obtain different values and ascertain if they agree with your markings. A Cheap Meter

Aerials 7.

Outdoor Twin Aerials.

Aerials.

TWIN 2 TYPE AERIAL WITH WOODEN SPREADERS.

TWIN "T" TYPE AERIAL.
A Pre-Set Resistance

A NEAT and handy variable resistance, such as may be used to decouple the screen of an S.G. valve is illustrated in the accompanying sketch. A piece of ebonite (A) about 1 in. by 1 in. is drilled at each end. The surface of the ebonite from terminal to terminal is thickly coated with graphite by means of a soft pencil, and the second terminal holds a piece of pencil lead such as used in a rule. The whole thing may be immersed in wax to allow the knobs of the toggle switches to just ride easily inside them in course of their operation. The principle of their coupling may be easily gathered from the accompanying sketches, and it will be found that the "snap action" is definitely transmitted to the main control knob.-W. H. Arrun (Liverpool).

Operating Multiple Toggle Switches

I HAVE two receivers in use, one for medium/long-wave reception, and the other for short-wave work. Each has three contact points. It happened that I intersected a second D.P.D.T. switch (No. 1), the centre contacts of which I brought the leads from the centre contacts of the first switch. The outer contacts of the second switch are taken to the respective BEVELLED loud-speaker terminals.-A. C. Lamb (Dewsbury).

THAT DODGE OF YOURS!

A novel change-over switching arrangement.

H.T. negative from the eliminator is taken through a 60-milliamp fuse bulb to the L.T. negative pin of the plug. It is then a simple matter to plug the power on to either set as required. The loud-speaker terminal leads of the two sets are brought out and taken to the end contacts of a D.P.D.T. switch (No. 1). The centre contacts of this switch are led off to a BEVELLED loud-speaker terminal.-W. H. ARTHUR (Liverpool).

A Simple Record Wiper

A novel change-over switching arrangement.

A simple record wiper.

A Novel Wire-stripper

A Novel Wire-stripper for strapping on the wrist.

PRACTICAL WIRELESS

Readers' Wrinkles

THE HALF-GUINEA PAGE

August 11th, 1934

A method of operating multiple toggle switches.
THE FOUR-RANGE SUPER-MAG TWO
A New Two-Valve for the Experiment and His Family.
By "ELECTRIX".

Fig. 1.—A three-quarter rear view of the set, showing the rear panel.

Fig. 2.—The wiring diagram.

Fig. 3.—The theoretical circuit diagram.

Fig. 4.—A rear view of the finished receiver.

Fig. 5.—The panel layout.

PRACTICAL WIRELESS
August 11th, 1934

PRACTICAL WIRELESS
August 11th, 1934

Fig. 1—In order to satisfy both these conditions in the most satisfactory manner a 0.0001 mfd. variable reaction condenser is used and functioned independently on S.W. When the 3-point switch is pushed in, however, a fixed condenser of similar capacity is put in parallel with it. With this very simple arrangement reaction control is delightfully easy on every wavelength.

Other Components
Two aerial terminals are provided, one for S.W. and the other for broadcast reception. Each is connected to the appropriate component through a separate set-condenser so that the optimum setting can be found and retained for long and short waves. The detector valve (a new one of high amplification) operates on the usual deeky grid system although the values of grid condenser and leak are rather unconventional; values were chosen which proved to be equally satisfactory for each wavelength. The grid leak is taken to the 50 ohm. potentiometer, wired across the filament supply, so that exactly the correct grid voltage can be applied under all conditions. The potentiometer can be left in almost any position for more or less local reception, but it is extremely valuable when operating at long distances where it is difficult to deal with all waves, and that channel is specially designed for this purpose.

Instead of the usual S.F. transformer, a "Transegrator" is employed which combines a high efficiency transformer with a parallel resistance-capacity feed circuit. The arrangement makes for "straight" line operation without any introduction of load modifications, making unnecessary the use of a primary and secondary impedance. The transformer is used in conjunction with a tuned circuit and a relay is used to operate the selector valve chosen to suit the conditions prevailing on the grid of the detector valve. The relay is in the filament supply, and the circuit is designed so that when the relay is on the detector valve is cut off and the valve is driven by an ordinary filament transformer.

The positions and dimensions of the panel boxes in Fig. 5. Details of the construction and wiring are most easily obtained from the photographe Fig. 3, 4 and 5, and the wiring plan, Fig. 2. All wiring is in "Glazzer" insulated wire, which can be attached to the terminals after taping the ends by basting and folding under the tape. The connections are made only by soldering the ends to the aerial terminals, and the wiring plan, Fig. 2, shows how the connections are made to the aerial terminals of the coil assembly. These are made by looping the wire round the holding screws before tightly screwing down the latter.

The two connections shown below the wiring and, of course, serve to earth the set.

(Continued overleaf)
THE FOUR-RANGE SUPER-MAG TWO
A New Two-Valve for the Experimenter and His Family.
By "ELECTRIX"

Fig. 1.-A three-range rear view of the set, showing the height layout.

Fig. 2.-The wiring diagram.

Fig. 3.—The theoretical circuit diagram.

Fig. 4.—A rear view of the finished receiver.

THE building of a receiver for ultra-short waves has always been considered as a job quite apart from the construction of a standard broadcast receiver. So much so that experimenters who required a set for S.W. work, have almost invariably found it necessary to employ a separate set for the purpose, keeping another for broadcast reception. A number of constructors have tried to combine the two functions in a single instrument, but in very few cases have the results been really satisfactory. The writer has been a shortwave enthusiast for several years, and has experimented constantly with a view to simplifying the apparatus required for both reception and transmission, but his efforts have only recently met with unqualified success. Even now the success is due as much to improvements in manufacturers' components as to improvements in actual design.

General Considerations

It is well known that any loss in efficiency is much more pronounced on short waves, and that the construction and operation of the set is very "clean" and symmetrical, but as mentioned above, it has passed through many experimental stages, or intending constructors are specially requested not to try to "improve" it by using different components or by altering the layout to suit some conventional cabinet. All the parts have been chosen after careful experiments, and the highest selectivity and range of frequencies obtainable have been determined by patient trial and error to secure the result of a long experience.

Selectivity and Range

In a broadcast receiver, selectivity is of the utmost importance, and especially so in a receiver of this type. The selection of the coil assembly is obviously highly on all wavebands, and in this respect the set stands out as being somewhat unique.

In a broadcast set, selectivity is, of course, cheaper, and is one of the writer's pet fancies because it can be finished in such a variety of ways to suit amateurs of all degrees of technical skill. It is not for sale, but is entirely sui generis, with each part of it being adjustable to suit the particular requirements of the user. One thing is certain, the writer is sure that any amateur worth his salt can improve on it. The writer is sure that any amateur worth his salt can improve on it.

Moreover, the writer's idea was eventually reached without the aid of any technical knowledge, and that this idea was eventually reached without the aid of any technical knowledge.

Perhaps the greatest difficulty in this type of construction was the necessity of using a separate set for broadcast, bands approximately 10 degrees or so.

In working out the design of the "Four-Range Super-Mag Two," the first consideration was to make a set which was sufficiently compact and neat whilst being as good as the best experimental model. When this has been done, gradual modifications were introduced so that the same set could be used successfully for reception on the longer wavebands. Without economising all the difficulties encountered it can be said that this idea was eventually reached without detraction in any way from the efficiency of the S.W. Perhaps the greatest difficulty in this respect was to obtain a satisfactory system of tuning from one waveband to another without incurring capacity losses in the tuning. This was solved by employing coils with self-contained switches, with a result that the only other switch required was a simple 3-point one, and the additional wiring was in this respect only negligible.

The main unit, the "Four-Range Super-Mag Two," is a two-valve designed to cover four different tuning ranges and giving a high degree of selectivity. The ranges covered, by the way, are from 18 to 35 metres, 30 to 65 metres, 220 to 650 metres, and 650 to 2,500 metres. Efficiency and the degree of magnification are equally high on all wavebands, and in this respect the set stands out as being somewhat unique.

All conditions tuning is remarkably easy, and motion control beautifully smooth. The final appearance of the set is very "clean" and symmetrical, but as mentioned above, it has passed through many experimental stages, or intending constructors are specially requested not to try to "improve" it by using different components or by altering the layout to suit some conventional cabinet. All the parts have been chosen after careful experiments, and the highest selectivity and range of frequencies obtainable have been determined by patient trial and error to secure the result of a long experience.

Coil Assembly

The coil assembly is of course, a very important part of the set, and especially so in a receiver of this type. The selection of the coil assembly is obviously high on all wavebands, and in this respect the set stands out as being somewhat unique. For instance, the writer's idea was eventually reached without the aid of any technical knowledge, and that this idea was eventually reached without the aid of any technical knowledge.

Perhaps the greatest difficulty in this type of construction was the necessity of using a separate set for broadcast, bands approximately 10 degrees or so.

In working out the design of the "Four-Range Super-Mag Two," the first consideration was to make a set which was sufficiently compact and neat whilst being as good as the best experimental model. When this has been done, gradual modifications were introduced so that the same set could be used successfully for reception on the longer wavebands. Without economising all the difficulties encountered it can be said that this idea was eventually reached without detraction in any way from the efficiency of the S.W. Perhaps the greatest difficulty in this respect was to obtain a satisfactory system of tuning from one waveband to another without incurring capacity losses in the tuning. This was solved by employing coils with self-contained switches, with a result that the only other switch required was a simple 3-point one, and the additional wiring was in this respect only negligible.

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the entire screening system. The two leads appear to be to keep up the spirits of the working the set
forward. The containing cabinet specified the wiring, of the transcoupler to the 2 mfd. by-pass used to connect the " High " terminal easily. The spaghetti resistance itself is made up from a set of " Byduron " components. Its internal dimensions are 14in. wide by 7in. high by 14in. deep, so it is sufficiently large to accommodate both accumulator and high-tension battery.

**Working the Set**

It is best to employ a high-tension battery of no less than 100 volts, and with a voltage of about that figure the appropriate grid bias voltage will be 3. With these voltages the total anode current consumption is between 6 and 6 milliamperes, so a battery of the smallest capacity is adequate and will give satisfactory service for several months.

When batteries, aerials, earth, and speaker are connected, the set is connected to the " High " terminal of the containing cabinet specified. The transcoupler (Bulgin) is made up from a set of " Byduron " components. It is mainly used to connect the " High " terminal " A " to the speaker, and the " A " terminal is made up from a set of " Byduron " components. Its internal dimensions are 14in. wide by 7in. high by 14in. deep, so it is sufficiently large to accommodate both accumulator and high-tension battery.

**LIST OF COMPONENTS FOR THE FOUR-RANGE SUPER-MAG TWO**

1. Plywood Panel, 14in. by 7in.
2. 1 Board, 14in. by 9in. by ½in.
3. Pair Panel Angle Brackets (Bulgin).
4. Ebonite Terminal Strip, 14in by 1½in. by ½in. (Becol).
5. 9 Terminals: marked " A " and " A.1."
6. Earth " L.T.-+ " and " L.T.-."
7. " H.T.-+ " and " H.T.-."
8. L.S.-F. (Bridge Type " R ").
9. 1,0005 mfd. Variable Condenser with Slow Motion Drive (Jackson Bros. Type " D ").
10. Dial Indicator (Bulgin).
11. 1,0001 mfd. Reaction Condenser (Jackson Bros. " Midget ").
12. 2-spring Slow-motion Switch (Bulgin " Junior ").
13. 3-spring Wavechange Switch (Bulgin)."A."
14. 1,250 ohm Potentiometer (Colvern type " M.T. ").
15. 1 set of " Four-Range " Coils; supplied complete with Ganged Aligned switches and in-plate (Colvern " Four-Range ").
16. 2,0001 mfd. (max.) Pre-Set Condensers (Colvern).
17. 1,0002 mfd. Fixed Condenser (Dubilier type " D ").
18. 1,0001 mfd. Fixed Condenser (Dubilier type " D ").
19. 1 mfd. Fixed Condenser (Dubilier type " D ").
20. 1,000,000 ohms, Metalized Resistance (Dubilier, 1 watt).
21. 1 pair G.B. Battery Clips (Bulgin No. 1).
22. 1 Winder Plugs; marked " G.B. + " and " G.B. - " (Belling Lee).
23. 2 Col. Glaze, odd lengths flex, ½in. (J. J. Eastick and Sons).

**APPARATUS**

**RADIO IN THE NEXT WAR**

**Will a Gramophone Record Replace a Battle Cry?**

By RICHARD ARBIB

... mote greater efficiency and at the same time the considerable economic advantage of the new equipment. The British armies on the march in future wars, which we sincerely hope will never take place, will be able to play music through the loud-speakers to the troops at long distances, and this will be an effective form of entertainment for the troops.

Orders to columns of infantry on the march can be given by the sergeant-major mounted on a horse, or by the sergeant-major or sergeants shouting the directions from one to another, so that by the time an order has reached the last sergeant many minutes may have elapsed. When it is necessary to bring a regiment immediately to the halt this factor may have serious consequences.

**Power Amplifiers**

The adoption by the War Office of high-power amplifying equipment would follow the reaction was set to its best position for one station with low attenuation and then tuned to the 250-500 band, at 600 to 900 to 2,000,000 band, the former of which is obtained by turning the coil switch to left or right for the 18 to 25 meter, or 30 to 60 band respectively.

**For Short-wave Work**

To use the two lowest wavebands connect the aerial to the terminal " A. " and pull out the knob of the 3-point switch and turn the coil switch to left or right for the 18 to 25 meter, or 30 to 60 band respectively.

Searching is done in a manner similar to that just described, but as tuning is much more delicate it must be carried out by using the slow-motion knob only.

**LIST OF COMPONENTS FOR THE FOUR-RANGE SUPER-MAG TWO**

1. Plywood Panel, 14in. by 7in.
2. 1 Board, 14in. by 9in. by ½in.
3. Pair Panel Angle Brackets (Bulgin).
4. Ebonite Terminal Strip, 14in by 1½in. by ½in. (Becol).
5. 9 Terminals: marked " A " and " A.1."
6. Earth " L.T.-+ " and " L.T.-."
7. " H.T.-+ " and " H.T.-."
8. L.S.-F. (Bridge Type " R ").
9. 1,0005 mfd. Variable Condenser with Slow Motion Drive (Jackson Bros. Type " D ").
10. Dial Indicator (Bulgin).
11. 1,0001 mfd. Reaction Condenser (Jackson Bros. " Midget ").
12. 2-spring Slow-motion Switch (Bulgin " Junior ").
13. 3-spring Wavechange Switch (Bulgin)."A."
14. 1,250 ohm Potentiometer (Colvern type " M.T. ").
15. 1 set of " Four-Range " Coils; supplied complete with Ganged Aligned switches and in-plate (Colvern " Four-Range ").
16. 2,0001 mfd. (max.) Pre-Set Condensers (Colvern).
17. 1,0002 mfd. Fixed Condenser (Dubilier type " D ").
18. 1,0001 mfd. Fixed Condenser (Dubilier type " D ").
19. 1 mfd. Fixed Condenser (Dubilier type " D ").
20. 1,000,000 ohms, Metalized Resistance (Dubilier, 1 watt).
21. 1 pair G.B. Battery Clips (Bulgin No. 1).
22. 1 Winder Plugs; marked " G.B. + " and " G.B. - " (Belling Lee).
23. 2 Col. Glaze, odd lengths flex, ½in. (J. J. Eastick and Sons).

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**WILL THE authorities fully appreciate how the latest developments in short-wave transmitting permit the radio transmitters and receivers will be of assistance to soldiers in the field in future wars, the quality of their speeches or official orders, and the capacity for use with armies on the march appears to have been strangely neglected. A considerable increase in the training and maintenance of bandsmen whose efforts are spectacular and heart-stirring when playing in front of their regiments on the parade ground, but are of little use when regiments are on the march in war-time.

The function of regimental bands, when examined from a practical viewpoint, would be of little use when regiments are on the parade ground, but are of little use when regiments are on the march in war-time.

The spaghetti resistance itself is perfectly straight.
TELEVISION RECEIVING CIRCUITS
By H. J. Barton Chapple, Wh. Sch., B.Sc., A.M.I.E.E.

MANY and varied are the number of radio receiving circuits which can be employed in conjunction with television apparatus in order to obtain images which are visually satisfactory. No hard and fast rules can be laid down in this connection owing to the varying distance of constructors from the London National Station which radiates the signals, coupled with questions of local environment. Bearing these individual factors in mind, however, it is possible to furnish details of types of circuits which from actual practical experience have given good results. Contrary to popular belief quite a simple "straight" set can be built up which will modulate successfully an ordinary disc television receiver, especially if this machine incorporates a beehive or "letter" neon lamp in lieu of one of the flat plate variety. A well-tried circuit of this nature is shown in Fig. 1 together with component values, and this is satisfactory within approximately thirty miles of the London National station. It is a simple home-made set with a variable-mu high-frequency pentode stage (this may be replaced with a screen-grid valve of the variable mu or "straight" class if preferred) together with anode load detector stage coupled to a pentode output valve. For simplicity a straight aerial tapped coil is shown, but this can be modified to suit individual tastes provided the circuit is not made too selective. For a simple home-made set, L1 can consist of 60 turns of No. 24 gauge D.S.C. wire wound tightly on a 3-inch diameter former, a tap being made at the fifteenth turn from the earth end.

The variable-mu feed to V1 is quite standard practice, but in the anode circuit coils L1 and L4 constitute an H.F. transformer arrangement, L2 consisting of 60 turns of 36-gauge D.S.C. wire wound on a 3-inch diameter former, while L3 has 60 turns of 24-gauge D.S.C. wire on the same former, the windings being kept close together to give a tight magnetic coupling. If the constructor has some old type two pin plug-in coils available, these can even be used. L1 then becomes a No. 60 tapped coil, L2 a No. 40 or 60 coil, and L3 a No. 60 coil, coils L1 and L4 being mounted close together to give the required degree of magnetic coupling. The detector stage is quite normal, the appropriate negative bias to the grid of V1 for anode bend rectification being furnished by GB—2. Resistance capacity coupling links V1 and V2 and, in order to reduce the total high tension voltage required, the neon lamp (and synchronising condensers) are decoupled from the circuit by a 0.0005-mfd. condenser, and the anode by a 0.0005-mfd. condenser coupled, with the circuit not made too selective.

Standard valves are quite satisfactory for this set, V1 being of the V.P.2 or 220 V5 type, V2 of the PM1LE or L210 type, while V1 is can be either a PM26 or a 220PT. It will be noticed that the coils specified are only for the medium waveband, it being assumed that the set is to be used only for television. If desired, however, dual range coils may be included, in which case the receiver, in addition to being available for television reception, can serve as a stand-by battery set for home use.

A Mains Receiver
Fig. 2 shows a mains-driven three-valve receiver following on very similar lines to that of Fig. 1. The same valve combination and methods of coupling are used, while a grid bias battery is employed for the anode bend detector stage, it being proved by test that this gives slightly better results than when automatic bias is used. The eliminator side is quite standard and for the valves a choice can be made from AC/SG, MSG/IA, 84VB for V1; MH4, 41 MFD, AC/HL for V2; PM36, 615PT, PT625 for V3; and 460BU, DW4, U14 for V4. In the case of the mains rectifying valve it must be arranged that the transformer windings give only a 400-volt feed after rectification as the component values have been calculated on this basis.

A circuit of somewhat greater range and power for disc-type receivers is indicated in Fig. 3. The eliminator side has been omitted here, as this can follow standard lines, while battery bias is shown for simplicity. This latter can be converted to automatic bias if desired. Briefly, the circuit shown consists of a band-pass filter with condenser coupling to give a wide peak separation. V1 is a standard 3.G. valve, but a variable-mu H.F. pentode or S.G. valve can be used if desired. This valve has a choke-grid feed to a power grid-detector valve, followed by an R.C. coupling to the first L.F. valve with two power valves arranged in push-pull in the output stage. No rectification is included in the detector stage, while the neon lamp of the disc television receiver is linked to the extremities of a centre-tapped output choke via two 2 mf. condensers.

(Continued overleaf)
IT is customary in a modern receiver for the detector valve to serve the double function of a first low-frequency stage when a gramophone pick-up is used, and many listeners are somewhat surprised to find that the results on gramophone do not attain the same standard as the radio section.

When results on gramophone are poor the entire receiver is usually held to be above suspicion if it gives good reception on ordinary broadcast, and the gramophone pick-up and volume control travels between the service departments of the bewildered manufacturer and the disappointed purchaser.

The trouble is usually to be found in the detector valve, which is called upon to perform such widely different functions that it is not surprising when it fails. In a well-designed receiver the output valve should overload just before the detector valve, but when the gramophone pick-up is plugged in and bias applied, the impedance of the valve rises considerably, and also, instead of being able to work far into the positive its grid swing is now restricted to the point where grid current begins. The grid swing being thus restricted, the valve overloads too easily, and is often so overloaded that it becomes unbearable before sufficient voltage is developed to load up the output valve by 50 per cent. When this state of affairs prevails the volume on gramophone without noticeable distortion will be only half of that obtainable on radio.

The most obvious cure will be to use a detector valve of very much lower impedance so that it will have the necessary grid swing to accommodate sufficient input from the gramophone pick-up; but, unfortunately, this course is not always desirable, as it may lower the efficiency of the receiver when working on radio and may rob the receiver of its ability to carry out the work allotted to it.

The most simple way of overcoming this difficulty is to use a directly-heated super-power valve also resistance-capacitance coupled to the detector valve and acting as a separate feed to the grid or Kerr cell. The two fixed resistances and potentiometer wired in series and joined across the 500-volt H.T. feed serves the purpose of applying the correct polarizing potential to the detector cell for optimum working. The source of high tension can be any standard high-powered eliminator, but for simplicity this is not shown.

Fig. 3.—A television receiver suitable for long-distance reception.

Finally, when working on gramophone record reproduction, although it may be necessary to reduce it to the conventional 60-90 on radio. This can very easily be achieved by having a suitable dropping resistance in the anode circuit, which can be shorted either by a switch or by the use of a single circuit jack to receive the pick-up plug instead of the usual single circuit jack without the additional limb.

Finally, when working on the gramophone side do not adhere too closely to the grid bias recommended by the makers in this particular instance, as in some cases the valve recommended may refer to the valve when used as an H.F. amplifier.
Wireless on Arctic Aeroplane

Mr. John Grierson, the well-known airman who is now on the first stage of his flight to America, on the Arctic air route, is relying on a special Marconi short-wave aircraft installation for reporting his progress.

This short-wave transmitter, which has been specially developed for the flight, operates on a wavelength of 34 metres, and when in the air barely messages are transmitted, giving the position and other particulars of concern. The Radio Society of Great Britain has arranged for its members to listen to Mr. Grierson's transmissions throughout his flight, and on his second stage from Londonderry to Iceland several members of the Society successfully received all his messages until the final one notifying his arrival.

In addition to the wireless transmitter, the machine is fitted with a Marconi-Redfern "homing" device, which, in the absence of wireless direction-finding facilities on the Arctic route, is of the utmost value to the aviator. It enables him to fly accurately to any wireless station on his route, and it also gives him the facility to check his course during the flight. This is particularly valuable in view of the magnetic conditions in the Arctic which frequently render the ordinary compass unsteady and unreliable.

The "homing" device is extremely simple in operation. A three-way switch indicates to the airman if he is flying on his correct bearing, or if he has veered to the right or to the left of it. On the flight from Londonderry to Iceland the "homing" device worked perfectly and materially assisted Mr. Grierson to accomplish this difficult part of his enterprise without a hitch.

New Teleprinter Service

We are informed that a private teleprinter service has been now installed between the London Office and the Chippenham works of the Westinghouse Brake and Saxby Signal Co., Ltd. The installation at each end includes, of course, a Westinghouse metal rectifier, which is a standard part of the A.O. teleprinter equipment.

By Air to Olympia

ARRANGEMENTS have been made by Marconiphone to enable Marconi men throughout the period of the Exhibition at Olympia by air. Hillman Airways, Ltd., will supply a fleet of aeroplanes for the exclusive use of Marconi men throughout the period of the Exhibition. The service will be on similar lines to that in operation last year, but with vastly improved facilities in comfort, convenience and speed.

A daily service will be established from all the principal airports in the British Isles to Heston and from there conveyance will be arranged to Olympia. Dealers are invited to notify the Wireless Telephone Publicity Department as early as possible as to the date on which they wish to travel to Olympia and also the return journey. (Only return passages booked.)

The daily service will be subject to inquiries received, and only be made at those airports from which bookings have been arranged. The cost is 3d. per mile each passenger, taking mileage as on a direct line between the airport and Heston Aerodrome. This includes conveyance from Heston to Radio Exhibition and a visit to Hayes may be included at the dealer's special request. All bookings must be made not later than August 11th, but in order to facilitate organization, orders should be received by the 5th as early as possible. Where large parties are travelling together, reduction may be made in the cost.

The following are some typical return fares:

- Bristol: £2.15.0
- Birmingham: 3.0.0
- Bradford: 3.0.0
- Glasgow: 10.0.0
- Harwich: 0.0.0
- Leicester: 2.15.0
- Liverpool: 5.0.0
- Manchester: 5.0.0
- Newcastle: 7.5.0
- Sheffield: 4.5.0

Twelve airplanes will be available, and six are of the very latest type, being the new De Haviland Dragon Pullman planes to seat six passengers. They are most luxuriously fitted and are capable of an air speed of 190 miles per hour.

Outside Broadcasts

CONCERT-PARTY relays from Bellevue Gardens are now appearing fairly regularly in the B.B.C. programmes. The bandstand at Bellevue is an open one and occasionally it is exposed to the elements. Every precaution is taken, however, and special microphones are used to accommodate the audience.

Group Listeners

In a booklet issued by the B.B.C. entitled "Broadcast Education in Great Britain—1922-1934," it is stated that, considered in relation to the total number of licence-holders, the number of group listeners is unimpressive; but considered as the first fruits of an experiment with a new medium, it is more interesting, especially to those who are familiar with the difficulties and, above all, with the apathy which meets formal adult education. Moreover, the groups have a significance quite unshared by individual listeners. They are living evidence that a number of listeners have realized their own responsibility for seeing that broadcasting plays a part in the cultural life of the community and that they have shown their readiness to co-operate with the B.B.C. to that end.

Round the World of Wireless

Shrewsbury Floral Fête

DURING the evening of August 12th the Mayor of Shrewsbury (Mr. Richard Mansell) will give Midland Regional listeners his recollections of the Shrewsbury Floral Fête over the past fifty years. The show was founded in 1875, and since 1882 has been a regular feature of the Shrewsbury Musical and Dramatic Bands as its principal musical feature.

The three bands this year are those of the Coldstream Guards, Scots Guards, and Welsh Guards, and they will be relayed on Thursday, August 10th, the second and closing day of the famous Flower Show. With the exception of Shrewsbury, Massed Guards Bands are not heard out of London.

The three conductors are: Major Andrew Harris, the Senior Director of Music in the Brigade of Guards; Lieutenant J. Cauwley Windram; and Lieutenant H. E. Dowell.

Golf Broadcast

The Men's International Golf Match, to be held at the Prestwick Golf Club on August 17th, and at 22.00 on that day Bernard Darwin will give an eye-witness account of the matches for West Regional listeners.

Works of F. A. Nichols

Frank A. Nichols has been associated with National broadcasting since the spring of 1927, and in honour of his fifteenth birthday, on August 9th, a special "Jubilee" programme of his work will be broadcast from Manchester. It will consist of excerpts from some of the 532 radio plays and sketches in which Mr. Nichols has taken part. Although he is well-known to-day in the rôle of Bill Brown of Owdham, some listeners may be too young to remember him as Newman Hyde, the Lancashire comedian (his only solo rôle), or his more recent appearances as Griffith Griffiths, of the Professor Zweinstein and Mr. Griffith Griffiths sketches.

Variety Programme for National Listeners

Students and Allen, the talented broadcast and film actors, who recently arrived in Europe from New York, are to appear at the top of a variety programme for National listeners on August 11th. They will have several British broadcasting "stars" to keep them company; for example, Norman Long, Harry Hensley, and Bob Wilton (in "The Fireman," assisted by Iris Parnell). Kneale Kelley will be back from his holidays to conduct the B.B.C. Theatre Orchestra on this occasion.

Light Entertainment from the Scottish Regional

The Motherwell and Wishaw Town Band, conducted by Jack Remington, with Mac Johnston (contrabass) and William McCulloch (entertainer), will present a programme for Scottish Regional listeners on August 13th.

On August 15th the Sunshine Follies will present a new programme in the Pavilion Theatre, Perth, which will be relayed to Scottish Regional listeners. The cast includes George Doonan, Elsie Prince, Muriel Burns, Jimmy Jerome, the Sunshine Girls, and the Rhythm King's Band.
SHORT WAVE SECTION

FAULT-FINDING IN A SHORT-WAVER

By FRANK PRESTON.

Nearly all S.W. Troubles Occur in Connection With the Reaction Circuit, and the Methods of Overcoming Them are Described on This Page.

Generally speaking, the principal forms of trouble which occur in a short-wave receiver are the same as those in a normal broadcast set, and can be traced and cured in the same way. There are, however, additional faults which are peculiar to short-wave instruments, and the newcomer to S.W. work may find a good deal of difficulty in interpreting the symptoms.

The most widespread fault in the average type of simple short-waver, particularly one of the Det.-L.F. variety, is poor reaction control. Sometimes this manifests itself in the inability to obtain reaction (and generally, therefore, reception) below a certain wavelength, but quite often it is found that feed-back is steady and normal at some parts of the tuning dial, and "ploppy" or even unobtainable at other dial settings. The latter difficulty is usually described by saying that there are "dead-spots" in the tuning range.

Incorrect Values

When it is found that the set refuses to oscillate below a certain wavelength, although it functions normally at higher condenser settings it is frequently a sign that the component values are incorrect, or that there is too much capacity between components or wiring. The former point cannot be dealt with at any length, because the actual values required depend so much upon the particular circuit employed, whilst if the receiver has been made to some published circuit the difficulty should not arise. In general, however, it may be said that the values of all condensers should not exceed about one-third of the equivalent ones in a set intended for medium-wave work. For example, a .0005-mfd. tuning

winding, the size of the tuning winding and the capacity of the reaction condenser. There are some experimenters who prefer to use a reaction winding having a larger number of turns than the tuned winding in conjunction with a reaction condenser of comparatively low capacity, whilst others would rather employ a smaller reaction winding along with a condenser of rather large capacity. Both systems have their advantages in different circuits, but the experimenter who is not very accustomed to short-wave work will nearly always find it preferable to adopt the latter plan. The reason is that the large coil and small condenser are more liable to form a resonant circuit and to "take charge" of the tuning. In other words, the circuit tunes to stations on the waveband covered by the aerial coil, and makes it impossible to receive signals on wavelengths lower than those covered by the reaction circuit.

For most purposes it will be found satisfactory to employ a reaction winding having approximately 80 per cent. of the number of turns used for the aerial or grid winding. For example, when the grid winding consists of four turns (this number on a 5/8 in. diameter former should cover a wavelength range of about 18 to 30 metres) the reaction coil should have about three turns. With an 18-turn grid coil (50 to 110 metres) a reaction winding of thirteen or fourteen turns. In the case of tuning coils having more than about twelve turns, however, it is often possible, and better, to make the reaction winding only about half the size of the other one. It is always worth while to experiment with the number of reaction turns, in order to find the smallest winding which will produce oscillation over the complete waveband in conjunction with the particular value of reaction condenser chosen.

Dead-Spots

Dead-spots in the tuning range are sometimes due to a bad choice of reaction-circuit values, but more frequently to the use of an unsuitable type of aerial coupling or to the employment of an H.F. choke of poor or unsuitable design. There are three...
main methods of aerial coupling, all of which are well known, and are used for other than short-wave reception. In the first, the aerial is connected through a fixed or variable condenser to the "top" of the grid coil, in the second the aerial goes to a tapping on the grid winding, and in the third a separate, loosely-coupled aerial winding is made use of. It is scarcely possible to say definitely that any one is better than the others, since all have their uses in different circumstances. The beginner, therefore, advised to try them all, and in doing so different sizes of loose-coupled aerial windings and different tapping points on the grid winding (which amounts to the same thing) should be tried. A considerable amount of interesting experiment can be carried out along these lines, and the result will fully justify the time spent.

Aerial-Reaction Coupling

There is another form of coupling which, although not a very well known one, is worth a trial. This consists of coupling the aerial to the reaction coil, either by means of a loose-coupled winding or by connecting it to a centre tap—preferably through a small variable condenser. Very often when all other methods of removing "dead-spots" have failed this will prove successful.

Although there are various alternative methods of applying reaction, the modified Reinartz system illustrated in Fig. 1 is nearly always employed. It has its advantages, of course, but the "throttle" control circuit shown in Fig. 2 will often be found better in giving a smoother variation of feed-back. Besides this, the Fig. 2 method is less inclined to affect the tuning circuit. The pictorial circuit is self-explanatory, and it need only be said that it is preferable that the reaction condenser should be provided with a fairly long extension spindle in order that hand-capacity effects may be avoided as far as possible.

The old "swinging-coil" method of reaction control is worth a trial, despite the criticisms that have been levelled against it. Provided that a really smooth and even movement can be imparted to the swinging-coil the method is almost ideal. This delicate and accurate movement can best be obtained by mounting the coil on a spindle rotated by means of a slow-motion condenser drive. The principal objection is that coil-changing would be inconvenient where this method was employed; it is, therefore, preferable that it should only be applied to sets intended for one particular short-wave range or to those in which a multi-range tuner is fitted.

THE WIRELESS CONSTRUCTOR'S ENCYCLOPAEDIA

(2nd Edition)

By F. J. CAMM

(Editor of "Practical Wireless")

This invaluable encyclopedia is written in plain language by one of the most accomplished designers and writers on wireless construction. Obtained at all Booksellers at 5d. and 6d. from Geo. Newnes, Ltd., 81-11, Southampton Street, E. Strand, London, W.C. 2.

THEY ALL MAKE SURE AND USE...

T.C.C.

ALL-BRITISH CONDENSERS

BUDAPEST, Sottens, West and London Regionals, Kalundborg, the Empire transmitter, and a score of others...they all rely on T.C.C. Condensers when they are sending you programmes. The Service they give demands continuous dependability, that is why their choice is T.C.C. Condensers.

At your end...your receiver—little use these stations giving you of their best if your set is out of commission because "a little something" has gone wrong.

**

To you the smallest fixed condenser in your set is as vital as the biggest condenser in the transmitter. Keep the chain complete, see that your set is fitted with T.C.C. Condensers, and an assurance that you will not miss a programme because of a faulty condenser. T.C.C. experience and "repeated test" methods are your guarantee.

The illustration is of a 2 mfd. Type 50 NON-INDUCTIVE T.C.C. Condenser for 200v. D.C. Working, tested to 400v. D.C. Price 3s. 6d.

The Telegraph Condenser Co., Ltd., Wales Farm Rd., N. Acton, London, W. 3
Radio Exhibition

With the approach of the Radio Exhibition at Olympia, many component manufacturers are introducing special new lines. Information is already to hand concerning many of these components, and amongst the descriptions on this page will be found some details relative to these new lines. We would consequently remind readers that some little difficulty may be experienced in obtaining these items from their local suppliers, owing to the fact that full supplies are not yet available, and therefore, unless the items are urgently required, their orders should be postponed until the exhibition is well under way. In the case of an urgent order, the manufacturers themselves should be approached.

New Polar Condensers

In accordance with the present-day scheme of reducing the size of components, Messrs. Wingrove and Rogers, manufacturers of the popular Polar accessories, have introduced for the new season some neat and compact ganged condensers, two samples of which are illustrated above. The overall size of these may be judged by noting the proportions of the control spindle, which is of the standard tin section and is lm. in length. These condensers are known as Polar Midget Gang Condensers, and are constructed with stout steel frames and cover, and the rotor section is mounted in ball bearings to remove all friction and at the same time to provide a really smooth movement which is fully controllable by means of a slow-motion drive. There are, of course, a number of ganged condensers at present on the market which prove so stiff in the bearings that when a slow-motion drive is attached the pointer is continually slipping and accurate readings are not possible. A further improvement in these ganged condensers is to be found in the trimmers which are situated at the top and which are non-slipping and retain their setting most accurately. The adjusting screw projects from the dust cover and reduces the risk of short-circuits should a metal screw-driver be employed for the trimming adjustment. Connection to the fixed sections is made through the medium of a stout brass arm and a screw, with an alternative arm for a soldered joint if that is preferred. The finish is in grey cellulose, and the whole instrument has a most workmanlike appearance. The two-gang condenser costs £1., and the three-gang (for straight or super-het. circuits) costs £6. 6d.

Atlas Mains Unit

The illustration at the foot of this page shows the new Atlas Type T.10/30 Mains unit, which is an addition to the present range of mains apparatus manufactured by Messrs. H. Clarke and Co. (M/cr) Ltd. This is designed for connection to any A.C. supply from 200 to 250 volts having a periodicity between 40 and 120 cycles and the output is suitable for battery receivers employing "straight" or Q.P.P. outputs connecting up to 30 mA. Three positive H.T. tappings are provided, the first giving 60 to 80 volts at minimum and maximum positions, and the second giving 50 to 90 volts in three positions—minimum, medium and maximum. The high voltage output is rated at 120 or 150 volts, the alternative values in essence being obtained by inserting the appropriate plug into the socket carrying the desired marking. A small panel at the lower edge of the case is provided with three sockets marked 10, 20 and 30 mA, and a plug may be inserted into the socket showing the output which it is desired to employ in the maximum tapping position. To the left of this panel is a small tumbler switch which brings into circuit a trickle charger for the L.T. accumulator and provides a charging current of 0.5 amps. Rectification is carried out by means of a Westinghouse rectifier, and the connection provided is of a high order. The Unit may be thoroughly recommended. The price is 60s. 6d. cash, but is also obtainable on hire purchase terms of 10s. deposit and eight monthly payments of 8s. 6d. each.

Eleclex Duplex Coil Price Reductions

A substantial decrease in the price of the popular Duplex Short Wave Coil and its base is announced by Messrs. J. J. Eastick and Sons. In future the coil will cost only 2s. 6d. and the base 1s. 6d. Readers will remember that roughly the coil has cost 5s., and the base 2s. 6d. This handy combination will enable anyone to build a short-wave receiver, converter or adaptor, and provide a ready method of changing the range over the bands from 15 to 30 and from 28 to 60 metres.

Everett, Edgcumbe and Radiolab

We recently reported on the interesting Radiolab products and we now understand that the well-known firm of Everett, Edgcumbe and Co., Ltd., makers of the well-known Milnes and other electrical instruments, have taken over the manufacture of the Radiolab products and are extending the range of radio instruments to include the smaller Everett electrical meters.

Milnes Radio Speakers

Milnes Radio Co., Ltd., of Bingley, Yorks., have previously been known only for the ingenious H.T. battery which they have marketed for some years and which, as our readers know, possesses the novel feature of being rechargeable from a 6-volt accumulator. They now intend to enter other branches of the radio field and are producing a permanent magnet moving coil speaker in two sizes—one at 32s. 6d. and one at 43s. 6d. These may be obtained in cabinets at a slightly increased cost. A special two-claw magnet is used, possessing unusually high flux density and giving splendid results. The Input transformer is of the Universal type and thus enables any output valve to be matched satisfactorily.

A further line which will be shortly introduced by Messrs. Milnes will consist of a superheterodyne receiver. This has been designed for use with the special Milnes H.T. supply unit and employs 5 valves incorporating 8 stages and 9 separate tuned circuits. Every modern feature has been included in this receiver, further details of which will be given at a later date.
**PRACTICAL LETTERS FROM READERS**

The Editor does not necessarily agree with expressions by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

**Five-valve Superhet Wanted**

Sir,—Superhetolyrones are becoming very popular with the manufacturers, and I believe they have come to stay. I appreciated the article by Frank Preston in *Practical Wireless*, June 23rd, 1934, entitled "Some Superhet Pointers."

Personally speaking, I want to see more articles about superherts, and what I would like to see more than anything else is a good five-valve superhet for the home-constructor, with either class B or pentode output A.V.C. and single-knob tuning. Can we please have such a set in the very near future, please?—W. R. Ghynan (Mona-ghan, I.P.S.).

We have Mr. Ghynan’s suggestion under consideration, and we hope to be able to carry out the course of particulars of a set of the lines that mentioned above.—Ed.

**A South African Reader’s Thanks**

Sir,—I have received my copy of "Everyman’s Wireless Book," for which many thanks. It certainly is a very informative and helpful book, and has helped me considerably in clearing up many of the "snags" connected with wireless. I have taken advantage of the offer I have taken advantage of, and I must congratulate you on the production of so helpful a book.—J. E. Kay (East London, South Africa).

**Steam-Roller Radio**

Sir,—Yet again Dr. Hackenoff speaks! As he has already stated, certain secret seeds were sown—planted among men at the Institution—some time ago, in hope that wireless for steam-rollers might crop-up and stay up—and now, we gather, from Dr. Hackenoff’s humble abode, that all his hush-hush husbandry-cum-careful culti-vation—has fruited enough to crown him with the label of the Canned-Goods Game!"

Some will say: "Hack’s a hop-head, and this is the aftermath of a session with the Fop." Others will tell you it’s all a trick, done with concealed wires—but we ourselves would rather say: "Well, Hack’s at the Inst., isn’t it?"

"I got this idea," he tells, rather than informs us, "from watching a steam-roller climb the most at Rugby, and from playing ‘Old Nan River’ on my Radio-Chaffreutter—with a set of magnetic hay-forks.” And, strangely enough, we find ourselves believing him! "Don’t erect any new set or statues in my honour until ourselves believing him!"

Chaffcutter "with a set of magnetic hay-forks"—THAT a valve will also be seen in which two separate valves are included in a single glass bulb—the two sections comprising an H.F. pre-amplifier and a triode.

Chocolate A.D. mains receiver is connected simply by touching a control knob on a mains-operated receiver, due to the rub screw respecting from the control knob.

THAT a severe shock can often be obtained simply by touching a control knob on a mains-operated receiver, due to the rub screw respecting from the control knob.

THAT a beach of stinging wax or Chaffreutter’s Composed will prevent the above trouble.

THAT if an A.G. mains receiver is connected to a B.C. mains supply it will probably be damaged owing to the mains transformer burning out.

THATCards should be exercised when choosing a ‘block’ condenser for use in a re-ciever employing a metal reflector in a voltage transformer set.

Sir,—Realizing steam-rollonauts—despite their disarming appearance—have, when roused, a nasty habit of taking those who upset them for a ride—which either ends up at the top of a tree, in custody, or in the unfortunate victim being "dumped off"—well, even inventors like living (although they’re not really supposed to!).

Fearing the worst, I decided to do my best—to give to steam-rollonautes the set of their lives, and I went all out. After luring two of the dusky dare-devils to the Institution, and observing their reactions to certain treatment, I soon discovered the style of set they were on, and sent for my constructors.

Receiving certain whispered instructions from myself—I decided certain mysterious crates, carts, crotchetry and sundry divers equipment, those gallant and enterprising young men—"The Constructors"—were each given a puff at my mighty "Inspirator" and locked away—in our D.X. periphery—O.M.G.!—with thoughts and theirs for the best.

Whatever really happened inside, I know not—but, as a result of what must have happened, the apparatus was wired and wired and wired waiting when I lifted the latch of the pent-house door. (Washed-out though they were, I knew my "There tish, Doc.—we done it on Shell!"

And so—almost overnight—was born the wonderful apparatus—its name, "Steam-Roller Radio"—our greatest gesture to our super-salutarian friends in safety—to pre-Victorian uniformity! With rollonauts appeased, my cup was full; my head, red.

The wonderful apparatus was designed by our own draughtsman, Dr. Hoey (who is, alas! only a poor man). From his daringly-drawn draughtswork to the Hopey 1500-line system—any owner of a *Practical Wireless* "Discovisor" (or my own "Televisor") will be able to construct a similar apparatus for himself; but, for those who have not this apparatus handy, I will give an old man’s description:

In the top left-hand corner of the set is a sturdily-built Malster-Hopwood "Storage-generator"—Maltese-cross model, roller-top fixing; from this to the set runs the X main lead. In the centre of the set is the input socket and hold-up; middle, sidereal time and gravity-indicators; top, co-axial cores connected to the putative rare earths, and the cuddlesome Barnarm-Pulpm controls; right, high-frequency "Damp-Bottle Rollonaut" (or output platform and canning apparatus.

But, as Dr. Hoey has now consented to turn out the credit, and as a part of my necessary plans, I think it only right to add his words: "Allt der kredit mit this give may be "Damp-Bollen Rolandfundt" ist master-bewary!"

Dr. HACKENOFF (Institution for Eccentrical Engineers, Univ. of Timbuctu).

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**RADIO CLUB AND SOCIETIES**

Club Reports should not exceed 200 words in length and should be received first Post each Month for publication in the following week’s issue.

**SLADE RADIO**

"Electrical ignition equipment" was the title of a lantern lecture given by Mr. J. E. Miller at a recent meeting of this society. Commencing with a slide showing the confusion system in use at the beginning of the century, a brief description was given of the co-axial cores which has been made up to the present time. Full details were then given of the systems now in use, and with stating details given an enormous variety of apparatus—some transformers, magnetic fields, and spectacles of various inventors and a few slides were shown. The question of condensers, testing of dynamos, and high tension cables were covered.

A demonstration was given with a specially constructed 100 square-meter squares receiver, and the effect of various engine speeds was shown. Readers who are interested in short-wave work are invited to write to Mr. J. W. Want, 27, Reboom- burt Road, Plymouth, for further particulars.

**SHORT-WAVE CLUB FOR PLYMOUTH**

It is proposed to form a chapter of the International Short-Wave Club in Plymouth, and readers of *Practical Wireless* who are interested in short-wave work are invited to write to Mr. J. W. Want, 27, Reboom-burt Road, Plymouth, for further particulars.

**INTERNATIONAL SHORT-WAVE CLUB (LONDON)**

A very successful evening was spent in the meeting of the London Chapter, held on Friday, July 20th, which indicates the increasing interest in short-wave reception. At this meeting a member, who is an acknowledged short-wave authority, gave an illustrated lecture on frequency changers, and described an apparatus constructed at the short-wave club which members agreed to be one of the most efficient receivers ever demonstrated at the Chapter. Full details of this receiver will be sent to members of the London Chapter.

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Full details of this receiver will be sent to members of the London Chapter. Owing to the rapid progress in the design of wireless manufacturers, the London Chapter, held on Friday, July 20th.

**JOIN THE PRACTICAL WIRELESS FAMILY**

PRACTICAL WIRELESS is the only monthly magazine devoted solely to wireless and electrical subjects. It is published in London, S.E.16. The Editor will be pleased to consider articles of a practical nature suitable for publication in *Practical Wireless*. Such articles should be on one side of the paper only, and should contain the name and address of the sender. Whist the Editor does not hold himself responsible for manuscripts, every effort will be made to return unsolicited manuscripts. Slides can be exchanged. All correspondence intended for the Editor should be addressed: *The Editor, Practical Wireless*, Gas, Netley, U.S.A. 811, Southwark Street, Strand, S.W.1.

Membership of the club costs 4s. 6d. per year, which is sent to the Secretary, Mrs. N. E. B. Russell, 28, Mary’s Place, Battersea, London, S.W.1.

**August 11th, 1934**

PRACTICAL WIRELESS

585
A Mongst the August Decca releases an excellent standard has been attained. The following selected records in the Polydor and Brunswick category should certainly be heard.

Decca

It is a long time since we heard a record from Greta Keller, the charming Viennese singer, who made so many friends with her broadcasts from the B.B.C. a few years ago—apart from her records. In "Easy Come, Easy Go," and "Don't Let It Happen Again" (F5078) she gives us her best. Since then she has been in America, singing and recording with the orchestra alone, and sometimes with that well-known pair, Ross and Sargent. (In private life she is Mrs. Joe Sargent.)

The issue of this new record is, therefore, of especial interest since Greta Keller will be paying us a flying visit in September, when she will be heard once more from the B.B.C.

The recording was done, of course, in the Brunswick Studios in New York.

A Successor to De Groot

The Alfredo Campoli Grand Orchestra (K784): "Evergreen" Selection. I wonder if everyone fully realizes the amazing versatility of Campoli. The above orchestra is his fifth recording unit selling on records to-day. Campoli as a violinist; his Salon Orchestra, the Novely Orche Vienna, his Trio; and now his Grand Orchestra. With these activities he combines regular broadcasting, concerts, cinema stage appearances, and accompanying work on recording sessions.

For a long time now he has been acclaimed as the worthy successor to De Groot. His two records issued this month are particularly interesting for their arrangements and orchestrations. I think that the "Evergreen" Selection will be found especially acceptable.

Billy Reid and his London Piano-Accordion Band (F0116): "Madonna Mine" and "Grinning" (In Grinning back with you). Billy Reid's Accordian Band have a long time been one of the big sellers on records.

You will be invited to listen to many recorded versions of "Madonna Mine," but I venture to think that Billy Reid's performance on Decca F0116 is one of the finest that will come into your possession.

Oskar Johnson Dance Orchestra (F2061): "Souvenir Tango" and "Talk to Me of Love, Mariu." The above name will be new to you—for a short time. It is a German orchestra, newly formed, and it already ranks as "The Jack Hylton Dance Band of Germany." No vocal refrains will appear on any of these records, and they will be individual in that the Continental style predominates, as the American and English styles predominate in American and English recordings. In Germany they are a phenomenal success, and their records in England will appear exclusively on Decca.

Don Barreto and his Cuban Orchestra (F5084): "Jungle Drums," I have written many times of this beautiful Cuban Orchestra now playing in Paris. Their playing is to me a joy, and personally am delighted to find a new record from them in the August List.

Roy Fox and his Band (F5081): "Over My Shoulder." The first thing that always strikes me about anything Roy Fox does is his efficiency. Even the smallest detail is handled with meticulous care.

I was present at the recording of the above, and was much struck by the care Fox took, and the experiments he made in order to get a true balance and a vitality of performance. He appears to be trying to get every ounce of personality into his records, and he has been specially rewarded in his version of "Over My Shoulder."

Brunswick

Connie Boswell (01816): "I Do All I Do in Dream of You." What a perfect artist Connie Boswell is! She always manages to find a different interpretation to a song, after hearing which others sound commonplace. At least, that is how I feel. Whenever a new "hit" is born at once make enquiries as to whether Connie Boswell is going to record it. One only has to look through a Brunswick catalogue to find such classes as "Time on My Hands," "I Cover the Waterfront," "It's the Talk of the Town at Dinner at Eight," "Emperor Jones," "Where, I Wonder Where," etc., etc., to find that her recording of these numbers is superb. They stand alone. She is, to me, the perfect "Blues" singer—an expression I don't care for, but it seems to be the accepted term.

Again she has surpassed herself in "All I Do is Dream of You," although I do not, frankly, care for the other side, "Little Man, You've Had a Busy Day." I understand, however, that such touches are popular in America.

But in spite of this first fall from grace, the other side more than makes amends for it. Please hear it.

A Calloway Concatenation

Cab Calloway and his Orchestra (01792): "Sweet Georgia Brown." Another record for the hot fans, played in characteristic Calloway style.

Casa Loma Orchestra (01793): "Love Me." "Love Me" is a sweet number written by that prolific writer, Victor Young, who incidentally, is the musical director of Brunswick Company. The Casa Loma Orchestra, apart from the beauty of its playing, is quickly identified by the vocal refrains of Sargent, who is rather like Jack Teagarden in style. They both have that "sleepy" style of the night singers, which is ideally suited to vocal refrains. The band is acknowledged to be one of the greatest in the world, and composed of operators, working on a co-operative basis. They are, at the moment, playing at Glen Island Casino, on Long Island, one of the smartest country clubs for the rich New Yorkers.

Decca-Polydor

The Decca-Polydor List does not contain anything that is particularly exciting for the thoroughly initiated music-lover. A popular list has been drawn up in order to attempt to cater for those less experienced in standard music—those who like good music for entertainment rather than for intellectual exercise.

Erna Berger (Soprano) (P0100): "My Dear Marquis" and "I'll Play the Innocent One." I would draw attention to the recording of "My Dear Marquis," as it is a record of two songs from the Johann Strauss opera, "The Bat." Brailowsky and Brailowsky (Pianist) (D07029): "Polonaise in A Flat Major, Op. 53." (Chopin). Brailowsky, one of the greatest pianists of our time, has not appeared lately in our lists, and his return will be cordially welcomed. He plays the very famous "Polonaise in A Flat Major." This is also a record to which I venture to draw your attention.

The Glorious "Fifth"

—Symphony, that is, by Beethoven. It would be, I think, safe to wager that if a hundred musically cultured folk were told they could take only one piece to the postulated desert island—this would be the symphony.

Now there is one factor which militates against universal popularity of many of the great symphonies and sonatas—one which our more astute modern composers would be wise to avoid whenever possible. This factor is the "Fifth" Symphony—so called for the hot fans, played in characteristic Calloway style.

It should be pointed out that it was written during an ardent love affair, and we are told that a commentator sees in it a portrait of the composer and his fiancée. Hear it for yourself and you will find that perhaps you yourself are just as strongly drawn.

There are four records in this new recording—Columbia DX106-519—and the very beautiful interpretation is by the London Philharmonic Orchestra under Dr. W. Sargent. I mentioned above the omnipresence of a vital message in this symphony. What is it? This can be interpreted only by the listener, but once a concept has been formed, nothing will shake a belief in what will have become one of the eternal classics. To that listener, Beethoven here is beauty of the rare, stirring, simple kind, which everyone may dress as he chooses to his lasting spiritual benefit. Hear it then, Beethoven's "Fifth," and re-title it for yourself.
Voltage Dropping Resistances

"I have built a three-valve set using 2-volt valves and wish to operate this from a D.C. eliminator giving 60-80 for screen; 80 volts for detector and 120-150 volts at 19 mA. I should be obliged if you could let me know what type and value of resistances I have to use to give me the correct H.T. output. Could I connect an H.T. battery in series with the eliminator to step up the H.T. output valves.

The idea is quite workable, but as the valves to be used are mains valves they will presumably operate with 200 volts H.T. and if your mains are higher than this you only require a small resistance to reduce the voltage to 200. You could then use a simple smoothing circuit, and do away with the eliminator. However, if you wish to retain this, an 80-volt battery connected in series with the positive lead to the eliminator will be quite satisfactory.

The A.C. Selectone

"Will you please tell me whether you can supply me with a copy of 'Practical Wireless' dated April 26th, 1933, No. 33, Vol. 2. I understand a wiring diagram was given in that issue of a two-valve. Could you also tell me whether arrangements were made in that circuit for biasing the detector valve when used for gramophone-record reproduction."—L. G. R. (Rugby).

A copy of the back number in question may be obtained from our Back Number Department, price 4d. post free. The detector valve was so designed that when switched over to gramophone reproduction the necessary biasing resistance was included in the cathode circuit. The output valve of this receiver was a Mazda AC/P, the output of which is rated at 650 milliwatts.

An All-Power Eliminator

"Please let me know whether you can supply a plan for an eliminator which provides H.T., G.B., and L.F. I want to do away with the batteries for good and plug into the A.C. mains."—G. A. C. (Southampton).

In Practical Wireless No. 5 we published a detailed constructional article of an all-power mains unit which should meet your requirements. This did not provide grid-bias voltages, as these are generally obtained by inserting a suitable resistance in the cathode of the valve which requires negative bias. Various articles have been published by us showing how to ascertain the value of the required resistance, and you should find no difficulty in converting your receiver.

A Misunderstanding

"A few days ago I was reading a valve book on the subject of pentode valves, and it said that in no circumstances should a pentode valve be coupled directly with the speaker, that is, the speaker should not be coupled between anode and H.T. positive, but choke or transformer coupling should be used. Will you please tell me why it is that in the Master Midget and the Pentode one-valve the pentode is coupled in the way that the book says is injurious to the valve?"—J. G. H. (Kew, Surrey).

We think you have misunderstood the book. The point which is probably stressed is that the anode circuit of a pentode valve should be found quite satisfactory, and it may be found better to use a 50,000-ohm resistance in the anode circuit of the detector valve and join this to the maximum tapping instead of to the 60-volt tapping. The customary fixed condensers must also be used in conjunction with this resistor.

Increasing D.C. Mains Output

"I have a small battery set operated from a D.C. mains eliminator. This gives an output of 120 volts, but I wish to use mains valves, taking 150 to 200 volts. I have arranged for the heater supply, but am not certain how to increase the H.T. output. Could I connect an H.T. battery in series with the eliminator to step up the H.T. output valves.

The idea is quite workable, but as the valves to be used are mains valves they will presumably operate with 200 volts H.T. and if your mains are higher than this you only require a small resistance to reduce the voltage to 200. You could then use a simple smoothing circuit, and do away with the eliminator. However, if you wish to retain this, an 80-volt battery connected in series with the positive lead to the eliminator will be quite satisfactory.
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(Continued from foot of column one)

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Reliable Canold Coils with Circuit, accurately matched, dual range, 35/- per coil; ditto, iron-core.

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Steel frame and cover. Ball bearing shaft. Small over-all dimensions. Trimmers operated from top. Matched within 1% or 1 month, whichever is the greater.

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ONE Midget 3 gang Condenser 16/6
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Specially designed high gain Q.P.P. Transformers suitable for use with latest Double Output Pentode Valves. Skeleton and Bakelite cased types available giving wonderful performance.

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KB 'NEW PUP'

3 VALVES. MOVING COIL SPEAKER

Here's one of the high-lights of the Show! Do you remember the original KB 'Pup'? More than 200,000 listeners have owned one. Now comes its successor—the 'New Pup' of 1935. We have aimed wholly and solely at giving the most and the best that we can for the money—really satisfying reception, and handsome cabinets.
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FINE WALNUT FINISHED CABINET
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KB '381' SUPERHET

with delayed automatic volume control

5 VALVES. A.C. or D.C.
Are you looking for radio that will bring you—and go on bringing you—first class entertainment without trouble? Here it is. Never has a receiver undergone such searching tests as this new superhet. It was 'taken for a ride' all over England, and stood up to the severest trials. It can never meet, in normal use, demands it has not already met.
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Standard Disturbance Suppressor 1118
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CAR RADIO INTERFERENCE SUPPRESSOR KIT

6 cylinder 20/-
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A description of the method evolved by the post office and by engineers throughout the world for the suppression of electrical interferences with Radio reception and including results of research work conducted by Belling & Lee, Ltd., with 37 illustrations. From your Radio dealer price 6d. or post free 6d. by sending the coupon.

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Double Choke and Condenser Unit
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Constant research and continuous experiment have resulted in the new Ferrocart coils and "Colpak," illustrated—even further advanced and in efficiency, precision and design than last year. Only by fitting Colvern components in your set can you be assured of the most brilliant reception. Make a special point of seeing them at Stand 38, Olympia. Made under licence from patentee, Hans Vogt.

The New Colpak tuning unit, 37/6

STAND 38 OLYMPIA

FREE Blueprints of splendid specially designed "up to the minute" sets.

To COLVERN, Ltd., Romford, Essex. Please send me full COLPAK CLASS B details and Blueprint of the JAC MAINS SET.

Strike out name of blueprint not required.
Stamps value 3d. to cover postage are enclosed.

NAME
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When the man who
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In the days when receiving "a foreign station" was a matter for congratulation—
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Post. 118/8/34. PLEASE WRITE IN BLOCK LETTERS.
IT STANDS ALONE

10, 20 or 30 m/A
at either
120 or 150
volts.

This new "ATLAS" unit has 6 outputs & gives the most power at the lowest cost

A MODEL FOR EVERY SET.
TRY ONE FREE ON YOURS.

There is an "ATLAS" Unit to make any Battery Receiver Mains-operated without alteration to set or valves; giving vastly improved performance for one-fiftieth the running cost of dry batteries.

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The new "ATLAS" Model T10/30 is the last word in Mains Unit design. In power, output and value, it surpasses any mains unit ever made.

No other unit in the world provides tapped alternative outputs of 10, 20 or 30 milliamps with alternative voltages of 120 or 150 for only 69/6 cash.

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You can run your battery radio set of any type or size from the mains and cut running costs from 60/- a year to less than ONE SHILLING A YEAR. Moreover, it means that no matter what battery set you may buy or construct in future years, you are assured of the correct voltages and outputs you require.

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H.T. Tappings, 60/30 v. (min. and max.), 100/50 v. (min., med. and max.), 120 v. and 150 v.
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For A.C. Mains 100/125 or 200/250 v. 40/120 cycles. Model for 25 cycle mains at same price.
Guaranteed for 12 months.
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No other unit gives so much for so little.

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THE RADIO OF THE FUTURE
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It does not matter how much or how little you have in mind to spend, you will find, in the "His Master's Voice" range, the set that is exactly what you want. "His Master's Voice" instruments range from £7. 19. 6 upwards, and each, at its price, is the finest set you can get for your money anywhere. Come and see the new models "His Master's Voice" are showing at Olympia. Very clearly are they in advance of their time.

SEE THE NEW "HIS MASTER'S VOICE" MODELS AT OLYMPIA

A set for every purpose—to flatter every purse

STAND Nos. 61 & 33, THE RADIO EXHIBITION,

OLYMPIA, AUGUST 16th—AUGUST 25th

"HIS MASTER'S VOICE"

THE GRAMOPHONE CO. LTD., 98-108, CLERKENWELL ROAD, LONDON, E.C.1
Welcome to Stand No. 8, Ground Floor!

Readers visiting Radiolympia should make a point of visiting our stand, which is No. 8, Ground Floor. Our technical staff will be in attendance to answer readers' queries and to offer advice. Readers will also be able to inspect the latest literature dealing with all aspects of wireless.

Our Show Guide
Elsewhere in this issue we give a full forecast of the exhibits arranged in alphabetical order. This forecast may also be used as a complete guide to the Show.

Getting to the Show
For the convenience of readers we show on page 630 a map giving the bus and Underground routes to and from Radiolympia. If you are a provincial reader (or even a London reader!) you will find this map of great use.

A Complete List of Exhibitors
On page 644 appears a complete list of exhibitors arranged in alphabetical order, the Stand No. of each exhibitor appearing against each entry.

Next Week's Complete Show Report
Next week's issue, our second greatly enlarged Radiolympia number, will contain a comprehensive stand-to-stand report of all the exhibits. There is always a colossal demand for our special Show issues and it is necessary for you to order next week's issue in advance.

The "Summit" and the "Armada"—Our Special Show Receivers
Our special Show receivers cater for both the battery and the mains user. The "Summit" represents the peak of performance at a really competitive price, and we enthusiastically recommend it to every reader who wishes to make an extremely selective, sensitive, and powerful receiver at low cost. The "Armada" is a small, mains-operated telegram—small in size, and, therefore, ideal for a small room. As its title, with subtle allusion to a different sort of mains suggests, it will enable the reader to roam the mains of the ether. Both are backed by our guarantee.

Scottish Radio Exhibition
A most important event, from the wireless listener's point of view, will be the opening of the Radio Exhibition, Kelvin Hall, Glasgow, which is being held under the auspices of the Radio Manufacturers' Association. The opening speeches will be relayed in the Scottish Regional programme on August 31st.

Entertainment from Blackpool
On August 24th another Blackpool Night's Entertainment will be broadcast from the North Regional. This will include organ music by Reginald Dixon from the Tower Ballroom; a sound picture of the crowds on the Pleasure Beach; dance music by Will Hurst's Band from the Palace Ballroom; variety from the Palace Theatre; dance music by Berlin's Band from the Winter Gardens; shows by the Arcadian Follies from the South Pier, and by Tom Vernon's Royal Follies from the Central Pier, and a visit to the Tower Circus.

Dominoes Dance Band from Newquay
West Regional listeners will hear Sutherland Felce's Dominoes Dance Band relayed from the Headland Hotel, Newquay, on August 25th. The band, which consists of four players, was formed in 1925, and has broadcast on more than 120 occasions. A chance offering of a cabaret engagement whilst in the South of France decided the future career of Sutherland Felce, and he set out to create a style that was different.

Three Choirs Festival
In the Regional programmes on September 4th a relay will be given from the Three Choirs Festival, which takes place at Gloucester. The relay consists of the Mozart Requiem Mass, and the three cathedral choirs of Worcester, Hereford, and Gloucester will be heard with the London Symphony Orchestra and with Isobel Baillie, Mary James, Trefor Jones, and Keith Falkner as soloists. Dr. Percy Hull, organist at Hereford Cathedral, will be the conductor. The conductor of the whole Festival is Herbert W. Sumson, who succeeds the late Sir Herbert Brewer as organist of Gloucester Cathedral. There are 350 voices in the Festival Choir.

Silver Band Concert from Bodmin
The St. Dennis Silver Band, conducted by A. G. Richards will give a concert for West Regional listeners from the Foster Hall, Bodmin, on September 1st. Jack Collings, the fisherman bass, will be the artist.
**INTERESTING and TOPICAL PARAGRAPHS**

Band. The midday period on August 17th will be filled by Tommy Kinsman and his Band.

Band Music During the Second Week of the Show

This 17.15-18.00 period of the second week of Henry Hall's absence at Radiolympia opens with Billy Mason and his Dance Orchestra (August 20th), followed by Terry Mack and his Serenaders, Dave Lea and his Band, Rudolph Dunbar and his Coloured Orchestra, Don Sesta and his Gaucho Orchestra in the order named. For the midday period on August 22nd Henry Hall and the B.B.C. Dance Orchestra will make a temporary return to the studio.

Another Outside Broadcast

**N O T H E R** North Wales Night's Entertainment has been arranged for August 21st in "Tango." Thomas O'Hara, who has often broadcast with his piano accompanist, will play with the Orchestra.

Concert by 2nd Battalion Black Watch

The principal feature for Midland Regional listeners on August 22nd will be a relay from the Arboretum, Derby, where the Band of the 2nd Battalion Black Watch, conducted by Mr. F. G. Lewis, is to direct the Midland Studio Orchestra on August 24th, Henry Hall, directing the B.B.C. Band. The midday period on August 17th will be filled by Tommy Kinsman and his Band.

**Tangos**

**FRANK CANTELL** is to direct the Midland Studio Orchestra on August 21st in "Tangos." Thomas O'Hara, who has often broadcast with his piano accompanist, will play with the Orchestra.

Northern listeners on August 16th. Although the programme will be an entirely new one, it will be supplied by the same artists, these being the "1934 Evening Follies" from Arecas, Llandudno, the Colwyn Follies from the Peverall, Colwyn Bay, and the Rhyl Municipal Silver Prize Band.

**S U M M E R S I L E N C E !**

**PROBLEM No. 100.**

Matthews, in the form of a mains set employing a detector and two L.F. transformer-coupled stages. He decided to bring this up to date, and accordingly fitted iron-core transformer coils and new ganged condensers with good results. As the set seemed now in good condition he decided to fit an R.C. coupled stage in place of one of the transformer-coupled stages, and therefore fitted this in place of the first stage, thus making the detector R.C. coupled to the first L.F. valve. He chose the values of the two resistances and condenser from the valve-maker's instruction sheet, but found that not only was the volume but the reception seriously reduced, but he could obtain no reaction. Why? Three books will be awarded for the first three correct solutions. The address for the first three correct solutions is: The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 5-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 100, and must be posted to reach this office and later than the first post Monday, August 18th, 1934.

**SOLUTION to Problem No. 99.**

Richardson had omitted to take account of the fact that he was not employing an H.F. stage, and consequently he affected the feed-back properties of the valve as he applied the negative bias. The majority of listeners have done this sort of thing themselves, and it should be interesting to hear whether Mr. Biles has discovered a new way of killing time.

"Bitter Brevities"

**H A L B E R T TATLOCK** has devised another set of "Bitter Brevities" which will be broadcast on August 22nd in the Scottish Regional programme. He will be followed by a programme of "Tunes we Remember"—old tunes that are now blue tunes. These gramophone records have been specially selected by Douglas Moolie.

**Welsh Concert Orchestra**

This orchestra, conducted by Ronald Harding, will give a concert from the studio for West Regional listeners on August 19th. This orchestra is composed of keen professional unemployed musicians, both men and women, who have no outlet for their talents and capabilities owing to the lack of vacancies in existing orchestras. Their audience on this occasion will be a vast one, spread over the Empire, for they will be heard by the Empire station.

**For Scottish Regional Listeners**

That popular combination, the John Mac-Arthur Quintet, are in the Scottish Regional programme on August 19th. The items will include Der Vogelhandler, by Bauckner, a Gavotte by Bohm, Courieux and Gigue by German, and a selection from "The Gondoliers" by Sullivan. The Scottish Military Band, conducted by John A. McIver, will present a popular programme on August 20th. Laurence Morgan, tenor, will be the soloist.

(Continued at foot of facing page.)
THE annual Radio Exhibition at Olympia is the period when thousands turn their attention to radio for the first time. A great proportion of this new generation of home-constructors become regular readers of PRACTICAL WIRELESS, and it is to them that this message is addressed.

This is not a normal issue, and for the benefit of new readers, who are making their acquaintance with PRACTICAL WIRELESS for the first time, I wish to reaffirm our objects and our policy. Quite naturally, the importance of the Wireless Exhibition has justifiably claimed a large proportion of our space, and to accommodate the Guide to the Show and announcements regarding manufacturers' new season's programmes, many regular features and articles have necessarily been held over.

Normal issues of PRACTICAL WIRELESS contain a fair blending of everything of interest to the wireless constructor, experts or amateur. There are practical articles on setting up radio, television, experts' replies to readers' questions, and many other interesting features written in everyday language and attractively illustrated by means of PRACTICAL WIRELESS copyright illustrations.

The Beginner's Supplement

We regularly feature a special supplement for the absolute beginner, and a new course for beginners commences in next week's issue. This course starts from first principles and proceeds through all of the varied aspects of radio and home construction. It is written in non-technical language and illustrated by means of non-technical diagrams. Even experts will find it an interesting refresher course. Those who have just taken up the hobby should follow this series week by week.

For the Short-Wave Enthusiast

For the short-wave enthusiast there is our regular short-wave section, which deals with the latest designs for short-wave receivers, methods of operation, the latest short-wave components, and all other avenues of this interesting branch of radio, including the ultra short waves. This also is a weekly feature.

Half Guineas for Readers' Ideas

Our readers' wrinkles pages give each week a selection of the best ideas received from our readers. We pay 10s. 6d. for every item so published. These wrinkles cover interesting and ingenious gadgets, components, and methods which considerably add to the enjoyment and the efficiency of home-built receivers. We award a special prize each week of one and a half guineas for the best wrinkle submitted. This feature affords you an interesting means of earning sufficient money to pay for your wireless components. Every reader stands an equal chance of winning these cash prizes.

The Free Advice Bureau

For the reader requiring technical advice, there is our Free Advice Bureau, which answers readers' questions promptly and accurately free of charge.

"Practical Television"

Our Television Supplement presents the latest news about persons, programmes, and apparatus relating to television. You will find all the news about the radio screen in this regular weekly feature, and in our companion journal, "Practical Television" — 6d. Monthly.

Our Policy

Our receivers are designed for cheapness of construction and efficiency of operation, and PRACTICAL WIRELESS has played a great part in bringing about the present low prices of components and valves. We only specify the parts actually used by our designers—no alternatives. Every receiver of PRACTICAL WIRELESS design must function in the manner which we claim it to do, and readers who encounter a difficulty may freely avail themselves of the technical advice of the designer.

Our Laboratories

The PRACTICAL WIRELESS well-equipped laboratories are staffed by enthusiastic experts, who are always tirelessly at work designing the very best receivers for home constructors. Other contributions deal in a fascinating way with this most modern of all sciences, and as a new reader you will appreciate that PRACTICAL WIRELESS does a great deal more to deserve your patronage than normally comes within the province of a journal. In nailing your flag to its mast you have secured not only the best technical information and the services of trained experts; you are ensuring that you are obtaining from your receiver the maximum of efficiency for the money you spend and the most palatable presentation of technical knowledge.

ROUND THE WORLD OF WIRELESS

"Schemes"

A NEW series of talks, entitled "Schemes," commences in the North Regional programme on August 17th. The projects selected are all either Northern in origin or liable to have a marked effect on the life of the North; none of them has a purely commercial object; and they have been chosen largely for their "news value" irrespective of whether they are yet practicable. Mr. Kenneth Spence, Honorary Secretary of the recently-formed Lake District National Reserve Association (better known as the "Friends of the Lake District") will initiate the series on August 17 with a talk about "The Future of the Lake District." In this he will outline the scheme which is on foot (sponsored by the "Friends" and kindred organisations) for preserving the beauty of the Lakes by regulating all forms of building development in the district, sometimes going so far as to buy stretches of country for the National Trust.

Radio Folk for Belgium

THE L.N.E.R. are arranging two special trains and special steamers for two parties, totalling 470 passengers, under the auspices of the Philco Radio and Television Corporation of Great Britain, Ltd., to visit Zeebrugge and the Belgian Coast. The first party will leave Liverpool Street Station on Friday, August 10th, at 8.35 p.m., returning from Zeebrugge on Sunday night, August 12th; the second party will leave at 8.30 p.m. on Friday, August 17th, and return on Sunday, August 19th.
Here is the "Summit" ready for insertion into its cabinet.

The "Summit" can truly be described as one of the very best battery receivers that has been designed in the Practical Wireless laboratories. Regular readers know what this means, and that it would be difficult to give greater praise to any set. There is, therefore, no necessity to emphasize the extreme efficiency of the receiver, nor even to say that it is probably more effective than any simple three-valve battery set that could be made at a reasonable price. Another point of great interest is that the set has been designed on strictly economical lines; every unnecessary component has rigorously been obviated, and nothing except real essentials has been retained. This does not mean that those valuable refinements which are so popular on present-day sets have been omitted, for the set has every feature which is generally wanted by the average listener. For example, there is a remarkably smooth-working volume control which operates on the first (variable-mu pentode) valve, whilst iron-cored tuning coils are used in both tuned circuits. The "Summit" is selective enough for all requirements, but in addition there is ample provision for modifying the actual degree of selectivity to suit any particular set of conditions.

A Handsome Design

The special cabinet chosen is of very handsome design, and can be bought either as a plain table console, or with a set of legs so that the receiver may form a complete piece of furniture and may be stood on the floor. The controls are few in number, but nothing has been omitted which might make for better reception, or which might in any way simplify the operation. There are two tuned circuits, both of which may be controlled by means of a single knob, although an accessible trimmer is provided, and this takes the form of a second tuning knob concentric with the first. By this means the very distant stations which would never be received in the normal way can be brought in with ease; all the advantages of separate tuning condensers are thus secured without the attendant disadvantages.

Variable Selectivity

It has been said that the sharpness of tuning is ample, and this statement might be amplified by stating that the London stations, when only about ten miles away, occupy no more than one degree of the tuning scale, even when the aerial is connected to the least selective tapping on the first coil. Moreover, either of these transmissions can be eliminated merely by rotating the knob of the trimmer condenser through a small angle; this is true proof of the correct matching of the two coils and their associated circuits. Reaction is provided, but this is required only when distant stations are being received, or when extreme selectivity is called for, such as, for instance, when the set is being used within two or three miles of the local station. Both coils, and also the tuning condenser, are adequately screened so that there is no danger of "break-through" occurring.

It will be evident from the illustrations on this page that the set is entirely self-contained, the batteries and loud-speaker being all accommodated neatly within the
THE "SUMMIT"

The Peak of Performance
Selectivity, Sensitivity and Power

This view shows the "Summit" in its cabinet. The batteries are accommodated behind the speaker.

The "Summit" is popular type of horizontal cabinet specified. Incidentally, the loud-speaker unit is of an entirely new pattern just released by Messrs. Whiteley Electrical, Ltd.; its name—the "Stentorian"—is truly descriptive of the unit, for the volume which it delivers is truly remarkable, so much so, in fact, that it is hard to believe that Class B amplification is not employed.

The "Summit" is Easy To Build

The whole of the constructional work is of the simplest possible nature, and can safely be undertaken by the beginner, even if he has never before attempted home construction. The chassis, which is of the metallized-wood type, is supplied in ready-made form by Messrs. Peto-Scott, and it is a perfectly simple matter to mount the necessary components. The positions of all the parts can readily be determined by making reference to the wiring plans and also to the photographs. Most of the components are attached by means of ¼-in. wood screws, but the two-gang tuning condenser is fitted by means of the three bolts which are supplied with it. A word of warning is called for in connection with this component, especially since two of the bolts are used on the underside of the chassis for taking earth-return connections. Because of this the bolts must necessarily be screwed up tightly, and in doing this there is some danger of the tubular "legs" on top of the chassis breaking through the metallized surface, so that they do not make proper electrical contact with it. This eventuality can be avoided in one of two ways; one is to place washers between the feet and the chassis surface, and the other is to avoid tightening the bolts unduly.

Constructional Pointers

Terminal socket strips are used for making connection to the aerial and earth leads, and also to the loud-speaker, and these are mounted by means of wood screws after making two series of ¼-in. holes through which the metal sockets may pass. It will be found that the screw terminals on the back of the sockets are not at first accessible since they are adjacent to the baseboard instead of facing the bottom of the chassis. They can easily be reversed before fixing, however, by gripping them with a pair of pliers.

The reaction condenser and on-off switch, it will be noted, are mounted on the three-ply front strip of the chassis, the latter having two 5-16-in. holes for the purpose. The rest of the assembly is perfectly straightforward and calls for no comment.

Straightforward Wiring

Little explanation is called for in respect of the wiring since this can readily be followed by referring to the large-scale wiring plans provided. Most of the connections are made by means of insulated connecting wire, and only a few of them require to be soldered. Those which are soldered are the connections to the volume control potentiometer and to the 1-mfd. fixed condenser. As can be seen from the various illustrations, the fixed resistances

(Continued on next page)
and tubular fixed condensers are attached to the various components by means of their own connecting wires, and these components have been placed in such positions that the wires do not need to be extended or even cut off short.

Battery Connections
There are three flexible leads, these being for the grid-bias battery connections, and these are passed through a hole made through the baseboard of the chassis near to the G.B. battery clip. The only other flexible leads are those which comprise the battery-cord assembly, and these are attached to the terminals by forming loops in their ends which fit over the terminal shanks.

After the wiring has been completed, and before the set is fitted into its cabinet, it will be advisable to give it a preliminary trial and to set the trimmer on the rear half of the gang condenser. This little matter will be fully dealt with next week, when full operating details will be given.

We shall also deal next week with fine adjustments, how to connect up the "Summit" for use as a radiogram, and, in fact, with how to extract the last ounce from this, our latest battery receiver which continues the policy of designing efficient receivers on a competitive price basis, which policy we inaugurated early this year with the "Leader Three." Readers who would care to inspect our experimental model of the "Summit" may do so on Stand No. 8 of the Ground Floor at Radiolympia. Our Technical Staff will also be delighted to answer any queries which intending builders care to ask, either at the Show itself or through the post.

List of Components

Two dual-range coils, types A.D. and T.G. (Wearite).
One two-ganged condenser (C1 and C2) (G.B. "Unitune").
One .003 mfd. differential reaction condenser (C6) (Graham Farish).
One 50,000-ohm potentiometer (R3) (Ferranti).
Five resistances: 10,000 ohms, 30,000 ohms, 40,000 ohms, 50,000 ohms, 1 megohm. (R6, R5, R1, R2 and R4) (Dubilier, 1 watt).
Three .1 mfd. fixed tubular condensers (C3, C4 and C9) (Graham Farish).
Two .0002 mfd. tubular condensers (C5 and C7) (T.M.C.).
One 1 mfd. fixed condenser (C8) (T.M.C.).
One 5.1 Niclet L.F. transformer (Vatley).
Three valveholders: 2, 4-pin and 1, 5-pin (Clint).
One "L.M.S." screened H.F. choke (Graham Farish).
One "Snap" H.F. choke (Graham Farish).
One 100 m.a. fuse and holder (Bulgin type F.5).
Three wander plugs, GB-1, GB-2, GB+ (Belling Lee).
One "Stentorian" Standard M.C. speaker unit (W.13.).
One 120-volt H.T. battery.
One 9-volt G.B. battery.
Three valves: 1, V.P.210; 1, H.L.210 and 1, H.P.T.220 (Cossor).
IN a way, it might be said that there have been so many changes in valve design during the past year, it being argued that there have been fewer new types introduced to the public. It is true that there have been so many startling novelties as Class B valves, variable-mu’s of various types, superheterodynes, and other developments, but nevertheless considerable improvements have been made, and valve design has certainly not lagged behind developments in other directions.

The H.F. pentode has been well-nigh perfected; Class B has settled down and is rapidly becoming a standard to fit the base with pins of some kind or other which fitted into corresponding sockets in the holder. It was known that this method was not entirely satisfactory because it necessarily introduced unwanted capacity between the various electrodes, but provision for diode valves and to-devices and a better form of mounting. As the number of electrodes was increased, however, it became absolutely essential to invent some new form of mounting which has been entirely overcome by replacing the grid and the corresponding tuning coil.

Another important change which has been made in regard to the construction is in connection with the base connector. For some time like fourteen years it had been standard to fit the base with pins of some kind or other which fitted into corresponding sockets in the holder. It was known that this method was not entirely satisfactory because it necessarily introduced unwanted capacitance between the various electrodes, but provision for diode valves and to-devices and a better form of mounting. As the number of electrodes was increased, however, it became absolutely essential to invent some new form of mounting which has been entirely overcome by replacing the grid and the corresponding tuning coil.

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WHAT changes have been made in the design of receivers since a year ago? What changes will be made between now and the Radio Exhibition of 1935? These are two questions which the enthusiast might ask himself, and from the consideration of which he might derive considerable mental entertainment.

Thinking over the changes during the past few months, perhaps the first impression which one gets is that receivers have been considerably reduced in size, as well as in price, despite their undoubted increase in the way of performance. The smaller dimensions have been secured by the use of modern components which the constructor has demanded should be less bulky and more efficient than their prototypes. There has been another strong influence at work, however, which is the rapidly-growing popularity of radio receivers for use in the car. It is obviously essential that a car receiver shall be extremely compact, and experiment very soon proved that it was possible to make a really compact instrument which was just as effective in every way as the larger ones which have become practically standardized during the past few years. As soon as it was generally realized that compactness could go hand-in-hand with efficiency, the public claimed that their wireless receivers should be reduced in size. After all, a small set is far less obtrusive, and can be placed in the drawing-room without making the room look like a glorified laboratory, and it is easier to make the small instrument harmonize with the furniture.

In spite of the pruning-down which has been done it is rather surprising to find that the external appearance of receivers has changed very little. There is still a fret, behind which is placed a loud-speaker unit, and the tuning dial—although altered in detail—still takes pride of place. It is true that the number of control knobs has been reduced, and this is certainly a move in the right direction, which is directed towards making a wireless set look like a piece of furniture and less reminiscent of the laboratory.

Automatic Tuning

Contrary to general expectations there has apparently been little attempt to camouflage the loud-speaker opening, and still less to dispense entirely with such a fretted hole in the cabinet. A couple of years ago there seemed to be a determined effort to produce a set with automatic tuning, and by means of which any one of a number of stations which happened to be wanted could be received merely by pressing an appropriate button. Moreover, a receiver of this type was actually made, but, although it appeared to be quite satisfactory on the whole, it is regrettable to find that the makers have found it necessary to go out of business. This has been a case in point of the fact that the public will not readily accept any device, however clever, which differs materially from others with which it is familiar. Let us hope (for the sake of non-technical listeners) that the automatically-tuned receiver will again be given a trial, and that it will prove as popular as it deserves to be.

Low-Priced Efficiency

Despite what has just been written, the home constructor has probably not been left without something which he can find, without making any effort to buy, and it is the arrival of the low-priced receiver which has apparently been given to every important PRACTICAL WIRELESS receiver and—significantly enough—the idea has been widely copied by other designers, including those who previously pinned their faith to the flat-baseboard form of construction. Yet another instance of "We lead others follow!".

Generally speaking, the form of construction adopted has not changed very much during the year, and this is in agreement with the views which we expressed a year ago. This does not mean that design, or even home-construction, has become stagnant, but merely that the constructional methods used by PRACTICAL WIRELESS a year ago were ahead of their time and were so sound that they could not be materially improved upon.

One could not leave the subject of this article without making reference to a tendency in design which was demonstrated a few months ago by the introduction of the "Atom Lightweight" portable receiver by this journal. This was, and still is, the smallest and lightest portable receiver of its kind ever placed before the home constructor. It will undoubtedly be copied, but it does point to the direction in which design is leading.

What of the Future?

Looking to the future one may justly wonder whether any very great improvements or modifications could be made to existing receivers, such as the height of their efficiency. They will certainly become smaller; more of them will be of the mains-operated type; automatic tuning will come; knobs and dials will disappear; loud-speakers will probably be separate from the receiver, and the number of valves will be reduced.

One other direction in which design will probably lead is in connection with the construction of a receiver of the semi-portable kind which can be used equally well in the car as in the home.

The Changes Which Have Taken Place During Recent Times are Summarized in This Article, and Probable Future Developments are Indicated

By FRANK PRESTON

ITEMS OF NOTE AT THE SHOW.

Flood-light Tuning—A novel system of tuning indication in which a column of light rises and falls in a thin glass tube. Seen on Blackmarphon and Column-tube receivers.

Automatic Record Changer—An ingenious device which plays thirty records, turning each one over and playing both sides. Seen on Autotrope receivers.

Spectrum Tuning—A device which illuminates the tuning dial with red and green lights for each wavelength and so renders only the appropriate station names visible. Seen on Atlas receivers.

Pointograph Tuning—A device which renders accurate tuning possible by means of a moving pointer. This is normally on at an angle, but when accurately tuned the pointer becomes vertical.

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Chassis Construction.

Rather more than a year ago there were two schools of thought on the question of receiver chassis; one required a metal chassis which would give rigidity and ample screening; the other was in favour of a wooden one which was much easier for the average constructor to deal with. PRACTICAL WIRELESS solved the problem by standardizing the metal-sprayed wooden chassis. This has since been employed for every important PRACTICAL WIRELESS receiver and—significantly enough—the idea has been widely copied by other designers, including those who previously pinned their faith to the flat-baseboard form of construction. Yet another instance of "We lead others follow!".

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To the more technical of wireless amateurs and experimenters the "circuit is the thing." The circuit arrangement comes first and foremost: it is the nucleus around which the whole set is designed, and the basis of all experiments. So far as ready-made receivers are concerned, it has been a very definite superheterodyne year, and a large number of circuit improvements and modifications concern this type of valve arrangement. Looking back over the last five years one quickly realizes that superhets have made wonderful progress. Only a very short time ago a superhet had upwards of seven valves, these being arranged as: first detector, oscillator, three intermediate-frequency stages, second detector and low-frequency output valve. To-day it is possible to construct a reliable superhet, by using only three valves. The first of these is a combined first-detector oscillator, the second is a highly-efficient variable-mu pentode I.F. amplifier, and the third is a diode-pentode which performs the functions of second detector, I.F. amplifier and automatic volume control.

Improved A.V.C.

A very notable circuit improvement which has taken place during the last year or so concerns the provision of really effective automatic volume control. Whereas with the older receivers distant stations were useless for entertainment purposes due to the fact that their received signals varied in intensity as a result of the inevitable fading, these stations can to-day provide good, enjoyable programmes. The change is due entirely to the provision of effective A.V.C. whereby the signal voltages applied to the detector (second detector in a superhet) are used to bias a preceding variable-mu stage. Thus, as the signal voltage applied to the detector increases, so does the negative grid bias voltage fed back to the H.F. amplifier increases, thereby reducing the effective degree of H.F. amplification. When the signal voltages are at a minimum the bias voltage is reduced and the H.F. amplification is thereby increased.

At first, it was considered that A.V.C. could be applied only to superheterodynes or receivers having a minimum of two H.F. stages, but the simple three-valve receiver introduced by Practical Wireless last October proved that this was not the case. It was not claimed that this set would reproduce all stations at uniform volume level, but those who made it did find that it very largely overcame the fading which was normally experienced when listening to certain stations.

H.T. Economisers

Another circuit improvement which has been effected, and which is somewhat similar in principle to A.V.C. is the provision of a means for cutting-down the consumption of high-tension current by a battery valve of the high-power L.F. type. This improvement was incorporated in the "1934 Fury Four Super," and consists of a means of varying the grid bias voltage to the output valve according to the intensity of the signal voltages being handled. The economiser unit consists essentially of a high-frequency metal rectifier, connected in series with a fixed condenser, between the anode of the last valve and earth. A fixed potentiometer is connected in parallel with the rectifier, and the tapping is connected to grid bias positive, whilst the negative G.B. lead goes to the grid of the valve in the usual manner.

Normally the G.B. voltage is set to a much higher value than that actually required by the valve, but a small percentage of the signal voltages appearing at the anode are rectified and tend to make the positive G.B. point more negative. In other words, the rectified voltage acts in opposition to the G.B. battery, with a result that the negative voltage applied to the grid of the valve is reduced. It will be seen that as the signal voltages increase the G.B. voltage is reduced. Consequently, when the valve is fully loaded it receives its rated G.B. voltage, but when the signal intensity is low it is over-biased, so that it consumes less H.T. current. As the valve is fully loaded for only a very small proportion of its "working" time the saving in current is considerable.

Paraphase Amplification

A circuit development which has taken place on the low-frequency side concerns what is known as paraphase amplification. The chief advantage conferred by paraphase is that harmonic distortion is almost entirely overcome, and reproduction is made more natural.

This form of amplification has not yet become very widely known, nor is it yet employed at all extensively, because the "characteristic" requirements of the special L.F. transformer are somewhat critical and depend upon the valves employed and other parts of the circuit. This means that the transformers have to be made separately and specially chosen to match the rest of the circuit; this involves a certain additional expense to which most constructors are not prepared to go. A slight modification of the original paraphase arrangement consists of using two similar valves in the output stage; the primary winding of the output transformer being connected between the anode of the first valve and the grid of the second.

Band-pass Arrangements

A circuit modification which has this year come into great favour, although it was certainly employed as long as two years ago, is the use of a band-pass filter between the H.F. and detector valves instead of in the input circuit to the first valve. In the simpler forms of paraphase circuit this idea has proved very valuable. By its adoption even greater selectivity has been obtained than with the form of coupling previously in use, and greater efficiency on the H.F. side has been secured. Apart from this modification, band-pass coupling has not been so popular during the past year as it was in the two preceding years. The reason is probably to be found in the better selectivity to be secured by the use of up-to-date coils, and the fact that those who employ a simple receiver do not now feel so anxious to receive a number of foreign stations as to obtain really good quality reproduction from the "locals."
A PART from the fact that scientists and technical research experts must endeavour to develop television as an art, it is essential that, in order to complete our broadcast entertainments, this branch of wireless must be added to that which we already possess. There are, of course, many sceptics who hold that it can never come in our day, but they, presumably, are content to sit at home during a broadcast relay and whilst they listen (?) to the loud-speaker, read a book, or sit and look out of a window at the passing traffic, or in some other manner, deflect their attention. Surely no one can hold that they are getting even 50 per cent. from the transmission. Experts have even written in various places stating that for the full enjoyment of a programme, it is necessary to darken the room—or in other words prevent the attention from being distracted. It needs very little imagination to visualize the great advantage which would accrue to the listener who could not only hear, but also see, the various items which are performed for his benefit. It is quite true that little would be gained by seeing a violinist play his instrument, or even a singer rendering a song. But there are numerous items which would not only be improved by a vision accompaniment, but which are definitely of little value without such.

We are sure the majority of listeners will agree that television must soon be made practicable, and the various demonstrations which we have witnessed bear ample proof that it is now only a matter of a little time before the listener will be enabled to look in and obtain even greater pleasure from his pastime. So convinced are we that the day is near at hand that, as readers who have already seen the television programmes will know that the acrobatic performers form a most pleasing object for broadcasting. No sound whatever is needed for this type of broadcast, except perhaps a quiet musical background, and yet there must be very few members of the public who do not like this type of entertainment.

Experts have already stated that with the holiday periods, and fine days available, the opportunity presents itself to take a trip into the country by car and watch the images under a new set of conditions. The receiving equipment, especially if it is of the transportable nature, can easily be accommodated in a car together with any batteries. Then when actually undertaking the reception tests it will be quite useful to have the receiver on the running board. The television set can be of the portable disc type, while the radio receiver can also be of a simple type for this purpose. If any trouble is experienced from the daylight, then a temporary stiff paper observation tunnel can be mounted over the image screen aperture. Open-air experiments of this nature will prove invaluable.

Comparison with the Films

Many people endeavour to try and compare broadcasting with the films and liken the present type of transmission to the original silent films, which gave entertainment for many years. But this is hardly a fair comparison. In the silent days, we were able to see just what was done by the gestures of the actor, and if some point needed stressing which was not exactly related to the scene being depicted, a caption was thrown on the screen. With the broadcast performance, however, we can not have someone interpolating "He now walks across the room," to tell you that some stormy scene is about to be witnessed between two people. True, the all-important Effects Department have spent much time in developing "noises off," and a good imitation of someone walking across a room can be broadcast. But on most occasions the majority of receivers this might also sound as though someone were knocking at a door, or beating time to something. Thus, the type of the broadcast has to be arranged to suit the invisible manner of the audience and much of the quality of a transmission is thereby lost. There are hundreds of artists who cannot at present appear in the home owing to the fact that their abilities lie in their actions or skill in some particular direction, and anyone who has already seen the television programmes will know that the acrobatic performers form a most pleasing object for broadcasting. No sound whatever is needed for this type of broadcast, except perhaps a quiet musical background, and yet there must be very few members of the public who do not like this type of entertainment. As we have pointed out, television must come and all our readers should hasten to acquaint themselves with the principles involved and commence to take advantage of the present limited transmissions in order to see for themselves how far the art has at present progressed and to join in the general development of a new science.

Television Images Seen in Country

Although to many the 11 a.m. television transmission furnished by the B.B.C. every Friday morning is inconvenient, there are no doubt many readers free at that time who take advantage of the signals to carry out tests. It may not have occurred to these that with the holiday periods, and fine days available, the opportunity presents itself to take a trip into the country by car and watch the images under a new set of conditions. The receiving equipment, especially if it is of the transportable nature, can easily be accommodated in a car together with any batteries. Then when actually undertaking the reception tests, it is quite useful to have the receiver on the running board. The television set can be of the portable disc type, while the radio receiver can also be of a simple type for this purpose. If any trouble is experienced from the daylight, then a temporary stiff paper observation tunnel can be mounted over the image screen aperture. Open-air experiments of this nature will prove invaluable.

Pack your television receiving apparatus in a car and go into the country to watch the B.B.C. morning transmission.
WIDEN YOUR CHOICE OF PROGRAMMES

No matter what type of Receiver you use—Battery or All-Electric (A.C. or D.C.)—there is a Cossor Screened Grid Valve to suit it. By fitting one of these highly efficient valves you can considerably widen your choice of programmes.

Because Cossor S.G. Valves have negligible inter-electrode capacity they permit exceptionally high effective amplification, and this means increased range. To fit a Cossor Screened Grid Valve, therefore, is a simple way of improving performance.

Cossor Screened Grid Valves

Cossor 2-volt Screened Grid Valves

<table>
<thead>
<tr>
<th>Type</th>
<th>Filament Amps</th>
<th>Anode Volts</th>
<th>Imped.</th>
<th>Alpha Factor</th>
<th>Mutual Conductance m.A.</th>
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<td>100-200</td>
<td>0.1</td>
<td>100,000</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Cossor A.C. Mains Screened Grid Valves

<table>
<thead>
<tr>
<th>Type</th>
<th>Purpose</th>
<th>Imped.</th>
<th>Alpha Factor</th>
<th>Mutual Conductance m.A.</th>
<th>Price</th>
</tr>
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<tbody>
<tr>
<td>MSG-HA</td>
<td>Super H.F. Amp's</td>
<td>500,000</td>
<td>1,000</td>
<td>2.0</td>
<td>17.6</td>
</tr>
<tr>
<td>MSG-LA</td>
<td>Super H.F. Amp's</td>
<td>200,000</td>
<td>750</td>
<td>2.5</td>
<td>17.6</td>
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<tr>
<td>MVSG</td>
<td>Variable-Mu S.G.</td>
<td>-</td>
<td>-</td>
<td>2.5</td>
<td>17.6</td>
</tr>
</tbody>
</table>

To A.C. Cossor Ltd.,
Melody Dept., Highbury
Grove, London, N.S.

Please send me free of charge a copy of the Cossor 72-page Wireless Book

To: B.V. 33

Name
Address

PACK 19/074
ON TOP AT OLYMPIA

SEE THE RANGE OF OSRAM VALVES ON STAND NO. 34

Osram valves
MADE IN ENGLAND

REDUCED PRICES
You can NOW buy OSRAM VALVES from 5'6

### Charging a Portable-Set Accumulator

For those who are in the habit of using portable sets with their cars, the following dodge will eliminate the possibility of a run-down accumulator.

The requirements are as follows: A miniature on-off switch, batten mounting bulb-holder, tail-lamp bulb, length of twin flex, inspection-lamp plug (or two single plugs of the Clix type). One lead from the plug, wired in series with the lamp-holder and switch, and is taken to one terminal of the set battery. The other lead from the plug is taken straight to the set battery.

### That Dodge of Yours!

Every reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1 for the best wrinkle submitted, and for every other item published on this page we will pay 5s. Send it in to us addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., 811, Southwark Street, Strand, W.C.2. Please note that every letter sent in must be original. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

---

#### Handy plug-in adaptors for accumulators.

![Handy plug-in adaptors for accumulators.](image)

---

#### An Adjustable Workshop Light

I HAVE found the following idea very useful in my workshop where I had no portable light. I fixed a cheap curtain spring about 4 in. in diam. and 8 ft. long, on two cup hooks in the ceiling (about 10 ft. apart), and threaded on this one of the "egg" type aerial insulators, as shown in the sketch. Through the other hole in the insulator I threaded the flex from the ceiling rose. With this arrangement I have a handy electric light, which can easily be moved to any position over the bench. - A. Hawkins (Neendham Market).

---

#### A simple adjustable workshop light.

![A simple adjustable workshop light.](image)
THE "ARMADA"

An Efficient Low-priced Radiogram.
Satisfy the Most Exacting Requirements.

This view shows the completed radiogram in its neat cabinet.

The builder of a modern mains-operated receiver desires that it shall be operative for the reproduction of gramophone records in addition to the radio programmes, and the reason is to be found in the fact that, generally speaking, the mains receiver is capable of a much greater output of volume than a battery receiver and, consequently, it will be used on many occasions for dancing purposes. So far, however, the radio-gramophone has been looked upon as an ornate piece of cabinet work, and has generally been designed and built to resemble the cabinet gramophone of two or three years ago. The term "radio-gramophone cabinet" in fact, on glancing through any cabinet catalogue, will be found to include pedestal items ranging in size from one just sufficient to incorporate a gramophone mechanism and a radio set to an elaborate piece of furniture housing a complete library or cocktail cabinet. Portable and table-model gramophones have for a long time been on the market, and there is obviously a need for a radio-gramophone which will take up no more room than a moderately-sized table gramophone. The receiver portion of the "Armada." Messrs. Peto-Scott have developed a cabinet which follows these lines, and the "Armada" has been designed to be incorporated in this cabinet. Accordingly, it may be stood on a table, or on a small low stool or pedestal, and although taking up no more room than an orthodox radio set, will provide the full entertainment which is obtainable from the combination of radio and gramophone records. It does not, unfortunately, house the records, but a suitable small cabinet could be obtained for that purpose and built to form the lower section in place of the table or stool, or, alternatively, one of the many commercial portable record-carrying cases could be utilized and would take up very little space.

The Layout

An examination of the complete apparatus will reveal that it has been divided into three completely separate sections—the receiver proper on the lower part of the cabinet, the mains section or power pack on the centre section, and the gramophone motor and pick-up on the upper portion immediately beneath the lid. This method of sub-division is not necessarily carried out on account of the smallness of the cabinet, but greatly facilitates construction from the point of view of the home constructor, and will also assist in testing and in the location of any faults which might develop during the course of its operation. In addition, it breaks up the various circuits and so ensures stability and freedom from interaction from the various parts should they be clumsily associated. Thus even the new-comer to home construction may safely undertake the assembly of a receiver of this nature, as he is freed from all anxiety concerning the results of his handiwork.

Circuit diagram of the "Armada" Mains Three.
MAINS THREE

The Performance of which will
ments. Simple and Cheap to Build.

The Circuit

The circuit of the complete receiver is
shown in Fig. 1, and it will be seen that the
more or less standard arrangement of H.F.
stage followed by a detector and a pentode-
output stage is employed. The H.F. valve
is one of the new variable-mu H.F. pentodes,
and is fed from the aerial system through
the medium of a band-pass tuner, which,
together with the H.F. coupling coil, is one
valves. It will be noticed that no fuses
are included in the actual apparatus,
and safety is assured by the utilization
of a special plug which includes two fuses.
This is attached to the mains flex and is
used for connecting the apparatus to the
nearest mains socket. Although of the
two-pin type, it is possible, when desired,
to connect this to an ordinary lamp
socket by using one of the special
Goltone converter plugs. Before doing this, however,
you should make certain that
your local electricity supply
does not prohibit the use of
a radio-gramophone on the
lighting circuit. To ensure
hum-free operation electrolytic
condensers have been used in
the L.F. biasing circuits, and
ample decoupling is provided
at every point.

Construction

The actual construction
may be divided up into
three sections, as mentioned
above, and the receiver
proper will receive our first
attention. The chassis will be
found to be ready metallised
and cut to size, and before
mounting any components it
is preferable to drill holes at
the points marked "M.B." and
to insert in these holes short
bolts, under the heads of which soldering
tags should be fitted. These provide earth-
anchoring points for various wires, as shown
in the wiring diagram. Next cut the slots,
or drill separate holes, to accommodate the
leads from the coil unit. With the maker's
(Continued overleaf)
with coloured connecting wire, soldering being resorted to at the common connecting points. Make certain that the insulating washers are included when mounting the volume control, or this component will not function. The reaction condenser is provided with an insulated spindle and bush, and therefore this necessity for precaution does not arise. When this has been completely wired the mains unit should receive attention, and it will be noticed that the speaker is mounted on the baseboard with these parts. Wiring may be completed from the wiring diagram, and it then only remains to connect the two parts and the gramophone section, and details concerning the completion of the apparatus will be given in next week's issue, together with operating instructions.

LIST OF COMPONENTS FOR THE "ARMADA" MAINS THREE.

- One set Farrar coils, types GI, G2 and G3, with mains on/off switch (Colvern).
- One three-gang Midget condenser (C1, C2 and C3) Polar.
- One Arcuate slow-motion drive (Polar).
- One .00015 mfd. differential condenser (C7) (Polar).
- One .0002 mfd. tubular condenser (C10) (Polar).
- One .0005 mfd. tubular condenser (C17) (T.M.C.).
- One .00005 mfd. tubular condenser (C10) (T.M.C.).
- One .00001 mfd. tubular condenser (C10) (T.M.C.).
- One 0.001 mfd. type 250 condenser (C4) (T.C.C.).
- One 3 mfd. type 80 do. (C11) (T.C.C.).
- One 5 mfd. type 80 do. (C5 and C6) (T.C.C.).
- Three 4 mfd. type 80 (C14, C15 and C16) (T.C.C.).
- Two 5-pin valve holders (Clix).
- One 7-pin valve holder (Clix).
- One screened H.F. choke (binocular) (Telsen).
- One screened H.F. choke (standard) (Telsen).
- One mains choke (Telsen).
- One 5,110 ohm volume control (C.P.157) (Varley).
- One "Trumpeed" electric gramophone motor (B.T.H.).
- One A.C./V.D., one A.C./H.Z., and one A.C./Y valve (Hivea).
- Aerial and earth terminal strip (Bellinger & Lee).
- Two component brackets (B.R.G.).
- One Bulgin fuse plug (with fuses).
- One Metaplex chassis to fit tablegram cabinet.
- Wire, flex, screws, etc.

Dimensions diagram of the controls of the "Armada." (Continued from previous page)

template, drill holes to accommodate the fixing bolts of the three-gang condenser, and finally drill the holes to take the aerial and earth terminal strip. The various holes for the inter-connecting wires should next be drilled, after marking their position, by placing the various components temporarily in position, using the photographs and the wiring diagram as a guide. When this has been done the parts may all be mounted, leaving the condenser and coil unit until last to avoid the awkwardness of the complete assembly. Wiring is carried out.

WIRING DIAGRAM OF THE "ARMADA" THREE.
PRACTICAL WIRELESS

SUMMIT 3. ARMADA MAINS 3
NEW SPEAKERS—ELIMINATORS—KITS

PILOT AUTHOR KIT

EXACT TO SPECIFICATION

The Pilot Kit SERVICE was founded in 1919.

Originators of Kits of Parts in 1919, we supply all your Radio needs. CASH, C.O.D. or EASIWAY. Our Customers are invited to take advantage of our FREE Technical Service or call for Demonstration at our Showrooms—77, City Road, London, E.C.1, or 62, High Holborn, London, W.C.1.

NEW MANUFACTURERS’ KITS in Sealed Cartons

Balance in 11 monthly payments of £5/7/6.

NEW LISON SKYSCRAPER THREE. Classic model with Magnets N.C. Send 10/3.

NEW LISON SKYSCRAPER FOUR ALL-WAVE CHASSIS MODEL. Complete Kit comprises all components, including set of Lison Valves. Cash or C.O.D. Carriage Paid. 45/12/6.
Balance in 11 monthly payments of £10/3.

NEW LISON BAND-PASS SKYSCRAPER THREE. Complete Kit comprises all components, including set of Lison Valves. Cash or C.O.D. Carriage Paid. 43/17/6.

NEW LISON WALNUT CABINET THREE. Complete Kit for building, includes valves and modern walnut cabinet. Cash or C.O.D. Carriage Paid. 45/24/9.
Balance in 11 monthly payments of £11/2.

NEW ELIMINATORS

ATLAS C.A.25, for Mains, Class “B” and O.P.P., four loudspeakers. 60/26, 50/60, 150, 150 25 m.A. Cash or C.O.D. Carriage Paid. 45/17/6.
Balance in 11 monthly payments of £6.

ATLAS C.A.34, in Walnut, 100W, 200W, 300W, three loudspeakers. 60/80/20, 100/100/200, 200/250/250, 25 m.A. Cash or C.O.D. Carriage Paid. 45/17/6.
Balance in 9 monthly payments of £6/5.

NEW SPEAKERS

W.B. STENTORIAN SENIOR, Permanent Magnet M.G. SPEAKER. For Power, Pentode and Class “B” Cash or C.O.D. Carriage Paid. 32/7/6.
Balance in 7 monthly payments of £5/9.

Balance in 8 monthly payments of £5/6.

BLUE POT "STAR" MOVING-COIL SPEAKER. Complete with Universal matching transformer. Cash or C.O.D. Carriage Paid. 41/12/6.
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PETO-SCOTT PERMANENT MAGNET MOVING COIL SPEAKER

Not a Midget—FULL SIZE CONE Power or Pentode. Cash or C.O.D. Complete with input transformer. Send Carr. Paid. 45/2/6.
Balance in 6 monthly payments of £6.

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SPECIALLY DESIGNED FOR WIRELESS—

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PETO-SCOTT WALNUT CABINET 19/6

EXCLUSIVELY SPECIFIED—PETO-SCOTT WALNUT CABINET 19/6

Specially designed at the request of PRATICAL WIRELESS for the Summit 3. In exquisite walnut, a superb example of cabinet craftsmanship. Internal Dimensions 20" wide; 10" high; 12" deep. Carriage Paid. 45/0/0.

PETO-SCOTT CO. LTD., 77, CITY RD., LONDON, E.C.1

Tel.: Oxford 24097. 10/11/3.

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Everywhere new at OLYMPIA for CASH, C.O.D. or EASIWAY.

ARMADA Mains 3

KIT "A" Author’s Kit of First Specified Parts, less Valves and Cabinet. Cash or C.O.D. Carriage Paid and 11 monthly payments of £7/9.

KIT "B" Author’s Kit of Second Specified Parts, less Valves and Cabinet. Cash or C.O.D. Carriage Paid and 11 monthly payments of £8.

KIT "C" Author’s Kit of Third Specified Parts, less Valves and Cabinet. Cash or C.O.D. Carriage Paid and 11 monthly payments of £9.

KITS — See Latest Easyway Lists.

EXCLUSIVELY SPECIFIED—PETO-SCOTT TABLEGRAM CABINET 19/6

Specially designed to the request of the Armada Mains 3. In beautifully grained woods, faultlessly constructed and hand finished polished. In Oak or Mahogany to choose, no extra. State when ordering.

IMMEDIATE DELIVERY

SEE THE PILOT ON THE COVER.

PETO-SCOTT

"WALNUT CABINET"

PETO-SCOTT CO. LTD., 77, CITY RD., LONDON, E.C.1


PETO-SCOTT DELIVERY LIST

IMPORTANT.

List of your wants. We will quote you by return.

CASH, C.O.D. or H.P. on our own system of easy payments. Send us a list of your wants. We will quote you by return.

G.0.D. order value over 10s. sent carriage and post charges paid.

G.0.D. order value over 10s. sent carriage and post charges paid.

GET IN TOUCH NOW.
"Yes, I’m fully charged
Look at my indicator"

I am the Exide “Indicator” Battery. When I say “Full” I am full—and that’s that. When my hand approaches "Empty" it is time to get me recharged—and that’s that. The point is that with me you always know where you stand. I put an end to uncertainty. I put an end to the risk of being let down by a run-down battery.

* The Exide Batteries already equipped with this invention are the “D” types listed below.

PRICES WITH ‘INDICATORS’

<table>
<thead>
<tr>
<th>Type</th>
<th>Voltage</th>
<th>Capacity</th>
<th>Price</th>
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<tbody>
<tr>
<td>DTG-C</td>
<td>2 volt</td>
<td>20 a.h.</td>
<td>5/-</td>
</tr>
<tr>
<td>DFG-C</td>
<td>2 volt</td>
<td>45 a.h.</td>
<td>9/-</td>
</tr>
</tbody>
</table>

* These prices do not apply to the Irish Free State.

Exide Batteries are obtainable in sizes to suit every set from Exide Service Stations and all reputable dealers. Exide Service Stations give service on every make of battery. • EXIDE BATTERIES, Exide Works, Clifton Junction, near Manchester. Branches: London, Manchester, Birmingham, Bristol, Glasgow, Dublin, Belfast.

'STILL KEEPS GOING WHEN THE REST HAVE STOPPED'
At last year's exhibition a number of interesting changes were witnessed in the design and construction of loud-speakers, and one of the most interesting, and one which undoubtedly attracted the greatest amount of attention, was the Microlode principle incorporated in the W/B speaker. As our readers are by now aware, this was an ingenious tapped matching transformer, fitted with selector arms, so that by a combination of the setting of the two arms it was possible to match the impedance of any type of output valve and so obtain optimum results from the speaker.

Class B
In addition to this we saw for the first time various Class B speakers in which a complete Class B stage was fitted. At this year's exhibition we cannot expect to see such radical departures from existing design, and it is quite safe to say that the loud-speaker of to-day, so far as quality is concerned, is practically perfect and will deal satisfactorily with the range of frequencies at present transmitted by the R.B.C. There is, however, room for improvement in the range which can be handled, and this will be dealt with later on.

W/B Again
At this year's exhibition the great surprise is again promised by Whiteley Electrical. As with last year's surprise, so this year they have developed something new, but instead of a departure from existing design, the improvement is to be found in the magnet system. A new alloy has been found which has resulted in greatly increased magnetism, and thus for a given size of magnet a much stronger gap strength has been obtained. This has far-reaching results, as may be seen from the following: The experimenter knows that the speech coil of an M.C. speaker is included in a small gap which is part of a magnetic system, and consequently the speech or music current fluctuations through the speech coil intersect the magnetic lines existing in this small gap, and this gives rise to the movement of the speech coil which, as it is part of the diaphragm, causes this to move and so reproduce the sounds. Obviously, therefore, if the magnetic lines are weak, the movement of the speech coil will also be weak.

Gap Size
To maintain a sufficient and reasonably strong field across the gap this is reduced to extremely small dimensions, and consequently the speech coil must be very small, and to enable the diaphragm to be given a substantial movement it must be made light in weight. With the new magnet it is found possible to use a much larger gap, and consequently the speech coil may be made more substantial, leading to the introduction of a larger cone and so, throughout all the parts that matter, introducing improvements. Great things may thus be expected of this new arrangement.

OUR NEW MONTHLY
Practical Television

Television Frequencies
These two instances represent probably the only radical " introductions " at this year's exhibitions, but before closing this report we may note perhaps it would be well to point out that with the introduction of television apparatus and the consequent necessity of greatly extending the frequency range at present utilized, a demand will arise for improved design in both broadcast amplifiers and loud-speakers, as the probability is that the amateur will build a high-class receiver to which to connect his vision apparatus and will, at other times, utilize that amplifier for broadcast reception. With the natural progress which will result from the increased frequency response it is only natural to expect some change in quality of sound output, and thus speaker design may need modification before the next exhibition arrives.

The Piezo Speaker
A failing of the cone type of speaker has always been the poor high note response. By this is not meant that the cone type of speaker is no good for high notes, but it definitely does not extend into the range of the higher harmonics, and although it gives splendid results when well designed, it cannot be said that it reproduces faithfully any sound which is rich in these harmonics. In America a speaker has been developed which is remarkably good in this latter respect, and it utilizes a movement which arises from the effect of electrical currents on a crystal of Rochelle salt, or, as it is more commonly known, a piezo crystal. Unfortunately, as with practically everything in this life, nothing is perfect, and the ability to deal so faithfully with the upper frequencies is met in this system with a failure to go right to the other end of the scale. Consequently, to obtain a true overall response, in which the lowest and the very highest frequencies are handled faithfully, it is necessary to combine a piezo-crystal speaker with a moving-coil speaker and this combination will be seen for the first time this year on the Rothermel stand. It is interesting to note that the piezo-crystal has also been utilized by this firm in the production of gramophone pick-ups and microphones.

How the Loud-speaker Has Developed During the Past Season
What is Your Favourite Circuit?

OUR SPECIAL RADIOLYMPIA COMPETITION

PRIZES: FIFTY W.B. STENTORIAN SPEAKERS IN SIMPLE FREE-FOR-ALL COMPETITION

Fifty of these splendid new W.B. Stentorian speakers, which incorporate an ingenious new principle in speaker construction, providing greater output for a given input, and vastly improved quality are offered in a simple competition in accordance with the Rules and Conditions given below. These speakers cost 42/- each, and are renowned for the brilliance of their reproduction and extreme sensitivity. A switch-arm is incorporated at the back which enables matching to be carried out without having to disconnect the speaker—in fact whilst the speaker is in operation.

STUDY THESE RULES CAREFULLY!

1. In the centre column appears a list of nine features of design. What you have to do is to answer the various questions in the space provided. The fifty senders' of coupons most nearly agreeing with the popular vote will each receive one of the W.B. Stentorian speakers.

2. After filling in the coupon in this way, fill in your name and address in block letters at the foot of the coupon, and post, in a sealed envelope, addressed to The Editor, "Practical Wireless," Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

3. Mark the word COMPETITION in the top left-hand corner of the envelope. Post to reach us not later than August 31st.

4. Readers may send in as many attempts as they like in one envelope, provided that each attempt is written on a separate coupon, each of which must bear the full name and address of the sender.

5. Only one speaker can be awarded to each reader.

6. The result will be published in our issue dated September 15th.

7. The Editor's decision is final and legally binding, and this is an express condition of entry. No correspondence whatever can be entered into regarding this competition.

Here is one of the 50 New W.B. Stentorian Speakers offered as Prizes in this Simple Competition.

WHICH IS YOUR FAVOURITE CIRCUIT?

<table>
<thead>
<tr>
<th>Battery or Mains?</th>
<th>All-Wave, Broadcast, or Short-Wave Bands?</th>
<th>Superhet or Straight Circuit?</th>
<th>Power Output over or under 2 Watts?</th>
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<tr>
<th>Self-contained or External Speaker?</th>
<th>Table or Console Cabinet?</th>
<th>Combined or Separate Controls?</th>
<th>Radiogram or Provision for Pick-up?</th>
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<th>Self-contained or External Aerial?</th>
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REPUTATION

The AMPLION reputation for producing speakers giving life-like reproduction, fine tonal balance, sensitivity, and the ability to handle heavy input without the slightest signs of distortion, is faithfully upheld in this 1935 "LION."

Perfect Matching to every class of output is obtained through the Universal Transformer covering from 1 to 20 ohms and from 2,000 right up to 40,000 ohms; normal or centre tapped.

Refinements include, terminals for connecting up an extension speaker. Sockets to which can be connected leads for volume or tone control. The terminal strip is clearly engraved so that it is a simple matter to secure exact and perfect matching with any receiver which you may acquire.

Sealed Magnetic Gap. Every AMPLION "LION" Speaker can be relied upon to indefinitely maintain its perfection of reproduction, because all incorporate the new "Sealed Magnetic Cap."

AMPLION "LION"

PERMANENT MAGNETIC MOVING COIL SPEAKER

Universal Transformer. Cone diameter, 7 inches. Magnet of new design. Exceptionally heavy and provides extremely high sensitivity.

AMPLION "LION SUPER" 10-INCH CONE, 55/-

AMPLION (1932) LTD.
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FACING OLYMPIA AUGUST 16th to 25th

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DOUBLE PENTODE POWER OUTPUT

PRICE COMPLETE £4.17.6

TRIPLE PENTODE WORKABLE A.C. & D.C. 8000 to 250 VOLTS Outputs 100 and 50 watts. Ultra selectivity and tuning range. Ideal also for gramophone pick-up. High-gain pentodes, with automatic tuning. Also three other splendid new LOTUS models. 

TRIPLE-TUNED A.C.

Variable-type, a.c. & d.c. input. Inductive output. Moving-coil loudspeaker. Ultra selectivity and tuning range. Price complete £10.10.0

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LOTUS RADIO (1933) LIMITED,
OLD FRIENDS AND NEW

TRANSFORMERS
which make any set a better set. The AF5 illustrated here, price 30/- is the choice of engineers and musicians—specified wherever high amplification and nearly perfect reproduction are essential. (Ratio 1/3.5, Inductance 260/80 henrys, 0/10 m/A).

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Types G5, GH5, G1 and GH1
Accurate to within 5% of their rated values, non-varying and maintaining the stated value even when working at full rate for long periods. Inductance and capacity negligible. From 300 ohms to 2 megohms. Price 1/- and 1/6 each. Without holder 6d. each less.

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Ferranti Potentiometers are constant in value and silky in action. Although not usually required to carry appreciable current they will dissipate 0.25 watt continuously. They have a slight negative temperature coefficient. Standard values: 50,000 ohms, 100,000 ohms, 250,000 ohms, 500,000 ohms, 1 megohm. Type P with knob as illustrated. Price 3/9. Type PS with knob and mains switch 4/6. Logarithmically graded types, 1/- each extra.

THE HEPTODE
The Ferranti VHT4 combines in one valve the function of both oscillator and modulator, and, in addition, is a variable Mu type, enabling full A.V.C. to be obtained in sets with only one I.F. stage. Price 20/-.

2-volt Battery Heptode VHT2 also available Price 18/.

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Ferranti—the lowest price quality condensers on the market—are made with extreme care to work efficiently and without possibility of breakdown. They are designed and made by engineers whose experience includes the building of condensers for working pressures of more than 1,000,000 volts. Prices from 1/-.

M.1. SUPER SPEAKER
After being unsurpassed for years the M.1 speaker is now available in a still better form. A new suspension better and freer than before and a remarkable magnet of aluminium steel with a gap half-inch deep, are now incorporated.

Write for leaflets to FERRANTI LTD., HOLLINWOOD, LANCASHIRE.

At Stand No. 70 you will see some old friends. The AF3 and AF5 will be there for instance, because after years of service, these transformers have proved their title to supremacy. But the many new friends will prove to be of interest to the Radio man whose watchword is "Quality." The AF9Cs; the new Resistances; the Volume controls; the Electrolytic Condensers, and above all, the comprehensive range of Ferranti Valves. The new season's range of constructor's sets alone is worthy of the closest inspection. A display of Radio at its very best. A Wireless Exhibition in itself.
The novel and compact Adey portable receiver which employs the Adey self-coupling valves.
The exhibit of the day is the new "Atlas," which embodies a number of improvements in the design and construction of the popular "Augusta" unbalanced type. The new model is lighter in weight, requires less spiral winding, and has a smoother, more even tone. It is also more rugged and durable, with a longer life expectancy.


costs only £1 6s.

This is the self-contained battery-powered radio equipment made by Messrs. Roberts (Silvertone, Ltd.)

BRITISH BROADCASTING CORPORATION PUBLICATIONS, Broadcasting House, W.1. Stand No. 58.

BRITISH Q.W.Z. BATTERY, CO., 205, Bedford Avenue, Ealing, Ealing, Stand No. 229.


H.R.E. will be seen Pig Valves, the Pig Invisible Aerial, the Pig Invisible Armchair or music, and may be obtained complete with table or floor stand. The speakers range in price from £5 5s. to £22 2s., the latter having two horns and a "V" connector, together with a substantial reproducing unit.

BLOCK BATTERIES LTD., By-Pass Road, Barking, E.11, Stand No. 41.

IMPORTANT additions to the range of goods, including amplifiers, radio chassis and IF amplifier units, turntables, speakers, buffers, microphones, radio receivers and gramophones, oscillators and valve voltmeters. The amplifiers cover various purposes and have outputs from 12 watts to 90 watts, whilst the microphones are suitable for speech or music, and may be obtained complete with table stand or floor stand. The speakers range in price from £5 5s. to £22 2s., the latter having two horns and a "V" connector, together with a substantial reproducing unit.

The new "Atlas" receiver. This set embodies what is known as automatic tuning whilst, as can be seen, the loudspeaker baffle board is arranged on an unusual angle.


costs only £1 6s.

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vision coils. A further point of great interest to the home constructor is the announce-
ment that many existing units will be substantially reduced in price.

BURGON & WIRELESS (1930), LTD., Great West Road, Brentford. Stand No. 102.

A range of receivers at competitive prices will be shown, all of which are provided with a new
form of tuning scale which is on the "eclipt-
acircle" principle; it is called by the makers
"one-place tuning." The single versus battery re-
overs of all types, including three different portable
models and one instrument, fitted with dual loud-
speakers and having a Class B output stage.

BURNDEPT, LTD., Light Gun Factory, Erith, Kent, 81.

BURLINGTON STREET, A. F., LTD., Abbey Road, Barking.

Also be shown.

A new series of efficient and low-bright coils of the "striped" type, which has
just been introduced by Messrs. Bulgin, as a reply to the "Practical Wireless"
Low-price-with-efficiency Campaign.

CENTRAL EQUIPMENT, LTD., 101, London Road, Liverpool. Stand No. 4.

COMI aerial and earth accessories will be seen
on this stand, including the No.
Mark Aerial and Silfite. The former is a novel
arrangement of stout copper wires built into an
insulator and designed for vertical reception against
the side of a house, whilst the latter is a similar
arrangement incorporated with a special high-
metallic compound for improving the efficiency of
the earth connections.

CHLORIDE STORAGE AND BATTERY, CO.,

A full range of Chloride and Drydex batteries
will be seen on this interesting stand in the
Grand Hall Gallery. A feature of the exhibit will be
the "D" type cells fitted with the indicator
which created so much interest on its recent intro-
duction. The indicator consists of a dial over which
moves a needle between positions marked "full," "half," and "empty," giving a direct indication
as to the state of the cell and affording an accurate
idea of the time it can be expected to last before
re-charging is necessary. Examples of all types of
Chloride high-tension batteries include the specially-
designed polished metal plates to hold Chloride 60-volt
batteries. It will be noticed that the range of
Drydex dry batteries has been extended, a number of
special batteries having been developed for the
postal and most recently-designed battery operated
receivers.

CHURCHMAN'S LTD., 79, Maidenhurgh Street,
Colchester, 721.

CITY ACCUMULATOR CO., LTD., 18-29, Newman's

A "loudspeaker" Receivers will attract a great deal
of attention on this stand. The range of receivers point out that the exhibits here will con-
 sist of receivers, amplifiers and tuning packs, designed
and sold many months prior to the exhibition, and
not some items hastily thrown together at the last
moment. The Supertwin Tuning Unit is a superhet
pattshaped specially designed for the Heptode
Frequency Changer, and is complete with 3 coils;
l-bising condenser, deciding condenser and 25,000-ohm
low-control potentiometer. This sells at £2 12s. 6d.

The Bulgin coil assembly shown above
represents an excellent effort to produce
a really satisfactory all-wave tuner. It is the result of
several years' experiment.

BROADCASTER, 29, Bedford Street, Strand, London,
W.C.2. Stand No. 727.

A representative of loud-speakers, this
stand will be devoted to reproducers of
various types. From the small single
permanent-magnet type of speaker to the
large double-entrained balance units every
trade is catered for by the Col-
nection Company.

The Bellphone speaker, for instance, costing
£18 18s., and weighing 74lbs., represents one
of the large models, whilst
the £5, costing
17s. 6d. and
weighing only
1lb. 4ozs., re-
gresents the
other extreme.

In addition, a P.2 pick-up will also be seen, and
this embodies all the latest
features in modern pick-up technique.

The Bush coil assembly shown above
represents an excellent effort to produce
a really satisfactory all-wave tuner. It is the result of
several years' experiment.

BROWN BROS., LTD., Great Eastern Street, E.C.2.

Stand No. T7.

IN addition to many existing and popular lines,
Messrs. Brown will be showing a number of
new components which will still further add to the
long list of useful parts which have been produced
during the past years.

BULGIN AND CO., A. F., LTD., Abbey Road, Barking,
Essex.

A neat and attractive
double-speaker receiver by Burgon
Wireless, Ltd. It has an attractive form of "click-free" tuning.

An extremely efficient
ultra-short-wave coil of the
plug-in type by Messrs.
Bulgin.

An extant coil assembly shown above
represents an excellent effort to produce
a really satisfactory all-wave tuner. It is the result of
several years' experiment.

BULGIN AND CO., A. F., LTD., Abbey Road, Barking,
Essex. Stand No. 191.

In addition to many existing and popular lines,
Messrs. Bulgin will be showing a number of
new components which will still further add to the
long list of useful parts which have been produced
during the past years. From the smallest switch
to the new short-wave coils the components are of
very high merit, and visitors will be able to spend a
considerable time at this stand.

BULGIN BURGOYNE WIRELESS (1930), LTD., Abbey Road, Barking.

August 18th, 1934

PRACTICAL WIRELESS

623
Practical Wireless GUIDE TO THE SHOW

GRAND HALL - FLOOR PLAN

"PRACTICAL WIRELESS" THE LEADING WIRELESS WEEKLY

Special Note!
Stands Nos. 1 to 133 are on the Ground Floor;
Stands 201 to 272 and T1 to T32 are in the Gallery.

A Detailed Stand to Stand Report of the Exhibits will appear in Next Week's Second Enlarged Show Number! Order your Copy Now!

For Details of 'Bus and Underground Routes to and from Olympia See Page 635.
Graham Farish presents
The finest Radio Magazine ever published

Packed from cover to cover with Interest, and Instructions for building 3 magnificent new Battery Sets.

SKY RAIDER

The most advanced set of our time. NEW-type Coils, NEW-type Valves, NEW-type Speaker... AND results that will amaze you.

SKY RAIDER IS THE SET TO BUILD!
Fully described in this issue with full-size Blue Print FREE

Also instructions for building two other interesting modern circuits

Wonderful new BATTERY VALVE developments

Host of new ideas for your present set

"CONTACT" World-wide Station-finder

Intimate News and Views from your favourite Station abroad, etc., etc.

HERE IS THE MAG. YOU'VE WANTED!
STAND TO! AT
SEE THESE TWO FOREMOST

Radio Fault-Tracers

Testing made Easy—Accurate—Simple!
A Sensational New UNIVERSAL (A.C.&D.C.) Avo Minor

Here — for everyone — is a younger brother of the famous Universal Avometer. This new meter makes both A.C. and D.C. tests. It gives you a wonderful new ability to trace faults accurately — quickly — easily — with all the assurance of the technical engineer. Entirely new testing facilities are combined with famous Avo Minor precision and simplicity.

The Famous D.C. Avo Minor

Ten ACCURATE Meters in One

Radio's triumphant little helper. Testing is simple, easy and accurate with this instrument. It tracks the slightest defect, traces the most baffling fault. Ten precision meters are combined in one. You can test your set like an expert. No other small D.C. meter has the same accuracy.

See it at Stand 2 and see how it can win you a valuable cash prize.

A NEW AID
Radio Servicing Simplified

This invaluable new book gives a complete survey of radio testing in non-technical language. The testing of modern valves and every conceivable fault is explained in easy phraseology. Numerous diagrams. A book compiled for both the amateur and engineer.

2/6 Post Free

THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO., LTD.
WINDER HOUSE, DOUGLAS STREET, LONDON S.W.1. TELEPHONE VICTOR 4094/5
Stand No. 85. Amongst the receivers to be seen on this stand is the 7-5-8, the figures representing the colour of the illumination changes for each waveband and only the names of the stations on the appropriate waveband may be seen.

There is a very modern design of some of the cabinets which will strike a new note. The large and easily-read tuning "dial is an interesting feature of this Ekco consolette. The "No-Mast" aerial which has become so popular since its recent introduction.

The "No-Mast" aerial which has become so popular since its recent introduction.

This is a set of the latest type of Colvern G-type coils, the cores of which are now self-supporting, as was being used in their assembly.

Various types of gas-core (FerrantWare) coil may be seen on this stand, and it will be noticed that the method of assembling the bakelite casing on these coils has been modified and is now practically perfect. The coils themselves are still designed to have the same characteristics and it is only in the modifications that the modifications have been made and the new ones provide greater mechanical strength and durability. A coil for every purpose may be seen here.

A coil for every purpose may be seen here.

A console radiogram from the extensive Cossor range of 1935 receivers.

Another Ekco set of attractive and unusual design.

Another Ekco set of attractive and unusual design.

The "No-Mast" aerial which has become so popular since its recent introduction.

A console radiogram from the extensive Cossor range of 1935 receivers.

One of the Cossor chassis, It's very rigid being made of blood steel, and employs a rather unusual form of mounting for the rectifying valve.

A transparent Bakelite moulding for the rectifying valve is evident here.

The "No-Mast" aerial which has become so popular since its recent introduction.

A transparent Bakelite moulding for the rectifying valve is evident here.

The popular Melody Maker Kit will be seen on this stand, and they cover trans-four battery receivers and kit-sets will share a place on the stand. The popular Melody Maker Kit will again be seen, and this incorporates the screened H.F. pentode in A.C. models together with an all-metal chassis ready drilled and all nuts bolts and screws supplied ready for assembly.

GLOVER, LTD., Mawney's Road, Romford, Essex. Stand No. 26.

Among the new circuit features incorporated in the receivers may be mentioned the station pre-selector and noise suppressor which enables the superheterodyne circuit to be rendered insensitive to a pre-selected number of high-quality stations and at the same time entirely suppresses all noise and interference between stations. Fully delayed A.V.C. (amplified) will also be featured.

In addition, the well-known power units, in some of which provision for trickle-charging is made, will also be seen. Each of the new Ekco units is provided with adjustable top-ups for correct output; voltage output and S.G. supply. The manufacturers state that running costs are approximately 1s. per year.

CONCORDIA ELECTRIC WIRE CO., LTD., New Sawley, near Mansfield, N.5. Stand No. 238.

VARIOUS types of gas-core (FerrantWare) coil may be seen on this stand, and it will be noticed that the method of assembling the bakelite casing on these coils has been modified and is now practically perfect. The coils themselves are still designed to have the same characteristics and it is only in the modifications that the modifications have been made and the new ones provide greater mechanical strength and durability. A coil for every purpose may be seen here.


In addition to the exhaustive range of wireless valves some other interesting equipment will be seen here. Cathode ray tubes and associated apparatus; neon tuning devices; complete receivers and kit-sets will share a place on the stand. The popular Melody Maker Kit will again be seen, and this incorporates the screened H.F. pentode in A.C. models together with an all-metal chassis ready drilled and all nuts bolts and screws supplied ready for assembly.

DALLAS AND SONS, LTD., 6-10, Belterton Street, London, N.C. Stand No. 72.

A complete representative selection of commercial apparatus will be on show at this stand.

A console radiogram from the extensive Cossor range of 1935 receivers.

The "No-Mast" aerial which has become so popular since its recent introduction.

A complete representative selection of commercial apparatus will be on show at this stand.

Another Ekco set of attractive and unusual design.
Practical Wireless GUIDE TO THE SHOW

A variety of the well-known Dubilier electrolytic and tubular condensers.


Spatial apparatus for the use of deaf persons will be the principal feature on this stand, and such items as microphones, loud-speakers and cinema apparatus to enable deaf persons to hear the performances will also be exhibited. Some Public Address amplifiers will also be shown in various ranges from £38 to £85, as well as a special Mixing Unit for use with the amplifiers.


As wholesale suppliers, Messrs. Dew will have on show receivers and components of every description, and by nearly all the well-known manufacturers.

DIBBLE, LTD., 34, Carlton Crescent, Southampton. Stand No. T71.

A section of this firm will confine its exhibits to items selected from various sources.

DIGGLE, A. CO., Reliance Works, Jans Street, Rochdale, Lancs. Stand No. 12.

CHARGING Plant will form the basis of this firm's exhibit, and various instruments from £30 will be shown. These items are designed to operate in a most efficient manner, and are low in running costs and easy of maintenance. They are obtainable on hire-purchase terms.

DUBILLER CONDENSER CO. (1925), LTD., Dimond hire-purchase terms.

As manufacturers of condensers, this firm will obviously devote its exhibits to various types of capacitors. From the minute mica condenser, no larger than a penny, to the large transmitting condensers which are used in commercial stations, there is practically no type of condenser which Messrs. Dubiller do not make. Among the new items will be seen some novel electrolytic in metal case, where the polarity may be reversed without damage. A " block" type of electrolytic in metal case will also be seen. Micc, paper, and dry electrolyte condensers are also on view in various types and sizes, whilst resistances, anti-interference devices, and static condensers will also be included on the stand.


MESSRS. DUCETTO intend to give a general wholesale display of most of the manufacturers exhibiting. All provincial representatives will be in attendance, and several facilities for trade customers to review the exhibition in miniature, and under comfortable conditions, will be provided.


This principal exhibitor on this stand will be the range of accessories and receivers for which they are wholesalers. In addition, there will be a number of H.T. units, transformers, choices, and rectifiers of which they are the makers.


A wide range of the well-known Earl reproducers will be shown, and ample technical details regarding them will be available to the inquiring purchaser.


SECRETION from commercial ranges will form the exhibit of this firm of wholesalers.

EDGE RADIO, LTD., Dolly Blue Works, Raphael Street, Bethnal. Stand No. 91.

EDISON SWAN ELECTRIC CO., LTD., 155, Charing Cross Road, London, W.C.2. Stand Nos. 88 and 84.

In previous years, this firm will be showing a range of the famous B.R.A. loud-speakers, the B.T.H. Needle Armature Pick-Up and Tone-Arm, £40, the B.T.H. Waste Pick-Up and Tone-Arm, and the full range of Mazda valves. A special display will be made of the gramophone recorders in both A.C. and D.C. types, the prices of the two being, £7 15s. and £5 17s. 6d., respectively.


MONG the receivers to be seen on this stand will be some radio-gramophones, incorporating the Stenole principle. In addition, a 5-volt battery amplifier, incorporating a wireless output stage, will attract attention. The largest model, a 5-volt radiogram, with automatic record changer, incorporates every modern refinement, including silent and visual tuning. The output is 8 watts, obtained from a powerful push-pull stage.

ELECTRO DYNAMIC CONSTRUCTION CO., Devonshire Grove, S.E. Stand No. 117.

O THIS Stand will be seen the well-known Electro Dynamic Interference-free rotary converter, and other types of noise converter and alternator. In addition, a new line in the form of a petrol-driven alternator, consisting of a neat and compact self-contained petrol engine, tank and silencer coupled to a self-existing alternator will be seen.

ELLESMERE, LTD., 70, Great Eastern Street, London, E.2. Stand No. 262.

A representative collection of receivers and accessories chosen to provide dealers and others with a combined selection arranged under one group.
A petrol-driven battery-harging plant made by the Electro Dynamic Construction Co.


This firm is well known as manufacturers of high-grade testing and measuring instruments, and this year they have added to their range by taking over the British models. Thus the stand will be devoted to an exhibition of instruments suitable for all testing purposes, and will range from gauge meters suitable for panel-mounting purposes to large apparatus suitable for laboratory use.

**THE EVER READY CO. (GREAT BRITAIN), LTD.**


The whole Ever Ready range of large apparatus suitable for laboratory use will be shown. This range includes high voltage, high grade testing and measuring instruments, and will range from midget testing instruments to large apparatus suitable for laboratory use.

**FERRANTI, LTD., Hollinwood, Lancashire.**

No. 570. A range of Ever Ready and Winner grid-bias batteries will be seen on Messrs. Ferranti's stand. Another feature of the display on this stand will be the Ever Ready accumulators which have been a speciality of the firm for the past 30 years.

**GARRARD ENGINEERING AND MANUFACTURING CO., LTD., Swinton, Wilts. Stand No. 56.**

A Universal Gramophone Motor, designed for operations from A.C. or D.C. mains. This is fitted with speed regulator, automatic stop, etc. A new radiogram unit will also be seen, in which the overall dimensions have been reduced to enable a complete unit to be included in a smaller cabinet than was hitherto possible. This is complete with pick-up, electronic filter, volume-control, and Record Changing Units will also be exhibited.

**FLINDERS (WHOLESALE), LTD., Shaftesbury House, Cechester. Stand No. 70.**

SELECTED Items from various ranges will be displayed by this firm of wholesalers.

**FULLER ACCUMULATOR CO. (1925), LTD.**


**GILBERT & CO., LTD., 73, Arundel Street, Sheffield.**

A new range of accumulators, known as "Standard de Luxe" plate types, will also be exhibited. These batteries have been completely discontinued.

**GOODMAN (CLERKENWELL), LTD., 23-30, Drysdale Street, London, N.1. Stand No. 217.**

At the time of going to press no details have been released concerning this exhibit.

**GOODMANS (CLERKENWELL), LTD., Turnmill Street, Clerkenwell, London, E.C.1. Stand No. 125.**

LOUD-SPEAKERS will form nearly the whole of the display on this stand, no less than seven entirely different models being exhibited. These are designed for use with a 25-watt public address instrument with 100-watt output, and are of the die-cast type.

**GRAMOPHONIC (H.M.V.), LTD., 56-108, Clerkenwell Road, London, E.C.4. Stand No. 46.**

In the stands of this company will be found eleven different types of receiver, ranging from range battery models to the elaborate radio-models with automatic record-changing devices.

**GRAMOPHONE CO. (H.M.V.), LTD., 56-108, Clerkenwell Road, London, E.C.4. Stand No. 46.**

In the stands of this company will be found eleven different types of receiver, ranging from range battery models to the elaborate radio-models with automatic record-changing devices.

**HENDRY AND CO., LTD., 164, Elgin Road, Croydon.**

No. 70. There are two battery-operated receivers featuring in this season's programmes. One of these is called the "Compact S," a powerful and well-built three-valve set in a handsome bakelite cabinet, which houses a moving-coil speaker as well as the accumulator and battery. It has simultaneous control, an illuminated scale, and separate selective and volume controls. The other battery set, which has "Class B" output, is a four-valve set with the power of a mains receiver, giving a wide range of facilities.

**HOLLYWOOD PHONOGRAPH CO. (H.M.V.), LTD., 26-32, Kingsway, W.C.2 (see Newst, Ltd., George).**

**GILBERT & CO., LTD., 73, Arundel Street, Sheffield.**

A selection of trade items will form the basis of this exhibit.

**JONES, A., 19-30, Drysdale Street, London, N.1. Stand No. 217.**

**LUDWIG SPANIER, LTD., Turnmill Street, Clerkenwell, London, E.C.1. Stand No. 125.**

**KILBURN SPEAKERS, LTD., Turnmill Street, Clerkenwell, London, E.C.1. Stand No. 126.**

**LUDWIG SPANIER, LTD., Turnmill Street, Clerkenwell, London, E.C.1. Stand No. 125.**

**LUDWIG SPANIER, LTD., Turnmill Street, Clerkenwell, London, E.C.1. Stand No. 125.**

**LOUD-SPEAKERS will form nearly the whole of the display on this stand, no less than seven entirely different models being exhibited. These are designed for use with a 25-watt public address instrument with 100-watt output, and are of the die-cast type.

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In the stands of this company will be found eleven different types of receiver, ranging from range battery models to the elaborate radio-models with automatic record-changing devices. In each model-their construction.

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In the stands of this company will be found eleven different types of receiver, ranging from range battery models to the elaborate radio-models with automatic record-changing devices.
The "Halycon" receiver shown on the left is a good example of the trend to combine the radio set with a useful piece of furniture. The instrument on the right is an attractive "Halycon" console model.

The first time and these include H.F. pentodes, a General Purpose Triode and a 2½ watt output rectode. A full-wave rectifier will also be shown and all these valves are characterized by the high performance and low price, the output pentode, for instance, costing only 1½d.

Our New Sixpenny MONTHLY MAGAZINE "Practical Television" may be purchased from Stand No. 8, Ground Floor.
NEW MAGNET PROVIDES TWICE THE VOLUME.

An extraordinary new magnetic material, exclusive to W.B. Stentorian Speakers, gives double the strength of an ordinary magnet at the same cost.

NEW SPEECH COIL BRINGS AMAZING REALISM.

Previously used only on W.B. public address models, the Whiteley Speech Coil becomes usable on Stentorians because of the new magnet's enormous strength. It gives crisper attack and better definition.

INNUMERABLE ADDED REFINEMENTS COMPLETE A BRILLIANT DESIGN.

Improved "Microlode" feature gives accurate matching to any output as principal speaker or extension. Complete dust protection at back, front, and sides of air gap. Oversize cone on Senior Model and many other improvements in detail.

AN AMAZING ADVANCE

STENTORIAN

We are exhibiting at

Stentorion Senior (PMSI) ... 42/-
Stentorion Standard (PMS2) ... 32/6
Stentorion Baby (PMS6) ... 22/6

Write for the new W.B. Stentorian leaflet.

See them at Stand No. 98

A W.B. Speaker is specified exclusively or as author's first choice in every prominent journal's "Star" Exhibition receiver

WHITELEY ELECTRICAL RADIO CO., LTD. (Dept. D.), Radio Works, Mansfield, Notts.

Sole Agents in Scotland: RADIOVISION, Ltd., 233, St. Vincent St., Glasgow, C.2

TELSEN COMPONENTS

specified for the 'Armada 3'

TELSEN L.F. SMOOTHING CHOKE
Fulfills every high-efficiency requirement when used in the rectified mains output circuit of a receiver. The maximum permissible current is 50 m.a., D.C. resistance 1,000 ohms and inductance is 28 henries at 25 m.a. Presented in an attractive black bakelite moulded case, with easily accessible terminals and fixing holes.

TELSEN STANDARD SCREENED H.F. CHOKE
For wavelengths between 100 and 2,000 metres, such as are covered by the ordinary radio receiver. Carefully designed and constructed in accordance with the latest technique, it provides consistently high efficiency over the whole of its wave range, interaction with other components being eliminated by the earthed metal screen.

TELSEN SCREENED BINOCULAR H.F. CHOKE
Designed and constructed to ensure consistently high efficiency over the entire waveband for which it is intended, viz., 10 to 2,000 metres. Small and compact, it occupies the minimum of baseboard space, while the metal screen, which is connected to an earthing terminal, entirely prevents interaction with other components.

VISIT STANDS NOS. 75 AND 101 AT RADIOLYMPIA

Announcement of THE TELSEN ELECTRIC COMPANY LIMITED, ASTON, BIRMINGHAM
JACKSON BROS. (LONDON), LTD., 72, St. Thomas Street, London Bridge, S.E.1. Stand No. 114.

The latest type of Jackson Bros. all-enclosed three-gang condenser. The Simplex Electric Turntable will again be shown on this stand, and the price has now been fixed at two guineas, for either 10 or 12in. sizes. The turntable is suitable for 200-250 volts or 100-150 volts 60-cycle mains.

KOLSTER BRANDES, LTD., Gray's Way, Sidcup Kent. Stand No. 84.

The design of the cabinets used for the A.R. receivers will prove a great attraction, and the various circuit details will interest many. The Selectrol, a T-valve suppressor of 10 guasses is an attractive model, and the 8-valve A.C. radio-gramophone is a luxury, instrument, in which the cabinet has provision for storage records. Two output pentodes in push-pull deliver ample volume for dancing in a small hall.


A SELECTION of various commercial products will be seen on this wholesale stand, and will include some of the highlights from the exhibition.

KINGSWAY RADIO, LTD., 2-9, Dane Street, High Holborn, W.C.1. Stand No. 44.

THIS firm will exhibit all types of transformers as well as a comprehensive range of L.F. transformers, chokes, tuning coils, microphone transformers, mains transformers, and other components. As well licensees for the manufacture and sale of the "Simplex Electric Turntable," these will also appear on the stand.


THIS firm supplies at wholesale rates only, and the exhibits on the stand will comprise the popular ranges of receivers by all the well-known makers.

LISSEN, LTD., Lissenium Works, Isleworth, Middlesex. Stand No. 82.

A COMPREHENSIVE range of battery, A.C. and D.C. mains receivers will be shown by Messrs. Lissen, and these will range in price from £4 10s. to £9 9s. In addition, some interesting Kits of Parts will be on view, including the new famous Sky-tuner series. Also, a complete range of R.T. and G.B. batteries will be seen, together with some R.T. accumulators. Car radio will be represented, and radio enthusiasts should make a point of seeing the excellent Lissen developments in this branch of radio.


THE latest type of Jackson Bros. all-enclosed three-gang condenser. To the home-constructor as they have already been extensively used by us in the construction of some of our receivers. Small modifications in design and alterations in the price of some of the components will add interest to the exhibits.


THIS firm supplies at wholesale rates only, and the exhibits on the stand will comprise the popular ranges of receivers by all the well-known makers.


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MAIN POWER RADIO LTD., Broadway Works, Eastern Road, Romford. Stand No. 230.

MANUFACTURERS ACCESSORIES CO., LTD., 3-9, St. Thomas Street, London, E.C. Stand No. 76.

EVERY type of receiver, from the simple battery-operated three-valve to the 9-valve heterodyne auto-radiogram, may be seen on Stand No.T25. The Lissen B.P. receiver -- an attraction hide et at a competitive price.

LISSEN, LTD., Lissenium Works, Isleworth, Middlesex. Stand No. 82.

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A distinctive note is struck by this latest Marconiphone console receiver. It is a set for the connoisseur.

McMICHAEL RADIO, LTD., Slough, Bucks. Stand No. 60.

The exhibits on this stand will comprise a still wider range of McMichael complete receivers. The suitcase portable which has been a popular favourite for a number of years will again be in evidence and in this year priced at 15 guineas. Other receivers on show will be a powerful mains superhet at 16 guineas, a twin speaker superhet (for A.C. mains) at 18 guineas, a mains transportable superhet at 15 guineas, and the "Duplex" battery transportable, which has Class B output, at 14 guineas. The twin speaker superhet is a very advanced model employing fully delayed automatic volume control in conjunction with an inter-station noise suppressor and automatic tone control. The mains transportable is capable of supplying an undistorted output up to 3 watts.


The exhibit of outstanding interest on this stand will be a new loud-speaker to be known as the "Mastersinger." This is based upon a novel idea in sound-projection which has been found to produce excellent results. The speaker is mounted close to the ceiling, the sound being projected upwards and then reflected down again. An electric-light shade is suspended below the speaker, and this helps to produce the combined speaker and light shade. The price of the standard model "Mastersinger" speaker has been fixed at 12 guineas, including shade, whilst a senior model is available at 25 guineas.

MULLARD WIRELESS SERVICE CO., LTD., Mullard House, Charing Cross Road, London, W.C.2. Stand No. 65.

Year by year the radio enthusiast and the professional radio engineer expect to see on the stand of the Mullard Wireless Service Co. something which represents a notable, if not startling, advance in radio valve technique. They have never been disappointed, and they will certainly not be disappointed this year.

A front view of the Mullard M.B. battery receiver.

This is another smart receiver which is being exhibited by McMichael. It is an A.C. superhet.

MILNES RADIO CO., LTD., Victoria Works, Bingley, Yorks. Stand No. 249.

As manufacturers of the ingenious H.T. supply unit, which, as our readers are aware, may be charged from a 6-volt accumulator, this item will prove the centre-piece of the stand. In addition, however, Messrs. Milnes will be exhibiting some new speakers, obtainable in cabinets or as chassis, together with a new receiver designed for battery operation from the H.T. supply unit. Special switching is fitted so that this unit may be put on charge as required, and such refinements as A.V.C., tone control, extra speaker switching, etc., are fitted. Although employing only 5 valves, there are 8 stages with 9 tuned circuits, so that the latest Marconiphone pick-up, selectivity is of a very high order, which is noted for its excellent response.

One of the new Mullard universal valves, which is fitted with a new type of base. This picture shows the neat internal arrangement of the Mullard M.B. 3 receiver.
In every class of valve—battery-operated, A.C., mains and "Universal"—the Mullard Wireless Service Co. offer types which are certain to have a pronounced influence on set design during the coming season, and to result in enhanced efficiency of reception.

Among the new battery valves will be found the new 6-volt H.F. pentodes, of variable- and ordinary- characteristic. In addition, a double-diode-tetrode will be seen, together with output pentodes and general-purpose valves such as the ever-popular P.M.2.B.A.-a Class B valve designed for operation with a small negative bias—will also attract attention.

In the mains class will be seen the new octode, double-diode-triode, separate double-diode, H.F. pentodes and output pentodes, together with their counterparts in the universal type of valve.

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An addition to the Mullard range will be the emission of a complete receiver, known as the M.B.R. This is a battery receiver employing three pentodes, and is completely self-contained.


TRANSFORMERS designed to permit of tone control will be seen here. In addition, a special tone control transformer for use in Q.P.P. circuits has been developed and will be on view. A Class B Driver transformer and output chokes, together with a Class B converter will be exhibited, and a new "Mullard" loudspeaker which has been adopted at the leading private school for deaf children will prove of interest.

NATIONAL ACCUMULATOR CO., LTD., 50, Grosvenor Gardens, S.W., Stand No. 225.


This firm specializes in the repair and servicing of receivers and components, and they will have a special display featuring the repairs which they are able to effect at attractive prices. Additionally, they will have on show a motor-boat radio kit.

NEW LONDON ELECTRON WORKS, LTD., East Ham, London. Stand No. 39.

Besides showing the lines which were sold last year, the New London Electron Works will have on view a new aerial which has recently been patented, and which is to be sold as the "Electron Globe Aerial." Details of this are not available at the time of going to press.

NEWNES, GEO., LTD., 8-11, Southampton Street, W.C.2. Stand No. 8.

The "Ossicaide" portable deaf-aid unit.

The units are extremely well made, being steel-constructed and fitted with automatic overload switches. A "Davenset" electric shop display sign will also be on view, as well as a number of metal Transformers and power chokes.

A new Philips Radiogram.

The new Plew disc-type television receiver, which has a built-in power amplifier.

The complete long-range television receiver, fitted with telegraphic adjustment. Figure re production from discs resembling gramophone records, combined with sound reproduction from the same disc, is also a feature of apparatus manufactured by this company, and a model will be seen on the stand.

This complete receiver is being provided and shown by Ore Radio.
For twelve years Formo leadership in the Component field has been a recognised fact. Details of the new 1935 Formo range will confirm that such leadership has been adequately maintained. Make a point of seeing the Formo Stand at Radiolympia. New ideas for the home constructor—new Components, practical and inexpensive, make it a Mecca of interest for every radio owner.

RADIOLYMPHIA
STAND 59 MAIN HALL

Stand 59 will show you exactly how far Formo Radio Components have advanced ahead of all others in design and purpose.

Formo Products, Ltd., Masons Hill, Bromley, KENT.
Telephone: Ravensbourne 2379.
Impedance Tuning
solves this problem

-what is the correct transformer ratio to give perfect reproduction?

R & A "MULTIMU" gives instantaneous matching with any valve or circuit

The R & A Multimu not only sets a higher standard of reproduction, but also instantly solves the "matching" problem.

The Multimu gives instantaneous matching with any valve or circuit without exception.

The 1935 range of R&A Permanent Magnet and Mains Energised Reproducers includes models from 21" to 55".

Unsurpassed reproduction and fidelity in each class.

It will pay you to hear the new R&A models before making a purchase.

Send us a postcard for full details.

OLYMPIA—STAND 53
REPRODUCERS & AMPLIFIERS, LTD.,
WOLVERHAMPTON

August 18th, 1934

"MULTIMU"
P.M.M.C. REPRODUCER

42/-
and thus enable listeners for a really low price to obtain a test instrument which will measure both D.C. and A.C. supplies.

The de luxe Rota-meter costs 6s., and is a most elaborate instrument incorporating nine separate test scales, each brought into use by the range switch.


This well-known firm of receiver manufacturers will this year have an even wider and more comprehensive range than heretofore. There are several new models, one of the most interesting of which is the "Cambridge" radiogramophone which is priced at 50 guineas for either A.C. or D.C. use. This price includes an automatic record changer, but either model can be obtained without the changing device, the prices then being 40 guineas and 35 guineas for A.C. and D.C. respectively. There is also an extremely attractive table model which is the "Cambridge" receiver, a two-valve receiver with a dual-range frequency meter with which has concealed tuning controls.

The price without switch is 3s. 6d., and with double-pole switch, 5s. A new line will take the form of carbon resistors retailing at 1s. per watt and some well-made wire-wound components with ratings up to 100 watts. Another useful packing for the service man is a set of replacement resistors in various sizes and ratings. There will also be a range of volume controls in all resistance ratings, with and without snap-action switches.

Pye receivers is the concealment of the controls, and A.V.C., tone control, and a "sound reflector" cabinet. A full-vision tuning scale is fitted and this Is clearly marked with station names. The price of the new set will this year have an even wider and more comprehensive range than heretofore. There are several new models, one of the most interesting of which is the "Cambridge" radiogramophone which is priced at 50 guineas for either A.C. or D.C. use. This price includes an automatic record changer, but either model can be obtained without the changing device, the prices then being 40 guineas and 35 guineas for A.C. and D.C. respectively.

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The cabinet work is outstanding for design and workmanship, and the quality and volume of the output have never been so high as this year. This useful and neat testing instrument is the Pifco "Rotameter." One of the new Regentone receivers.

Another excellent test meter which is made by Pifco; the "Rotameter." is priced at 50 guineas for either A.C. or D.C. use.

Radio Society of Great Britain.

August 18th, 1934
A RIST (1927) LTD., Waverton Works, Lovehithe, Stand No. 33.

The products exhibited on this stand, No. 233, include samples of all kinds of wire, flexible and conductors used for wireless, including heavy gage wire, copper, aluminum, crocodile wire, crocodile tape, speaker cords, telephone cords, aerial wire, connecting wire, screened tubing, screened flexible tubing, and also mains leads.


A full range of recorders will be shown, as well as a variety of receivers and components by all the well-known makers.

SMITH AND SON'S (111/A), LTD., Criffithwood Works, known makers.

TUBING, and also mains leads.

A. RITA (1927), LTD., Waveney Works, Lowestoft.

CONNECT LEAD-IN WIRE, BATTERY CORDS, CROCODILE CLIPS, FLEXIBLES AND CONDUCTORS USED FOR WIRELESS, INCLUDING A.

SWIFT LEVICK & SONS, LTD., Clarence Street, London, S.E.1. Stand No. 77.

Details have yet been received concerning the exhibits on this stand.

SINCLAIR SPEAKERS LTD., 13, Vale Royal, N.7. Stand 222.

SMITH AND TONS (W/ A), LTD., Cricklewood Works, Stand No. 47.

NO details have been received at the time of going to press, of the exhibits of this firm.

SOUNDCHERIES REPRODUCERS LTD., Rothwell Music, Canterbury Road, N.W.6. Stand No. 43.

THIRED main features of the display on this stand will consist of the well-known loud-speakers having been developed in the home market and exported from magnet systems. The range consists of the Midget, Junior, Standard, Senior, and Deluxe Models, and some special models designed for manufacturers' use will also be seen. The new piano-electric speakers, pick-up and microphones will also be shown.

SOUND SALES LTD., Tremwill Greve Works, Duncan Road, London, N.15. Stand No. 262.

THERE will be two interesting power amplifiers showing on this stand as well as a special double time base for 30-line and 120-line cathode-ray television. In addition to these items there will be a special battery charger for use with car batteries which are normally overloaded due to the extra drain imposed upon them by car-radio equipment.

The "Sound" moving-coil loud-speaker which proved so popular at last year's show will again be exhibited, in conjunction with an extensive range of mains transformers, chokes, and incandescent lamps. An entirely new line will be a range of paper condensers designed particularly for use in receivers. These will be available in capacities of from 1 mfd. to 8 mfd., and will be suitable for use in cabinets with self-contained loud-speaker units. A wide range of short-wave wave components will also be on view.


FOUR receivers will be seen on this stand, two four-valve universal mains super-amplifiers, and two five-valve receivers, one a universal mains set and the other a car-radio receiver. Shadow tuning is incorporated in one of these receivers and all circuits embody the latest devices such as A.V.C. etc. The car-radio receiver has a cable drive to the remote control, so that back-lash is avoided. The output is 3 watts and is a total consumption of less than 3 amps. from the car battery.

SUN ELECTRICAL LTD., 118 & 120, Stringer Cross Road, W.2. Stand No. 715.

THIS exhibit will consist mainly of items from various manufacturers' ranges and will prove of great interest to the dealer.

SWIFT LEVICK & SONS LTD., Clarence Steel Works, Sheffield, 4. Stand No. 318.

HE new 1934 intermediate-frequency transformer, exhibits a display of permanent magnets used by loud-

speaker manufacturers. The cross and link type permanent magnets for loud-speakers in chassis and cabinet sets will again be on view as these have proved to be most efficient and are still being used in large quantities for moving-coil loud-speakers.

The new nickel-aluminium steel will be employed in magnets of various attractive designs combined with a finish of nickel not previously obtained and will doubtless appeal to those who are in the market for the last word in loud-speaker magnets. The largest and smallest moving-coil speaker magnets in the world will also be exhibited.


IN addition to existing types of public address amplifiers and associated equipment, Messrs. Tanny will be exhibiting some new types comprising of portable loud amplifiers; mobile amplifiers, projection speakers, and a new radio-gramophone Amplifiers for any output from 6 to 120 watts will be seen, and some of the equipment will well repay inspection.


NO details have been received concerning the exhibits of this company.
THE NEW "J.B." UNIVERSAL LINACORE

This new J.B. Universal "Linacore" Tuner is suitable for use with either Battery or Mains valves. It has been designed to make possible the construction of really efficient receivers with the minimum possible complication and the maximum certainty of success. It simplifies set building considerably—and is far more efficient and compact than if home assembled. Complete with volume and reaction controls and all switching. Use this new Universal "Linacore" and get performance like a superhet!

J.B. "LINACORE" UNIVERSAL TUNER
(for use with Battery or Mains valves)
Model B.P.U. (Cat. No. 2129) 65/-

VIVID RADIO WITH THE LINACORE 3°

TO HELP YOU INCORPORATE THE "LINACORE" IN YOUR SET

We are offering you—for only 3d. (4d. Post Free)—a large broadsheet "Vivid Radio" containing three full-size blueprints and full wiring instructions for incorporating a "Linacore" in your set. Post the coupon today, and be sure of getting your broadsheet before they are out of print!

FILL IN COUPON AND POST TO-DAY

See the "LINACORE" at Stand No. 114, Radiolympia.

COUPON

To Jackson Brothers (London) Ltd.,
72 St. Thomas' Street, London, S.E.1.
Please send me "Vivid Radio." I enclose 4d. in stamps to cover postage, etc.

Name...
Address...

Practical Wireless
TELSEN ELECTRIC CO., LTD., Aston, Birmingham. Stand Nos. 75 and 101.

P. E. T. will be on exhibition, complete receivers. Telson will also exhibit a complete range of their signal receiving equipment for use in connection with their complete receivers. The complete receiver incorporates some novel features, and it is said that it will be displayed for the first time, including standard sizes suitable for four to five watt A.C. mains, and other equipments suitable for discharge current up to 25.5 ma. The No. 2 range, which is Flumax Standard Energy batteries, are suitable for discharge currents up to 6.5 ma, and in the super capacity type up to 12 to 20 ma.


MESSRS. VOIGT will be showing a protected unit which is intended to withstand the rough handling ineradicatable from many P.A. jobs. This unit is arranged so as to be shower-proof, and when the developments now taking place are complete it will be capable of withstanding output estimable at 4 x 10^7 ergs. They will also show a bent horn, the former component to be suitable for domestic use. The price of the bent horn without its case is £3 15s. 0d. The case of the unit will depend upon the style of finish selected. The excellent quality for which the unit is known is such that it will always be available to the consumer without objection from the manufacturer. Reflector type cased horns will also be shown.

WESTMORINGH BRACE AND SAXBY SIGNAL COMPANY, LTD., 62, York Road, King's Cross, London, N.1. Stand No. 84.

METAL, rectifiers in various types suitable for B.F. and H.F. and other purposes will form the bulk of the exhibits of this firm. Rectifiers suitable for H.F. mains units, 4 volts 2.5 and 4 volts 4 amps.

VARLET, 34, Farriag Farm, London, N.W.3. Stand No. 56.

Some starting new types of speaker known as the Stenorian will be seen on the W.B. stand and these will be of considerable interest. Possessing new magnet systems, these speakers have been made reproduction a much more realistic thing than it was before.

THOMSON, DIAMOND AND BUTCHER, 34, Farrington Road, E.C. Stand 112.

A range, known as Plumes Standard Energy batteries, will be on show, and range from the most simple type to the most elaborate. These include all the former with ball discharge indicating devices. The cost of the case will depend upon the style of finish selected. The excellent quality for which the unit is known is such that it will always be available to the consumer without objection from the manufacturer. Reflector type cased horns will also be shown.

UNIVERSAL ELECTRIC CO., LTD., Stoneham Road, Bradford. Stand No. 244.

IN addition to complete receivers, Messrs. Teisen will be exhibiting a complete range of their instruments for use in conjunction with the Universal valves that are used with such outstanding success in the "Practical Wireless" - "Loader Three." There will also be a range of new wave-sweep wave-vectors, all of which use "Moyset," as the insulating medium; this material is non-hygroscopic and has extremely good insulating properties. A new oscillator coil which has been designed for use in conjunction with the Universal valves, and which is priced at only 6s., will also be in evidence.
Good Orchestral Discs

Practically all the ordinary records of the latest "His Master's Voice" lists are of a light nature. Marek Weber and his Orchestra have made the most polished orchestral record that has been issued for many months with a selection of those entrancing airs from "Lilac Time" on H.M.V. C2673. This should be especially popular, for these tunes will be heard in the new film about the life of Schubert which is to be released shortly.

Two other orchestral records of note are "Kiss me again" and "Echoes from the Piazza," by the London Palladium Orchestra on H.M.V. B8198, and a selection of celebrated love songs arranged by Henry Hall, called Love Tales, by the New Mayfair Orchestra on H.M.V. C2674. The pieces by the Palladium Orchestra were popular items during the recent Crazy season at this well-known music-hall. The tender intimacy of "Speak to me of Love," the carefree phosphorating of "A Bachelor Guy," the passionate intensity of Grieg's "Ich liebe dich," the quiet fervor of "Drink to me only," the longing of "God send you back to me," and the wartime memories of "If you were the only Girl," are all admired in this selection.

Another medley is entitled "On the March," and is played by the premier English Military Band, that of H.M. Coldstream Guards, conducted by Lieut. J. C. Windram on H.M.V. B8187. It is interesting to compare this performance with the "Zampa Overture," played by the American Legion Official Band on H.M.V. C2680.

Stirring Songs by Peter Dawson

From stirring music we pass to stirring songs, where Peter Dawson can be heard singing "The Devout Lover" and "The Tramp's Song," on H.M.V. B8191. This popular Australian singer probably holds the record for having made the most gramophone recordings. He must be nearly approaching his thousandth title.

Two essentially English songs are "The Fiddler" and "Come to the Fair," which are admirably sung by Stuart Robertson on H.M.V. B8194, whilst lovers of organ music can recognize "Moonlight and Roses," which Walter Glyne sings with "The World is waiting for the sunrise" on H.M.V. B8195, amongst the many pieces of Lemare's organ piece "Andantino."

Paul Robeson seems to have been specializing about children during the last few months, and his admirers will learn with interest that he has now recorded "Little man you've had a busy day" on H.M.V. B8095, coupled with "I ain't lazy, I'm just dreamin'."

Jessie Matthews' memorable performance in "The Good Companions" has now been eclipsed by her work in "Evergreen," her latest picture. The story of the film (which is based on the play) centres on the daughter of an actress impersonating her mother, and goes back from the present day over a period of twenty-eight years. Miss Matthews plays the daughter, and, as is natural in so kaleidoscopic a role, she has a good many songs to sing. "Just By Your Example."

"Butterfly." "Butterfly" contains some great music, which runs with the gamut of every phase of conduct or emotion as the pitiful tale unfolds. The sublime, childlike faith of Butterfly in One Fine Day, gloriously sung by Rosa Pampamini, the Love Duet in Act 1—emotion lit with perfect music; the cruel disillusionment (E Questo?), despair in poignant melody—all unforgettable experiences for the hearer. There are, in fact, few operas whose music tells the tale so faithfully as this. Well, this is "Butterfly." You must decide if you are able to cope with a strange tongue, and whether tragedy may be sung to you or not. But perseverance is worth while in hearing this opera, it will penetrate the consciousness from the first moment.
B.B.C. Educational Talks

Since the autumn of 1924 the B.B.C. has set aside part of the evening programme for adult education, and during last winter some 1,100 discussion, groups met regularly to follow the series of talks, and they comprised, approximately, 13,200 listeners, although the number of listeners to broadcast talks is certainly infinitely larger. The growing public interest, as shown in the public demand for the printed programmes of talks (of which 200,000 copies are now distributed three times a year), implies that there exists a large audience which listens to talks individually and perhaps spasmodically. The results of such listening cannot be scientifically traced, but that they are considerable is shown periodicaly by the effect on public opinion of some of the more important series. Experience has shown that adult education talks should last for not less than twenty minutes or more than thirty minutes, and should be delivered between 19.30 and 21.00 (7.30 and 9 p.m.).

Good-bye, Poldhu

According to a recent report, Poldhu (MPD) is closing down. This station will always be remembered as the first one to span the Atlantic. In the old days, Poldhu meant a great deal to home-broadcaster seamen, and many wireless operators will remember the thrill of switching up to the long wave when within the two-thousand-miles radius on the off-chance of picking up a few dots and dashes of MPD’s note—the first sign of home, after months of absence in foreign waters. Poldhu, which did such good service in the early days, was eventually eclipsed by the big strides made in wireless development in recent years. Operators who used to listen regularly for its note began to miss it, and then learned that experimental work was the cause of its desertion of ships at sea.

New Broadcasting Station for Palestine

It is interesting to note that the Palestine authorities have decided to provide a broadcasting service for the Holy Land. Plans for the new service are already well advanced and a site for the broadcasting station has been selected about seven miles north of Jerusalem.

The work of constructing and installing the new station has been entrusted by the Palestine Department of Posts and Telegraphs to the Marconi Company, and work on the manufacture of the equipment has started at the Company’s Works at Chelmsford, Essex.

The power of the new station is 20 kilowatts unmodulated aerial energy, and broadcasting will take place on a wave-length of 449.1 metres. The transmitter is, however, adjustable from 200 to 545 metres, so that a change of wave-length can easily be effected should this be desired at a future date.

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Mr. Ralph Stranger, who is a master of lucidity, has produced in this book a valuable and fully explained synopsis of technical terms that everybody can understand. It will prove indispensable to everybody who reads technical books and journals. Fully illustrated throughout.

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By Ralph Stranger

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Do You Know What This Graph Means?

The man who can analyze these curves and understand what they indicate knows his job. But if they do not convey to him perfectly definite information, it would appear that he needs more training than he has had. He is not competent to fill a responsible position in wireless.

Radio has developed so rapidly throughout the last ten years that it has now greatly outgrown the supply of technically qualified men required for the better posts. Moreover, it continues to develop with such speed that only by knowing the basic principles can pace be kept with it.

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PRACTICAL WIRELESS

August 18th, 1934

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PRACTICAL WIRELESS

August 18th, 1934

IMPRESSIONS ON THE WAX

(Continued from page 643)

Brilliant Harp Recording

An unusual instrumental record is a harp medley of National airs played by Mario Lorenzi, coupled with Lincee's "Glow Worm Idyll." This record conveys very faithfully the fulness of tone or range of expression of which the harp is capable in the hands of a master.

Rain da Costa's rhythmic piano playing is as brilliant as ever in her arrangements of "Just by your example" and "Ridin' around in the rain" on H.M.V. B6216, whilst Derickson and Brown are heard singing "Lazin'" and "All I do is dream of you," on H.M.V. B8204 in their own inimitable style.

Ray Noble's New Dance Successes

Amongst the new dance records Ray Noble is again strong. He has recently been using a new arrangement for recording in the studios whereby he conducts his orchestra from a soundproof box and hears their performance through a loud-speaker at his side. He is thus able to determine exactly how the finished performance will sound and encourage the players. All the instruments of his orchestra are recorded in their proper perspective. On H.M.V. B6507 he conducts his band playing a medley of America's newest hits, "Moon Country" and a cheery onestep. "Happy," whilst on B6504 he treats two fox-trot. When you've got a little springtime" and "Over my shoulder," with polish and originality of style.

Eddie Duchin and his Orchestra, who are now causing such a furor in America, have recorded "Ill Wind" and "As long as I live," on H.M.V. B6501, whilst a new American band, Raymond Paige and his Orchestra, give a novel performance of the popular hit of the moment, "Love thy neighbour," coupled with Isham Jones's own hit, "Lazin'" and "All I do is dream of you," on H.M.V. B6505.

New Columbia Records

We are now able to hear film orchestras playing their hits on records in exactly the same way as they do for the screen performances. The R.K.O. Studio Orchestra play "Caroca Rumba," from the film "Flying Down to Rio" on H.M.V. B6506, with Rudy Vallee and His Connecticut Yankees version of "Sleepy Head" on the other side.

The hot rhythm record of the month is Hoagy Carmichael playing his own composition, "Lazy River," coupled with Henry Allen Jr. and His Orchestra giving an exhilarating performance of "Swing Out."

New Columbia Records

Albert Sandler and his Orchestra have provided in the August Columbia supplement "Maruschka," and "Cuban Serenade," two dreamy, wistful pieces of Continental origin. These records, with their melody and lilting rhythm, are certain of widespread appeal (DB1406).

Radiolympia Signature Tune

The theme tune of Radiolympia this year is "Tune In," and Henry Hall and the B.B.C. Dance Orchestra, who will play throughout the run of the exhibition, will be responsible for introducing it to the huge audiences that will throng the great radio show. As was to be expected, Mr. Hall and our national dance orchestra have recorded the signature tune on Columbia, with "Night on the Desert" on the reverse (CB760).

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Blue Spot Moving-Coil Chassis 45PM 5/- with order and 9 monthly payments of 5/-.

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All Carriage Paid.

To avoid delay, will customers kindly send first payment with order.

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PRACTICAL TELEVISION

SUPPLEMENT TO PRACTICAL WIRELESS

TELEVISION REVIEW

CHANGING FASHIONS

By H. J. Barton Chapple.

WE are all familiar with the changing fashions in radio both at the transmitting and receiving ends, but few have given thought to the radical differences in design in television transmitting equipment.

In Fig. 1 is shown the complicated and enormous transmitter used by Mr. Baird for some of his early attempts at scanning large scenes. On the left are the two discs having overlapping slots to produce the scanning effect as shown in a recent note in these columns. Coupled with this are the large metal wheels with radial arms terminating in lenses. With equipment of this character a very powerful driving motor was essential and this, coupled with the cumbersome nature of the machine, led to its final abandonment.

The next step was the straightforward apertured disc transmitter which ultimately took the form of a very simple disc machine of a portable type. This is shown in Fig. 2, and was developed for the first transmissions made from the old Savoy Hill headquarters of the B.B.C. some three years ago. The revolving disc, driving motor and arc lamp are supported on a small revolving turntable which in turn is secured to a three-legged stand with large wheels. In front of the circular case housing the disc is a sector-shaped arm holding two lenses. Either of these could be brought into use at will and were included to give a focused light spot scanning field for close-up or semi-extended images.

In the search for a more intense spot of light this machine was also abandoned in favour of the mirror-drum light spot transmitter, and the first design for this machine is illustrated in Fig. 3. The top cover is removed to show the mirror drum itself. Immediately below the drum is the arc light housing the resultant light beam passing along the tubular section, to be reflected back on to the drum mirrors, and finally reflected from these mirrors as an intense spot of light tracing out the scanning light strips. The tubular framework supports allowed the scanning beam to be moved to left or to right on a back runner. From the experience gained from this model the ingenious mirror-drum transmitter installed in the B.B.C. studio at No. 16 Portland Place was evolved. This machine is shown in Fig. 4, and it has been in constant use now for nearly two years, and, for the thirty line service, gives outstandingly good results.

Watching the Image

ONE of the recent morning transmissions by the B.B.C. Television Department included Signor Podrecca’s marionettes. As these figures move about within a relatively small compass it is possible to arrange the travelling light spot area to close-up dimensions, and the effects produced are really remarkable. Drama, melodrama, comedy, and ballet are performed by the puppets, the movements and actions being controlled by a veritable maze of strings.

Transmissions of this character have been a great favourite in the past, and in Fig. 4 is shown one of the original acts of the London Marionettes in progress. The photo-electric cells were fixed in a box above the aperture cut in the wall dividing the studio from the control room. This can be seen clearly and also the special scenery painted for television work, while the strings supporting the “performers” on the front of the stage are quite visible.

The “Televisor” employed by the B.B.C. for Press and public demonstration is a particularly interesting machine standing about 6ft. high. The image screen size is 14in. by 8in., while the screen itself

Fig. 1.—The large double-scanning transmitter used by Mr. Baird in some of his early efforts to scan big scenes.

Fig. 2.—One of the first forms of portable Baird television transmitter, which has now been superseded.

Fig. 3.—The first portable mirror-drum transmitter. This machine was the forerunner of that now used by the B.B.C. for its present television service.

Fig. 4.—Indicating how the first marionette shows were produced for television. The photo-electric cells are housed in the rectangular aperture box on the right.

August 18th, 1934
is made from thin frosted glass. This is shown in Fig. 5, together with the machine controls which are grouped round the screen for convenience of adjustment.

The question of automatic synchronizing by means of the picture signal does not arise, for since the mirror drum of the television transmitter is driven by a synchronous motor, then it is only necessary to employ a similar synchronous motor in the receiving "television" and feed this from the same mains supply. The two switches at the top of the left and right panels are the main on-off switch and motor start-run switch. Initially both these switches are snapped down, this feeding the mains supply to the independent running winding and furnishing a starting voltage of 300. When the motor pulls into its synchronous speed the right switch is moved up to give the running voltage of 110 volts, while the hood over the switch knob of the left-hand switch is released and springs back to its initial position.

For tuning-in the 261-metre transmission,

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NON-INDUCTIVE PAPER CONDENSERS • MICA CONDENSERS
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Test Match Broadcasts in Australia

Sir,—Now that the Test matches are on, I think it would be of interest to your many readers to know how the play is broadcast out here in Australia. The play starts at 8 p.m. (our time) and finishes at about 3.30 a.m. the next morning. The broadcast is carried out by cables which come here every three hours. In conjunction with the announcer is a gramophone record taken at some previous Test match. A wire is run from the gramophone on deck. The volume of this record which is being played all the time is increased when something startling happens such as a 4, 6, a catch, or a man going out. At first I thought the announcer was quite wild, but after a while I began to understand what he was getting at. In conclusion, I should be very pleased to correspond with someone in England if an enthusiast would please forward his address through the Editor.—Mr. J. H. Jones (Bendigo, Victoria, Australia).

Using Cheap Voltmeters

Sir,—The advice given in the July 28th issue of Practical Wireless on the use of cheap voltmeters is only too correct as I once found out for myself. About nine months ago I made a D.C. H.T. unit described in the Practical Wireless Encyclopedia. After connecting to the mains, I tested the readings with a cheap voltmeter, the 150-volt tap read 170 volts only, and the 80-volt tap just made a slight flicker on the needle. At first I thought the unit was at fault, but I found this was not so when I made a quick short circuit between the H.T.—and H.T.+ tap. Thinking the meter was broken, I put a "Fifo" meter on test, and a correct reading of 80 volt and 150 volt was obtained. I tested an H.T. battery with the cheap meter, and this read correctly. I at once came to the conclusion that the cheap meter was taking more milliamps than the H.T. unit would give out. I tested this voltmeter, in series, with a good milliammeter and found that it was taking not less than 30 millamps, in fact, the needle would hang up to 30 millamps; it might have gone more but for the fact that the meter was rated from 0 to 30 m.a. The moral, of course, is never use cheap meters on H.T. batteries, etc. —G. C. Surridge (Crawley).

Fury III" and Double-Diode-Triode

Sir,—Last year I suggested to you that "Fury III" should include a double-diode triode valve in the mixer, but you do not seem to have taken the matter any further. Perhaps the new Mullard is a suitable valve.

One often reads that the selectivity of the straight set cannot equal that of the superhet. I have not yet tried "Aerial into a Band Pass unit with 2-gang condenser. (Probably an extra preset would be necessary because of the aerial.) The 2 H.F. coils to be controled by a second 2-gang condenser. As, presumably, reaction would not be included, there can be no objection to two tuning controls.—H. M. Smith (Westward Ho).

"Hush Hush Mixture"

Sir,—I have got an Ecko transverse microphone, but there is a lot of background noise which pick up sound within a distance of two to three feet. The background noise is too loud. Do you think that "Hush Hush Mixture" does it? What changes make the silent background quality? (The above letter was recently received by one of our advertisers, Messrs. Electradix, Radios, a subsidiary of one of their customers.—Ed. )

S.W. Stations and Postal Addresses

Sir,—With reference to my article entitled as above, published in the July 28th issue, I notice that the address given for reports of the German transmissions is the old one, which was correct when the article was written. In order that Practical Wireless readers, especially new ones, will not be misled, it may be pointed out the new address was given on the Practical Letters page of the January 27th issue. It is as follows: German Short Wave Station, Broadcasting House, Berlin, Germany.—The Author.

CUT OUT THIS EACH WEEK.

To you know

—THAT some novel tuning devices will be seen at the show in which accurate tuning settings are obtainable.
—THAT the reason for the above devices is to be found in the employment of A.V.C. circuits and side-band cut-off resulting in poor quality.
—THAT some new types of speaker will be seen during the coming season and will considerably modify current ideas concerning reproduction.
—THAT in a new recording system for gramophone records the conductor of a band stands in a sound-proof cabinet and hears the band playing through the medium of phones.
—THAT the grid-bias battery must be disconnected in a receiver employing a variable stage, and the discharge itself through the control potentiometer.
—THAT the tuning coils employed with iron-cored coils must be of good quality or the benefit of the coil facilities will not be obtained.

The Editor will be pleased to consider articles of a practical character suitable for publication in Practical Wireless. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for any errors or omissions, every effort will be made to return them, if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, Practical Wireless, 36, Newgate Street, London, E.C.2. Owing to the rapid progress in the sale of wireless apparatus and the many new developments which daily present to our readers, we give no warranty that the details described in our columns will not be the subject of letters patent.

TELEVISION—A SUGGESTION

CHANCING to come across a recent copy of an Australian radio journal, it was most interesting to read an expression of opinion in regard to that country's outlook on television. After pointing out the difficulties that exist, the writer went on to say that many of those closely associated with actual television developments hold the view that the public to-day will only accept television when it is given to them in a form comparable with the standard of picture possessing an entertainment value similar to the moving and talking pictures of to-day. He also said large words, black and white pictures, etc., in the home is accomplished in a most satisfactory manner, the public would demand a similar standard from television. Without entirely disagreeing with this point of view, it is suggested that television will best be introduced to the public on lines similar to the manner in which radio and other industries have been developed. There is no doubt that the difficulties mean either direct or indirect for all developments and progress. Even motor-cars were not developed as a result of the work of one man or limited to the conditions of bad roads, solid tyres, faulty engines, badly designed bodies, and other innumerable difficulties; and so to-day we find the most difficult has been achieved and has gone a long way towards the public to-day, this is the development of television. Unlike radio, which is the old one, which was correct when the article was written. In order that Practical Wireless readers, especially new ones, will not be misled, it may be pointed out the new address was given on the Practical Letters page of the January 27th issue. It is as follows: German Short Wave Station, Broadcasting House, Berlin, Germany.—The Author.

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WHEN BUYING A RECEIVER LOOK AT THE VALVEHOldERS
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SPECIAL NOTE.

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we are unable to deal with the following types of queries:

1. Supply circuit diagrams of complete receivers.
2. Suggest alterations or modifications to circuits described in our contents.
3. Suggest alterations or modifications to commercial receivers.
4. Answer queries over the telephone.

Please note also that all sketches and drawings which are sent to us should be large enough to be printed.

Matching a Speaker

"I am using a Mullard PM.2B (with 150 volts on the plate) in conjunction with the M.C. speaker having a speech coil of 11 ohms. I wish to know the correct ratio of the transformer to use. I remember seeing an article on this subject, but cannot trace it."—E. A. P. (Catford, S.E.6).

The formula for ascertaining the correct transformer ratio is

\[
\text{Ratio} = \sqrt{\frac{\text{Optimum Load of Valve}}{\text{Impedance of Speaker}}}.
\]

The optimum load of the valve you are using is 14,000 ohms, and the impedance of the speaker coil is 11 ohms. The supply will not work at this ratio, which you give is the D.C. resistance of the speech coil, and not its impedance, you should multiply that figure by 11. That is to say, the impedance of an 11-ohm speech coil may be taken as 137.75 ohms. The ratio of the transformer will be found to be about 4 to 1, being the nearest commercial value obtainable.

Short-Wave Circuit Wanted

"I am on the lookout for a two or three valve short-wave circuit. It must be cheap and fairly simple to construct. Have you published anything which would be suitable for me?"—D. R. H. (Streatham).

The Empire Short-Wave Three might prove of use to you for the All-Wave Two. The former utilized a detector and two L.F. stages, together with a special type of short-wave coil made up by Radio Instruments. The latter employed iron-coated coils to cover short, medium and long waves. Blue Print No. 7 is obtainable in respect of the Empire Short-Wave Three and No. 28 in respect of the All-Wave Two.

A Microphonic Valve

"I have a valve which has been used in many circuits and it makes an unpleasant microphonic howl. This is very annoying when trying to tune in a station and someone walks across the floor. I have tried wrapping it in cotton wool, and also using various types of spring valveholder. Can you help me? I am also interested to know what makes it microphonic."—T. G. (Stoke Newington).

The noise is caused by the vibration of the electrodes and, therefore, you must arrange to prevent these from being set in vibration. A sprung valveholder will prevent jolts from being transmitted to the valve, but you will also find it necessary to cover the glass and preferably damp the glass by using lamps of plasticine or similar material under the wrapping. A tin or other type of cover over the valve, with some felt or other thick material round the valve so as to fit the cover, should prove effective.

A Ford Coil Query

"I am interested in the A.C. rectifier hint which you recently published, but am in doubt regarding one point. Your Ford coil seems to be the same as mine, opening with a sliding panel to the right. I have opened my coil and taken as much pitch as possible away, but I cannot find the primary to the second negative—only the leads to the condenser. Could you please help me in any way?"—W. A. C. (York).

The two leads in question will be found attached to the brass contact stud on the side of the case.

Finding the Capacity

"Will you kindly explain to me how to find the value in mfd. of any variable or reaction condenser when they are not marked?"—D. D. (Weston-super-Mare).

The capacity depends upon the dielectric, the area of overlap of the plates and the thickness of the dielectric. You will find it rather difficult to calculate these factors from most condensers and, therefore, think the most satisfactory thing to do would be to take the particular components to a local dealer and have them compared with similar items.

Fuse Position

"I have had an argument concerning the position of a fuse in a simple battery receiver. Can you please state definitely the correct position for the fuse so as to prevent the valves burning out?"—T. H. (Pinner).

If you examine a standard circuit, you will see that H.T. and L.T.—are joined together and to earth, and thus one side of the H.T. battery is already joined to the filaments. Consequently, you must arrange matters so that should the positive H.T. lead be joined to the filaments the entire H.T. Supply would be thrown across this part of the circuit and, therefore, the most obvious position for the fuse is in the H.T. negative lead. Use a fuseholder with two terminals, connecting one terminal to H.T.—and the other to L.T.—and to the filaments.

OSTAR-CANZ

UNIVERSAL HIGH VOLTAGE MAINS VALVES (MADE IN VIENNA)

are the only Universal Valves that can be wired in Parallel, Series, or Series/Parallel, and are therefore suitable for use in any type of circuit. They are available in all sizes up to 2500 watts. Write for full details of the range.

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Day in day out, year in year out, the lighthouse carries on with unfaltering reliability ... guiding and safeguarding the ships that pass. And though their jobs are so vastly different, a condenser has perhaps one thing in common with a lighthouse ... the need for absolute reliability. That is why so many set-builders are turning to T.M.C.-HYDRA condensers. By doing so they know not only that the condensers will be accurate to start with, but also that they will stay accurate in use. Equip your next set with T.M.C.-HYDRA condensers.

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"His Master's Voice" radio sets range from £7.10.6 upwards. They stand in a class apart! An illustrated list giving full particulars of all the outstanding features is obtainable free from any "His Master's Voice" dealer.
Military Band Concert from Portrush

A MilitarY Band concert is to be relayed from the Promenade, Portrush, on August 23rd. These concerts are a feature of the season in Portrush, but this is the first to be broadcast this year. The band, which will be conducted by Mr. George Dean (late bandmaster 1st Norfolk Regiment), will be the Bellist Military Band.

Craigantlet Hill Climb

A nother of the annual sporting events in Northern Ireland about which listeners like to hear is the Craigantlet Hill Climb, which takes place this year on August 29th. An eye-witness account will be given early on that evening by Peter Holmes.

Talk on Caravanning

A Midland Regional talk on caravanning will be broadcast by Major Vernon Brookes, who is well known to listeners as the commentator on the T.T. Races and Shelsley Walsh hill-climb. Major Brookes, whose talk is to be given on August 30th, is hon-secretary of the Caravan Section of the Camping Club. Recently he organized a record meet in Warwick Castle Park, where there were fifty-two caravans.

Southport Flower Show

His of Agriculture, will broadcast an eye-witness account of the Southport Flower Show for North Regional listeners on August 22nd. This show is one of the most important events of its kind in the country.

"Ship Ahoy"

Th is is the title of a programme which West Regional listeners will hear on August 23rd. One hundred and seventy Merchant Navy captains have been traced as residing in the county of Caernarvon, and the programme is a relay of the proceedings at their reunion in the Assembly Rooms, Pwllheli. Stirring encounters will be recalled by those whose own experience enables them to appreciate the reminiscences, and several popular sea shanties will be sung.

Oriental Night

Th is is the title of a special feature of the West Country Club on August 28th. It is described as a gala evening in honour of a visit by an Oriental potentate.

Sheep Dog Trials Broadcast

The National Sheep Dog Trials are being held on September 1st at Denton Park, Ilkley, Yorkshire, for the second year in succession. George Aitcheson (who recently described the Rydal Trials) will broadcast a running commentary for North Regional listeners.

Variety from Scottish Regional

Another excerpt from Harry Kemp's Summer Show will be relayed to Scottish Regional listeners from the Barrfields Pavilion, Largs, on August 31st. The artists will be: George West, Jack E. Haymond, The Jee Boys, The Clayton Sisters, Gladys Watson, Harry Carmichael and his Band.

A Caruso Concert from Blackpool

Enrico Caruso's concert at the Winter Gardens, Blackpool, in the summer of 1909 is being reconstructed by G. H. Dayne, and will form the theme of a special North Regional programme to be broadcast on August 29th—exactly twenty-five years after the original concert took place. Caruso's voice will be heard again by means of gramophone records, and the scene will be described in a running commentary, attention being drawn, for instance, to the presence in the audience of Mr. Eugene Sandow and Mr. George Robey.

Second "Schemes" Talk

Th e second of the "Schemes" to be represented in the North Regional talks series of that name is Mr. Walton Maughan's project for a Tyne-Solway Canal. Mr. Maughan, who will outline this scheme on August 24th, is an engineer now resident at Holmfirth, Yorkshire. His canal would link up two of Britain's largest coalfields, and would be wide enough to accommodate battleships; it would, moreover, provide the Air Force with an excellent base. Traversing a high "catchment" area in a district of heavy rainfall, the canal could tap a great source of hydraulic power for the operation of the great vertical-lift locks which would be necessary.

Oboe Recital from Midland Regional

Lucy Vincent, who will give a recital for Midland Regional listeners with Arthur Roberts (piano) on August 28th, was the first woman wind-instrument player in the country to be engaged with a symphony orchestra. She will play Handel's oboe concerto in C minor; three pieces by Sir Hamilton Harty, and, on the cor anglais, 'an Irish air,' "The Bard's Legacy."

A Tennyson Song-cycle

Tennyson's "Maud," like his "Locksley Hall" had a Lincolnshire scene, so a broadcast of the song-cycle composed by Arthur Somervell to its words has a Regional appeal. Arthur Crummer (baritone) is the vocalist who will be heard in this song-cycle on August 29th. Somervell's setting of "A Shropshire Lad" was recently given from Birmingham.
PRACTICAL WIRELESS  
August 25th, 1934

ROUND the WORLD of WIRELESS (Continued)

Interesting and Topical Paragraphs

Scottish Band Concerts

IN a 'concert' to be given by the Scottish Studio Orchestra, directed by Guy Daines, on August 29th, Alexander Fortune (tenor) will sing a number of popular Scottish songs. The concert will be followed by a gramophone programme entitled "Holiday on Record." This will include past and present holiday tunes. The programme has been arranged by Gordon Gilliard, dramatic producer to the B.B.C. in Scotland, and the items will be introduced by Pearl Elliott and R. F. Pearson.

Another Scottish Regional band concert will be broadcast on August 29th. The Bonnybridge and District Prize Band will be conducted by Gregor J. Grant. They will play an overture, "Raymond," an excerpt from "Tannhauser," and a selection entitled "Sweethearts of Yesterday."

Droitwich Spa Orchestra

IN the sixth of the Sunday evening concerts by the Droitwich Spa Orchestra, the violinist will be Eda Kersey. On August 26th she is to play, with orchestral accompaniment, Max Bruch's concerto in C minor, and, as a solo, "Bad Sheh," in which Ernest Bloch gives pictures of Jewish life.

Road to Ireland

FILSON YOUNG'S "Road to Ireland" programme will be broadcast on September 3rd in the National programme. This is in commemoration of Thomas Telford, the famous Scottish roadmaker, who died on September 2nd, 1834. The programme is described as "a romantic journey of yesterday and to-day from London to Holyhead." The characters to be heard are a romantic traveller, a Welsh patriot, a railway port er, a seaman, etc. There will also be the ghosts of Thomas Telford, of Telford's "Funeral March of a Marionette" and Mr. Bridson has written "A Motor Ride," "A Motor Ride to the Roosters, the famous war-time all male concert party, from the Victoria Pavilion, Ilfracombe. There were many War-time concert parties, and the Roosters was one of the few to survive. The party sprang from a scratch group shown in the Balkans early in 1917, the personnel being attached to the 60th Division, which was afterwards moved to Palestine.

A Broadcast About Hop Pickers

A CHEERFUL radio picture of hopping and the hopping season is to be embodied in a programme entitled "Opping 'OIday," which Laurence Gilliam and Pat Forrest are preparing for listeners on September 15th. Laurence Gilliam is a B.B.C. producer; Pat Forrest has had a varied career as miner, tramp, farmhand, newspaper reporter, editor, and advertising man. The programme which Gilliam will produce is in four phases. The first will be a shot of hop pickers leaving London Bridge Station at five o'clock in the morning on the "Hop-pickers' Special." The London Bridge Station sound portion will be followed by a short talk, to be given by an authority on the subject, contrasting hopping of fifty years ago with that of to-day. The third phase will consist of a series of such things as the hiring of hop-pickers, allocation to various living huts, interview with a farm manager, and a description of hopping in progress. The whole of this will be done by an actual relay from a hop farm.

"The Sincerest Form"

NINE London radio stars, including Stanley Holloway, Mabel Constan- duros, and Mrs. Feather, will be imitated by Midland contemporaries in a programme on August 27th. The title is "The Sincerest Form." Harold Pollard and Gerald Martin; Alma Vane; Alex Penney and Bruce McRae; while Jack Wilson and Jack Hill will represent Harry Pepper and Doris Arnold at the piano. Martyn Webster, the Regional producer, has worked in London, with eight of the nine stars to be imitated.

"Twelfth Night" - the drinking scene, and that between Viola and the Duke, which precedes it. A Gardiner Davies is the producer.

Shakespeare Plays from Midland Regional

DURING the evening of August 30th a Midland Regional relay of the Coventry Repertory Company's performance of three scenes from Shakespeare will be broadcast. This will also be heard by Empire listeners. The scenes chosen are the Balcony Scene from "Romeo and Juliet," and two scenes from "Twelfth Night." - the drinking scene, and that between Viola and the Duke, which precedes it. A Gardiner Davies is the producer.

Problem No. 101

Jackson found that his receiver was not working with a new three valve set was spoiled on account of interference from a nearby power station. Accordingly he decided that it would be necessary to screen his receiver. He secondly lined the cabinet with aluminium foil and earthed this, but as the noise still persisted he substituted he used a screened earth and aerial lead, with the screening earthed. The noise was substantially reduced, but in an endeavour to further eliminate the trouble he removed the actual aerial with the screened wire and connected the screening to earth. He found then that he received no interference and no signals. Even with the aerial cut to the limit the local station was微信号. Why? These books will be awarded for the first three correct solutions opened. Address your entries to The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. One reader should be received not later than the first post Monday, August 27th, 1934, and the envelopes must be marked "Problem No. 101."
ADJUSTING AND OPERATING
THE "SUMMIT"

This Week the Method of Obtaining the Optimum Performance from this Extremely Successful Receiver is Fully and Clearly Explained

SINCE reading the constructional article last week many readers will no doubt have commenced the construction of this most efficient battery-operated receiver. It is unlikely that any difficulties will have been encountered due to the fact that the work entailed is of a particularly simple nature. There is just one point which was not stressed last week, and which should clearly be borne in mind, which is that the spindle and, hence, the mounting bush of the reaction condenser must be insulated from the metal-chassis. This does not present any difficulty, nor does it entail the use of special insulating washers, since it is only necessary to secure away a little of the metallic surface from the three-ply front member of the chassis immediately round the mounting hole. This can be done quite easily by using the blade of a pocket knife or try means of a strip of glass-paper. Another, and rather neater, method is to remove the surface before drilling the hole; this is done by means of a centre-bit held in the brace.

Setting the Trimmer

There are very few preliminary adjustments to be made, chiefly because of the fact that the tuning condenser is provided with an external slider, but it is best to set the star wheel of the other trimmer to about its midway position. When this has been carried out it should be found that the external trimmer is somewhere near its midway setting when any station is tuned in. If this state does not present any difficulty, nor does it entail the use of special insulating washers, since it is only necessary to secure away a little of the metallic surface from the three-ply front member of the chassis immediately round the mounting hole. This can be done quite easily by using the blade of a pocket knife or try means of a strip of glass-paper. Another, and rather neater, method is to remove the surface before drilling the hole; this is done by means of a centre-bit held in the brace.

The finished receiver on the next pedestal which is made especially to accommodate the "Summit" cabinet.

The grid-bias battery fits into the clip provided on top of the chassis, and the G.B. plug should be inserted into the + socket, whilst the G.B. plug is inserted into the 9-volt socket. The best position for the G.B. wander plug depends upon the actual voltage of the H.T. battery, but assuming this to be of the voltage recommended, the plug should be placed in the 41- or 6-volt socket; if the battery is of only about 100 volts, however, this plug should be given a voltage of 100 to 120, according to the exact battery employed. In any case, the higher voltage is to be preferred on the score of optimum performance.

Grid Bias Voltages

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No doubt have commenced the construction of this most efficient battery-operated receiver. It is unlikely that any difficulties will have been encountered due to the fact that the work entailed is of a particularly simple nature. There is just one point which was not stressed last week, and which should clearly be borne in mind, which is that the spindle and, hence, the mounting bush of the reaction condenser must be insulated from the metal-chassis. This does not present any difficulty, nor does it entail the use of special insulating washers, since it is only necessary to secure away a little of the metallic surface from the three-ply front member of the chassis immediately round the mounting hole. This can be done quite easily by using the blade of a pocket knife or try means of a strip of glass-paper. Another, and rather neater, method is to remove the surface before drilling the hole; this is done by means of a centre-bit held in the brace.

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The finished receiver on the next pedestal which is made especially to accommodate the "Summit" cabinet.
In this Article the Author Describes Several Improvements that Can Easily be Made to the Battery Receiver. By J. EVANS

It is often argued nowadays that home construction of receivers is not worth while, as commercial sets can be obtained so cheaply. The great advantage derived from home construction does not lie in the initial saving, however, but in the fact that the circuit arrangement of the receiver is known to the owner, thereby enabling him to effect modifications with confidence when more efficient valves and components are placed on the market. This is not the case where the valves in use are quite suitable.

modern improvements that can be easily effected in the latter type of receiver.

Combined Radio-Gram Volume Control

When an eliminator without a variable S.G. screen voltage control, or 60-volt wet H.T. batteries are used, it is advantageous to fit a variable control in order that optimum amplification may be obtained from the H.F. valve. It is common practice to fit a potentiometer across H.T.+ and Grid terminals, with the S.G. screening grid terminal connected to the centre tap, but this potentiometer has the disadvantage of consuming approximately 1 to 2 ma. when the set is in operation. A series resistance, on the other hand, is not very reliable for dropping the voltage to the required value owing to the very low current taken by the screening grid. In Fig. 1 a control is shown which effectivley controls the S.G. screen voltage and an anode feed for the detector valve, but in conjunction with the 2 ma. condenser it also effectively decouples the detector anode circuit, and therefore helps to stabilize the receiver.

Fitting a Diode Detector

It is a well-known fact that the ordinary leaky grid detector valve introduces a certain amount of distortion, because it acts as a rectifier and as an amplifier, and, owing to the fact that for effective rectification the valve has to be worked on the bend of its curve, undistorted amplification cannot be obtained. In the interests of quality reproduction it is therefore advisable to use a rectifier that will not amplify; the modern Westinghouse WX Westector fulfills this purpose admirably. The ordinary triode detector valve may then be used to

Variable Bias Coupling for the Output Valve

When a dry battery is used for supplying H.T. voltage, H.T. current economy is of paramount importance. Several economical stages have been designed recently (Class B, Q.F.P., single economized pentode), but although these give very good results when the H.T. battery is supplying maximum voltage, a definite deterioration of quality is experienced as the battery runs down, and therefore frequent battery renewals are necessary.

To the average listener, the variable bias circuit shown in Fig. 4 is much more suitable. R1 is a variable potentiometer of 50,000 ohms, R2 a fixed resistance of the same value, and the bias battery should have a voltage of approximately double that required by the output valve. When the arm of the potentiometer is at maximum setting, a bias of half the G.B. voltage will be applied to the valve i.e., normal bias for maximum undistorted output, but as the potentiometer arm is moved towards zero setting, the bias voltage is gradually increased, and the output valve current consumption is consequentially reduced. It will be advisable to use a three-point on-off switch with this control, having the third contact connected to G.B., in order that the bias circuit may be broken when the set is not in use.

This control will be found a very useful addition to any battery operated receiver, as a power periodic valve (e.g., Pen. 230A, PM 22, Z 220) may then be used. When good reproduction of a symphony orchestra, piano recital, or organ recital is desired, however, the control may be set at maximum in order that maximum undistorted output may be obtained from the valve.
An examination of the exhibits at Olympia reveals the fact that there are certain components or pieces of apparatus which possess what might be termed "novelty" and which are undoubtedly attracting the attention of visitors. These novelties may be divided into groups, and some further details are given below concerning them.

**Tuning Dials**

The tuning dial has undergone remarkable changes during the past few months. It is now the exception, rather than the rule, to find on a commercial receiver a small hole behind which rotates an ivory scale bearing some arbitrary figures. Station-named dials are fitted to practically every receiver, and to simplify tuning the dial is now of the full-vision type, in either a straight, arcuate, or square pattern. The latter is now seen on three or four manufacturers' products, and the station names are arranged in a circle after the manner of the hour markings on a clock. For indicating purposes, two pointers are provided, and as the tuning control is operated these pointers travel round the "clock face" and indicate the setting. In addition to the easy visibility of this type of dial there is also the added advantage that no doubt exists in the mind of the user concerning which wave range control is adjusted, but separate scales, brought into action by the wave-change switch, coloured names illuminated by appropriate coloured lamps, and separate scales and pointers are found on this year's commercial receivers.

In addition to the above-mentioned indications some novel means of showing the exact tuning point in receivers fitted with A.V.C. are seen. The H.M.V., Columbia, and Marconiphone receivers utilize a device which gives the effect of a column of light rising and falling in a short tube. The Telson's "Pointograph" dial is designed with a pointer which indicates the wavelength setting of the tuning control as well as one which, as resonance is reached, gives an indication as a separate scale. Tuning is carried out for the horizontal position of the pointer. Other devices include rays of light or shadows which vary in width with the tuning adjustment, and all enable the volume control to be set to a silent point whilst a station is accurately tuned-in, and then the volume may be brought up to the desired level, thus avoiding all the noises of inter-station tuning, etc. The home-constructor may, of course, fit a device of this nature to his receiver by purchasing the new Cossor Neon Indicator.

**Loud-speakers**

The majority of loud-speakers this year possess the special tapped transformer arranged so that practically any ratio may easily be obtained and thus accurately match the output valve. At last year's exhibition Messrs. Whiteley Electrical introduced this arrangement in their Micro-lode, and now various modifications of the scheme may be seen. In some models a row of sockets is provided, and by choosing any pair it is possible to obtain any ratio. In others switches are provided for the purpose of selecting the desired tapping. Better quality and greater volume is, of course, obtainable when the speaker is exactly matched to the output valve, so that this improvement in speaker design is greatly to be appreciated. Modifications in magnet design are also to be seen this year, the Blue Spot utilizing a novel form of "bolted-up" magnet in place of the more commonplace "Claw" arrangement, and the W/B speaker, although very little different in appearance, embodies a new alloy which gives greatly increased field strength and consequently increased volume and better quality, owing to the ability to modify the cone and speech coil proportions. The speaker designed especially for use with a receiver which has a built-in reproducer is also becoming popular, and is provided with a special transformer, so that it may be included in circuit without affecting the quality of response of the built-in speaker. It will be appreciated that this is a vital point,
TUNING-CIRCUIT

CHANGES

The Improvements and Modifications which Have Been Made in Connection with Tuning Coils and Variable Condensers are Described in this Interesting Article. By FRANK PRESTON

At least a year ago a number of serious attempts had been made to perfect a system of tuning which is quite different from that which has been employed continuously ever since wireless receivers were first made. The old, and still universal, method of tuning by means of a coil and condenser is known to possess a number of undesirable features, the most important of which is its varying sensitivity and selectivity over even a narrow band of frequencies.

What of Permeability ?

When iron-core coils were perfected (if one may use such a word in connection with radio) it appeared only a short step to the introduction of permeability tuning. In fact, more than one so-called permeability tuner was placed on the market, but its début proved to be premature; this form of tuning had by no means reached a truly practical stage, but there is now, at last, an efficient, ganged permeability tuner available, it is made by Varley. As is by now fairly well known, the idea of permeability tuning is that the natural frequency (wavelength to which it will tune) of a coil is varied by moving a core of ferrous material nearer to, or farther away from, the turns of wire. It was not difficult to obtain a suitable wavelength variation in this way, and the principal obstacle appeared when it was attempted to make the tuner follow some definite "law." That is, it was not found by any means an easy matter to so arrange the core and its operating mechanism that an even separation of wavelengths or frequencies could be obtained. Thus, it was found that, at certain parts of the tuning range, several stations were crowded together, while at other parts they were separated by undue amounts.

Iron-Core Popularity

It is only about a year ago that iron-core coils became really popular, and at that time it was considered by many that in a very few months they would entirely ousted the ordinary type of air-core inductance. This opinion was, in fact, very freely expressed, but it is of interest to note that the forecast has by no means been fulfilled. There have been numerous factors which have acted against the iron-core coil, one of which has been that this kind of tuner has been produced in large quantities by several small firms who were without the necessary experience to produce a really satisfactory article, and because many such firms have been so unscrupulous as to use a core material vastly different from that which the inventor of ferrous cores looked so much trouble and time to produce. Instances have actually come to our notice of so-called iron-core coils which had nothing better than a block of hard wax for their core! Happily, such deception has been practised by only a very few "back-street" manufacturers, and the purchaser who has been "bitten" can only blame himself for not dealing with a well-known and reputable firm.

The Effect of the Superhet.

There is another, perhaps more important, reason why iron-core coils have not been used in such large numbers as was anticipated; this is because superheterodyne receivers have rapidly increased in popularity. The inference might not seem quite clear, but, as has been mentioned in PRACTICAL WIRELESS, the inherent selectivity of the superhet is extremely high, and therefore the advantages of ferrous-coiled cores in this direction are not nearly so marked. In this respect it is significant to remark that the majority of receiver manufacturers employ ordinary air-core inductances in their superhets, with praiseworthy results. It should not be gathered from the above remarks that iron-core coils are dead, for that is by no means the case; it is probable that they will become even more popular, especially as they are gradually being reduced in price.

Reductions in Size

Even if they had done nothing else, iron-core coils have proved extremely valuable in pointing the way in the reduction in size. They proved it that a coil could be made which were only a fraction of the size of those which had previously been employed, and this set designers thinking, with a result that even air-core coils have since been made considerably smaller. It is a fact that many of the air-core coils now available are very little larger than several of the earlier ones having iron cores. The efficiency of the newer coils also improved, as variable designers into improving the performance of air-core coils, so that to-day these have reached a high degree of efficiency.

A Coil That is Wanted

There have been few entirely new types of coils, because these have not been found necessary. Slight modifications have been made in some instances so as to make the coils suitable for use with the special superhet system of frequency-changing valves, such as the pentagrid, hexode, octode, etc., but it has not been found necessary to make any major alteration. There are, however, one new type of coil which the constructor would like to see. Reference is made to an oscillator coil for use in conjunction with a battery-operated pentagrid frequency-changer; a coil of this nature is used by one manufacturer of commercial receivers, but nothing of the kind intended for the home constructor has been brought to our notice.

Condenser Improvements

There have been no revolutionary changes in variable condensers, but some of the minor modifications are worthy of note. For example, condensers have been vastly improved mechanically, with a result that they are now more rigid and their trimmers provide a more uniform variation over the movement of the adjusting device. Additionally, the present-day variable condenser is considerably smaller than its prototype of a year ago; the reduction in size, however, is accompanied by improvements in accessibility and durability.

Although not being an integral part of the condenser, the tuning dial might be referred to as having been enormously improved. Larger scales with more "open" markings are notable, and full-vision scales (on which the full range can always be seen) have become almost standardized.

In looking to the future, it is to be hoped that it will help wondering whether or not the variable condenser will become obsolete. A year ago its doom was predicted when permeability tuning was moled, and quite recently a form of tuning has been experimented with in which the variable condenser is replaced by a variable resistance. Although the idea, it is stated outside the laboratory, is claimed that it gives almost uniform response over any complete tuning range. We shall see!
A Novel Tone Compensator for a Pick-up

It is well known that the amplitude of the bass notes on a gramophone record below 250 c.p.s. are attenuated for recording purposes, and to get true reproduction a compensation circuit of some sort is necessary. Here is a description of a novel circuit I have evolved for use with my pick-up. The values may vary for different pick-ups. It consists of a 20-henry choke, centre-tapped, a 20,000-ohm variable resistance, and a .1 mfd, condenser in series across the pick-up terminals, one half of the choke being short-circuited with a 500-ohm resistance. This is the novel part of the circuit, as without this resistance no compensation takes place. Varying the resistance varies the amount of compensation—minimum resistance, maximum bass notes. Actually this circuit absorbs the choking effect on the lower register, but as most pick-ups are not worked flat, this does not matter, and can be allowed for by advancing the volume-control.—R. V. Parsons (Longleavens).

A Trimming Dodge

WHEN modernizing an old set with twin-ganged condensers I was in difficulties as trimmers were unknown when the set was originally constructed. The following dodge, however, answers the purpose very well. A piece of copper foil (1/ins. by 4ins.) was wrapped with gummed paper (1/ins. by 1ins.) to within 1/16 of one end and just overlapping at the other. Round this was bent another piece of copper foil (1/ins. by 1ins.) pressed together so that the wrapped piece slid inside. A piece of 18 S.W.G. wire is soldered to the outer foil, and a piece of flex to the slider. The pieces of 18 gauge wire are soldered to the earth side of the condenser, and the flex is enclosed with the strap of gummed paper. The earth side of the condenser must be accessible, and the flexible piece simply wrapped round the foil and secured to the condenser with gummed paper. The condenser is then fixed between the two pieces of foil with further gummed paper, and any splices are made with flexible or surgical adhesive paper. The value of resistance varies for different condensers and may be calculated from the formula

$$R = \frac{20}{C}$$

where R is the resistance to be used, C is the capacitance of the condenser in micromicrofarads, and 20 is the number of henries of the choke. A trimmer is thus evolved which will suit almost any condenser.-R. V. Parsons (Longleavens).

Method of protecting aerial pulleys from rust.

A Novel Multi-pole Switch

THIS multi-pole switch converts the usual panel-controlled push-pull action into a lateral movement by means of two cams secured to the main operating shaft. The fixed contacts are arranged (to suit the actual circuit conditions) upon two solid blocks secured directly to the baseboard, whilst the moving (or operating) contacts are suitably arranged upon another block which slides between the two fixed blocks. The moving block is drilled to allow free lateral movement along two guide rods, as shown in the sketch, and four vertical pins, bearing upon the cams on the shaft, are fixed firmly into the block, thus causing the advancing or receding shaft to move the switching contacts from side to side. Two points of importance must be noted—stops must be provided to prevent overriding the cams, and the slope upon the cams must not be excessive; this should not exceed 30 degrees.—Wm. A. Harrebin (Aintree).
**SUPERHET IMPROVEMENTS**

How This Circuit has Developed During the Past Year.

By W. J. DELANEY.

During the past year the superhet receiver has made enormous strides, and is now probably one of the most popular of circuits. That this is definitely so may be ascertained by examining the complete receivers which will appear at the Exhibition this year. The majority of these are undoubtedly superhets, and the number of valves employed has now dropped to three or four, whilst still maintaining sensitivity. A feature is the introduction of new and improved transformers which are used for the frequency-changer.

In the original type of superhet it was necessary to use an H.F. valve for providing selectivity (by the addition of a tuned circuit), following this by the first detector-oscillator valve, and at a later stage by a second valve. To-day the pentagrid, the heptode, and the octode combine in one bulb the functions of the first detector and oscillator with greatly increased efficiency, and the higher magnification of this type of valve also enables the signal H.E. stage to be discarded with ease. In addition to this, the stability of this stage is greatly improved owing to the additional grids which are included in the valve, and although, theoretically, the superhet should need only the very minimum of decoupling (owing to the fact that each stage operates at a different frequency), no decoupling is really required when the modern assembly is employed.

**The Intermediate Frequency**

Probably one of the greatest drawbacks of the superhet receiver, as it appeared on our market a year ago, was the whistles which arose from what is known as second-channel interference. In addition to this, the tremendous amplification which has been employed (owing to the large number of valves which were used) led to annoying background noise, valve hiss, and similar faults, which in many cases proved louder than the actual signal which was being received. Obviously, therefore, a reduction in the number of valves will result in a reduction of these stray noises, and give improved quality. The question of the intermediate frequency has received careful attention, and although last year the English manufacturer used a different frequency from that employed in American receivers (due to the fact that we need to tune in to the long-wave band), a still further modification has now been made by some manufacturers with the result that the second channel whistle has been removed. This has in its turn led to the removal of the necessity of using a band-pass tuning circuit in the first stage, and a simple circuit tuner may now be used without the losses usually associated with a band-pass tuner.

The only point which has to be guarded against when using the new (higher) frequency is that losses in the necessary tuning circuits must be kept low and slightly greater care is called for in the design and construction of the coils and condensers. Several firms are now prepared to supply ganged condensers having the oscillator section shaped to provide accurate tuning with the new intermediate frequency, and as compared with the previous springs which are available, very slight adjustments may now be received concerning the supply of I.F. transformers for the home constructor, no doubt these will appear shortly.

**A.V.C.**

The automatic control of volume has now been perfected, and the modern superhet incorporates this as a matter of course. The intermediate amplifying stage or stages is controlled, together with the first detector-oscillator stage, generally through the medium of one of the double-diode triode or similar multi-electrode valves, the second diode being used for second detection. Thus, not only has the number of valves been reduced, with a consequent reduction in size and price of the finished receiver, but efficiency is much higher, whether efficiency is judged by performance or quality of output.

We have been carrying out a number of experiments for a considerable time in order to develop a superheterodyne receiver which could aptly be described as the last word for the home constructor. It must be realized that the manufacturer can turn out this type of receiver by mass production means to conform to a certain standard, but the home constructor asks that this standard should be improved upon, whilst at the same time the difficulties usually associated with the home construction of a superhet are avoided. At least two I.F. transformers are required, and in the modern component of quality both primary and secondary are tuned. Stray circuit capacities render it impossible to supply these transformers with the circuits definitely tuned, and therefore some form of tuning must be permitted to the constructor. With two I.F. transformers this gives four adjustments, and as the oscillator tuning condenser can be accurately adjusted with the main tuning condenser, this adds at least two more adjustments, and the permutations of six adjustments makes it possible to spend weeks in endeavouring to obtain the correct setting for each adjustment. We are slowly overcoming these defects, and if it is found possible to combine all the best features of the modern components with the ease of construction of a one-valve set, we shall publish full constructional details in these pages. In accordance with our policy, however, we shall not do this until the circuit has been perfected, but the notes given above will enable the newcomer and the interested amateur to see how this important circuit has progressed from a theoretical perfection to a practical proposition, and it is quite conceivable that before long the "straight" or simple circuit will become obsolete.

**Items of Special Interest**

(Continued from page 668)

and the special tapped transformer enables the adjustment to be carried out without any doubts arising as to whether an improvement could be effected by some other ratio of transformer.

**Components**

A general reduction in size of components, including valves, has obviously taken place during the past year, and the three-gang condenser, for instance, now occupies no more space than a single condenser of just over a year ago. The introduction of the iron-core coil enabled a reduction in size to be obtained last year, and improvements have naturally been made in this component with the result that it is still more compact, and generally provided with a self-contained wave-change switch designed to operate some other component, such as an on/off switch at the same time. The valve, in addition to the incorporation of more electrodes inside the bulb, has been reduced in size and slightly modified in shape, so that now it not only takes up less room, but is free from microphony and gives much better results.

50 Tested Wireless Circuits

By F. J. Camm (Editor of "Practical Wireless.")

This handbook contains every modern circuit, complete with instructions for assembling, component values and notes on operation. Obtainable at all booksellers or by post 5/- from New Amperes, 51, Ux. Ltd., 51, Southampton Street, Strand, London, W.C.2.

August 25th, 1934
Building the Gramophone Section and Connecting Up This New All-mains Three-valve Set

Before this novel instrument is completed it will be necessary to mount the gramophone motor and the pick-up on the upper part of the cabinet. The makers of the motor supply a very complete drilling template and instructions for this purpose, and it will be necessary first of all to find the centre of the motor board, which is the name given up in its correct position so that accurate tracking is ensured, and the template supplied with the pick-up should be used for this purpose. Carefully follow the maker's instructions, placing the template on the motor board in the required position and marking the hole for the passage of the pick-up leads. It will be noticed that an earthing lead is included on the pick-up, and this should be joined to one of the motor retaining bolts, and this in turn joined to the H.T. negative terminal on condenser C.14 on the mains pack when this is inserted in its position. Now screw the motor into position, and attach the connection link on the motor to the correct pair of terminals as denoted on the template, and which adapt the motor for the voltage of the mains with which it is to be supplied. A length of twin flex is next attached to the two terminals (see the template), and these leads are taken down and attached to the primary terminals on the mains transformer bearing a voltage marking corresponding to that with which the receiver is to be used. The two leads which are attached to the mains plug (and one of which passes via the on-off switch on the coil unit) are also attached to this pair of terminals on the mains transformer, and in this position both the receiver and the gramophone motor are rendered "alive," although the latter will not rotate until the pick-up arm is brought into the playing position. This operates a mechanical brake as well as an electrical switch, and thus avoids the necessity of fitting a separate motor switch.

Connecting Up

Connect the heater flex to the two 4-volt terminals on the mains transformer and the H.T. + and H.T. - leads to the terminals on condenser C.14. Preferably, whilst the receiver is being ganged, marked terminals, denoting corresponding positions, are fitted on the motor board, and if these are available and adjusted, it would be better to leave the motor on the motor board in the required position both the receiver and the gramophone motor are rendered "alive," although the latter will not rotate until the pick-up arm is brought into the playing position. This operates a mechanical brake as well as an electrical switch, and thus avoids the necessity of fitting a separate motor switch.

Mounting the Pick-up

It is now necessary to fit the pick-up in its correct position so that accurate tracking is ensured, and the template supplied with the pick-up should be used for this purpose. Carefully follow the maker's instructions, placing the template on the motor board in the required position and marking the hole for the passage of the pick-up leads. It will be noticed that an earthing lead is included on the pick-up, and this should be joined to one of the motor retaining bolts, and this in turn joined to the H.T. negative terminal on condenser C.14 on the mains pack when this is inserted in its position. Now screw the motor into position, and attach the connection link on the motor to the correct pair of terminals as denoted on the template, and which adapt the motor for the voltage of the mains with which it is to be supplied. A length of twin flex is next attached to the two terminals (see the template), and these leads are taken down and attached to the primary terminals on the mains transformer bearing a voltage marking corresponding to that with which the receiver is to be used. The two leads which are attached to the mains plug (and one of which passes via the on-off switch on the coil unit) are also attached to this pair of terminals on the mains transformer, and in this position both the receiver and the gramophone motor are rendered "alive," although the latter will not rotate until the pick-up arm is brought into the playing position. This operates a mechanical brake as well as an electrical switch, and thus avoids the necessity of fitting a separate motor switch.

Operation

Turn the left-hand control (volume control) to a midway position and set the pointer of the tuning scale somewhere near the wavelength of your nearest station, and switch on. After a short interval a faint hum should be heard from the loud-speaker, and if all is well faint signals should also be heard. Turn the volume control until the signals are at their faintest, and then carefully adjust the trimming controls on top of the condenser assembly. As signals become louder, reduce them on the volume control until the maximum position is found for the trimmers. Carry out the trimming operation at both ends of the waveband, and use that position which gives the correct over-all balance. The receiver is then ganged, and may be placed in its cabinet and the motor and pick-up connected. The latter has one lead joined to the vacant terminal on the switch of the coil unit, and the other lead is joined to earth. The mains section and the loud-speaker.

The nearest point. If desired, therefore, the plug may be used with an ordinary lighting socket, by obtaining one of the popular combination plugs which converts a lamp socket into a two-pin socket. Before doing this, however, make quite certain that your local supply company does not prohibit the use of a radio-gramophone on the lighting circuit. In some parts of the country there is a by-law to this effect. The control knob on the coil unit has four positions, each of which is indicated by letters engraved on the knob. When turned as far as possible anti-clockwise the receiver is switched off. A quarter of a turn to the right in a clockwise direction brings the medium-wave band into circuit, a further quarter of a turn brings the long-wave band into circuit, and a final movement switches out the radio side of the receiver and brings the pick-up into action. The control must then be turned in the reverse direction to switch off.
INTERFERENCE SUPPRESSION

A Brief Description of Most of the Devices which are Now Available for Combating All Kinds of Electrical Interference with Wireless Reception.

By FRANK PRESTON

The interference with radio reception caused by various types of electrical apparatus has presented a difficult and important problem for some years, but, far from automatically solving itself, it has gradually become worse. Although this form of interference is as old as wireless itself, it is rather surprising to note that it was not considered at all seriously until about three years ago. Prior to that it had been looked upon as inevitable, in addition to which it was not generally troublesome, due to the fact that the receivers in common use were considerably less sensitive than they have become of recent years.

That electrical interference—which evidence itself as a series of crackles, or scratching noises—can now satisfactorily be overcome is a definite fact, although this may come somewhat as a surprise to those who have not kept in close touch with radio developments during the past months and who, quite probably, gave up all thoughts of ever securing really enjoyable, trouble-free, and interference-free reception on account of the local conditions. Right up to the summer of 1934 it has not been possible to guarantee that all forms of electrical interference could definitely be overcome without tackling the trouble right at its source; very often an impossibility. The listener is now able, in something like 90 per cent. of cases, to overcome the trouble without making any modifications outside of his own apparatus. In the other few instances a compromise can generally be made by making slight alterations to the receiving equipment and by persuading the owner of the offending apparatus to make a small addition to his plant.

Post-office Assistance

Before going on to detail the various types of interference suppressor which are available it would be well to point out (principally for the benefit of new readers) that in all cases of difficulty the Post Office engineers are very willing to render whatever assistance they can, and without charge. All that the listener has to do is to obtain an appropriate Form from the Post Office from which he obtains his licence, fill it in and return to the address given on it. Very soon qualified engineers will look into the matter and give advice upon the steps which should be taken. If the source of trouble happens to be a fan, electric vacuum cleaner, hair drier, or similar machine used upon the listener's own premises, or if it is in the electric supply wires or switches, the engineers will suggest a remedy and offer to put this into effect for a nominal charge; if the source is external to the listener's premises they will suggest remedies to the owner of the plant concerned. Unfortunately there is no law which prescribes that devices should be fitted to electrical equipment so as to render them non-radiating, although such legislation is in force in some of the Continental countries. In any case such laws will probably never be required, especially when one bears in mind the efficacy of the suppression devices which are available at low cost.

There are two principal forms of suppressor device, one of which is intended for connection to the apparatus which is the cause of trouble, and the other which is designed essentially for use in conjunction with the receiver. The first type of device consists essentially of two fixed condensers, connected in series, and two safety fuses. The "free" terminal of each condenser is connected, through one of the fuses, to one terminal of the apparatus (or to one of the brushes in the case of an electric motor) whilst the series connection is joined to a convenient earthing point.

The Suppressor Units Available

A number of these excellent suppressor units are on the market, four well-known ones being made by Messrs. Belling & Lee, Messrs. T.C.C. Messrs. Dubiller, and Messrs. Ward & Goldstone. The first-mentioned firm have two chief models, one of which was introduced a year ago and costs 20s. 6d., the other being a newcomer of smaller type and designed especially for use in conjunction with small electric fans, machines and costing 8s. 6d. Messrs. T.C.C. introduced their No. 1 model some time ago, and this, selling at 10s. 6d., employs a pair of 2-mfd. condensers. Their new model, however, which is described as model No. 2, contains two 4-mfd. condensers and is intended for use in extremely difficult circumstances, or where the smaller model does not provide a complete cure; it is priced at 12s. 6d. The other two firms mentioned above have several different models, one of which is suitable for any particular requirement.

All the manufacturers referred to undertake to advise any intending purchaser regarding the type of unit most suited to his particular circumstances, whilst Messrs. Belling & Lee provide a questionnaire, and from the answers supplied to the various questions they will give free advice regarding the steps which should be taken in order to overcome the interference.

Despite the fact that the condenser units described are intended principally for connection to electric motors and similar pieces of machinery, they may be connected across the mains supply leads to the (mains) receiver, in which position they will considerably lessen nearly every form of interference.

Screened Aerial Devices

When the interference nuisance cannot be completely obviated by using one of the suppressors referred to above, the trouble is known that the trouble is from some outside source, it becomes necessary to employ a screened lead down lead from the aerial, and special screening material (which has the essential feature of low capacity) for this purpose is made by Messrs. British Radiophone, Messrs. Ward and Goldstone, and others. So long as the aerial is fairly high the provision of the screened down lead will almost invariably eliminate the trouble, but it is occasionally necessary to go to still further trouble by moving the aerial to a point outside the field of interference. This might entail the use of a down lead fifty, or even a few hundred, feet in length and the capacity of the screening would then be too great to permit of the aerial functioning correctly. Even this difficulty has been overcome, however, and special lead-in devices are on the market. The principles upon which these work have previously been dealt with in these pages, and it is briefly as follows: A step-down high-frequency transformer is inserted between the aerial proper and the end of the lead-in which is normally connected to it. At the "set" end of the lead-in there is a step-up transformer exactly matched with the (mains) receiver. The screen attached to the lead-in permits a relatively low H.F. voltage which passes through the screened wire the capacity has little or no effect.
Every worthwhile development in up-to-date Screened Grid Radio is incorporated in the new Cossor Melody Maker—Variable Mu S.G. Circuit—Super-selective Iron-cored Coils—Moving Coil Loud Speaker, etc. Because of its advanced design its performance is remarkable—better even than that of its famous predecessors. Send at once for full particulars—the coupon below brings you full-size constructional chart.

To A.C. COSSOR LTD., Melody Dept., Highbury Grove, London, N.5
Please send me full-size constructional chart which tells me how to build the new Cossor Melody Maker Model...

Insert Model No. required.

VARIABLE-MU S.G. CIRCUIT

SUPER-SELECTIVE IRON-CORED COILS

MOVING-COIL LOUDSPEAKER

TWO MAGNIFICENT MODELS

BATTERY MODEL 352
Complete Kit of parts includes Cossor Variable-Mu Screened Grid Triode Detector and Economy Pentode Output Valves, fully screened Super-Selective Iron-cored Coils, combined On/Off, Wavelength and Gramophone Switch and all the parts for simple home assembly. Handsome walnut finished cabinet 18" high, 14" wide, 9½" deep. Permanent Magnet Moving Coil Speaker. Terminals for Gramophone Pick-up, Plug and Sockets for Extension Loudspeaker. Price £5.19.0

Hire Purchase Terms: 14/- deposit and 10 monthly payments of 32/-

ALL-ELECTRIC MODEL 357
Complete Kit of parts similar to Model 352 but with Mains Variable-Mu Screened Grid, Mains H.F. Screened Pentode Detector, Mains Power Output and Rectifier Valves. Mains Energised Moving Coil Loudspeaker. For A.C. Mains only 200/250 volts (adjustable) 40/100 cycles. Price £7.19.0

Hire Purchase Terms: 20/- deposit and 10 monthly payments of 16/-

Prices do not apply in I.P.S.
A whole night's job becomes but a few minutes' work with the Pifco ROTAMETER.

The new De-Luxe moving coil model is amazingly accurate—it has a resistance of 200,000 ohms. The voltage scale registers up to 400 volts. In fact the ROTAMETER is a complete testing set in one handy-sized bakelite case.

Ask your dealer to show you one now, or write for fuller details to PIFCO LTD., Shudehill, Manchester, or 150, Charing Cross Road, London, W.C.2.
For Real Reader Service Buy
Practical Wireless
3rd Every Wednesday

Details of Exhibits of Outstanding Interest
On Each Stand — By the Technical Staff.

Stand No. 1
Wright & Weaire, Ltd., 748, High Road, Tottenham, London, N.17.

The range of coils shown by Messrs. Wright & Weaire seems to form the centre of attraction on this stand. The vast range which is covered by these coils, from the simple air-cored dual-range coil to the latest iron-cored suitable for use with the new valve and similar types of frequency-changer, enables the constructor to choose a coil to suit any type of circuit. In addition, the new I.F. transformers and other components, in which the new insulating material "Mykulan" is employed, also gives the constructor a new hope for experiment during the coming months. In addition to the coils, all the other accessories shown in a circuit, also attracts attention, and the new coil, designed for use with 7-pin valves, shows how the need has arisen for an extension of the range of this type of accessory. In addition, the coil winding apparatus, specially of interest to the manufacturer, gives the visitor some idea of the work which is involved in the manufacture of the simple tuning coil.

Stand No. 2

A useful testing instrument which has been added to the range of Avo-Instruments on this stand gives the visitor some idea of the resources of Messrs. Wright & Weaire in designing and manufacturing high-class components for the home constructor who wishes to make up a receiver to give really high efficiency at a minimum of expense.

Stand No. 3
G. F. & H. Burton, Progress Works, Bensale Street, Walsall.

This stand also devotes the majority of its space to an exhibition of components especially designed for the use of the home constructor. Some ingenious accessories may be seen, and the interest evinced in some of the items shows that the home constructor is becoming still keener in his knowledge regarding the why and the wherefore of the various parts which he utilizes.

Stand No. 4
Central Equipment Ltd., 158, London Road, Liverpool.

The ingenious no-mast aerial no doubt causes many listeners to wonder whether it is still worth while putting up with the unsightly prop at the bottom of the mast. In addition, the earth device and the interest which everyone seems to show in these accessories speaks well for the results which will be obtained in the coming months if the majority decide to overhaul the aerial and earth system.

Stand No. 5
De la Rue & Co., 50, Shornhall Street, London, E.I.P.

The interesting range of mouldings, etc., which are shown on this stand give the visitor some idea of the extensive branches which are covered in the manufacture of radio apparatus.

Stand No. 6

Many old friends called upon us at Stand No. 6 during the week, and we also made many new friends. It was surprising how many readers seemed to find the blue to call and thank us for the various hints or knowledge which they have acquired from our publications, and many stated that they had only come to the exhibition in order to make our acquaintance.

Stand No. 7
Haynes Radio, 57, Hatton Garden, E.C.

Some high-class examples of receivers and amplifiers are shown on this stand, and the tests which are made up for the home constructor, in which special tuned-out metal chassis are employed, enables the constructor to build up a unit having the appearance of the commercial product, but with the added advantage of the "hotting-up" which only the individual touch can produce.

Stand No. 11
New Television, Ltd., Wadson, Creteyton.

Here at last is the home-television receiver, and by the enormous interest which is displayed it is obvious that the public is definitely television-minded. The receivers produced by this company have shown that it is possible to obtain a satisfactory television apparatus at a really competitive price and a number of novel features have been included in the receivers. A new type of lamp, simple "focusing" adjustments, and a perfect synchronizing gear make the reception of a picture so simple that it is a matter of but a few minutes to turn on the mains and obtain some satisfactorily results from the small aerials which are seen on this stand.

Stand No. 12
A. Diggie & Co., Reliance Works, Jane Street, Rochdale, Lancs.

Although primarily of interest to the shopkeeper or service agent, the various types of charging plant which are seen on this stand interested...
STAND TO STAND SHOW REPORT
(Continued from previous page)

THE home constructor who is unable to charge his own accumulators, or it is interesting to be able to charge it, is done, and the plan gives some indication of the case which can be exercised in such a number as recharging a simple 2-volt accumulator.

STAND No. 11
ERIE RESISTOR CO., LTD., Waterloo Road, Cricklewood, N.W.

In addition to the resistors which are already on the market, a number of new components are on show on this stand. The new potentiometer or volume control shown is the problem of a sensitive and accurate control has been successfully tackled and overcome. In addition, the suppressors designed for use with motor equipment shows that this branch of radio is now becoming popular, and that the difficulty of eliminating the noise from plug, magneto, etc., has been overcome. A very fine exhibit.

PRACTICAL WIRELESS
August 25th, 1934

STAND No. 30
STRATTON & CO., LTD., Edystone Works, Bromsgrove Street, Birmingham.

This short-wave listener is affected to this stand and finds a great deal to interest him. Apart from the complete range of short-wave apparatus, as coils, tuning condensers, insulators, etc., the complete receivers are also shown. The cabinet construction, which is designed to withstand tropical climates, shows how the manufacturer has to contend with severe changes in temperature, and demonstrates that the English manufacturer has not overlooked the advantages of the colonial markets. A fine exhibit.

STAND No. 32
W. BALCOMBE, LTD., 52-56, Tavistock Street, E.C.2.

The fine line of 114v receivers on this stand well repays an examination. From the simple battery receiver to the most elaborate mains radio-price, the cabinet work as well as the circuit design have obviously been the result of much research and development.

STAND No. 34
GENERAL ELECTRIC COMPANY, Magnet House, Kingsway.

The G.E.C. trade mark is sufficient indication of the type of apparatus which is seen on this stand, and the range of receivers and loud-speakers is very attractive. Some interesting circuits are revealed in some of the receivers, and the cabinet work strikes a novel note in many respects. In addition to the complete receivers the loud-speakers, the A.O.C. and D.C. conversion units, the home broadcaster, the gramophone, motors, and the H.T., G.B., and I.T. batteries also attract a splendid display on the G.E.C. stand.

STAND No. 35
SUNBEAM ELECTRIC, LTD., Park Royal Road, London.

UNDOUBTEDLY the centre of attraction on this stand is the midget receiver. All the receivers (except the car radio) manufactured by this company use the universal mains circuit suitable for A.C. or D.C. without attention or in the Midget they have included a most elaborate receiver in the smallest space possible. We do not doubt that this type of receiver will be very popular in the coming year.

STAND No. 36
TELEGRAPH CONDENSER COMPANY, LTD., Wales Street, North Acton, W.3.

The green-sheathed condensers reveal the identity of this stand at a glance. The home-constructor is still as very familiar with the high grade component which bears the T.C.C. trade mark. The company is well-known for making the smaller condensers with which the home constructor is so familiar, the large transmitting and high-voltage condensers, which are tested up to 80,000 volts, and which are employed in broadcasting stations in many parts of the world and in research laboratories.

STAND No. 37
TELEGRAPH CONDENSER COMPANY, LTD., Wales Street, North Acton, W.3.

This Lamore " Unifive " receiver possesses novel features in circuit and cabinet design.
PRACTICAL WIRELESS

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STAND TO STAND SHOW REPORT

(Continued from previous page)

Some interesting points are to be observed in this public address amplifier, which is made by the manufacturer of the "Adeles" Deaf-aid.

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PRACTICAL WIRELESS
August 25th, 1934

STAND TO STAND SHOW REPORT
(Continued from previous page)

A neat sample of a compact speaker. The Beethoven Model 56.

STAND No. 59
GRANHAM, FARISH, LTD., Masons Hill, Bromley, Kent.

The once-famous Formo products appear again at the exhibition, and these are now being manufactured by the New Formo Company—a branch of Orange Grove. Of special interest is the fact that all the items which are manufactured by this company are produced for the home constructor only, and are not even available for art manufacturers. Thus, these components are developed especially for their high efficiency and their suitability for home constructors, and they function in a most admirable manner. The original Formodisc is still formed as a pressed condenser, and in addition there are the new trans-formers chosen, conondensers, tuning coils, and other items too numerous to mention.

STAND No. 60
McMICHAEL RADIO, LTD., 79a, Parkhurst Road, N.7.

In addition to the famous Duplex Transportable, there are a number of other old friends on this stand. The portable has still further been improved, and the two-speaker console receiver is also a most interesting item on this stand. In both cabinet work and circuit design these receivers are entirely up to date.

STAND No. 61
GRAMOPHONE CO., LTD., Hayes, Middlesex.

In addition to the elaborate radio-gramophones which the H.M.V. company have produced, there is an extensive range of smaller receivers, in which the bulb-light tuning device forms quite an interesting feature. The popular pick-up is also seen on this stand, and the chassis of some of the receivers gives visitors a good idea of the work which is involved in building up sets of this nature, while the average listener would not doubt hesitate to try to locate a fault in a circuit which is involved in these receivers. The method of colour coding the wires, boxes, diodes, and other parts of the circuit is to be easily traced out when once understood.

STAND No. 62
PHILLIPS LAMPS, LTD., Charing Cross Road, London, W.C.2.

Quite a few examples of complete receivers are on show on this stand, and it is interesting to note that in at least one case Messrs. Phillips have utilized the superhet circuit. Furthermore, this firm has specialized in the use of multi-tuned circuits in preference to the superhet feature, and the super-tunements feature, as it is called, still forms the basis of the major part of their equipment.

STAND No. 63
AMPLION (1932), LTD., 82, Rosenean Street, E.C.2.

The all-electric table model superhet, in which all the latest circuit improvements, such as the octode frequency changer, etc., have been incorporated, forms the centrepiece of attraction on this stand, and the new loud-speakers, which the Amplion range, is one of the modern speakers, designed in the full light of modern technical knowledge, and gives promise of a very popular life.

STAND No. 64
ORR RADIO, LTD., 79a, Parkhurst Road, N.7.

A number of receivers forms the basis of this exhibit. Circuits of the latest type, receivers being designed in the most modern fashion, and certain items of novelty attract much attention. The "Inchworm" set, designed primarily for use on trains and yachts, shows that attention has been given to markets which as yet have not received the attention they deserve, and the wave-band covered by 100 to 200 metres offers a number of interesting transmissions.

Two interesting components which have been added to the Graham Farish range. The "Max" and the "Quiet" Transformers.

STAND No. 65
MULLARD RADIO VALVE CO., Mullard House, Charing Cross Road, London, W.C.2.

The usual Mullard stand is easily picked out in the Exhibition, and in addition to the vast display of valves, the large models have a story to tell. Obviously the very latest valves attract the major part of the visitor's attention, especially the octode with its six grids, all arranged one above the other. In addition to this part of the exhibit, however, the new receiver, the M.B.3, proves a popular item. This is the first receiver to be manufactured by the Mullard people, and it employs three pentodes in the popular K.G. detector, and i.f. circuit. Reaction has been eliminated, and thus there are only two controls—a tuning control and a volume control—the latter combined by the function of an on/off switch. This receiver is designed for the battery user it should prove a very popular item during the coming season.

STAND No. 66

A further display of G.E.C. apparatus is seen on this stand, and proves as attractive as the exhibits on this company's other two stands.

STAND No. 67
ULTRA ELECTRIC LTD., Earnse Road, Chalk Farm, N.W.3.

The popular cock-dial tuning scales which were introduced by the Ulter Inc., and which have been extensively copied, give the receivers on this stand a very pleasing appearance. The circuits employed in the receivers, as well as the general arrangement of the cabinet, etc., fully meets modern day requirements, and the prices, too, are well in keeping with the present tendency.

The novel Amplion Lion loud-speaker, and a new receiver which has many novel points.
The Lotus

11, HAMMERSMITH ROAD
FACING OLYMPIA AUGUST 16th to 25th

This amazing new set has been designed to give the very finest possible reproduction. It is selective, easy to tune and of handsome appearance.

PRICE COMPLETE
£4.17.6

Also two other splendid new Lotus models as follows:

TRIPLE PENTODE
Variable M.A. PENTODE, M.A. PENTODE DETECTOR, Output pentode, Mains energised moving coil speaker. Provision for gramophone pickup. Works on any mains (A.C. or D.C.) of 100 to 250 volts. Hardwood inlaid modern cabinet in walnut and avadire.
Price complete: £7.19.6

TRIPLE-TUNED A.C.
Price complete £10.10.0

WRITE FOR FREE ILLUSTRATED BROCHURE
LOTUS RADIO (1933) LIMITED,
105, Judd Street, King’s Cross, London, W.C.1.

FOR GOOD RADIO’S SAKE
don’t miss the

THE INSTRUMENT FOR ACCURATE TESTING
No other small D.C. meter gives the same testing accuracy as the famous Avo Minor. It tracks the slightest defect, traces the most baffling fault with ease. Circuits, valves, components, batteries and power units can be tested quickly and accurately.

See the Avo Minor at Radiolympia—see how invaluable—simple—and accurate it is—and see how it can win you a valuable prize!

See also the New UNIVERSAL AVO MINOR
This new combination meter makes both A.C. and D.C. tests. It is 22 meters in one—gives wonderful new testing facilities. Illustrated Folder post free.

THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO., LTD.
Telephone: Victoria 3404/7

£120 CASH PRIZES waiting to be won in the AVO MINOR COMPETITION
Closing Date for entries extended until Sept. 16th. Get Free Entry Form at stand No. 2, Radiolympia.

A Book—Just Published RADIO SERVICING SIMPLIFIED
Every phase of radio testing is explained in easy language. Tests and fault finding exercises to test with over 100 exercises.

POST FREE

2/6

THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO., LTD.
Immediate Technical Recognition—

Solely specified by the designer of The “ARMADA” Mains Three described in last week’s issue

The R & A “MULTIMU” has been selected because of its amazing performance, due to the incorporation of ‘Impedance Tuning,’ and an entirely new magnet system.

Be guided by this and make the MULTIMU your choice, the best of its class and 12 months ahead of competitors—as usual!

★ New Magnet System gives amazing Sensitivity

★ Exceptional Brilliance and Attack in Reproduction

THE R & A MULTIMU gives instantaneous matching from 1 to 40,000 ohms, the unique ‘Impedance Tuning,’ enabling the reproducer to be instantaneously and permanently tuned to the receiver as accurately and simply as the receiver is to the broadcast station, regardless of make or type of output.

The MULTIMU magnet system is entirely new, and the sensitivity is even greater than many field excited moving coil models, giving unequalled brilliance and attack in reproduction.

Whatever type of receiver you own or may ever own—the MULTIMU as principal or extension reproducer will give you a brilliance of performance which must be heard to be believed, whilst ownership will compel a pride in possession never before experienced.

Your dealer can supply. Insist on R & A MULTIMU. There is no substitute.

Send postcard for details of complete range from 2 1/2 to 55/-
The novel appearance of the clock and the tuning dial strike a new note in this Aerodyne receiver. By reason of their radical design, these components are almost too numerous to describe, and includes such items as L.F. transformers, mains transformers, smoothing chokes, H.F. chokes, tuning coils, amplifier accessories, rectifier and tuning condensers, and so on. In the complete receiver line some novel features are to be seen, in particular the tuning circuit dial which employs in accurate tuning indicator.

STAND No. 216
MARCONIPHONE CO. LTD., 210-212, Tottenham Court Road, London, W.1.

There is on this stand literally a set for every purpose, and no person, whatever his or her circumstances, need be without one.

There are three different types of battery receiver, one 3-valve, one 5-valve, and one 6-valve, which are capable of giving the most excellent performance in any part of the British Isles. There are five tube mains superheterodyne receivers and no less than seven radio-grampophones, four of which are fitted with automatic record-changing mechanisms.

There are actually two absolutely new instruments which are being introduced for the first time at Olympia, i.e., the 239 A.C., which is a 5-valve superheterodyne radio-grampophone, with automatic record-changing mechanism, and the 255 A.C., which is a 9-valve superheterodyne, with automatic record-changing mechanism. These two instruments contain many refinements—incorporating modern ideas, and altogether, with the other instruments, complete a range which is absolutely second to none.

There are also the well-known Marconophone loud, popular on view on this stand.

STAND No. 77

As might be expected, the exhibits on this stand are principally dry batteries of every conceivable type and capacity. There is a range of rectangular batteries for every make and type of well-known experimental outfit, besides many more of general application. An item of especial interest just now, when television is coming very much to the fore, is a special 300-voi dry battery for cathode-ray television sets.

In addition to the dry batteries, Siemens have produced a representative selection of accumulators.

STAND No. 78
HELLESENS, LTD., Morden Road, South Wimbledon, London, S.W.19.

This stand is devoted entirely to the well-known Helleseins' dry batteries, which are available for almost every purpose. Of chief interest will be those types which are for H.T. purposes, and in this class there are replacement units suitable for use in any and every type of receiver, either commercial or home-made.

STAND No. 50
RADIO INSTRUMENTS, Putney Way, Croydon.

A COMPLETE 3-pump superhet pre-selector and oscillator tuning chassis, using " Micron " coils, is a special feature here. A new " Micron " H.F. transformer, similar in appearance to the well-known adjustable inductor coil, is also being shown in conjunction with a " Micron " H.F. choke, a new L.F. transformer with bifurcated core, the usual range of short-wave converters, etc. No less than seven different models of the popular B.I. receivers are to be seen, amongst which are the following: " Brite " twin-speaker, 5-valve, A.C. superhet; " Elite " 6-stage, 6-valve battery superhet, and the K.I. " Micron " Battery Three.

STAND No. 61
BURNEDT LTD., Light Gun Factory, Erith, Kent.

This exhibit on this stand consist of receivers of particularly high grade. There is a wide range, from an A.C. mains superhet, at 10 guineas, to a magnificent A.C. or D.C. radiogram at 52 guineas. The latter is not the only unique model, however, and it is interesting to find several receivers of this type. All the Burnedt receivers are designed to give reproduction of a particularly " true " nature; and with this object in every model is fitted with dual speakers mounted at appropriate angles so as to give a correct " soundfield " effect, instead of a narrow " beam " of sound.

STAND No. 84
BUSH RADIO LTD., Film House, Wardour Street, London, W.1.

There are four different superheterodyne models to be seen on this stand, including one for better operation. They range in price from £10 ls. 6d. to £15.

H. CLARKE & CO. (MCR) LTD., Atlas Works, Old Trafford, Manchester.

The new " Atlas " receivers—designated the " 7-5-8 " superhet—are the chief feature here. Incidentally, it should be pointed out that the figures indicate seven tuned circuits, five valves, and eight separate functions. This is a rather unusual way of describing the sets, but it has the advantage that it is descriptive and far more informative than a single figure which simple refers to the number of valves.

Another feature which will appeal strongly to hobby constructors is the latest " Skywaver " kit, available in various forms, including a " true " type. The kit chassis, which is easily modernised, contains an inductance box, " Micrion " coils, and has full automatic volume control, noise suppression, neon tuning, automatic record changer, illuminated wavelength-calibrated tuning dial, and an output of no less than 40 watts. Additionally, provision is made for the connection of the R.R. short-wave converter for reception on wavelengths from 14 to 60 metres.

STAND No. 35
STAND TO STAND SHOW REPORT

The novel appearance of the clock and the tuning dial strike a new note in this Aerodyne receiver. By reason of their radical design, these components are almost too numerous to describe, and includes such items as L.F. transformers, mains transformers, smoothing chokes, H.F. chokes, tuning coils, amplifier accessories, rectifier and tuning condensers, and so on. In the complete receiver line some novel features are to be seen, in particular the tuning circuit dial which employs in accurate tuning indicator.

STAND No. 97
RADIO GRAMOPHONE DEVELOPMENT CO. LTD., Trenchard Road, South Wimbledon, London, S.W.19.

Larsen's exhibits are confined chiefly to receivers of the medium and low-price types. A new no. of which will be of especial interest is a new three-valve hand-oscillator tuning chassis, available for either A.C. or battery operation, the prices being £10, £16, and £20, respectively. Another item which will appeal strongly to hobby constructors is the latest " skywaver " kit, available in various forms, including a " true " type. The kit chassis, which is easily modernised, contains an inductance box, " Micrion " coils, and has full automatic volume control, noise suppression, neon tuning, automatic record changer, illuminated wavelength-calibrated tuning dial, and an output of no less than 45 watts. Additionally, provision is made for the connection of the R.R. short-wave converter for reception on wavelengths from 14 to 60 metres.

STAND No. 35
KOLSTER-BRANDES, LTD., Sidcup, Kent.

RECEIVERS of every type and for every purpose are here, and at every price! " A " is truly descriptive of the excellent range displayed on this stand. There is a three-valve " New Pup " with many interesting features and having a tuning range from 500-600, and from 3,000-5,000, at &s. 10d. complete, to a remarkable 5-valve A.C. superheterodyne radiogram at 65 guineas. The latter is fitted with dual speakers, and has full automatic volume control, noise suppression, neon tuning, automatic record changer, illuminated wavelength-calibrated tuning dial, and an output of no less than 50 watts. Additionally, provision is made for the connection of the R.R. short-wave converter for reception on wavelengths from 14 to 60 metres.

STAND No. 35
H. CLARKE & CO. (MCR) LTD., Atlas Works, Old Trafford, Manchester.

The new " Atlas " receivers—designated the " 7-5-8 " superhet—are the chief feature here. Incidentally, it should be pointed out that the figures indicate seven tuned circuits, five valves, and eight separate functions. This is a rather unusual way of describing the sets, but it has the advantage that it is descriptive and far more informative than a single figure which simple refers to the number of valves.
The latest unit is the T.I.5005, which gives an output of 120 to 150 watts at 30 milliamperes, and is suitable for use with the standard, junior B, or Q.P.P. output. It is provided with three different voltage taps and is also designed to fit into the standard type of horizontal oscillators, with a 2-volt accumulator at 5 amp.

STAND NO. 96
WESTINGHOUSE BRAKE & SASH SIGNAL CO., 49, Vera Road, King's Lynn, N.W.

This year the new W.X.1050 Westerhoe makes its début at a Radio Exhibition. This Westerhoe is suitable for use in "straight" sets, or in any form of automatic heterodyne circuit, when any form of automatic volume control may be obtained. The new type of H.T. and L.T. units is now so complete that constructors will find a unit to meet their particular requirements. The new unit is the T.1030 and this gives an output of 2 volts at 5 amp. continuously at full load for over 60,000 hours, and shows the latest improvements. Previous Exhibitions, is is shown, in competitive price.

This popular set has much to recommend it. The "H.T. eliminator and L.T. trickle charger's is shown, which has much to recommend it is the Blue Spot "Star Junior" which sells at 35s. and will probably be used in large quantities by home constructors during the coming season.

STAND NO. 98
WINCHESTER & ROGERS, LTD., 1925, Strand, London, W.C.

Here is an exhibit of special interest to the home constructor. The set shown is an addition to the range of the firm (such as Polar Minor pint condenser, Polar condenser, etc.) which has been very successful in previous years. The latest model is the T.1030 and this gives an output of 2 volts at 5 amp. continuously at full load for over 60,000 hours, and shows the latest improvements. Previous Exhibitions, is shown. The new type of H.T. and L.T. units is now so complete that constructors will find a unit to meet their particular requirements. The new unit is the T.1030 and this gives an output of 2 volts at 5 amp. continuously at full load for over 60,000 hours, and shows the latest improvements. Previous Exhibitions, is shown.

Besides these, there are a number of other interesting items. Another interesting item is the "Superpak" tuning unit, which consists of two separate units mounted concentrically with each other. "Dual" is of especial appeal.

The enthusiasm for these sets has been so popular for many years are to be seen. The range of B.V.X. bases in both 'skeleton- and baseboard forms is of interest.

STAND NO. 95
TANNY PRODUCTS, Canterbury Grove, West Norwood, London, E.C.

This firm has become very well known during recent years in connection with their excellent public-address systems, and these are the chief features of interest. In addition to the complete equipment there are a number of special power amplifiers having outputs up to 120 watts, and also some portable amplifiers of various types. There is also a range of projection sounders for outdoor use as well as a variety of microphone equipment. All these new items are shown in the new Tanny radio phonograph, which has been designed particularly for the use of people to whom perfect reproduction is the main requirement.

STAND NO. 97

Five different receivers are displayed on this stand, the largest and most technical point of view being the 6-valve Stenode radioh. This gives a frequency separation of 5 kilocycles, is provided with amplified delayed A.V.C., high visual tuning, and supplies an output of 8 watts undistorted to a large "Magnavox" "Double U.S." loudspeaker. There are two other and smaller Stenode receivers and both have 6-valve batteries, operated with 2 volts at 5 amp.

There are three different types of interference suppressors for use in D.C. and universal receivers, although they may be used in other than D.C. sets. Other interesting items are the double electrolytic condensers, which are fitted into cylindrical aluminium containers (as are the standard types), but have been so successful that they have been found to be much more suitable for use in D.C. and universal receivers, although they may be used in other than D.C. sets. Other interesting items are the double electrolytic condensers, which are fitted into cylindrical aluminium containers (as are the standard types), but have been so successful that they have been found to be much more suitable for use in D.C. and universal receivers, although they may be used in other than D.C. sets. 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You have surpassed yourselves

Says Mr. F. J. Camm!

(editor "Practical Wireless")

"You have surpassed yourselves with this new Stentorian speaker. I thought you had reached the apogee when you introduced the Microlode last year; but to this present speaker, which I have submitted to test, I unhesitatingly accord full marks for a rich and entrancing quality in tone, and for an even greater sensitivity for a given input than was obtainable from your past high standard of speaker.

I feel that your Engineers must always be at work striving after the apparently unattainable and attaining it!"

Such an opinion from one of the foremost designers of to-day is not lightly given. To a technician of Mr. Camm's experience a list of interesting technical features alone is not sufficient—he requires results to prove the value of any revised design or new discovery. In the W.B. "Stentorian" Mr. Camm found them.

A W.B. "Stentorian" will bring an unbelievable improvement to your set.

You will hear a considerable increase in volume, due to the exclusive "Nital" magnet which at the same cost provides an enormous strength never before obtainable with a "commercial" material. Due to a new method of speech coil assembly you will find in your reproduction crisper "attack," and fuller natural bass, and a new "realism" which will astonish you.

You must not fail to hear a "Stentorian" on your set. You will be amazed at the difference. If you visit Radiolympia

SEE IT AT STAND NO. 98

Stentorian Senior (PMS1) - - - 42/-
100% dust protection. Oversize cone
Stentorian Standard (PMS2) - - - 32/6
Stentorian Baby (PMS6) - - - 22/6

Write for the new W.B. Stentorian Leaflet

STENTORIAN

Whiteley Electrical Radio Co., Ltd. (Dept. D), Radio Works, Mansfield, Notts.

Sole Agents in Scotland: Radiovision Ltd., 233, St. Vincent Street, Glasgow, G2.

Sole Agents in I.F.S.: Kelly and Shiell, Ltd., 47, Fleet Street, Dublin
One of the most interesting exhibits on this stand is the latest Varley gauged permeability tuner, which is shown in 3-gang and 4-gang types. This is attracting considerable attention due to its neat and novel design which has become very popular during the coming season. Another new line is the Deacon L.F. transformer, which has adjustable coupling so that the bandwidth which it covers can be varied over wide limits according to the degree of selectivity required at any time. Needle cores in all types are also on view, along with the well-known Varley "Power Pucker," A.V.C. unit, etc. Power transformers, L.F. transformers, chokes and, in fact, everything which the discerning constructor requires is to be seen and can be inspected at close quarters. No constructor can afford to miss the Varley stand.

Stand No. 104

The popular Grosvenor mercury dry batteries are of recent introduction, but there are also some new models which are ideal for radio manufacturers. They are well displayed, and their special feature is that the "business" portions of the earlier models are contained in transparent paper bags, with a result that the operatives can see at a glance that the unit is completely covered with wax; this ensures that there shall be no air bubbles which are likely to cause premature breakdown. STAND No. 105, TELEPHONE MANUFACTURING CO., LTD., Hollingsworth Works, Martell Road, West Dulwich, London, S.E.5.

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Stand No. 106

THE exhibits here will strongly appeal to those who are interested in the most modern high-power radio equipment, and who want the best and latest equipment. Great attention is being paid to record changers; one of the principal exhibits, this being an automatic type in that it not only changes from one record to another but also turns the records over so that both sides are played. Its capacity is thirty double-sided records; in other words, from three to four and a half hours' continuous programme. A complete and up-to-date radio-granophone is also being shown, which is fitted with the "Auto-tone" automatic record changer. This is a real "gimicky" outfit which comprises a highly-efficient superhet receiver, a high-power amplifier, and three separate rectifying valves; of the latter one feeds the receiver, another the amplifier, and the third, the field windings of the energised moving-coil speakers. The cost of the complete radiogram is £105.

Stand No. 107
VARLEY (OLIVER BELL CONTROL, LTD.), Bloomfield Road, Woolwich, London, S.E.18.

One of the most interesting exhibits on this stand is the latest Varley gauged permeability tuner, which is shown in 3-gang and 4-gang types. This is attracting considerable attention due to its neat and novel design which has become very popular during the coming season. Another new line is the Deacon L.F. transformer, which has adjustable coupling so that the bandwidth which it covers can be varied over wide limits according to the degree of selectivity required at any time. Needle cores in all types are also on view, along with the well-known Varley "Power Pucker," A.V.C. unit, etc. Power transformers, L.F. transformers, chokes and, in fact, everything which the discerning constructor requires is to be seen and can be inspected at close quarters. No constructor can afford to miss the Varley stand.

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RECEIVER DESIGNS SEEN AT THE SHOW

The large and easily-read tuning dial is an interesting feature of this Ekco console.

One of the Liscon models.

The large tuning dial is an interesting feature of this Ekco console.

The Beethoven S.G. three.

A distinctive note is struck by this latest Marconiphone console receiver.

The Halcyon console model.

The Multitone receiver with deaf-aid equipment.

A console radio from the extensive Cossor range of 1935 receivers.
PRACTICAL WIRELESS

August 25th, 1934

STAND TO STAND SHOW REPORT

(Continued from page 682)

STAND No. 117

ELECTRO DYNAMIC CONSTRUCTION CO., LTD.,

41 Kent Road, London, E.12.

HERE is an interesting display of converters and battery chargers of various types. The best-known converter in the series is one for converting D.C. to A.C. and is intended for the generation of power amplifiers, A.C. receivers, etc. The input may be taken from 40-volt mains, private house-lighting plants, or from L.T. accumulators, whilst an important point is that the unit is interference-free. Other lines are for supplying small direct current for public address and tackle for those who may be driven from the engine of a car, or may be obtained w i t h a petro1 engine. In addition, there are several accumulators and dry batteries, and a H.T. converter for use with car-radio receivers.

STAND No. 118

SWIFT, LEVICK & SONS, Clarence Steel Works,

Sheffield, 4.

THIS exhibit here const a very extensive range of various types of permanent magnets, most of which are designed for use in the construction of permanent-magnet moving-coil loud-speakers.

STAND No. 119

HARLEY TURNER RADIO LTD., Thornbury Road,

Iestowest, Middlesex.

There will be an expert's advice on the production of " quality " receivers, power amplifiers, and loud-speakers, and a comprehensive array of components and apparatus to be seen at the stand. The receivers are intended for more than the picket reception of the local station, but as constantly as long-range instruments. There are four principal models, styled the M.T., M.S., S.7, and S.12, respectively, which indicates that the receivers are ready-made, whilst the " S " indicates that the necessary parts are supplied as a kit; the figures " 7 " and " 12 " indicate the approximate undiluted outputs in watts. The Hartley-Turner loud-speakers are shown in three models, the first of which is for D.C., the second for A.C. and is provided with a 30-watt rectifier for field excitation, and the third is also for A.C. and has a 40-watt rectifier. The prices of the three models are £7, 8, and 10s. respectively.

A small number of special high-grade components, such as H.F. coupling units, mains transformers, smoothing coils, etc., are also on view.

STAND No. 121

BULGIN BATTERY LTD., Abbey Road, Barking, Essex.

THIS stand will probably prove of greater interest to the home constructor than any other at the Exhibition a new range of components. The Hull-Turner loud-speakers are shown as a kit; those may be driven from the engine of a car, or may be obtained with a petrol engine. In addition, there are several accumulators and dry batteries, and a H.T. converter for use with car-radio receivers.

STAND No. 122

GOODMANS (CLERKENWELL), LTD., Clerkenwell, E.G.

THIS exhibit on this stand included a new grille P.M. speaker—a de luxe instrument designed to give the maximum reproduction possible with an 8-in. speaker. The periphery of the diaphragm is supported between resilient pads, providing a " dead " suspension and ensuring the fullest bass response without loss of sharpness.

The transformer is of the multi-load type, providing ratios for four output valves. It costs 40s., or, fitted, with special extensions transformer providing four low resistance tappings, four push-pull and eight high resistance tappings, the ratios being selected by a selector switch, 50s. 6d.

The 12 watt moving-coil speaker, with an 8-in. diaphragm model, has a response range from 40 to 10,000 c.p.s. free from audible peaks or dips. Its sensitivity is obtained from a small damped bull, to be obtained from a fully loaded 5-watt Class B battery valve, where an output of 12 watts undistorted can be handled without difficulty.

The transformer is provided with a spare condenser. Other models shown included the " 12 watt " energized model at £10 10s., a public address speaker with a 20-in. diaphragm, £17 15s., and the P.M.D. at £20 15s. 6d.

A large exhibit includes displays of cell winding, stamping, turned parts, transformers, chokes, and other manufacturing components for the trade.

STAND No. 125

THE VEE CEE DRY CELL CO. (1927), LTD., Stoke
dale, Lonsdale, E.6.

This display is arranged as a kit. The standard range is one for converting D.C. to 110 volts. The unit costs 5 10s., or, fitted, with the familiar extension transformer providing four low resistance tappings, four push-pull and eight high resistance tappings, the ratios being selected by a selector switch, 50s. 6d.

A new notable deq-aid. This is the "Oscilite".

A full range of high-tension batteries and grid-bias transformers of reasonable price form the main feature of this exhibit.

STAND No. 207

British W.W. Battery Company, Trading

State, Shepp, Herts.

THIS firm specializes in work for electrical

under-take to convert all A.C. mains receivers.

in British radio receivers of various types. Their speciality is rectifiers for all purposes, and they also undertake the repair of all types of receivers.

(Continued on page 687)
SUMMIT 3 • ARMADA MAINS 3
NEW SPEAKERS—ELIMINATORS—KITS

Pilot Author Kit Exact to Specification

The Pilot Kit Service was founded in 1919.

Important

Mimicous Components, Parts, Kits, Finished Receivers or Instruments for Cash or C.O.D. or we may take payment of Easy Payments. Send us a list of your wants. We will quote you returns. C.O.D. returns over £1 sent carriage and post charges and GREAT BRITAIN ONLY. OVERSEAS CUSTOMERS CAN SEND TO US WITH CONFIDENCE. We carry a special export staff and save all delay. We pay back carriage—paid. Send full value. Cash or C.O.D. carriage paid for half carriage. Any surplus refunded immediately. Here purchase

Balance in 5 monthly payments of £4/6.

Cash or C.O.D. Carriage Paid and 11 monthly payments of £7/6.

Balance in 7 monthly payments of £7/6.

Cash or C.O.D. Carriage Paid and 9 monthly payments of £9/6.

Balance in 9 monthly payments of £9/6.

EXCLUSIVELY SPECIFIED PETO-SCOTT WALNUT CABINET 19/6

Specially designed at the request of Practical Wireless for the Summit 3. A superb walnut, a superb example of cabinet craftsmanship. The Summit 3 Internal Dimensions 10" wide; 10" high; 12" deep. Carriage Paid.

ARMADA Mains 3

KIT "A" Author's Kit of First Specified Parts, less Valves and Cabinet. Cash or C.O.D. Carriage Paid and 11 monthly payments of £10/6.


EXCLUSIVELY SPECIFIED PETO-SCOTT TABLEGRAM CABINET

Another magnificent Peto-Scott cabinet, specially designed for the Armada Mains 3. In beautifully grained woods, skillfully constructed and hand french polished. In Oak or Mahogany to choice, no extra. State which when ordering.

Peto-Scott 1935 Speakers — Tone and Quality as never Before


Tel.: Chiswick 24002. West End Showrooms: 42, High Holborn, London, W.C.I.

Dear Sir,—Please send me CAB/BU/GE. H.R. D. to order.

P.O. Box 21, Cash/Post. Deposit.

ADDRESS

PREVIOUS.

Send with order. CASH or DEPOSIT.

Pr.W. 7:4/7.

SIMPLY PLUGGED-IN.

1935 PILOT CLASS 'B' SPEAKER-AMPLIFIER KIT

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STAND TO STAND SHOW REPORT

Practical Wireless

867

August 25th, 1934

WIRELESS receiver, include connections, valve-holders, are the features of this exhibit.

J. GOODMAN, 20/30, Drysdale Street, are diaphragms and cones this firm largely caters for the mixtures installation, and for use in cinemas and churches, etc., to enable the deaf to hear. Enthusiastic interest was evinced in their new microphone and in their new universal portable amplifier, giving an undistorted output of A.C. mains of 500 to 200 volts.

A useful testing unit—the Radiobloc which is now marketed by Messrs. Everett, Edgcumbe and Co., Ltd.

The name of West is already well-known to all those interested in the field of wireless research which is of distinct and appealing quality.

gave the new model 25 guineas.

The B.S.R. 1934 reproduction, however, is the new branch of the firm, named Ekenton, and is manufactured in their new factory at Hill, Staffs.

Our NEW monthly Magazine

PRACTICAL TELEVISION

GD. EVERY MONTH
A new product by Milsen—a universal speaker.

Our NEW monthly Magazine
PRACTICAL TELEVISION
EVERY MONTH

Stand No. 244

On show here are all types of battery valves, A.C. and D.C. mains valves, universal mains valves, and an interesting mechanical device demonstrating the process of manufacture of the 362 A.C. mains valves. Interesting models which may be seen here are large specimens of their Battery S.G. and A.C. Mains Power Valve, and an enlarged sectional model of the 362 A.G. Mains Cathode.

Stand No. 245
ELECTRICITIES, 61, George Street, Croydon, Surrey.

Stand No. 246
THE WIRELESS LEAGUE, 12, Grosvenor Crescent, S.W.

Stand No. 247
MILNERS RADIO CO., LTD., Bingley, Yorks.

Whereas in previous years this concern has marketed only the Milnes H.T. Supply Unit, they are this year entering other branches of the radio field, as mentioned in last week's issue. The Milnes H.T. Supply Unit is, of course, as well known that it would be sheer waste of space to give information concerning it. Their new lines consist of a new permanent magnet moving-coil speaker with which two models are available—a cheaper model with a two-claw magnet and the de Luxe model employing a special magnet of the new nickel aluminium alloy. Both models are fitted with universal transformers which permit of matching to any output valve or the existing speaker. In chassis form it costs 22s. 6d., the de Luxe chassis costs 40s. 6d., and in walnut cabinets cost 47s. 6d. and 67s. 6d., respectively. Their surprise item is the Milne superhet receiver. This is a special battery-driven receiver incorporating the Milnes Speaker and designed for use with Milnes H.T. Supply Unit. The aerial set employs five valves with Pentode output incorporating eight stages and nine tuned circuits. Provision is made for gramophone pick-up and for extension speaker leads. The controls consist of a combined control wave change and gramo switch, tuning control, volume control, tone control and a change-over switch for speaker in set and extension speaker. Desired A.V.C. is incorporated. The cabinet is a splendid example of modern design in figured walnut and inlaid marquetry china. There are compartments for a Milnes H.T. Supply Unit 150 volt, and for the necessary L.T. accumulators for re-charging and filament supply. A special type of lever switch has been evolved so that the unit switch can be turned without reaching inside the cabinet.

Stand No. 251
COMMOGORD, LTD., Cambridge Arterial Road, Enfield.

This principal item of interest to the home constructor is the newly-designed pick-up which completely with a rest and carrier arm of the wave type, only costs 1½s. This novel pick-up is also included in the complete unit which Milsen. Commoiord have to show, and which includes gramophone motor, for A.C. mains, complete with automatic stop, speed and volume controls, and which costs only 25s. For users of complete receivers who wish to convert their apparatus to a radio-gram, the playing desk which incorporates the motor, pick-up and other accessories mentioned above, all in a polished walnut cabinet, will have a great appeal, and costs only 75s.

Stand No. 252
AERIALITE, LTD., Ashton-under-Lyne.

In addition to the Aerialite aerial and earth equipment and automobile aerials, this firm is exhibiting several new lines including their Quill's aerial brackets at 3s. 6d. per pair, their Leverstretch super aerial with a £500 lightningушunction, 600 ft. connecting 3s. 6d., a new compendium of aerial and earth equipment at 3s. 6d. and 4s. 9d., respectively, their Aerialite universal-fitting bracket for lead-in suspension, copper aerial wire and coax of flex.

Stand No. 254
CHLORIDE ELECTRICAL STORAGE CO., Cliffden Junction, Nr. Manchester.

A FURTHER مجله this exhibit is the D type cell with fitted with the charge indicator. The indicator consists of a dial over which moves a needle, the extreme marks of movement denoting full charge, half charge and empty. The reader may here inspect an absolutely comprehensive range of Radium and Drydax batteries and accumulators.

Stand No. 255

Ahorn loud-speaker built into a neat corner cabinet. The Voigt four-foot horn.
TELEVISION NOTES

THE TELEVISION RADIO RECEIVER. PART 1.


A Practical Article Pointing Out the Requirements of Modern Television Receivers, and How These Require-ments Can Best Be Met.

FROM the point of view of the television enthusiast, a television radio receiver (as distinct from the actual "viewing apparatus") comprises two sections: first, the receiver proper, that is, the radio frequency amplifier and detector stages, and, second, the low-frequency amplifier. This division may be considered arbitrary, but is very convenient for several reasons. For example, results of some sort are possible by using the radio frequency ports of a well built set, but the low-frequency amplifying arrangements of the average domestic receiver are seldom the best for technical work, for reasons which will be given later.

It therefore happens that a television enthusiast conducts the initial experiments with his ordinary broadcast receiver, using, perhaps, a special low-frequency amplifier as he becomes more and more fascinated by his new hobby. Later on, he may consider the building of a radio frequency receiver specially for television work, and, of course, such a set is really essential if serious television experiments are to be carried out and the best images are desired. Two sets are also necessary for the simultaneous reception of sound and vision on the present service of medium-wave television broadcasts.

Fidelity

It is proposed, therefore, to discuss the requirements of television receivers and to show how these requirements can best be met; the present article deals with the radio frequency side, leaving the low-frequency amplifier to be described in the second article. It will be assumed that the reader already possesses some knowledge of the principles of set design and construction, and that it is therefore not necessary to give extended explanations of basic facts.

To begin with, then, a very much higher standard of fidelity is essential for television than for sound reception, because a very considerable degree of distortion can be tolerated by the ear without annoyance, whereas comparatively slight distortion mars the image transmitted by television.

Care must be taken, therefore, in the early stages not to introduce distortion. Nor, although it is not so generally recognised as it should be, there are other methods by which distortion can more easily creep into the high-frequency and detector stages of a receiver than into the low-frequency amplifier.

The most obvious form of distortion is that due to interference from a programme on a neighbouring wavelength. A reasonable degree of selectivity is therefore essential, and it is often found desirable to incorporate at least three tuned circuits. A tuned aerial circuit and band-pass coupling between the high-frequency valve and the detector will give adequate selectivity, or if two H.F. stages are employed, single tuned circuits between each should be sufficient. At the same time, selectivity must not be pushed to the limit or the image will lack definition and detail, due to the cutting of the side-bands, with consequent loss of the higher frequencies.

By the way, although carefully ganged condensers and matched coils are essential for sound reception, where the receiver has to be capable of easy and rapid tuning to a large number of stations, this is not so essential in a television receiver designed to receive the images radiated from one station only. It is quite sufficient, therefore, in many instances, to make use of components already on hand, and separate tuning condensers may be employed if desired, since it will only be necessary to calibrate the set once and for all.

Another Cause of Distortion

The next cause of distortion which must be guarded against is the overloading of one or more of the high-frequency valves. Because valves in these stages are primarily intended for handling and amplifying weak signals, they have a limited "acceptance," and thus can produce serious distortion if called upon to handle large signal voltages from powerful or nearby stations. For this reason it is strongly recommended that variable-mu valves be employed in the high-frequency stages; for although their maximum sensitivity when used with minimum grid bias is fully equal to that of a popularly called "straight" H.F. amplifier, they will handle without distortion very much larger signals when increased bias is applied; and the fact that the overall amplification is reduced is immaterial, because the initial signal is stronger. This is clearly indicated in the accompanying diagram of Fig. 1.

The degree of high-frequency amplification to be provided depends upon two main points: first, the distance between the receiving set and the television transmitter, and, second, the type of detector valve used. It is clear that a receiver installed within a few dozen miles of the transmitter would need less amplification than one situated several hundred miles away. Then a sensitive leakage grid detector generally will be found to give better results with comparatively small signals than a diode grid detector, which is at its best when fed with a really strong input voltage. Again, any type of triode detector gives a certain degree of amplification as well as rectification, whereas a diode detector does not amplify, but will handle without distortion very much bigger input signal voltages.

Bearing all these points in mind, therefore, the ideal television receiver would probably be one having two high-frequency stages, each employing a variable-mu H.F. pentode, and with single tuned circuits in the aerial and in both H.F. couplings. Such an arrangement would be adequate for television reception anywhere in the British Isles from the points of view of both sensitivity and selectivity, and the variable-mu characteristics of the valves would enable steps to be taken to avoid distortion through overloading. Again, the large amount of high-frequency amplification thus available would render the use of reaction quite unnecessary, thus eliminating yet another fruitful cause of image distortion.

The Detector Stage

The next point for discussion is the detector stage. There are three main alternatives from which to choose. First of all there is the familiar leakage grid system, which, as every listener knows, is a most sensitive detector. But it is hardly sufficiently free from distortion for television reception, and is preferably avoided whenever possible.

Even the modified form of leakage grid detector known as "power grid" is scarcely good enough for the purpose, and it is better to turn to the second alternative, namely, the anode-bend detector. Provided the incoming signal can be built up by the high-frequency amplifier to really good strength, an anode-bend detector is almost, if not quite, the most satisfactory arrangement. In both cases it must be understood that triode valves only have been considered.

Now it is quite possible to use screen-grid valves, and also high-frequency pentodes, as detectors, both on the leakage and anode-bend systems, but they are not the best for television detectors. Their merit, for sound reception, is that they will operate satisfactorily with quite small inputs, but for television, where a considerable amount of H.F. amplification, if not essential, is incidental to methods for obtaining adequate sen-sitivity.

(Continued overleaf)
Do You Know What This Graph Means?

The man who can analyse these curves and understand what they indicate knows his job. But if they do not convey to him perfectly definite information, it would appear that he needs more training than he has had. He is not competent to fill a responsible position in the wireless industry.

Radio has developed so rapidly throughout the last ten years that it has now greatly outgrown the supply of technically qualified men required for the better posts. Moreover, it continues to develop with such speed that only by knowing the basic principles can one be kept up to date.

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PRACTICAL TELEVISION

(Continued from previous page)

sitivity, the screen-grid or pentode detector, with its small working grid base is not really a workable proposition.

Therein lies the second type of detector which has interesting possibilities for television, namely, the diode detector. A properly designed diode detector device will handle very powerful inputs without introducing distortion. It is true that, as has already been pointed out, such a valve possesses no amplifying power, but it is a simple matter to introduce additional low-frequency amplification to compensate for this.

Three methods whereby diode detection may be arranged are available. As a makeshift, or for experimental purposes, any ordinary three-electrode valve may be employed, the grid being used as the diode anode, or the grid and anode may be strapped together.

If no suitable diode is available, diode detection can be obtained by a double-diode-triode, of which types are available for broadcasting as well as British wireless practice.

Included in the I.C.S. range are Courses for the Wireless Television Operator. The Operating Course is vital to mastery of the subject to be recorded is scanned by the television receiver which can be distinct from, or a part of, the gramophone turntable equipment. This latter form is shown in the accompanying illustration, Fig. 4, the image being projected on to a mirror standing over the rectangular aperture.

The electrical pick-up used for "playing" on the vision record has to be capable of passing a wider band of frequencies than is required for sound purposes, otherwise the image seen will be badly lacking in quality owing to the absence of the higher frequencies so essential to detail.

Method of Operation

The scheme is really quite a straightforward one, complete development being held up owing to incidental problems connected with the recording and playing back of the television signal.

There is, however, a third type of detector known as the diode detector. This, in addition to inculcating the art of salesmanship, provides knowledge which enables the salesman to hold his own with the most technical of his customers.

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PRACTICAL TELEVISION

VARIOUS details have already been published in some of the daily papers lately about the recording of television signals on gramophone records, inferring
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With present-day valves and circuits it is a comparatively easy matter to design a receiver to pull in dozens and dozens of stations, but such a set would be practically useless for the present congested state of the ether. A receiver with so-called “knife edged” selectivity or “hair line” tuning is not actually “programme selective.” Incredibly fine tuning causes considerable distortion. To be selective while retaining all the essentials for good quality reproduction, each programme must be picked out boldly from the surrounding chaos. That is exactly what this new Lissen Band-Pass 3 does. Programmes hitherto spoilt by overlapping stations, now received clean and bright by reason of the three tuned circuits—programmes spoilt by excessive side-band cutting, now received full of depth and detail by reason of the band-pass circuit and the Power Pentode Output coupled to the fine moving-coil loud-speaker. No other receiver can possibly give you a greater sense of complete satisfaction.

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Mention of “Practical Wireless” to Advertisers will Ensure Prompt Attention
PREPARING FOR THE WINTER ON SHORT WAVES.

How to Overhaul and Test a Receiver to Ensure Maximum Results.

By K. E. BRIAN JAY.

THERE are some people who think that because a wireless set has few moving parts there is nothing that can go wrong, but this, of course, is a mistake; dust can creep in, nuts can get slack, the slight jars unavoidable when dusting may shake connections loose, and all these things cause the receiver to become noisy, and lose its efficiency. Any receiver will suffer in this way, but the effects will be most noticeable on short waves, where slight rubbing between metal and metal, or dust, in bearings and joints will cause bad noises in the headphones, and it is therefore very desirable that the receiver should be overhauled and its defects repaired before the winter season, when with the return of dark evenings it is likely to be much used.

In the search for sources of noise first examine the filament circuits; look for dirty joints and especially test the switch, which can be a potent noise producer; clean its contacts and bend them a little so that they press more firmly on the plug. If it still makes a noise in the 'phone when the knob is wriggled it should be replaced, preferably by one of the Q.M.B. snap type, which is much less likely to develop a bad contact. When indirectly heated valves are used, test the resistance of the heater leads; a high resistance here will cause a bad drop in the voltage at the heater terminals.

Testing the Wiring

Next test the whole of the wiring of the set. Be sure that all joints are soldered, pull each one sharply to see that it is sound; it seems at all loose, even although the wires do not come apart, indifferent connections are responsible for more noise than any other single item. If the connections are made simply by means of the terminals on the components they should all be screwed tight and tested by pulling. Pay particular attention to terminals which carry flexes; often turning the screw causes the strands of the flex to spread with the earth return and that any bolts that hold them together, such as are sometimes used in screening boxes, are screwed up tightly. Make sure also that wires that ought to be in the air are not rubbing against a screen or on a metalized base-board.

Tuning Condensers

Now turn your attention to the tuning condensers. With the receiver switched on turn the dial slowly and listen for noises. If you hear any, as you are very likely to do, remove the condenser and clean it; a pipe-cleaner or feather can be used to remove the dust between the vanes and a small paint brush will be a help in dealing with the bearings. Should there be any slackness in the bearings it can be taken up by means of the adjusting screw in the bottom plate, but this is an operation that requires care or the plates will be put out of alignment and will rub on one another. A tiny drop of very thin oil can be applied to the bearings when they are clean. Do not forget to look to the pigtail connections on variable condensers; the noisiest short-wave receiver I ever heard always had all its trouble to a defective pigtail in the reaction condenser. The spirals of the pigtail must not touch one another as the moving vanes are turned nor must they rub against the spindle or bearing. See also that there is no break or weakness in the pigtail, especially if it is made of thin metal foil.

While you are treating the condensers do not neglect the slow-motion dial; remove the dust from it and apply a little oil to the bearings.

Examine the Coils

After the condensers the coils. If they are plug-in coils examine the pins and clean and spread them apart a little with a pen-knife so that they make good contact with the sockets. Return any wandering turns to their proper place, and if necessary keep them there with a spot of shellac varnish or Durofix for coils wound with very thick wire. Coils wound on valve bases suffer badly from handling, and it is sometimes best to rewind them, quite a simple job; make sure you put on the same number of turns though, or the calibration of the receiver will be thrown far out. It will be disturbed in any case if the coils are rewound, but not very much if the same wire and number of turns are used on the original former. In receivers fitted with dual range coils the wave-change switches must be examined and cleaned or even renewed if they are very noisy. In some home-constructed sets the wave-changing is done by means of a plug on a flex; in such a case it will probably be worth while changing the flex for a new piece. The plug and sockets must, of course, be sound.

When the whole of the internal wiring is checked and the components cleaned and dusted, attend to the external wires to the batteries. Examine the B.C. leads for signs of corrosion at the accumulator end and also for broken strands at both ends; cutting off the dirty ends and cleaning a fresh part of the flex will be enough if screw type spade tags are used, but if the tags are soldered on it may be necessary to replace them with new ones. The H.T. and G.B. wander plugs must be cleaned and spread out and the connections to them tightened up and, of course, the telephone leads must not be forgotten; if there is a great deal of noise when they are shaken there is probably an internal break and they must be replaced.

Lastly, the valves are cleaned and agreed with a plug-in type if they exist. If there is any bad noise left now it almost certainly arises from a defect in some component such as a H.F. choke, L.F. transformer, resistance or grid leak, and in that case each component must be systematically tested in the way that has been described in these pages before.

Checking the Batteries and Valves

There may still be a falling off in efficiency and to prevent this the batteries and valves are checked. Measure the H.T. voltage when the set is first switched on and then after it has been in operation for three hours or so. Any great difference between the two readings indicates a new battery is needed. Check the voltage of the grid bias battery, and if necessary renew it; renew it in any case if it has been in use more than a year. It is assumed that the L.T. accumulator has been properly looked after all through the summer, and therefore will not be in need of special attention now.

It is a good plan to measure the plate current of the valves and compare it with the value given in the maker's curves; a wide divergence indicates a defective valve that is probably working far below maximum efficiency, and may be noisy. If a milliammeter is not available you may be
A Brief Summary of the Changes which Have Been Made in the Design of the Tuning Coil During the Past Season.

At the time of last year's exhibition at Olympia it was possible to describe most comprehensive modifications which had been introduced in the design of the tuning coil during that year. Since that date, however, no such detailed changes have been seen, although there have been several interesting developments in this important section of the broadcast receiver. The introduction of the powder-iron core enabled the size of the tuning coil to be greatly reduced and also enabled Litz wire to be used with decreased H.F. resistance, and further enabled the screening of these coils to be carried out without in any way losing efficiency. Thus it might have been said that the coil was well nigh perfected. Since last year's exhibition, however, the Lucerne Plan has become effective, and this has necessitated some important modifications in the design of the coil to suit modern needs, and with the forthcoming introduction of the Droitwich transmitter (October 7th) it is highly probable that some still further alteration will have to be made.

Wavelength Range

A year ago it was customary for the coil to cover bands of 200 to 900 metres, and about 850 to 2,000 on the long waves. Under the conditions existing with the Lucerne Plan it is necessary to modify this range to include certain stations which are easily receivable in this country on small receivers. For instance, Fécamp is a very good station, and unless the tuning coil has a minimum tuning point some way below 200 metres it cannot be satisfactorily tuned in. The new Droitwich station will probably render it necessary to modify the long-wave range in order to take full advantage of this station and other stations in this portion of the band, bearing in mind the fact that the power of this new station will be probably in the region of 150 to 200 kilowatts. The London National will cease to function when Droitwich comes into play, and thus the medium-wave band will offer more programmes to southern listeners. The demand for selectivity does not arise in every part of the country, and with the increased efficiency of the modern valve and other components it is now possible to construct a receiver in which a really efficient air-core coil will offer adequate selectivity if used in the correct manner, and accordingly several makers have, during the past few months, re-introduced this type of coil as an addition to their range of iron-cored coils. The Wearite Universal coil is a good sample of this new method of construction, and the efficiency of the coil was demonstrated in the Leader series of receivers which we recently described. Other coils designed on these lines, that is, with air-cored but carefully designed selective windings, may be found in the Bulgin, Burne-Jones and other catalogues. They employ metal screening cans and offer adequate selectivity for modern needs in most parts of the country. Obviously in the London area, with a large external aerial, it may be found difficult to provide sufficient selectivity to receive stations separated only by a few channels from the London stations, and it is then that the iron-core coil with probably the addition of a further H.F. stage will be found necessary.

The Superheterodyne

With the increased popularity of the superheterodyne circuit the necessary coils have also become popular, and now practically every manufacturer who includes coils in his range of components can supply the coils necessary for this type of circuit. The introduction of the special frequency-changer valves has led to the development of oscillator coils having characteristics suitable for the pentagrid, heptode and octode valves, and thus render the construction of the superhet much simpler.

Beyond these few changes there has been nothing which is of importance to the home constructor, and Messrs. Varley are still the only firm who are marketing a complete permeability tuner in which the variation in inductance is carried out by a movement of the powder-iron core instead of the more usual parallel tuning capacity. Great things were expected of permeability tuning at last year's exhibition, but for some reason or other they have not matured during the season. It is difficult to account for this, as it is obviously a much better system of tuning than is obtained by the parallel capacity method now in use, and the losses are certainly likely to be much lower. In a way, too, it is the more logical method of tuning, but we must wait and see whether it will become the universal tuning system of the future.
The perfect tuning Unit, making possible the design of a receiver giving good quality at all wavelengths. Both 3- and 4-gang units available. Perfect tracking of aerial circuit. Initial matching is maintained.

Permeability Tuner (3-gang) BP 100 £3.7.6
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Pentode Type, 10/-, BA & BX, 9/-.
362 AC MAINS. HLA, 7/6, PXA, 9/-.
SG4 & VSA, 12/6, ME & RIM, 10/-.
RB41, 7/6, RB43, 10/-, DC MAINS at SAMB PRICES as AC MAINS. Should your dealer not stock, send P.O. to Dept 44.

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Extra value in that the expenditure you would normally make on rectifier replacements is entirely eliminated.

Gone, too, is the worry that your set will let you down just when you want to show it off to your friends.

Westinghouse Metal Rectifiers are undergoing a continuous life test at full load, to find out exactly how long they will last. So far they have been on duty for over 60,000 hours and still show no sign of a falling off in output. 60,000 hours is 30 years when used six hours a day (the average use of a Wireless Set), and you will get exactly the same performance from the metal rectifiers in the A.C. Mains Receiver you buy.

Remember, Westinghouse Metal Rectifiers never let you down, but, if you would like more detailed information as to their merits, send 3d. in stamps to Dept. Pr. W. for a copy of the new 1935 edition of “The All Metal Way.”

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BULGIN QUALITY RADIO COMPONENTS

OLYMPIA, STAND 121.

Do not fail to call and examine the numerous brand new BULGIN Components now available, all designed in accordance with the latest research and practice. Prices have been reduced to the lowest level consistent with the high quality of material and workmanship for which BULGIN PRODUCTS are justly famed.

NEW S.W. TUNER.
A specially designed 5 range low loss switch assembly made to accommodate plug-in coils units covering wavebands from 10 up to 2,000 metres.

Numerous new short wave components.

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Tone Controls of unique construction giving improved top note and bass response. Improved types of wire and chemical composition volume controls, with and without switches.

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5, 7 and 9 pin chassis and baseboard. Bakelite or "Ceramic" low loss insulation. Two new models for the 5 and 8 pin side contact valves. A type for every purpose.

NEW SWITCHES.
More additions to the famous range of BULGIN switches, including new Rotary, Toggle and the latest quick-make-and-break wavechange switches.

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Please send me, post free, a copy of the new BULGIN Catalogue No. 151 "N," for which I enclose threepence in stamps.

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Abbey Road, Barkingside, Essex.

PRACTICAL WIRELESS August 25th, 1934
THE BEGINNER'S SUPPLEMENT

OUR NEW COURSE FOR BEGINNERS.

In This Article the General Principle of Broadcast Transmission is Simply Explained.

BEFORE we can fully appreciate the varied principles which are involved in modern wireless transmission and reception it is necessary to understand the simpler method of sound propagation. Broadcasting is simply a method of transferring sound from one place to another without the intervention of any sort of wire. Sound may be described as the effect upon our ears of air vibrations produced by the vibration of an instrument emitting that sound. When a musical string is plucked or bowed we hear a sound but actually the vibration from the string does not become sound until it reaches our ear. As the string vibrates, or moves backwards and forwards very rapidly, it alternately pushes and releases a small quantity of the air in its immediate neighbourhood and this small movement is imparted to the particles of air nearby and so on, the movement spreading outwards very rapidly in all directions. The jostling and moving which takes place in the particles of air eventually reach our ear, and the very thin membrane inside our ear is, in effect, struck by the moving air waves and so caused to move in sympathy with the air movements, and in this way the original sound is recreated and we become aware of the noise.

The Telephone

The instrument invented by Bell was the first satisfactory solution to the problem of conveying the sound waves from one place to another beyond the normal range of our hearing, and in this instrument a device known as a microphone is employed and the sound waves are directed so that they impinge on the diaphragm of this microphone. By means which will later be described the movement of the diaphragm (which would correspond to the movement of the drum of the ear) sets up varying electric currents in a pair of wires, and these wires are led to a somewhat similar device at the other end. Here, the varying currents flow through a magnet and so cause another diaphragm to be varied exactly in sympathy with the original diaphragm's movements and this reproduces the sound. For wireless broadcasting exactly the same principle is utilized, but, instead of employing the wires connecting microphone and reproducer, a further change is made and the vibrations are distributed through space by means of a radio wave which travels in a manner very similar to light, at a speed of 186,000 miles per second. So far as is at present known, this radio wave is incapable of affecting any of the normal human senses, and, therefore, it is impossible to hear any broadcast matter without the aid of a wireless set.

THE WIRELESS CONSTRUCTOR'S ENCYCLOPÆDIA

By F. J. CAMM
( Editor of "Practical Wireless")

Third Edition. 5/- net.

Wireless Terms and Definitions stated and explained in concise, clear language.

From all Bookshops, or by post 5/- from Geo. Newnes, Ltd., Southampton St., London, W.C.2

An illustration of a high-power broadcast transmitter, showing the large coils and other accessories.

A modern broadcasting studio, with two microphones.
When Buying An Umbrella You Look At The Frame

When Buying A Receiver Look at the Valveholders

Ask the Salesman what make of Valveholders are used in the receiver you look at. If he says "CLIX" and nine out of ten do say "CLIX," then you can be satisfied that the receiver is modern and built throughout of quality components.

CLIX SPECIFIED FOR

"ARMADA MAKES THREE"

The sexy catalogues bore: "CLIX, Price.
Stand 216 Olympia

LECTRO LINX LTD.,
79a ROCHESTER ROW, LONDON, S.W.I

PRACTICAL WIRELESS

READY MADE OR HOME-MADE?

Is It Better to Make Your Receiver or to Purchase One Ready Made?

Some Important Details Which Answer This Question

At the present time there are a number of really cheap wireless receivers on the market, and this has led to the belief that it does not pay in size or price to make a wireless set at home. It is probably safe to say that it is impossible to build a receiver at home at the price of a similar type of commercial receiver, but it is necessary to go rather deeper than this in order to ascertain whether or not it is worth while to build your own. Dealing first with price, it will probably be found that this season it is quite a simple matter to obtain one which will not cost more than the commercial receiver which contains the same number and types of parts. Hitherto, it has been the custom in an endeavour to obtain a really cheap set the manufacturers of complete receivers set out to utilize components which were stripped of all unnecessary decoration, and also, in many cases, which would not be suitable for the purpose for which they were designed to be used. Thus, in the case of a smoothing choke, for instance, this was designed to use the minimum size of core and the thinnest wire, and the smallest number of turns so that it smoothed the particular supply in a cheap receiver. The cheapest choke in the component market would undoubtedly be found to be housed in a bakelite case—not for appearance necessarily, but so that it was protected and would not give rise to shocks when handled by the constructor. The wire would also be of a much heavier gauge than was really essential, and the rating would probably be found to be stated in the catalogue as suitable for 20 to 60 milliamps—in other words, it was more of a general purpose instrument. Obviously, therefore, it would cost more than the previously mentioned component. The same applies to the other accessories in a commercial receiver, they have, in the majority of cases, been stripped down to the bare minimum and consequently a considerable amount of money has been saved.

A Safety Factor

It does not need much imagination to see that in the event of overload—no matter how such overload may be caused—there is every risk of a complete breakdown in more than one part. This is a factor of vital importance to the user of the apparatus, not from the point of view of personal safety, but also from the point of view of serviceability. Should the maker's guarantee have expired a considerable amount of money may have to be expended to put the receiver into working condition again, and, furthermore, in the majority of commercial receivers, it will be necessary to send the apparatus to a service station to be attended to owing to the inaccessibility of the parts. Contrast this with the home-built receiver described in a wireless journal. The designer, in choosing the circuit and components, will have before him not simply an ordered list of all the manufacturers of component parts. Thus, should he need a smoothing choke for a mains receiver, he will work out the current his receiver is expected to handle, and then will examine all the lists and select those which will handle that current with safety, narrowing his choice down to the make which is having the highest inductance, and finally selecting that which has physical dimensions suitable for the design which he is working upon.

Admittedly, until recently the constructor had to pay an unenviable figure for his components owing to the method in which these components were built up, but we have taken up this point with the manufacturers, and it is hoped that of the policy which we have adopted and which resulted in the introduction of the "Leader" series of receivers, a number of components may now be obtained in a similar condition to that in which they are supplied to the receiver manufacturers, a condition known as "stripped." That is to say, instead of terminals, long leads are fitted; no elaborate case surrounds thy component, and yet the original safety factor is still there.

Experimental Scope

There is, however, another more important point which must not be overlooked. Radio at the moment is by no means perfect, and it is quite possible for drastic modifications to be made in a very short space of time. For instance, during the past twelve months the valve alone has moved along most unthought-of lines. Listeners with a commercial receiver will find that it is almost impossible to modify the lay-out in order to take advantage of a new idea, or even to try out a new arrangement in order to satisfy themselves regarding some astounding claim. The home-made receiver, on the other hand, is readily accessible, and furthermore, when a new idea is introduced, the technical Press generally shows how the scheme may be fitted to an existing receiver which they have already described, or gives some hint as to how an existing receiver can be fitted with new components, and so on.

"Clix" Series of Receivers, a number of components may now be obtained in a similar condition to that in which they are supplied to the receiver manufacturers, a condition known as "stripped." That is to say, instead of terminals, long leads are fitted; no elaborate case surrounds thy component, and yet the original safety factor is still there.

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RADIO CLUBS AND SOCIETIES

Club Reports should not exceed 200 words in length and should be reviewed four weeks prior to the issue date. For each standard for publication in the following week’s issue.

ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY

New Zealand readers of Practical Wireless will be interested to know that the Southland Branch of the Anglo-American Radio and Television Society has been formed by Mr. James Smith, ZLAC. The branch is in Christchurch, and details are as follows:

- The branch held its first meeting on May 24th, 1934.
- Meetings are held every Thursday evening at the Firemen’s Hall, 188, Ernack Street, Christchurch.
- An attractive programme is being drawn up for the remainder of the season.
- Further particulars may be obtained from Mr. Leslie W. Orton, “Kinghamdor,” Witham, East Anglia, England.

SLIDE RADIO

The programme of lectures, etc., for next month is as follows:

- Sept. 6th. — Lecture by Mr. Harvey Marsden, Short-wave working. R.S.W.R. Clubhouse and Naval, with special films of Rugby and W.B. station.
- Sept. 20th. — Demonstration of the new AvoDapter, which comprises the names of the firms from whom purchases can be made, and details are as follows:
- Experimental, Ltd., 110, Hilleres Road, Gravely Hill, Birmingham.

Catalouges Received

To assist readers, desirous of obtaining various articles, a postcard is issued to the names of the firms from whom purchases can be made, and details are as follows:

- Experimental, Ltd., 110, Hilleres Road, Gravely Hill, Birmingham.

THE NEW AVDAPETER

It is often happens when wishing to check up one’s own or somebody else’s set that there is a doubt as to the best way to work about the job. Of course, an ordinary meter can be used, but this may necessitate the disconnection of wires for inserting a meter, with subsequent re-storing. This sort of thing, however, is provided for the new Avadapeter, which consists of a clip (instantly convertible for 4- or 5-pin valves) into which sets are connected to a testing holder or base, which provides for the taking of voltages and currents in all the valve circuits, with comfort on the bench. The Avadapeter is a 5- to 7-pin conversion adapter, which enables the operator to deal with multi-electrode valves also with ease and efficiency. It is used in conjunction with either plug or base depending on the type of valve to be tested. The plug is inserted in the valve-holder of the valve under suspicion, and the valve plugged into the Avadapeter. A switch and link are provided to enable anodes, grids, screens, filament or heater currents and voltages to be measured. The currents and voltages of any circuit can be taken simultaneously or separately.

For those who already own an Avadapeter, the new spade and plug are provided to enable anodes, grids, screens, filament or heater currents and voltages to be measured. The currents and voltages of any circuit can be taken simultaneously or separately.

EASY PAYMENTS — “There’s no place like HOLMES.”

You can buy options on easy payments. Also you can get the latest wireless in Wireless Time, thousands of satisfied customers.

RADIO FOUNDRY

STAND 27 OLYMPIA

BRITISH MADE by
High Vacuum Valve Co., Ltd., 113-117 Farringdon Road, London, E.C.1

PRACTICAL WIRELESS

HIVAC

THE SCIENTIFIC VALVE

BRITISH MADE

Hivac use only the highest quality glass obtainable because “soft” glass will not stand up to and retain the “hard” vacuum essential to high efficiency and consistent characteristics.

The broad “pinch” allows greater spacing of lead out wires thereby reducing inter-electrode effects.

HIVAC SPECIFIED FOR THE “EXHIBITION 3”

BATTERY TYPES FROM

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Mains Types From

3/9

Obtainable from all Curry’s branches and high class dealers.

SIFAM ELECTRICAL INSTRUMENT CO. LTD.

134 E.C.4, York Works, Birrington St.

PATENTS AND TRADE MARKS


August 25th, 1934

PRACTICAL WIRELESS

699
and
WHEN THE
SHOW WAS
OPENED....

The fare at Olympia offers many surprises ... new circuits, new tuning devices, new cabinets. But had you the time to investigate you would find T.C.C. condensers "all over the show." Look inside the leading commercial receivers, call at the various press stands, see how often you meet the "condensers in the green case." Then go over to Stand 37 and see the range of T.C.C. condensers, the comprehensive selection of NON-INDUCTIVE paper types, the electrolytics, and the big transmitting condensers. Spare a second more, realise how their dependability has made T.C.C. the premier amongst condenser makers — realise too, you can have that dependability — for no extra cost.

T.C.C.
ALL-BRITISH
CONDENSERS
The Telegraph Condenser Co., Ltd., Wales Farm Road, N. Acton, W.3.

SEE THE COMPLETE RANGE ON STAND 37

Impressions on the Wax
By "TONEARM"

If we were to look up our dictionary for a definition of the word "practical," we should probably find, in common idiom: "putting knowledge to real use." Now knowledge, or science, or art belong to an abstract world, and whilst there seems to be no objection to putting the first two to very practical ends, there exists the fervent conviction that art should survive for its own sake — subjectively, as it were, in deference to the cliché, "Art for Art's sake."

There is no reason why the aesthetic should not contribute something of itself to the practical. This is not to say that every expression of art should be turned into money: this would be, firstly, impossible for many, and secondly, unhealthy for everybody. But there is no valid or proper reason why art should not be viewed in terms of practical values, practical in the sense that one may look for some new experience or sensation, apart from the purely academic viewpoint which many would have us adopt. Cannot we get at the message behind the mere expression?

Let us make an attempt to do so — here, of course, we are dealing with musical art as we hear it on gramophone records. We begin to listen to, say, the Beethoven Fifth Symphony (I know of no better illustration), detached from any other purpose than that of listening to some "good music." Almost at once, from behind the art which inspires it, leaps out the practical. There is a message there, persistent, vital, urgent. What that message is belongs only to Beethoven and the hearer, but in it is a very real structure on which may be built many foundations, all acutely real and translatable into action or conduct. Surely this exemplifies the practical side of music.

There are two ways, and two only, of hearing music. There are only two ways of talking of music. One — the frigid analytical method, where the poor corpse is laid on the slab of polemical dissection and cold-blooded evidence delivered as to the physical structure and condition of the deceased (thus the usual form of criticism); and, two, the intimate, honest effort to describe the attributes of a living entity always with us and its message and influence on our lives. Art for Art's sake — heaven forbid!

We shall go much farther than that in our efforts to draw our pictures! Everybody must take something away — something which will guide towards richer practical rewards. And this end can only be achieved by a portrayal (in the practical sense) of the piece before us. Does it really mean anything to us? Will it be of any value to us this time next year? Are ordinary, intelligent folk able to sense its merits, able to understand it? These are the questions we shall ask and endeavour to answer. The composer, the poet, and the artist either worked for you, or they did not; we shall try to show how far their efforts have succeeded.

From time to time we must examine an opera, and at the moment Madame Butterfly is presented to us. Listening to opera presents a double difficulty where its language is other than our own (as in this case). And yet there is no reason to run away from it. The emotional content of the music of the best operas is, with
Conducting in a Sound-proof Box

By means of a new invention which was tried out recently at the H.M.V. Recording Studios in London, one of the greatest difficulties in obtaining satisfactory performances of orchestras when performing in front of a microphone for the purpose of broadcasting, or making records and films, will be solved. In the past the conductor has not been able to obtain an accurate impression of how the performance is sounding to the listeners in the case of broadcasting, or how it will sound ultimately in the case of records or films. For example, a visitor to the recording studio during a dance band session recently found himself unable to hear orchestral accompaniments when the performance was heard through the loudspeaker. The new invention, which has been developed under the guidance of the greatest expert in the "His Master's Voice" studios, enables the conductor to hear the performances of the orchestras under their direction in the same way as the recording engineers do, and also as they will sound on the finished records. The conductor stands in a specially made sound-proof cabinet with glass windows about the size of a telephone booth. He does not hear the performance direct, as it is situated in the studio, and he directs his orchestra whilst inside the cabinet. He is able to hear the dead singers' voices through the loudspeaker in the cabinet whilst directing the orchestra through the window.

CONDUCTING IN A SOUND-PROOF BOX.

Ray Noble, the dance music composer-conductor, used for the first time recently a new invention when making records in the "His Master's Voice" studios. He conducted his orchestra from a sound-proof box and heard their playing through a loudspeaker at his side. Thus he was able to ensure that all the instruments were perfectly balanced and managed to obtain effects that have not been possible hitherto.

Droitwich—and After

THE new B.B.C. giant station at Droitwich will not officially begin broadcasting until early in September, but unofficial testing is now taking place every night after the other stations have closed down. Every possible precaution is being taken to ensure that there will be no last-minute hitches. But there is another reason for these early tests. The Radio Exhibition opened on August 15th, nearly a month before Droitwich starts transmitting in earnest. The new station will have a power of 150 kilowatts, as against Drayton's 30 kilowatts, and it is possible that this tremendous increase will vastly alter reception conditions.

Up-to-Date Tuning Scales

By not waiting for the official opening of Droitwich, the B.B.C. are providing radio manufacturers with an opportunity to check the performance of their new sets against actual transmissions. An example of the thoroughness with which manufacturers are taking their preparations is provided by E. K. Cole, Ltd. The new EKCO models are being issued with Droitwich already marked on the tuning scales, so that the sets will be completely up-to-date immediately transmission begins. These dials are also easily replaceable in the event of a change-round.

Easy Terms


W.B. STENTORIAN STANDARD P.M. MOVING-COIL SPEAKER

SENT ON 7 DAYS' TRIAL

For Pneum. Pensions and Class "B" send only 7s. for 7 days' trial. If approved, balance in 7 monthly payments of 6/-, 7/-, or 8/- and C.O.D. Carriage Paid.

BLUE SPOT "STAR" JUNIOR P.M. MOVING-COIL SPEAKER

SENT ON 7 DAYS' TRIAL

With loud-speaker and input transformer. Send only 2/6 for 7 days' trial. If approved, balance in 7 monthly payments of 3/-, 4/-, or 5/- and C.O.D. Carriage Paid.

TELSEN "323" KIT

Complete Kit of Parts for new Telsen Straight 3. Send only 3/-; Cash or C.O.D. Carriage Paid. 6/-/6.

N.T.S. CLASS "B" SPEAKER

SENT ON 7 DAYS' TRIAL.

With half-size Case and tapped input transformer. Send only 2/6 for 7 days' trial. If approved, balance in 7 monthly payments of 5/-, 7/-, or 8/- and C.O.D. or carriage or cash. Power or Pentode Model, same price and terms. Write in type required. Send only 2/6; Cash or C.O.D. or C.O.D. Carriage Paid. 6/-/6.

ATLAS ELIMINATOR

SEND FOR IT ON 7 DAYS' FREE TRIAL.

Model CA.12. For A.M. Sets. 100/900 v., 5 k.w./150 v., £2 7s. 3d. in 11 monthly payments of 3/-, 4/-, 5/-, and C.O.D. or C.O.D. Carriage Paid.

New Times Sales Co.


PRACTICAL WIRELESS

August 25th, 1934

P.W. 25/8/34

ONE MONTHS' TRIAL

On Easy Terms


Balance in 11 monthly payments of 5/-, 7/-, or C.O.D. Carriage Paid.
HOME CONSTRUCTION

IN 1935

Radiolympia has Much of Interest for the Home Constructor,
for Many New Components are to be Seen

NINETEEN-THIRTY-FIVE will certainly be a constructors' year. Some months ago it appeared that interest in home construction was flagging, but the introduction by PRACTICAL WIRELESS of the "Leader" series of receivers marked a change, and that change is continuing to become more pronounced. As we show on another page the prices of components for set building are certainly lower than they have ever been before, whilst the standard of home-made receiver performance is particularly high.

It might so happen that some readers of this special "Olympia" Number forsook home construction a few months ago while prices were rather high, and it is chiefly for the benefit of such people that this article is being written. Those who have not been actively engaged in home construction during the past year or so might be in some doubt regarding the latest components which are now available, and perhaps in rather a quandary to know what type of set they should make for the coming "season" (if there is any "season" in wireless to-day, which we very much doubt), and a few notes concerning the available parts will prove useful.

H.F. Pentodes

Whether it is proposed to make a superhet or a "straight" receiver, variable-mu or plain H.F. pentode valves will be required, for these have almost entirely supplanted the ordinary S.G., which was previously a popular favourite. The latest valves are much more stable than their prototypes, and are capable of producing a far greater degree of sensitivity. In addition, valves of the variable-mu type provide the best form of volume control—either automatic or manual. When the output circuit is being considered users of mains apparatus will almost invariably desire to use an output valve giving an undistorted output of two or more watts, and such valves are readily obtainable. The battery-set user will wonder whether to employ Class B or pentode L.F. amplification; where a particularly large volume is desired the former will be preferred, but it should not be overlooked that most of the latest types of coil speaker are considerably more sensitive than their predecessors, so that a really ample output for most purposes can be secured by the use of one of the many high-efficiency pentodes. In this connection it might be mentioned that the new W/B "Stentorian" speakers, for example, will give nearly twice the volume of sound for any given signal input than would last year's models.

Tuning Components

When it comes to the choice of a tuning circuit the constructor can choose between iron-core and air-core coils. In the case of a very simple local-station receiver, or when selectivity is not of prime importance, the air-core inductance can still be used with every success. But when sharpness of tuning is a deciding factor, iron-core coils have it every time. There are tuning condensers in plenty, and we do not know of an unsatisfactory one made by any of the better-known manufacturers. Where compactness is desired recourse can be had to one of the many midget tuning condensers which are every bit as effective as their larger brethren. Such components are made by Wingrove and Rogers ("Polar"), Wilkins and Wright ("Utility"), and others, whilst very attractive full-vision tuning scales of various types can be obtained for any of these.

Those who favour the superheterodyne on account of its selectivity, but who desire better quality of reproduction than this type of circuit is normally capable of providing, will be pleased to learn that it is possible to obtain oscillator coils and intermediate-frequency transformers of the adjustable type. These can be set to provide any band-width acceptance from about 6 to 12 kilocycles, so that the best possible quality can be secured from the nearby stations, at the same time as maximum selectivity is available when distant stations are wanted.

Multiple Switches

Many constructors prefer to cut down the control knobs to the lowest convenient number, and these will find the multiple anti-capacity switches made by such firms as Bulgin and Burne-Jones ("Magnum") extremely valuable as a means of combining the functions of a number of separate units. Other combination controls are to be found on many of the circuits of tuners which are to be had for any and every circuit arrangement—the Colvern-matched tuners are a case in point.

There are still many houses which are supplied with D.C. mains, and as these will eventually be replaced by A.C. the occupants are often in doubt as to the most suitable type of receiver to build. This question now lends itself to a ready answer, because almost every type of valve can to-day be bought in a form which can be operated equally well from A.C. or D.C. mains. These universal valves are by no means "experimental," but are just as satisfactory in every way as their A.C. counterparts.

All-Wave Tuning

Until this year there has been a dearth of tuners which would cover not only the long- and medium-wave bands, but also the principle short-wave ranges. There are now, however, two or three entirely satisfactory all-wave tuners; one of these employs interchangeable coils so that not only can short waves be received in addition to the broadcast bands, but any particular short-wave range can be accommodated. This tuner will go down to 10 metres and up to 2,000 metres merely by operating a switch.

Most readers are well aware that the ultra-short-waves are coming into greater prominence in connection with television, so it is not surprising to find that special coils for ultra-short wavelengths are obtainable.
THE NEW COMMERCIAL RECEIVERS

A Résumé of the Salient Features of the 1934-35 Ready-made Sets.

THE variety of new receivers for the 1934-35 "season" will be as great as, if not greater than, for any previous year. Prices will be lower than ever before in the history of broadcasting, whilst the sets themselves will be much smaller in regard to their physical dimensions. In the new models will not be so distinctive in the matter of new and unusual circuit arrangements as in respect of the many practical improvements which will be incorporated. As was the case last year, superhetordynes will predominate, and there will, in fact, probably be a far greater number of superhets at Olympia than at any previous Exhibition. "Straight" sets will not be entirely absent, but these will be featured in the lower-price range as a general rule. A rather important proof of the extra popularity of the superhet is afforded by Messrs. Philips Lamps, who last year employed their well-known "superinductance" principle in all their larger and more powerful receivers; they have not forsaken this efficient circuit, but they are producing two superhet—one for A.C. operation, and one of the universal type.

A.C.—D.C. Operation

Incidentally, it is worthy of mention that most of the better-known receiver manufacturers are including one or more universal (A.C. or D.C. operation at will) receivers in their range. This is in response to an ever-increasing demand, and has been made possible by the comparatively recent introduction, by British manufacturers, of extraordinarily effective universal valves. Among those who are producing universal receivers mention might be made of such well-known firms as Messrs. Ekco, Messrs. Telson, Messrs. Aerdynne, Messrs. Ultra, Messrs. Pye, and Messrs. McMichael. There are, of course, many other firms producing such sets, but it is obviously impossible to mention every one by name.

One important change which has taken place with regard to commercial super-heterodynes concerns the reduction in the number of valves. This change commenced more than a year ago, but it has now advanced to the stage at which a total of four valves is the rule rather than the exception. The reason is not far to seek, and it is that the pentagrid, octode, and other special frequency-changing valves of extremely efficient types are now available. Additionally, the double-diode-triode and double-diode-pentode have now been practically standardized for use in the second-detector position, where they also perform the functions of first L.F. amplifier and automatic volume control.

A.V.C. is to be found in nearly every one of the new season's sets. This statement calls for an explanation, since it might not appear at first sight that there is any close relationship between A.V.C. and the superhet. The fact is that nearly all of the automatic volume control devices function more efficiently on the higher wavelengths (lower frequencies) at which the intermediate-frequency amplifier is designed to operate. Additionally, these devices vary slightly in efficiency at various frequencies, and can therefore only produce uniformity of result when they function continuously at the same frequency.

Whilst on the subject of intermediate frequency it might be mentioned that a number of the latest superhets have L.F. amplifiers which operate at a higher frequency than heretofore. The chief advantage of this is that a wider wavelength range can be covered by a set of this kind, and this is exactly what is wanted to cope with the conditions imposed by the Lucerne Plan.

Visual Tuning and Noise Suppression

It has been pointed out in these pages before that the normal use of A.V.C. brings one or two difficulties in its train, not the least of which is that it is more difficult to tune the set to the exact resonance point. This is because the signals from any particular station remain at constant intensity over a fair number of degrees on the tuning dial, due to the "levelling" effect of the automatic control. This does not mean that selectivity is in any way impaired, but that a peculiar form of distortion is obtained if the dial is not set to the true tuning point; this is because half of the sound is "cut out." The only real solution to this difficulty rests with the use of visual tuning, and this is a feature of most of the latest models. There are a number of methods of providing visual tuning, but one of the most popular is due to the recent development by Messrs. Cossor of a special form of neon indicator.

The device consists of a relatively long neon tube in which the two electrodes are placed at the top and bottom respectively. When the set is not tuned to a station the characteristic neon glow is very weak, but as resonance is reached the glow extends towards the upper electrode. Thus, exact tuning is indicated when the glow reaches its maximum length. The neon indicator is employed in the Cossor model 335 A.C. superhet, as well as in several of the Ultra receivers, and others. There are several other types of visual tuning indicator, one of which takes the form of a milliammeter connected in the anode circuit of one of the controlled valves; the needle shows a maximum deflection when the set is exactly in tune. Other visual indicators indicate resonance by the width of a band of shadow, or of light, on a scale, whilst a particularly novel system is used on the Alba superhet. This receiver employs what the makers have called "searchlight" tuning, and a triangle of light is thrown on to the scale as the set is switched on, this rotating as the tuning knob is rotated. As the set is brought into tune with a station the width of the "searchlight" becomes less.

(Continued overleaf)
Visual tuning at once overcomes what was at first a serious drawback of A.V.C.—the large amount of inter-station noise. This has, of course, been prevented in many cases by the provision of some type of noise suppressor, quiet A.V.C. or "squelch" device, but it can be obviated more simply and cheaply simply by turning the (L.F.) volume control to its minimum position, tuning entirely "by eye," and advancing the volume control after the desired station has been selected.

The new receivers make it more than ever evident that the old idea of describing a receiver by the number of valves it contains is quite futile. For example, a four-valve superhet fitted with one of the many types of frequency-changers and a diode-pentode second detector acts in every way as seven-valve of previous type. Thus, the idea of naming a set by the number of tubes, rather than notes, which it contains is gaining ground. We believe that Messrs. Ekco were the first to standardize this method of nomenclature last year, but it is now being used fairly generally by most manufacturers.

New Tuning Devices

MUCH thought has been expended on the matter of tuning dials since last year, and it is gratifying to find that there has been a general improvement. Mention has already been made of the "searchlight" dial, and it is only fair that we should also mention "clock-face" tuning which was introduced by Messrs. Ultra. In this system the "clock face" is divided into two halves, for medium and long waves; the small hand covers the wavelengths from 200 to 550 metres, and the minutes hand from 550 to 2,000. In such a system it is easy to see at a glance the frequency of the station being received, whereas in the "squelch" type, it can be a matter of uncertainty as to whether the station received is medium or long wave.

The human ear, however, is not equally responsive to all frequencies. As a matter of fact, it is most sensitive to frequencies of the order of 1,000 cycles per second, which corresponds to notes about two octaves above middle C of the piano. For the frequencies below 100 cycles, and for the extreme upper register (above 8,000 cycles), the response of the ear is much more feeble. Now, unfortunately, it is just those frequencies to which the ear is most sensitive that some loud-speakers reproduce the worst, so the natural deficiency of the ear is aggravated by what may be termed the artificial deficiency of the speaker. On the other hand, the human ear is notoriously accommodating and is more easily deceived than any other human organ. It therefore recognizes and accepts for reasonably life-like reproduction sounds which vary considerably from the original produced in the studio, and it is a fact that listeners may become so accustomed to what is really very poor reproduction that they do not realize the extent to which the sounds produced by their loud-speakers fall short of perfection.

It is, however, not a difficult matter to carry out at home one or two practical tests which will indicate roughly what kind of response curve a speaker has. To carry out really accurate tests, expensive and very accurately designed apparatus is required, but this is generally outside the means of the average listener.

By H. BEAT HEAVYCHURCH.

There are other less accurate devices which anyone can try at home if he possesses a fairly sensitive microphone. The microphone should be installed in a room away from the speaker and sounds as near as can be judged at equal intensity should be produced, running right up and down the scale. This can be done by means of a piano or by stringed instruments. If you possess a violin this will be excellent for the upper frequencies, but a 'cello will be required to give a good test in the deeper notes. With such a test, of course, it is difficult to judge when the sounds performed at the microphone are of equal intensity, but they do give a fair indication of performance.

A Simpler Method

There are other less accurate devices which anyone can try at home if he possesses a fairly sensitive microphone. The microphone should be installed in a room away from the speaker and sounds as near as can be judged at equal intensity should be produced, running right up and down the scale. This can be done by means of a piano or by stringed instruments. If you possess a violin this will be excellent for the upper frequencies, but a 'cello will be required to give a good test in the deeper notes. With such a test, of course, it is difficult to judge when the sounds performed at the microphone are of equal intensity, but they do give a fair indication of performance.
Impressions on the Wax

(Continued from page 700)

the dramatic poetry of the story, often so ennobling as to make it of intrinsic worth to us. It is therefore comforting to know that very good translations, side by side with the original, are easily obtainable. So before we begin it is possible to absorb the whole story, and thus listen intelligently. To "Butterfly," then, in an abridged form on six Columbia records at 4s. each (OX200-205). The set is comprised of all the "high-lights" of the opera. The company and orchestra are of the Scala, Milan, and the Milan Symphony respectively. (You get a free portfolio and leaflet if you buy the six at once.)

Still Beethoven

There are no apologies due for remaining in such good company, for it may be some time before we are again so privileged. The Third Piano Concerto must be noticed first, because of its almost commonplace charm, secondly, because it has no bewildering thunder-and-lightning displays, and lastly, because of the oneness of the soloist (Artur Schnabel) and the London Philharmonic Orchestra. The theme seems almost pastoral—nature en fête. One can visualize woodland scenes with the intrusion here and there of building. In the middle comes the Largo—the third movement. This is a sublime thing, almost a proud, stately lament, able to handle against its effect, and yet it has in essence simplicity itself. Back to our rusticity to close, through music as clear and understandable as the day. Here is a great masterpiece for lesser folk, performed with unusual harmony between soloist and orchestra. This concerto is one to treasure for years to come, and you will hear it on five H.M.V. records—DB 1940-1944.

Two Vocalists to Enjoy

We must now turn our attention to two singers who have given of their very best. First is Josef Schmidt, tenor. He has recorded a really notable performance of O Paraíso from Meyerbeer's L'Africaine. This is the leading tenor solo of the opera and was immortalized by Caruso (on a record) and by Jean de Reszke, who played the part of Vasco de Gama nearly forty years ago. It is a lovely thing, sung in a most romantic scene in the opera, and I cordially commend it (and Schmidt's rendering of it) as a record to earn many times over its cost in pleasure. It is on Parlophone R1605. Also from the same company another treat of great appeal—a vocal setting to the Flower Waltz in a most romantic scene in the opera, and I cordially commend it (and Schmidt's rendering of it) as a record to earn many times over its cost in pleasure. It is on Parlophone R1605. Also from the same company another treat of great appeal—a vocal setting to the Flower Waltz in the orchestra, and Chorus do it, with remarkable effect. One can visualize woodland scenes with the intrusion here and there of building. In the middle comes the Largo—the third movement. This is a sublime thing, almost a proud, stately lament, able to handle against its effect, and yet it has in essence simplicity itself. Back to our rusticity to close, through music as clear and understandable as the day. Here is a great masterpiece for lesser folk, performed with unusual harmony between soloist and orchestra. This concerto is one to treasure for years to come, and you will hear it on five H.M.V. records—DB 1940-1944.

Lighter Moments

We must all of us be frivolous now and again if we are to retain our balance, and here is an exceedingly jolly record which carries its artistry to a very high degree. Sketches on records are few, but The Insult, on Columbia DB 1179, is a gem. It is done as well as Emmy Bettendorf, and was immortalized by Caruso (on a record) and by Jean de Reszke, who played the part of Vasco de Gama nearly forty years ago. It is a lovely thing, sung in a most romantic scene in the opera, and I cordially commend it (and Schmidt's rendering of it) as a record to earn many times over its cost in pleasure. It is on Parlophone R1605. Also from the same company another treat of great appeal—a vocal setting to the Flower Waltz in the orchestra, and Chorus do it, with remarkable effect. One can visualize woodland scenes with the intrusion here and there of building. In the middle comes the Largo—the third movement. This is a sublime thing, almost a proud, stately lament, able to handle against its effect, and yet it has in essence simplicity itself. Back to our rusticity to close, through music as clear and understandable as the day. Here is a great masterpiece for lesser folk, performed with unusual harmony between soloist and orchestra. This concerto is one to treasure for years to come, and you will hear it on five H.M.V. records—DB 1940-1944.

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PRACTICAL LETTERS FROM READERS

The Editor does not necessarily agree with all opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

"A Wonderful Gift"

Sir,—Many thanks for the camera received safely. It is certainly a wonderful gift and will always be with me on future holidays and pleasure trips. The free service is also greatly appreciated, and I think it is typical of PRACTICAL WIRELESS in being so generous as to enable its readers to benefit in this way.—F. N. Bedwell (Streford-on-Avon).

Another Reader’s Thanks

Sir,—Thank you for the excellent camera which came, appropriately enough, on August Bank Holiday morning. It was a great surprise, seeing that my application was posted only on the Thursday previous. Your gift service is indeed splendid, and when considered with the weekly entertainment regularly derived from PRACTICAL WIRELESS, it makes one glad to be privileged to share all these good things.—Frances (Cumbrain, MoC).

"Local Experts"

Sir,—I quite agree with our friend "Service Man" from North Shields. I do not think these so-called local experts realize the enormous amount of damage they do by carrying out these something-for-nothing jobs. I could quote a good many cases where very expensive receivers have been messed up completely by men who, not knowing the technical and real theory, venture to test out and reconstruct sets which call for more knowledge than is anticipated. A person knowing a little about radio is a dangerous person, and some people with the knowledge of fixing batteries think they understand all about radio, and venture to gain knowledge at someone else’s expense. The only alternative is send the set back to the maker if it happens to be a commercial set.

Now this is dangerous to us service men with the knowledge of the fundamentals and wide principles of radio, gramos, and similar apparatus, and also dangerous to the manufacturer, because if a receiver and circuit is understood, as it would be by every good service man, reconstructing becomes child’s play. I have overhauled sets which have been ruined in appearance as well as performance by these so-called local experts. I have noticed more lately that these experts very seldom have much to do with all-mains sets, as a shock now and again with 2 or 3 amperes passing is not encouraging. I cannot do better than say that unfortunately design changes so rapidly that people become disappointed after hearing an up-to-date receiver, two months after buying what they thought was the best obtainable. I also venture to say that really good service men are few, but so-called local experts are plentiful. I hope that by the time television is commercialized some protection will be available for the really genuine service man.—W. Parsons (Margate).

Our Practical Journals

Sir,—Congratulations on publishing a new journal at the popular price of 6d. a month devoted solely to Television. I wish you success with it. As an interested reader of the Television section of PRACTICAL WIRELESS I have long felt that much of the information you gave had necessarily to be considerably curtailed in order to get it into the available space. With The Practical Motorist, PRACTICAL WIRELESS, Practical Television and Practical Mechanics, you have four sound journals which are much appreciated in my district.—S. J. (Birmingham).

The Price Question: “Practical Television”

Sir,—I read with extreme interest your leading article on the Price Question in PRACTICAL WIRELESS dated August 11th. I am sure that your policy has had a great deal to do with the steady rise in price which is now possible to make an excellent wireless receiver. It has always been my contention that home-construction of a wireless set is immeasurably better than a commercial receiver at a popular price, and I am glad to think that my favourite weekly radio journal has come to the conclusion that it is now possible to make a set at a price which takes away the appeal of the cheap commercial sets. I am pleased also to note that you have entered the field with Practical Television, and am sure you will take the lead in this young industry as you have done in the wireless field. I subscribe to all of your Practical journals and wish you continued success.—E. G. (Llandudno).

CUT THIS OUT EACH WEEK.

To you know

—THAT the choice of the intermediate frequency in a super-heterodyne receiver will affect the occurrence of whirlies throughout the tuning range.
—THAT artificial resonances may be introduced in a circuit to give emphasis to certain frequencies so as to make up for defects in a super-heterodyne receiver.
—THAT electrolytic condensers must not be used on a raw A.C. supply.
—THAT mica dielectric condensers are preferable, and almost essential, in high-powered R.F. amplifiers.
—THAT the reason for the above rules is to be found in the fact that a positive voltage must not be impressed on the grid of the amplifying valve.
—THAT to obtain maximum performance from a dual speaker system, a filter circuit should be fitted to limit the frequencies handled by each unit.
—THAT a plate of metal fixed high up on the side of a house will furnish a good aerial system for a flat-dweller who cannot erect the orthodox type of aerial.

PRACTICAL WIRELESS August 25th, 1934

The Editor does not necessarily agree with any opinions expressed by his correspondents.
Aerial Impedance Transformer

I have purchased a special interference eliminator which has no name, but which is embossed with some figures and what appears to be the letters U.S.A. The device is undoubtedly of American origin, and in that country they do not utilize the long waves. Consequently the transformer has been designed to function on the medium waves only and it upset the remainder of your tuning circuit on the long waves. Although similar units are on sale in England, these are of either English manufacture, or have been designed for our market and they therefore function more or less satisfactorily on both wavebands.

Coil Data Required

"I have recently obtained a pair of screened coils, but no circuit diagrams or explanations of connections were given. The only means of identification upon them is the Patent Nos. and the following is transferred on the base: DSG/2. Each coil has its primary and wave-change is effected by means of a worm-drive. I wonder if you could supply any information extending these circumstances.

We regret that we have no details concerning these particular coils. They were made by the London Electric Wire Company, and if you write to them they may be able to assist you. Their address is: Church Road, Leyton, E.10.

Telson Coil Connections

"I have a Telson screened coil No. 216. Unfortunately I have lost the connecting instructions and should be glad if you could tell me the numbers for the various leads." — R. S. D. (Portsmouth).

Terminal 1 is for Aerial or Anode; Terminals 7 and 6 are to be joined to earth. Terminal 8 is the grid connection; Terminal 5 is the anode side of the reaction winding, and terminal 3 is the earth side of this winding. A three-point-wave-change switch is required, one pole of which is joined to earth and the other two poles to terminals 3 and 4.

Coil Winding Particulars

"I have an old ebonite former for 6-pin base, 11 in. diameter, 3 in. long. It has 8 slots in it apart and about 11 deep. I wish to rewound it for medium and long waves. Will you kindly let me have number of turns per slot?" — W. G. (Tunbridge Wells).

We regret that we cannot, for obvious reasons-

Ventilating a D.C. Set

"I am going to construct a D.C. set, but must use a 100-watt lamp for voltage dropping purposes. What is the best way of arranging ventilation for this set so that the heat will not damage the cabinet or other wireless parts?" — R. Y. (Bristol).

It will be very difficult to arrange a lamp to avoid damage to the wireless components. A small metal box with a back could be constructed and lined with asbestos sheeting if desired, but it would have to be arranged so that the lamp was well clear of the cabinet side and speaker. A better arrangement is to purchase a special D.C. condenser or resistance unit from the correct type, and fit this in the receiver, when the question of heat dissipation will not be found so serious. Suitable resistances may be obtained from advertisers in this journal.

Complete Diagrams

J. S. (Worthing), R. A. W. (Hull), and others.

As explained many times on this page, we regret that we cannot supply complete circuit diagrams to individual requirements.

The Queries Coupon appears on Page iii of cover.
MISCELLANEOUS ADVERTISEMENTS

Advertisements are accepted for these columns.—Rates of 5d. an inch, 2½ per cent. on rates (minimum charge 1s. 6d.). Display lines are charged at 1s. 6d. per inch. Orders under 5s. cannot be sent. C.O.D. PLEASE SEND FOR ILLUSTRATED CATALOGUE POST FREE.

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