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PRAG 8/601

L.115
Television Goes Ahead

We learn that important extensions to the Crystal Palace transmission system are being considered by the Baird Company. This will permit an additional three-quarters of a million square feet of space, which will give greater scope for experimental transmission and research work in connection with ultra-short-wave vision.

"Time to Spare" Series

We are informed that the B.B.C. has now completed the investigation into charges made in the House of Commons by Mr. W. E. H. Mann, the Parliamentary Secretary to the Ministry of Labour, that "had the full facts been declared there was no need whatever for there to be any tragedy at all." Correspondence with the Ministry of Labour makes it clear that statements as broadcast were correct, but also that there was no omission that could justify the contention that "had the full facts been declared there was no need whatever for there to be any tragedy at all."

P.E.N. Club Conference

One of the most interesting Scottish events in 1934 promises to be the P.E.N. Club Conference which goes into session on the third week in June. On June 13th, Marian McNeill, the Scottish writer and an enthusiastic member of P.E.N., will give a talk on this important event. Several hundred distinguished literary men from all parts of the world are expected to attend the conference.

Three Counties Show Discussion

On June 11th, the eve of the Three Counties Show at Hereford, a regional discussion will be relayed to Midland Regional listeners from the Society's offices on the showground, with a view to bringing out the significance of the event to the community. Two farmers, a representative of the agricultural implement industry, and the secretary will take part. The first show at Hereford was held in 1798. Worcestershire and Gloucestershire Societies amalgamated with Herefordshire in 1895 and 1922, respectively, and in spite of heavy loss by the flooding of the showground at Worcester several feet deep in 1924, the Three Counties has made great progress.

New South African Broadcasting Stations

FURTHER particulars of the new Marconi broadcasting stations at Grahamstown and Pieternelaarburg, mentioned on this page in last week's issue, are now to hand. In accordance with the practice adopted in a large number of modern wireless stations the new transmitters will be built up in the form of a commercial switchboard, on the face of which indicating meters and controls are mounted, while the valves and wireless circuits are installed at the rear. Safety gates on both sides of the "switchboard" front give access to the transmitting circuits. A control desk in front of the transmitter provides a means of supervising the transmission and the power plant. Both transmitters will have a power of ten kilowatts in the aerial, the maximum undistorted modulation being 100 per cent. The working wavelengths of the stations will probably be chosen between 480 and 530 metres, while the available wave-range covered by the transmitters is 200-545 metres.

Central Council for School Broadcasting

The Central Council for School Broadcasting, which entered recently on its sixth year of office, in the absence of the Chairman, Lord Balfour, Dr. W. Vaughan, Vice-Chairman, took the chair. Dr. Vaughan drew the attention of the Council to the expansion in the programme of broadcasts to schools. It was ten years since the regular service had been started with five half-hour afternoon periods each week; now, the school programme occupied most of the National wavelength between 14.00 (2.0 p.m.) and 16.00 (4.0 p.m.), and for the coming academic year the B.B.C. had also granted a daily period of broadcasting time in the morning programme.

The Council received a report from the Executive Committee containing the programme proposals for September 1934, to June, 1935. New features in the programme are a course entitled "Some Districts of England," which has been specially designed for the smaller rural school; a course for young children on Music and Movement, which will provide the necessary musical background for rhythmic work; and a course of broadcast talks for older pupils on Peoples of the World, which has been planned in response to a widespread request from senior schools for a course which would provide a basis for training in the geographical aspects of world citizenship.
ROUND the WORLD of WIRELESS (Continued)

“Made in the North” Series

THE two concluding talks in this series, "The Calendar" and "Home Life Afloat," will be heard by the National listeners on June 20th, the microphone adaptation having been made by Barbara Burnham, of the B.B.C.’s drama staff. Producer is Howard Rose.

The action of this play occurs in the period before the alteration of the rules of racing and the rules of Tattersalls affecting disqualifications. "The Calendar" was first produced at Wyndham’s Theatre in 1929 and revived at the Lyceum in 1930, with Mr. Wallace as producer. Margaret Banham was in the cast. No arrangements have yet been made for the casting of the broadcast version.

Concert from South Devon

A CONCERT from Dartington Hall, South Devon, on June 16th, will be relayed for West Regional listeners only. Wayne March, the composer, will hear the Boyd Neel String Orchestra (leader, Louis Willoughby), Marie Kochinska (harp), who will play the Dansse Profane for harp and strings by Debussy, and Trude Rittmann (solo pianist). The only amateurs who will take part in the concert are the members of the Dartington Hall Chorus. They are drawn from the Dartington Hall Estate to the district round, and for the concert they will be approximately a hundred strong. The concert will be relayed for the National listeners by the orchestra, singing the choruses from the Peasant Cantata, by Bach. The conductor and music director is Ronald Biggs.

Serenade from Canterbury Cathedral Choirs

On the evening of June 12th, London Regional listeners will hear a serenade from the Choirs at Canterbury Cathedral. For this a B.B.C. Orchestra of forty-two players will be used and Dr. Boult will be the conductor. The programme consists of Bach (Brandenburg Concerto No. 4 in G), Mendelssohn (Schero in G minor), Vaughan Williams (The Lark Ascending), and Schubert (Symphony No. 5 in B flat). Marie Wilson is solo violin.

School Choir’s Broadcast

A NOTTINGHAMSHIRE school choir, which has won national and awards at leading musical festivals, will be heard in the Midland Regional programme from the Midland Regional studios on June 14th. This is the High Oakham Central School Choir, founded in 1927 by Harry Smith, music master, who conducts. It has given demonstration concerts by request as far afield as Bolton, Lancashire,
Wires and Wireless
Details are Here Given of the Various Wires Used for Wireless Connections and for Winding Coils.

By W. H. Deller

The various wires employed in a wireless receiving system and other apparatus closely linked with it, and for such purposes as carrying current from the mains, are of many different classes. It is, therefore, proposed briefly to describe them within the space of this article and at the same time dispense practical suggestions and hints that may prove helpful when using them.

What Wire Is
Wire is a product obtained by drawing a metal that has been previously rolled to a diameter through a series of hardened dies. Each successive die is of a shade smaller than the diameter of the preceding one. This difference is equal to the variation between one size of wire and the next smaller size. The drawing process is carried on until the required size is obtained. For small sizes, diamond dies are used, the diamond being suitably mounted in a metal holder and a hole of the correct size being drilled through the diamond. As the wire during the operation completely fills the hole in the die the material, within very narrow limits, comes through with a constant cross-sectional area. The difference between one diameter of wire and the next nearest size to it is smaller or larger, as the case may be, by one gauge. This gauge is equal to a certain number, which is governed by the gauging standard employed. Wires in general use in this country are manufactured to correspond to the British Imperial Standard Wire Gauge. For the purpose of this article, gauges above No. 16 will not be considered.

From No. 16 gauge down to No. 50 gauge there are, including these, thirty-five sizes; they are each designated by a number followed by the letters s.w.g.; No. 16 s.w.g. is equal to .064 in. diameter, or one-thousandth of an inch only, this being, by the way, finer in diameter than an average human hair. Wires may be measured conveniently down to No. 26 gauge (.018 in. diameter) by means of a gauge of the gap type such as is shown in Fig. 1. To identify a size, first place the wire within the range of the gauge, select a slot which looks near enough to the size of the wire, and enter the wire into that slot. If it goes in, or will not go in, try it in the next size smaller or vice versa.

The correct gauge size is that indicated against the slot into which the wire passes without forcing. Apart from the difficulties of manufacturing gap gauges accurately below this size, the wires then begin to get too fimsy to handle and also the changes in diameter become very gradual. After No. 20 gauge this change is of the order of tenths-of-thousandths of an inch only, so that measurement must be carried out by means of a micrometer, as in Fig. 2, or by a direct indicating device.

Overleaf is given a table of gauge sizes and corresponding diameters in inches, from No. 16 to No. 50 s.w.g., along with other useful wire data.

Classes of Wire
Wire for electrical purposes falls into one of two broad classes. These are either bare or insulated. The insulation, apart from the composition of the metal, may vary according to the use for which the wire is intended.

Aerial Wire
The generally-accepted standard for this class of wire for an outdoor aerial is that known as 7/22 bare copper and consists of seven strands of No. 22 s.w.g. wire bunched together and twisted spirally to form a wire rope, as it were. In an efficient aerial system connection is best made to the lead-in terminal by soldering the end of the wire into a thimble type connector. Bending the end of the wire into a loop for connecting purposes does not provide such a good contact, as the terminal and nut can only engage with the high spot on the wire, allowing water to penetrate between. Corrosion at this point is often a source of cracking noises and should be prevented. By reason of its low resistance value, this wire provides an ideal earth lead.

Bare Copper Wire
This wire is chiefly used for the interconnecting of units or component parts. When used for this purpose the wire should be obtained in a tinned condition. This is necessary to protect the surface of the wire and prevent corrosion. The tinning is also an aid where soldered joints are made.

To keep the resistance offered by the wire within reasonably-low limits, a gauge of not lower than No. 18 s.w.g. should be used. On account of the liability of the wire to sag, and as a precautionary measure against insects or small birds causing short circuit, wire of this size must be enased between the terminals in an insulated sleeving.

Heavier gauge wires, such as No. 16 s.w.g., are stiff enough to be self-supporting, and may, with careful spacing and subsequent handling, be fitted in a bare condition. In fact, this method was not so long ago almost universally adopted for wiring up. All joints were soldered with flux or flux coated to fit the section of the wire, which was usually 1/16 in. square. Crosses or tees were also available, these being made in like manner for use at the junction of a wire or wires with another one.

Insulated Wires for Wiring Up
For this purpose also a wire is manufactured and marketed under the name "Glazite." This is a tinned copper wire enased in a tight-fitting sheathing of hard insulating material. Although hard, the insulation is flexible, and will not crack or peel, even where the wire is sharply bent. The insulation is not fixed to the wire, thus it strips easily for making connections, and will, by marking round the wire, take on the form of a tube. Soldered joints can be made without burning or discolouring the insulation. By using several of the different colours in the range in which this particular wire is made, the various circuits may be easily distinguished.

Where connections are made by forming eyes on the ends of the wire, make the internal diameter of the eye as close to the diameter of the screw thread as possible. The formed end should be put over the terminal screw in such a way that the nut when tightened turns towards the extreme end of the wire. This procedure

(Continued on next page)
WIRLESS WIRING

(Continued from previous page)

counters the tendency of the loop to open when assembled in the reverse way.

Flex

is the name by which flexible wire is known. Its uses are for carrying current to apparatus of a portable nature, for making connections in conjunction with a plug to any one of several sockets such as are in a H.T. battery and in similar cases, as in electrically connecting a fixed part to a moving one.

For purposes like this stiff wires are objectionable mainly on account of the crystallinity and the brittleness of the metal that is likely to result from constant movement. Flexibility is obtained by substituting a large number of fine wire strands of a total current carrying capacity equal to and in place of one single wire. The size of the flex is denoted by the number of strands and the gauge of the wire, No. 35/40 flex is made up of 35 strands of No. 40 S.W.G. on each conductor (see Fig. 3).

A wide range of different flexible wires is made and the choice will depend upon for what purpose it is to be used. The wire is insulated with a covering of cotton and vulcanized rubber or in some cases rubber only. In this condition it is put up to a specified condition when there is a single wire only. Where a twin or triple conductor is required, the rubber covering is braided with silk or cotton and the wires twisted together. The braid is made in a variety of colours and flex can be had with each braid coloured so as to meet conditions where a single wire will not be sufficient. 

Extremely flexible leads, such as those sometimes used in earphones have the wires insulated with a covering of cotton or rubber only. After cutting the wire push back the braid, if any, and scrape rather than cut the insulation of the bared wires up, and after doubling them back twist them again. This will provide a hard mass of cotton and the connecting screws can make a good contact. Watch this point carefully when connecting to a strain. For glasses of free bending the wire is likely to be subjected to hard wear. See that the insulation is firmly held in place by the screw heads so that it cannot be pulled off in use. The wire is used in this condition for connecting the terminal ends break, away from such leads. Certain quantity of single silk covered wire will answer the purpose. Bare metal supports should never be used for the purpose of holding a flexible lead carrying current from the mains owing to the danger of the insulation chafing and causing a short. Properly insulated hooks are available for this purpose. Under this heading must also be included what are known as battery cords. These consist of a bunch of flexible leads, having proper means for making connections from the batteries and to the components, formed on, or attached to the ends. The leads are enclosed within a tube of braid for the greater part of their length.

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CUTTING OUT NOISES ON THE MAINS

An Interesting Account of Some Experiments Carried Out by the Writer in an Attempt to Eliminate Electrical Interference

By DEREK ARCHER

A PART from noises in the actual receiver, which can be located by various tests which have been outlined in this journal previously, it will be found that the ordinary electrical equipment of the home, such as the lighting and the power circuits, switches, fuses, etc., can be a source of continual trouble.

A mains test, the device in the general electric circuit and the result of the test was decided that equipment outside the home was the cause. A first test was made by feeding the receiver direct from the live side of the main fuses, the mains switch being open; the crackling and hissing entirely disappeared; in fact, the receiver had a perfectly quiet background.

The interfering hissing put in the switch and immediately the switch was put in again. The accompanying diagram shows the entire electrical circuits of the house in question, and the points lettered are dealt with one by one as they occurred in the actual tests. Some of the points seem so small that it might appear to be unnecessary to deal with them, but it was found that every detail which received attention added its quota towards the reduction of background and other noises.

The decrease in the general background noise, carriers-wave noise, and valve hiss, was very small, and, in fact, the receiver seemed to have lost its " liveliness," but this was not so as the results proved on test. The decrease in the general background noise was so marked that a casual inspection at the switchboard, the actual fuse wires being left out for safety.

The main switch next received similar attention. Excepting that the small springs were not dipped into the acid, the procedure was identical. These springs were washed in paraffin and finally dipped in vaseline. On assembly the switch blades were inspected to see that these made good hard contact with the switch contacts and, where necessary, these were bent until such contact was obtained. The switch was replaced on the board and the fuses fitted with new wire. A test was made at this stage, but little improvement resulted, and a casual inspection of the mains switch became necessary. The company's fuses, D, were dirty, corroded, arkael covered, with verdigris. The contacts and the blades of the switch were washed in nitric acid and rinsed off in cold water. The metal parts were attached to the switch, and dipped into the acid for about a second, transferred to the hot water, given a good swish round, and then rinsed off in cold water. In most cases the first dipping was enough, but the contact sector plates had to have another dipping. (It is very important when drying and cleaning to see that all traces of the acid are removed by a really good washing in cold water.) The fuse boxes were again assembled and re-fixed to the switchboard, the actual fuse wires being left out for safety.

The metal work separated from the porcelain pieces removed with the hot water and the nail brush, the porcelain parts being left out for safety. Even the mush, which is generally put down to aerial noise, carrier-wave noise, and valve hiss, was very small, and, in fact, the receiver seemed to have lost its " liveliness," but this was not so as the results proved on test.

All the fuses, B, were dirty, corroded, and covered with verdigris. Using an insulated screw-driver where necessary, these were carefully removed from the switchboard, great care being taken to keep the live ends of the cables coming from the meter and the company's fuses, D, separated. (If perfect safety is required, the company's main fuses should be withdrawn, and this usually means a visit from the company's engineer to unscrew and recut the fuse box for you. Using reasonable care, this course can be avoided.) The contacts and the screws of the fuses were so corroded that scraping with a knife or cleaning with emery cloth seemed an endless job, so the violent action of nitric acid was called for. The acid was used outside the house, as the fuses from the acid are obnoxious and corrosive. The fuses, as stated, were unscrewed from the switchboard and all the metal work separated from the porcelain parts. The iron fuse box was given a dust-over, and the grime adhering to the porcelain pieces removed with the hot water and the nail brush; the porcelain then being rinsed off in cold water and dried. The metal parts were attached to a piece of wire and dipped into the acid for about a second, transferred to the hot water, given a good swish round, and then rinsed off in cold water. In most cases the first dipping was enough, but the contact sector plates had to have another dipping. (It is very important when drying and cleaning to see that all traces of the acid are removed by a really good washing in cold water.) The fuse boxes were again assembled and re-fixed to the switchboard, the actual fuse wires being left out for safety.

Earthing to Conduit Pipes

The fuses for each separate circuit were withdrawn one at a time with the receiver switched on to indicate which circuits were giving the trouble and the worst was fuddled first. The extra fuses, H, were treated as before, and new fuse wires fitted, but this did not effect a cure. The switch in this circuit was also taken down and properly cleaned, but without much effect. The fault was, after inspection, located in the twin lead-covered lead just at the point where the cable entered the steel tube used for leading the cable under a concrete path and so into the house. Some attempts had been made when the cable was put in to protect the lead covering against the sharp end of the tube, by wrapping adhesive tape round the entrance, but this proved ineffective. The lead covering had been worn away by movement, and rain had entered the skin, rotted the tape covering, and perished the rubber. This section of the cable was replaced by a new piece and the junction made well away from the pipe.
THE MASTER MIDGET

The Designer Here Gives Some Further Notes on the Construction and Operation of This Remarkable Little Receiver With Some Suggested Modifications

There are several commercial midget receivers of the mains-operated type on the market, but as far as I know, no manufacturer has managed to cater for the battery user. It was left to Practical Wireless to produce the first genuine battery-operated midget set.

I designed the Master Midget with the object of catering for the home constructor who it is possible to make an efficient and inexpensive miniature receiver for use where electricity is not available. It is, of course, entirely self-contained, the moving coil being wound up on the spindle of the tuning condenser and the whole unit is in a cabinet with an average capacity accumulator being accommodated within. The cabinet measures approximately 5 in. by 10 in. by 11 in.

The practical details of this little set were given in Practical Wireless of May 12th, but for the benefit of those readers who are about to embark on its construction, I am giving here a few further hints on its assembly and operation.

First of all there are one or two points regarding the wiring. Naturally, with so small a receiver the wiring need not be of any particular amount of care, but if it is set about in the right manner it is not difficult or tedious. The whole secret is to leave the joining up of the parts until a rigid baseboard, and the erection of the accumulator compartments until after the main part of the wiring is completed. In this way it is much easier to get at the various components to wire them up. When the wiring is completed as far as possible the panel and baseboard are screwed together and the accumulator partitions fixed in place. The remaining connections between the components on the baseboard and those on the panel can then be carried out.

To make a neat job of the flex leads to the H.T. and G.B. batteries they can be plated up on to the panel. Incidentally the best way to make a connection to a terminal with flex is to bare about an inch of the wire, bend this in a loop round the shaft of an awl or the nose of a pair of round-nosed pliers, and then, holding the two sides of the loop to twist the awl or pliers round and round. This twists the wires together and leaves a neat round loop when the tool is withdrawn. The loop is then slipped over the terminal.

Connections to the Foli Screen

In connection with the tinfoil shield at the back of the panel, the foil is cut away round the hole for the reaction condenser spindle, that is the hole on the extreme left when looking at the back of the panel, and also round the hole which takes the wave-change switch spindle—the one at the bottom. The spindle of the tuning condenser is cut away right through the foil and thus makes contact with it. In the case of the filament-switch spindle it does not matter whether this makes contact with the foil or not, since with the particular switch the spindle is insulated. Of course, if any other type is employed it is safest to cut the foil away here also, because with many makes the spindle is in direct electrical connection with the switch contacts. In this case, to allow the spindle to touch the foil consisting of the receiver you might be led to expect something which you happened to have on hand, you may find the receiver in operation be a little "ploppy." A different detector valve or a different transformer, for instance, may produce this effect. In this case a very simple and effective remedy consists in increasing the value of the decoupling resistance. Instead of the 20,000-ohm resistance specified you should use a 30,000-ohm or 40,000-ohm component.

If stations overlap, or the local station can be heard over a large movement of the tuning knob, this can be overcome by unscrewing the knob of the pre-selector (inside the receiver beside the tuning coil) a turn or two. Do not screw it out too far, however, or the range of the set will be reduced.

Tone Control

With a midget receiver, you might be led to expect tone rather below the average in the matter of quality of reproduction. For instance, you might be quite prepared for the loss of a few notes at either end of the range. The tone can be combined with the "boxed-in" effect usually associated with small enclosed speakers. On the contrary, however, the reproduction is excellent. There is a very fine range of the higher frequencies, and although the bass does not "boom" out it certainly does not lack. Speech is particularly well reproduced. Owing to the careful positioning of the detector valve, which is placed as far from the back of the speaker as possible, there is no tendency towards microphonic noises, while a very rigid panel and baseboard assembly together with a stout cabinet reduces the possibility of unwanted resonances to a minimum.

The over-emphasis of the high notes usually associated with a pentode output valve is compensated for by means of the grid-stopper resistance, R3. The value chosen for this, namely 100,000 ohms, is that which has been found to give the most natural tone with the particular valve and speaker specified. However, this particular value is by no means essential and considerable variation in the tone of the receiver can be effected by using other values; thus a 250,000 ohms (1 megohm) resistance will mean less resonance to the high notes, so making the general tone appear lower. A lower resistance, on the other hand, will produce greater emphasis of the treble. In this way you can, in a large measure, adjust the tone of the set to suit your own taste. (W. B. Richardson.)

THE WIRELESS CONSTRUCTOR'S ENCYCLOPEDIA

By W. B. Richardson

354 PRACTICAL WIRELESS June 9th, 1934
A Handy Disc Cutter

A Handy Disc Cutter

ALL that is required for this handy cutter is a length of perforated strip, to one end of which is fastened a short piece of pointed 2BA rod. The other end of the strip is bent to a right angle to which is attached an old safety razor blade, bolted at an angle to allow for cutting, as shown in the sketch. This tool will be found most useful for cutting out loudspeaker cones, television discs, etc., the perforations in the strip allowing discs of various sizes to be cut. —T. D. COOLEY (Sunderland).

A Novel Tuning Scale

HERE is a dodge for those who, having built their own receiver, wish to give it the advantage of a professional looking scale, calibrated with names of stations, and transparent for rear illumination. The method described is for use with a pointer and rectangular panel indicator, but it is easily adaptable to others, such as sliding cursor, drum, etc.

A piece of white card is placed in the panel behind the pointer and a station tuned in, a dot is then made behind the pointer, and a station tuned in, a dot is then made behind the pointer, and a station tuned in, a dot is then made behind the pointer, and a station tuned in, a dot is then made behind the pointer, and a station tuned in, a dot is then made behind the pointer, and a station tuned in, a dot is then made behind the pointer, and a station tuned in, a dot is then made behind the pointer, and a station tuned in, a dot is then made behind the pointer, and a station tuned in, a dot is then made behind the pointer, and a station tuned in, a dot is then made behind the pointer, and a station tuned in, a dot is then made behind the pointer, and a station tuned in, a dot is then made behind the pointer, and a station tuned in, a dot is then made behind the pointer, and a station tuned in, a dot is then made behind the pointer, and a station tuned in, a dot is then made behind the 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An Improvised Variable Resistance

A MAKESHIPT graded variable resistance can be made by shunting a potentiometer of the straight-line type by a fixed resistance of about equal value. The maximum resistance of the combination is then about half that of each component separately. The variation in resistance is between that given by an ordinary variable resistance and a graded type. The connections are shown in the accompanying illustration.—A. GOODALE (Wandsworth).

Another Improved Microphone

WHEN giving a recital of gramophone records, with the radiogram and speaker placed in different rooms, the possession of a microphone is a decided advantage. If a suitable one is not at hand, a fairly efficient substitute can be improvised from the pick-up and a match-box cover. The latter is simply impaled on the needle of the pick-up, as shown in the sketch, during the intervals in the recital. Announcements are made with the mouth placed close to the match-box cover.—S. RAINBIE (Wishaw).

Adapting a potentiometer for use as a variable resistance.

A simple improvised pick-up.

Re-centring a Speech Coil

WHEN some of the cheaper and lighter makes of moving-coil speakers it is sometimes extremely difficult to re-centre the speech coil by any of the well-known methods. In some cases the magnet and speech coil are not out of centre, but "out of parallel," due to the chassis having been distorted by unequal screw pressure, warped baffle, or other defect of mounting. The following method can then be tried with advantage: The fixing bolts or screws of the magnet plate should be slackened off one at a time, and a small feeler gauge, which can be a small finger of copper or brass foil, tried between plate and chassis, at the weakened corner. If the feeler can be inserted without pressure then the gap should be packed with foil either in single pieces, or folded as many times as necessary to fill the gap, and as close to the fixing bolt as possible. It may be found necessary to pack under more than one place, but great care should be taken to tighten up each bolt or screw before slackening off the next.—W. H. GEDDES (Manston).

Reparing a Bakelite Knob

THE Bakelite trimmer knob of my two-gang condenser broke at the grub screw being tightened too much, the broken part being that which took the strain of the nut on the grub screw. To preserve the appearance of the set it was essential to mend the knob, and the usual glues and cements would not stand the strain. A good repair job was made as follows: A piece of sheet iron was cut with a hack saw and filed to a cross shape, as shown in the sketch. Holes were drilled in it for the grub screw and the spindle so that when the arms of the cross were bent down round the Bakelite centre the grub screw and its nut would fit in under the long arm. The grub screw hole might be threaded, though I did not do this. By suitably bending the arms the claw can be made a tight fit over the Bakelite centre of the knob, and then the strain is taken evenly by the whole moulding and the broken piece is cemented on with a thin layer of liquid cement.

Although used for a trimmer knob, the idea is applicable in similar circumstances to many other kinds of knobs.—V. W. HETREED (Old Windsor).

A novel stand-off insulator.

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A novel stand-off insulator.

Re-arranging the Bakelite centre.

Method of repairing bakelite knob.

A novel stand-off insulator.

The accompanying illustration shows a novel but efficient stand-off insulator, made from an ordinary glass sulphur which can be obtained for twopence at any of the cheap stores. The hole in the case can be drilled with an ordinary twist drill with the aid of a rectangular cam and camphor for lubrication. The hole takes about a minute to drill.—E. ROYDBSON (Newport).

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Radio Out-of-doors

Some Suggestions for Using the Ordinary Receiver in the Open Air

By FRANK PRESTON

With the approach of summer weather interest in wireless reception is rather liable to fall off. The reason is that, instead of sitting by the fireside in the evenings, most folk prefer to get out into the open air, spending the time in the garden or on the tennis court. But anyone who is really interested in listening need not forgo his pleasure in this respect simply because most of his time is spent in the open air. It is a perfectly simple matter to extend the speaker leads so that the loud-speaker can be taken into the garden, and even if the distance happens to be fifty feet or more there need be no difficulty if the proper method is adopted.

The proper method is to couple the speaker on the choke-capacity principle if this form of connection is not already employed in the set itself. The usual system to be followed in adding a choke-capacity output filter to an existing receiver is to connect a good low-frequency choke in place of the speaker to the appropriate terminals on the set, a lead then being taken from that speaker terminal which is connected to the anode of the output valve to one side of a large-capacity (1 to 4 mfd.) fixed condenser. The speaker is then connected between the other side of the condenser and earth. Needless to say, the choke should be so chosen that it matches the output valve, and it should therefore have a rated inductance of about 40 or 75 henries respectively, for power or pentode valve, when carrying the normal anode current.

A Single-wire Speaker Extension

By following this method of connection it will be seen that it is only necessary to take a single lead from the set to the speaker, because the earth-return connection can be obtained at the speaker "end" by making contact with a short metal spike pushed into the ground (see Fig. 1).

If two speakers are available, or when the normal speaker is a fixture inside the set, the primary winding of one speaker (assuming it to be a moving-coil instrument) can be used in place of the choke previously mentioned. Should it then be desired to put the inside speaker out of action it will be necessary to disconnect one of the leads from the secondary of the coupling transformer to the speech coil. In many cases shows a neat unit for connection between the speaker and the set for obtaining control of both tone and volume without having to touch the controls of the receiver.

Just as when the speaker is used inside the house, it is desirable to see that it is placed in the best position, since slight alterations might affect the tone of reproduction to an appreciable extent. Generally it will be found best to place the speaker in a corner between two walls or fences, or just inside the summer house or pavilion. Where there is a pond the speaker should be as far away from this as possible since the water has a "deadening" effect.

Taking the Set Outside the House

When it is desired to listen out of doors

this lead will be soldered at both ends so that it will have to be cut as shown in Fig. 2; when that has been done it will be found most convenient to fix an ordinary push-pull switch for connecting or disconnecting the inside speaker when required. The method of arranging this is also shown in Fig. 2, and it should be mentioned that the wire from the speech coil must be left quite slack so that there will be no tension or "pull" on the diaphragm.

Tone and Volume Control

Those who have not previously used a loud-speaker out of doors will probably find that reproduction appears very "thin" and rather high-pitched, this is because the sound reflection that is normally obtained from the walls of the room is absent. The obvious manner in which to overcome this difficulty is to fit some form of tone control or, at least, a high-note filter. Methods of doing this have been previously described, but it might be mentioned that the simplest one is to connect a .01-mfd. condenser in series with a 50,000-ohm variable resistance between the speaker terminals. These components can most conveniently be mounted in the speaker itself, as shown in Fig. 3.

Some means of varying the volume at the speaker "end" will also be desirable, and it might be pointed out that a few simple methods of doing this were described in an article in the issue of Practical Wireless dated March 10th, 1934. The simplest one of all is to connect a potentiometer between the "supply" leads and the speaker terminals, also fitting a fixed condenser to prevent high-note cut-off at low volume levels. Fig. 4 is an illustration reproduced from the latter article, and this

Fig. 1.—This diagram shows how a single extension lead will suffice for the extra loud-speaker.

Fig. 2.—In order to enable the existing speaker to be cut out a switch must be inserted as shown here.

Fig. 3.—A tone-control or high-note filter.

Fig. 4.—A combined tone and volume control unit.
fairly regularly it will be worth while to erect an aerial; but it is not a bad idea to make sure that the aerial is fixed to the roof of the house and not to a wall, since it may make it necessary to take out another licence, as many people believe, provided that both aerials are on the same premises and housed in the same building.

There are a number of ideas which can be used for makeshift aerials; the simplest of all is to collect a wire and fasten it to an iron rod. Simply scrape a bright place on the metal and tie a piece of wire round it, or even use a large piece of wire with a length of wire attached. A very obvious method of "erecting" an aerial is to sling a length of insulated wire, with a small weight attached, over the bough of a convenient tree.

An earth lead seldom gives rise to any trouble, but it is simple enough to solder a length of wire to a metal spike which can be pushed into a spot of (preferably damp or clay) soil. If there is a stream running nearby an excellent earth connection can be obtained by throwing a length of bare wire into the water. When an aerial terminal is not provided with a good earth connection, taken to the aerial terminal, will prove to be an excellent substitute. The normal earth terminal will be left disconnected.

In The Car

Those readers who travel by car and who wish to take the standard wireless set with them can do so quite conveniently, and, although the set cannot be used whilst the car is in motion, its main equipment can be fitted with special suppressor resistances and so on, it will function very satisfactorily when the car is not in motion. An aerial could be provided by sticking one of the "adhesive tape" type of aerial materials round the outside of the roof, whilst the earth lead will provide an excellent contact to the earthed earthy ground beneath the car. The earth lead can be bound round the brake pedal rod, or it may be properly attached to any of the chassis framework or even to one of the wheels, which hold the top of the gear box in position.

NOTE ON POWER TRANSFORMERS

Some Interesting Details Concerning the Mains Apparatus.

By R. S. ROBERTS

PRACTICAL WIRELESS

June 9th, 1934

The most common alloy in use to-day is a mixture of iron that has had a small percentage of silicon (among other things) introduced into its composition to achieve, as far as possible, the desired magnetic state. The most common alloy in use to-day is silicon steel, which consists of iron that has had a small percentage of silicon introduced into its composition to achieve, as far as possible, the desired magnetic state. The most common alloy in use to-day is silicon steel, which consists of iron that has had a small percentage of silicon introduced into its composition to achieve, as far as possible, the desired magnetic state.

The actual power unit, when the set is running at full capacity, gives an overall efficiency in excess of 70 per cent. We can expect an overall efficiency in excess of 70 per cent. The actual number of turns on the primary has to be calculated to conform to a certain ratio of turns. The actual number of turns on the primary has to be calculated to conform to a certain ratio of turns.

Two Forms of "Loss"

The two chief causes of loss in a transformer are (a) iron loss, and (b) copper loss. (a) "Iron loss" is the general term given to losses in the iron circuit due to hysteresis and eddy currents and is partly overcome by "laminating" the core into thin sheets insulated from one another in order to reduce, as far as possible, the eddy currents. The laminated core is a very effective cure. (b) "Copper losses" are due entirely to the resistance of the windings. It is an unfortunate fact that when we wind a coil we introduce resistance, and when we pass current through the coil, power is dissipated in the form of heat. In the case of the power transformer, it is obvious that the external load will cause current to pass through the circuit, and—and if we take the resistance of the windings and the magnitude of the current, it is possible to calculate the "copper loss" according to the well-known equation: 

\[ \text{Power} = \text{Current} \times \text{Resistance} \times \text{Time} \]

Another source of loss is due to leakage of flux. In other words, the lines of force due to the primary of the transformer do not all travel round the iron circuit, but some of them "stray," as it were, into the air and represent loss—but we shall discuss this later.

Transformer Efficiency

The efficiency of a transformer from the efficiency point of view. It is obvious that the user has to pay for losses in hard cash. With large power transformers the efficiency is usually high and in the region of 96 or 96.5 per cent. Of course, that 990 or 995 watts output will be obtained with 1,000 watts input; the small transformer is much less efficient. In most modern radio sets and power units generally there is a higher efficiency than this and, though the actual figure varies widely depending on the transformer manufacturers, it is usually in the region of 80-85 per cent. At first sight these figures do not appear to be bad, but in the use of the transformer as an efficiency figure for purposes of calculating running costs of the receiver or power unit it is another factor to consider—the rectifier. The rectifier has an efficiency which is much lower than that of the transformer, and the overall efficiency of the combination of transformer plus rectifier will be less than that of the transformer alone. The effective efficiency of transformers having a high-tension winding will not be affected by the rectifier, but the effective efficiency of transformers having a low-tension winding will be less than that of the transformer alone. The effective efficiency of transformers having a high-tension winding will not be affected by the rectifier, but the effective efficiency of transformers having a low-tension winding will be less than that of the transformer alone.

...
WIN £1 A WEEK FOR A YEAR
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SIMPLE! EASY-TO-WIN!!

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Have you entered yet?

Life runs all the smoother for some extra cash. You can easily win some, too. Just your natural, usual interest in radio can bring you a welcome windfall in a way that will at the same time give you a greater radio enjoyment.

Simply by utilising your interest in the performance of your set, you can win a valuable prize and more than enjoy the winning of it.

Ask your nearest radio dealer for particulars and free Entry Forms for the novel AvoMinor competition. Free and open to all, it gives you a rare chance of tuning in to the spare money that you could do with, or winning one of twenty-five prizes that every radio man needs.

Get an Entry Form to-day. You don't have to be technical or even particularly clever. Here is an easy and exclusively radio way of winning a prize.

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W.W.2.
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A Full-size Blueprint was Given Free with Last Week's Issue

Next, you can insert the valves into their holders. Looking at the set from the front, the valve on the 220 G.E., that at the back on the right is the first, and the 320 H.T. detector. Connect the screened lead to the anode terminal on top of the G.E. valve, and attach H.T. +1 going to the screening grid of the first valve, being joined onto the 30-volt socket and H.T.-2 into the 210 volt socket. These voltages have been found to give best results in the original receivers built in our laboratories, but it might prove worth while to experiments with different voltages for the H.T. +1 tapping.

Switch on the set by turning the left-hand rotary switch knob in a clockwise direction, and turn the two centre switches to either their long or medium-size positions. The essential points with which these switches are supplied are marked "Long" and "Short" at the top and bottom respectively, so it will be obvious in which direction the toggles should be moved. Although rather obvious, it should be mentioned that it is absolutely essential that both switches are turned to the same position, besides otherwise nothing will be heard.

Simple Tuning

Now turn both tuning condenser knobs up to zero (that is, the condenser plates face out of model) and, if necessary, alter the position of one knob until the 0-180-degree scale coincides with each other. Turn the right-hand (reaction) knob slowly in a clockwise direction into the "Click" position. This "Click" position indicates that the set is oscillating. Prior to this the two tuning knobs can slowly be twisted together until a whistle is heard, immediately reduce the reaction setting, and slowly re-tune until the station is heard clearly. At first, the re-tuning can be done by turning both knobs together, but when signals have in that way been brought to their maximum strength the two knobs should separately be moved slightly in each direction. When this has been done it will be found that the two knobs can then be kept in the same relative positions whilst other stations are being scanned for. Wherever, an effective tuning effect can be secured by operating the smaller (central) tuning knobs themselves; this will only be found necessary whenever receiving comparatively weak or more distant stations.

Regulation Control

The medium control will be found very useful, and, although sensitive, its operation in this case is very simple, the set going into and coming out of oscillation very gradually. If this does not appear to be the case when testing the set, it will be desirable to modify the medium grid valve by means of a small washer placed under the regulator. The washer is set to terminal 4 on the top coil; by no means essential.

After the receiver has been properly tuned and found to be functioning satisfactorily it can proceed to the earphone connection. It slides into position along two narrow runners, whilst the accumulator must be stood alongside the speaker unit. Remember also, that the battery plug wire to terminal 3 on the set before finally sliding the receiver into its cabinet. If the set is to be used in the field, the "Atom" can be fitted into its cabinet.

The "Atom" weighs only 18 pounds and can be carried with ease.

must be placed with the outlets toward the speaker, since if they face outward the wander plugs will prevent the back of the cabinet from being closed. The grid-bias battery is connected last, and can be laid either on top of the H.T. battery or between the battery and the speaker in the bottom of the case.

Aerial and Earth

When used with the throw-out aerial wire is piece of rubber-covered flex from H.T. to 210 volt, the method of operation will be exactly the same as the described above, but if the earth connection is dispensed with as, it might well be, reaction control will prove to be somewhat more critical. For this reason alone it is worth while to make use of an earth connection where a convenient earth point is available. When the set is used out of doors in the garden, the earth connection can be dispensed with, and the aerial wire may simply be laid along the ground or slung over the branch of a tree. Instead, it might be laid along the top of a nearby fence. In the case of the "Atom" the aerial may be alternatively slung over the branch of a tree as with an orthodox aerial, the greater the length of wire the better it will be.

Should it be found that instability, band-changing effects, or Vicarious operation are experienced, the wiring should be examined, and the position of the connecting leads compared with those which have been shown in the photographs of the original set. As we pointed out last week, the positions of the wires were carefully chosen and experimented with; consequently, they are very critical. It is essential that the screening lead used for some of the connections shall be effective (red and black) terminals respectively on the condenser, whilst the H.T. 2'4'2.95 plugs should be inserted in the positive and 41-volts negative sockets of the small grid-bias battery. The H.T. negative wander plug should, of course, be inserted into the negative on the high or Regulated tension battery, the plug marked +53 being to the hole in the back of the cabinet.

These illustrations show how very little space there really is when the "Atom" is fitted into its cabinet.

The circuit is also very straightforward, as can be seen from the above drawing.
OPERATING THE
ATOM LIGHTWEIGHT PORTABLE

This Ultra-efficient Receiver is Very Easy to Build and Just as Simple to Use

A Full-size Blueprint was Given Free with Last Week’s Issue

LIST OF COMPONENTS

<table>
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<tr>
<th>Part</th>
<th>Description</th>
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<td>360 Exide 2-volt Accumulator (Type PY4).</td>
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<tr>
<td>61V</td>
<td>361 Flex, Wander Plugs (H.T., H.T.1, H.T.2, G.B.)</td>
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<td>362 One Peto-Scott Atom Cabinet.</td>
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in potential across the neon lamp between the striking and extinguishing voltages of the neon lamp is maintained periodically as long as the battery lasts.

In order to prevent disintegration of the gas and electrodes in the neon tube a resistance $R_2$ is inserted in series with it, this being done at the expense of lengthening slightly the back-stroke time of the time base. In addition, to vary the periodicity of the cycle action, a filament rheostat $R_1$ and a variable condenser at $C$ are usually employed, although within a specific range either of these controls alone is sufficient to yield a variation in periodicity.

Using a Gas-filled Relay

The pair of deflector plates of the cathode-ray tube which are connected across the neon lamp thus have a uniformly increasing potential applied to them, and this has the required effect of deflecting the cathode-ray or electron beam across the screen. When the condenser discharges, the beam returns almost instantaneously to its initial position only to make the journey over again. The time of the traverse of the beam is controlled by the time constants of the condenser diode circuit.

In the time bases used for much of the practical work now being done with cathode-ray tubes, the ordinary neon tube $N$, shown in Fig. 2, is replaced by a gas-discharge relay or thyatron. This device functions in a manner similar to an ordinary three-electrode valve, except that once the anode has been made sufficiently positive or the bias on the grid has become insufficiently negative, a current between the cathode and anode commences to flow, which is stopped by the reduction of the anode voltage to a very low value. A circuit employing a device of this character is shown in Fig. 3, the gas-filled relays normally used being either neon or mercury-vapour filled. They are capable of passing a discharge current of 0.6 ampere peak value without any sensible disintegration of the cathode.

DEFLECTOR PLATES OF CATHODE-RAY TUBE. - Although it has been suggested that television can be applied for teaching purposes, it has been left to America to conduct a long series of experiments in this connection. The work has been undertaken by the State University of Iowa, the transmissions having been effected through the radio station W9XK. Dr. E. B. Kurtz has drawn up an interesting report in which he pointed out that the station was easily able to imagine himself in the classroom with the Professor in front, either writing on the blackboard, talking, or using pictures and models to illustrate lectures.
ADDING ANOTHER SPEAKER

Although Apparently a Simple Matter, the Addition of a Second Speaker Calls for Some Consideration, and the Points Involved are Discussed in this Article.

It is often a great advantage to be able to run a second loud-speaker from your set—to extend your radio to boudoir, nursery, or kitchen. On the face of it this is simple enough—merely a matter of running a piece of flex from the receiver to the extra speaker. However, on examining the matter closely, you will find that it is not quite so straightforward as all this, and several little problems present themselves. The addition or removal of a second or third speaker is bound to alter the working conditions of the receiver. For instance, if the output stage of the set is carefully matched with a certain speaker the sudden addition of another reproducer, even if of identical type with the original, will inevitably alter the load and upset the original matching. This will result in two things—a reduction in the volume and an alteration in the quality of reproduction.

The Effect on Volume and Tone

The reduction in volume is only what might be expected. After all, you cannot get something for nothing, and obviously the power provided by the set will have to be divided between the two speakers. Fortunately, however, the average modern set is rarely run at full power, so that any reduction in volume due to the increased load of an extra speaker can be compensated for by a turn of the volume control. The only thing to guard against is the use of two speakers of widely differing impedances, which would result in the one being starved at the expense of the other.

The easiest solution of the problem occurs when the two speakers are to be permanently connected to the receiver. If this arrangement is decided upon when building the set, two speakers can be correctly matched. First of all, note the optimum load required by the output valve, and then order two speakers each with an impedance of twice this figure. The two speakers are connected in parallel, as in Fig. 1. With this arrangement, which, incidentally, is preferable to connecting them in series, the total impedance seen by the two speakers is half that of one, hence the reason for having them each of twice the normal figure. As an example, suppose the load required by the output valve is 4,000 ohms. In this case two identical speakers of 8,000 ohms would be required. Actually, the matching is not critical, so that two speakers of, say, 10,000 ohms impedance would also be quite suitable.

Overcoming Self-capacity of the Leads

There is only one drawback to this arrangement, which is that if very long leads are used for the extension speaker the self-capacity of the leads may be sufficiently large to cause a weakening of the high notes.

In this case, instead of using the customary twin flex for the extension, separate lengths of bell or flex spaced apart will overcome the difficulty. Fig. 2 shows how the self-capacity of the leads can be reduced to a negligible amount by running one wire along the top of theskirting and the other along the bottom.

Fig. 1.—An extra speaker of similar type connected in parallel with the one in the receiver.

Fig. 2.—How to place uncapacitance wires to avoid speaker when the set embodies self-capacitance.

Fig. 3.—Connecting an extra speaker leads to avoid speaker when the set embodies self-capacitance.

Fig. 4.—A pictorial representation of the circuit in Fig. 3.

High-note loss due to the self-capacity of the leads is entirely ruled out if choke-capacity output is used in place of direct coupling. This method is now quite common, and is illustrated in Figs. 3 and 4. There is just one warning, however: if the set is operated from D.C. mains, the connection from the extra speaker to earth must be made through a good condenser of 1—or 2-mfd. capacity, as shown. Omission of this condenser may lead to the full voltage of the mains being placed across the two speakers.

The methods just described are ideal so long as both speakers are connected up, but it may not always be desirable to have the two switched on. See what happens if one speaker is removed. First of all, it will cause an increase in the output from the remaining one, although the power will not be anything like twice what it was previously. The other effect will be a slight reduction of the high-note response. With receivers fitted with a tone control this can be quite easily corrected, but in any case is not very pronounced.

Adjusting the Load Automatically

The increase in power may prove an annoyance when, say, the speaker which is most remote from the set is working at comfortable loudness and the local speaker is suddenly switched off. Reduce the volume from the distant speaker to its original level obviously necessitates a journey to the receiver to alter the volume control. However, this adjustment can be carried out automatically if the method shown in Fig. 5 is adopted.

A resistance is connected so that the action of removing the local speaker introduces the resistance into the circuit and by-passes the extra power which otherwise would be wasted.
By means of a slightly more elaborate arrangement than that shown in Fig. 5, it is possible to introduce tone correction. The idea is to use, in place of the resistance, a choke of similar characteristics to the disconnected speaker, that is, one whose impedance, like that of the speaker, increases with frequency. Experiments with an old loud-speaker unit, the remaining winding of a burnt-out transformer, or a pair of discarded headphones from which the diaphragms have been removed, naturally suggest themselves. A combination of a variable resistance and one of these improvised chokes connected in series can sometimes be made to match the characteristics of the speaker which they replace with a fair degree of accuracy. Thus when the local speaker is disconnected this choke device is introduced, and both the volume and quality from the distant speaker remain appreciably as before.

When fitting an extra speaker to a set which already contains a properly matched speaker, the best thing to do is to buy an extra speaker of the same impedance as the one in the set, and to connect it in parallel with it. Admittedly, this arrangement is not ideal, since the load will now be only half what it should be, but it is the best possible under the circumstances, and the load will at least be divided equally between the two speakers. Parallel connection is preferable to series connection on the grounds of quality of reproduction, for any defects in the reproduction from one instrument tends to be transmitted to the other when they are joined in series. With direct coupling the method of connection shown in Fig. 1 will be applicable, while with choke-capacity coupling the circuit of Figs. 3 and 4 is suitable.

Another circuit which can be used with direct coupling is shown in Fig. 6. It is quite simple, and combines the advantages of both direct coupling and choke-condenser coupling. The only extra component needed is a fixed condenser of about 1— or 2—mfd capacity. Although the existing speaker is directly coupled, the extra speaker is choke-capacity coupled.

**AERIALS 6—**

Various Types of Indoor Aerials and Earths

**TOPICAL TECHNICALITIES**

**TUNING INDICATORS.**

With the increased employment of automatic volume control circuits it is becoming necessary to provide an indication when a receiver is tuned exactly to the frequency of a transmission in order to obtain undistorted signals. The reason is that the A.V.C. arrangement reduces the strength of a signal, and therefore the load will at least be divided equally between the two speakers. Parallel connection is preferable to series connection on the grounds of quality of reproduction, for any defects in the reproduction from one instrument tends to be transmitted to the other when they are joined in series. With direct coupling the method of connection shown in Fig. 1 will be applicable, while with choke-capacity coupling the circuit of Figs. 3 and 4 is suitable.

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Australia, South Africa, India, Germany, the Chloride Electrical Storage Co., Ltd., "Annual Exide Battery Convention, held by Exide Goes to Scarborough other notable guests, will attend the official the Convention. held, the Convention being opened with an morning business sessions, devoted to dis- will be at the Royal Hotel, where the lands. The headquarters of the Convention at Scarborough, from June 12th to 14th, there being no other aerial it is both mast and aerial, them being the Exide Golf Challenge Cup. Ballroom,' which will be followed by a cabaret entertainment and dancing. 

By the Editor.

Exide Goes to Scarborough THE record number of 750 delegates and guests will attend the fourteenth Annual Exide Battery Convention, held by the Chloride Electrical Storage Co., Ltd., at Scarborough, from June 12th to 14th, among them being representatives from Australia, South Africa, India, Germany, France, Holland, Belgium, and the Netherlands. The headquarters of the Convention will be at the Royal Hotel, where the morning business sessions, devoted to discussions and the reading of papers, will be held, the Convention being opened with an address by Mr. J. G. Dunn, Managing Director of the Company and Chairman of the Convention. On Wednesday, June 13th, his Worship, the Mayor of Scarborough, Councillor G. K. G. Findar, and other notable guests, will attend the official Reception and Banquet at the Olympia Ballroom, which will be followed by a cabaret entertainment and dancing. The cares of business will be relieved by a number of social and other functions, among them being the Exide Golf Challenge Cup. Budapest's Combined Mast and Aerial THE new 1,005ft mast of the Budapest broadcasting station is now well known, but it is not generally realized that it is both mast and aerial, there being no other aerial than the "mast" itself, which is directly connected to the "Standard" 125kW transmitter. The mast that supports the usual form of aerial become charged and cause a strong wave propagation in the upward directions, which gives rise to fading. The "mast aerial" at Budapest is claimed to have only small radiation above the horizontal.

Uses of Cathode-ray Tubes CATHODE-RAY tubes are in general use for testing purposes in modern radio factories. As would be imagined, considerable use is made of C.R.O. tubes in the Cossor factory, where they are used to check frequency curves of superheterodynes, to mention only one of the numerous uses.

Frequency Extremes of the Tympani WHEN the deep roll of the tympani is heard from the loud-speaker, the happy owner probably never dreams that its true reproduction is dependent on the ability of the set to handle the treble faithfully. The lower tympani requires a range of 65 cycles to some 5,000 cycles for perfect reproduction.

Noise Caused by Rubbing Pipes A COMMON but obscure source of noise is that caused by two pipes rubbing together, particularly if one of them happens to be connected to the earth terminal of the receiver. The cure is to use a direct earth, and if trouble is still experienced, the only thing to do is to put a piece of leather or other suitable material between the pipes where they touch.

Cossor's New Factory O WING to the greatly increased demand for their products, Messrs. A. C. Cossor, Ltd., have been compelled to enlarge their production plant by a five-storey factory at Highbury. When the building is finished and the plant installed, work will be available for over 1,000 workers, which is a very worthy reduction, by one firm, in the number of unemployed persons in this country. The new building, which will have 60,000 square feet of floor space available for manufacturing plant, will have the following imposing list of materials used in its construction : 500 tons of British steel girder; 10,700 square feet of glass; 10,000 feet of steel conduit; 28,000 feet of electric cable, and 42,000 hollow blocks for flooring. The illustration on this page shows the steel constructional work of the new building.

NEW COSSOR FACTORY

A general view of the steel girder work for the new Cossor Radio Factory.

Micro-condenser in Aerial Lead WHEN the bottom of the short-wave dial is feasible, connect a very small condenser from aerial to grid, about .00005 mf. will do very well; this value can now be bought as standard.
Do You Know What This Graph Means?

The man who can analyse these curves and understand what they indicate knows his job. He will not be content to leave his theory of business to the school of hard knocks. He will, of course, do not convey to him specific 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. 1

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 LETTERS FROM READERS

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

Extremely Handy

Sir,—My Tool Kit to hand safely, and for which I thank you much. The Kit is everything that other readers have said about it, and which I can only reiterate. It will be extremely handy to anyone who suffers from "thumbs"!—R. M. Ross (Aldes, Ross-shire).

A Really First-class Gift

Sir,—I received one of your PRACTICAL Wireless Pocket Tool Kits, and they certainly come up to the high standard of PRACTICAL Wireless. I congratulate you on the production of a really first-class gift.—E. Myers (Johannesburg, S. Africa).

"A Very Handy Book"

Sir,—I have received my copy of "Everyman's Wireless Book" and desire to express my thanks for same. It is certainly a very handy book, and the information contained therein is, I think, very useful and helpful and should be in the hands of every wireless enthusiast.—H. P. Singleton (Blackpool).

A South African Reader's Comments

Sir,—I have taken PRACTICAL Wireless from No. 1 and find it an excellent paper. The Data Sheets have been extremely useful, especially those dealing with wire gauges and power transformers. The "Constructor's Encyclopaedia" is also an extremely useful book.

I wonder if you are aware of the fact that a British short wave or, better still, a short and medium set is practically unobtainable in South Africa. More than 80 per cent. of the dealers stock American superheterodynes, usually of the cheaper variety, that is in construction and performance though not in price, which is exorbitant of it.

I would like to make the following suggestion re PRACTICAL Wireless. Could the Short-wave Section be conducted in the same manner as the Television Section, by including a series of articles on faults.

My present set is a high-class superhet, and out of five hours daily listening I put in four hours to the Daventry transmissions, commencing at 5 o'clock G.M.T., just in time for the news.—B. Biermetten (Benoni, Transvaal, S. Africa).

Our Encyclopaedia in Iraq

Sir,—Many thanks for the "Encyclopaedia" and Data Sheets safely received; they certainly provide a quick and ready reference and are very well compiled. We find them particularly useful as they provide more up-to-date information than the various text books one has collected from time to time. I have just completed the design for a short-wave all-electric radio for particular use in this country, and if it comes up to expectations I will send along results.—A. J. Moore (Hinaidi, Iraq).

New Chassis System

Sir,—I think you will be interested to know that arrangements have been made for the supply of a sectionalized uniform chassis system which will be produced by Messrs. Colvern, Ltd. This system should be of value to constructors, as it enables a set to be built which is more comparable with a commercial article. The system includes a number of standard size brackets and plates, and also paxonin strips with cylinar tags, to form sub-assemblies.

The system is by no means a perforated metal scheme, but it utilizes only a few standard parts which is more convenient for the construction of most types of modern sets.—P. D. Tyers (Watford).

An Overseas Reader's Appreciation

Sir,—I have been a reader of PRACTICAL Wireless since Volume 3, and I find it so interesting that I have ordered my book self to get me all the back copies of Volumes 1 and 2. PRACTICAL Wireless is worth more than 3d., but to your overseas readers its value would be much enhanced if you can see your way to increase the Short-wave Section. You have designed the Lucus A.C. superhet, the Leader 3, etc., for the special benefit of your home readers, so what about a special set for overseas constructors, who are mainly interested in short waves. An all-wave set, incorporating the latest improvements, will be very much appreciated by us. It can either be a straight circuit or superhet—A.C., D.C., and battery types. Our voltage supply is 230 volts D.C. or A.C.—T. M. Lockyer (Kuala Lumpur, F.M.S.).

---

CUT THIS OUT EACH WEEK.

---

THAT a moving coil loud-speaker should preferably be enclosed in a dust-proof box to prevent the entry of metallic dust into the gap.

THAT microphone in a detector valve may be removed by placing anything into contact with the glass bulb.

THAT although a reaction winding and reaction condenser are inter-related there is a limit to the size of condenser which can usefully be employed.

THAT ordinary glass is a very efficient insulator and is difficult to work.

THAT all insulators require to be kept scrupulously clean to preserve their property.

THAT where more than one wire is used for aerial or earth leads to more than one aerial, the combined lead, they should be kept apart or otherwise prevented from coming into contact.

THAT ordinary cobbler's heel-bail is a splendid material for repairing holes in chassie panels and components.

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Do you know that arrangements have been made for the supply of a sectionalized uniform chassis system which will be produced by Messrs. Colvern, Ltd. This system should be of value to constructors, as it enables a set to be built which is more comparable with a commercial article. The system includes a number of standard size brackets and plates, and also paxonin strips with cylinar tags, to form sub-assemblies.

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The Editor will be pleased to receive articles of a practical nature 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 reader. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. Any letter that the Editor should be addressed: The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, no printed apparatus described in our columns is not the subject of letters pages.

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366 PRACTICAL WIRELESS June 9th, 1934
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PRACTICAL WIRELESS

June 9th, 1934

RADIO CLUBS AND SOCIETIES

Club Reports should exceed 200 words in length and should be received by our advertisers. Many club reports are scheduled for publication in the following week's issue.

SLADE RADIO

A lecture on "Frequency Changers" was given by Mr. G. C. Clarke at the last meeting of this society. In opening his lecture he briefly discussed, "What are frequency changers and why?" and passed on to the question: why he dealt with amplitude and frequency and intermediate frequency selection, and tone control. The question of how he dealt with frequencies, harmonics, and intermediate frequency selection was also dealt with. The development of superhet's followed, in which he described the various types and circuits from 1922 up to the present day. Many of the interesting points were described in detail, including the cause of second channel interference, and how it can be eliminated.

- Hon. Sec., 110, Hiliaries Road, Gravelly Hill, Birmingham.

ROLA MOVING-COIL SPEAKERS

At a meeting of the South Herts Branch of the above society, arrangements were made for Mr. T. J. Underwood to demonstrate his short-wave receiver at a future meeting. Mr. C. G. A. also challenged him to a test demonstration of his own short-wave receiver. This will take place about three weeks later.

- Tel. 2/6 at 238, Telephone: W. Orton, "Kingsthorpe," Willowbank, Uxbridge.

ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY

An inter-branch contest has been arranged by the A.A.R. and T.S. to discover which branch holds the DX championship. Branches which used their intentions of competing are the South Bucks Branch, the West Herts Branch, and the West Middlesex and East Buckinghamshire Branches. Other branches should notify H.Q. if they desire to join the contest. In the meantime, the members of the A.A.R. and T.S. (and Branch) hold the championship.

At the last meeting of the West Middlesex and East Bucks Branch of the above society, arrangements were made for Mr. W. J. Thompson to demonstrate his short-wave receiver at a future meeting. Mr. C. G. A. also challenged him to a test demonstration of his own short-wave receiver. This will take place about three weeks later.

- Mr. W. J. Thompson, "Stoneham Rd., Stoneham Rd., London, E.S."

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FAC'TS & FIGURES

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HIVAC K.F. PENTODES

TWO new high-frequency pentodes are announced by the High Vacuum Valve Co., Ltd., of 118-117, Harrington Road, E.C.1. One is of the variable-base type, reference VP216, and the other is of the "straight" type, reference HP215. As shown by the type numbers, they have 2-volt 15 amp, diamons, and each is designed for a maximum H.T. voltage of 150, with 70 volts for the screening grid. The mutual conductance of the HP215 is 1.2 mA/V and of the centre-tap may sometimes be rendered ineffective owing to the external wiring which is fitted, and thus the use of a device of this nature will assist greatly in obtaining silent working from A.C. mains. The travel of the arm is full 300 degrees, and the price is 2s.

FERRANTI NEW GLORIA RECEIVER

The new Gloria Complete which is announced by Messrs. Ferranti includes the refinement of an electric clock on the upper portion, and in accordance with the new B.B.C. twenty-four-hour system, the clock is provided with a twenty-four-hour dial. The normal twelve hours are arranged in Roman numerals round the face in the customary manner, and the figures from 13 to 61 are printed in ordinary figures beneath the others. The clock is almost elliptical, and presents a most attractive appearance when placed on the loud-speaker grille. The new Gloria costs 22 guineas.

A NOVEL CHLORIDE RECEIVER

BATTERY-USERs will be very interested to note the three views shown at the foot of this page. It was designed and built by Mr. S. Lendoll, of the Engineering Department of Electrode Batteries, for their managing director, and is a good example of what can be done in the way of manufacturing a really up-to-date receiver without calling into use the power supply mains. The circuit is of the standard type, embodying a pre-selector H.F. stage, hetrodyne oscillator, two I.F. stages, and a double-size-triode second-detector. The output consists of two FX4 valves in push-pull fed from a tone-corrector valve, all valves, with the exception of the output stage, being of standard 2-volt type. For high-tension accumulators totalling 250 volts are employed, and these are split up into parallel sections for charging. An ingenious switching device has been incorporated for charging purposes, and this puts all the sections of the H.T. batteries in series, parallel, for free disposal over 24 hr. On the reverse movement the sections are connected in series, and the receiver is switched on. The trickle charge current of the indirectly-heated type, with 4-volt heaters, the former requiring a current of 1 amp, and the latter 2 amps. The former valve is designated 41.M.T.O, and it is distinguished by its high value of conversion conductance and inherent freedom from modulator harmonics. The maximum anode voltage is 250 (modulator) and 100 volts for oscillator anode voltage. The Mod. screen voltage is 100 maximum. A standard 3-pin base is fitted, and the top cap is connected to the modulator grid. The new pentode is the 42MMF9, and this also has a 7-pole base, the maximum anode dissipation is 8 watts, and the anode voltage rating is 250 volts at 53 ma. With 15 volt grid bias, the optimum load for this valve is 8,000 ohms, and this value must be adhered to if best results are to be obtained. For tone compensation the makers recommend a 0.61 condenser and 10,000 ohms resistance in series.

FERRANTI ELECTROLYTIC CONDENSER BLOCK

The illustration below shows one of the newly-introduced Ferranti components, consisting of two 3 mid. dry electrolytic condensers in a wax container, and employing flexible leads for connecting purposes. This is type CE100, and costs 7s. 9d. It is designed for a peak working voltage of 500. There are a number of other dry electrolytic condensers in the Ferranti range, and these are contained in Pertinax boxes and cover all the most useful ranges.

TRADE NOTES

MR. FRANK GILL, O.B.E., Chairman of the board of Standard Telephones and Cables, Ltd., and of Creed and Co., Ltd., has been elected Chairman of Kodak Broads, Ltd., as from May 7th. Mr. S. Willing Cole, President of the Radio Manufacturers' Association, will retain the office of Deputy Chairman.

NEW BLOCK BATTERY

Block Batteries, Ltd., announce that they are now putting on the market a further type of nickel-iron battery, the "Container," having a capacity of 15 amp, hours at slow intermittent rates. In common with the other products of this company, the battery deviates very considerably from the ordinary type of accumulator, the chief characteristic being the terminals are at the front, thus making it extremely simple to connect and disconnect, and also adds greatly to the protection from corrosion due to acid chocking.

Three views of the interesting Chloride receiver which is described on this page.

June 9th, 1934

KABE HUM BALANCER

MESSRS. J. W. LECHNER AND CO. LTD., of 61, Spencer Street, Clerkenwell, E.C.1, have produced a neat new component designed especially for the removal of hum from A.C. operated receivers. This has an overall size no larger than a sixpence, and carries a wire-wound element having a total resistance of approximately 50 ohms. A small rotate-able arm is fitted in the same manner as a standard 2-volt type, requiring a total bias voltage of 0 volts for complete volume control purposes.

KARI HUM BALANCER

MR. E. J. Long, who has held the position of General Manager of the British Ebonite Company, Ltd., for the past ten years, has now been appointed Managing Director.

COSSOR FREQUENCY CHANGER

MERS, the recently-introduced A.C. valve is a frequency changer and a super-amercury. These are both of the indirectly-heated type, with
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 in the context of the equipment described in our pages, from articles appearing in previous pages, or on general equipment.

We regret that we cannot, for obvious reasons—(1) We do not have the means of reproducing diagrams of complete valve receivers.

(2) Single alterations or modifications of receivers described in our columnaries.

(3) Single alterations or modifications of commercial receivers.

Answer queries over the telephone.

Please note also, that all sketches and drawings which are sent to us, should bear the name and address of the sender.

THE MASTER MIDGET

"In the gridleter receiver which you recently described I notice that you do not mention the name of the tuning coil. Could you please tell me what it was and whether you used a screened coil which I have got, in its place? I also have a cabinet on hand, 21 in. high by 16 in. wide and 8 in. deep. Could I put the Midget in this?"

—E. A. E. (Dublin).

The coil which was used in the original model of the Midget was an Ignorance Type H.F. Unfortunately, this coil is not now made, although it may be obtained from many wireless shops. In this particular receiver, the coil is not critical, and any good make may, therefore, be substituted for that which was used in the original design. The connections to the coil will, no doubt, have to be modified to suit the particular component which is used, and the manufacturer's instructions for use in the particular cabinet should be read with care. The cabinet should be suitable, although you will have to make your own arrangements regarding the handling of the coil.

PERFORMANCE, NOT APPEARANCE

"Will you inform me what is the good or the use of the coil which is shown in the drawing on page 52?" —J. H. R. (Hull).

The connections to the coil will, no doubt, have to be modified to suit the particular component which is used, and the manufacturer's instructions for use in the particular cabinet should be read with care. The cabinet should be suitable, although you will have to make your own arrangements regarding the handling of the coil.

MODERNISING THE 1933 FURY

"I have a D.C. Fury Four, but owing to the radical change in the wiring, I am getting interferences all over the dial. Is there any way of modernising the set so as to remove this?"—F. J. W. (Hackney).

If you do not wish to completely rebuild the original version of the 1933 Fury, it would suggest scrapping the fitted coils of modern design, such as were employed in the 1934 models, for such a coil would present a line impedance which is not fitted, and the connections may be ascertainment from..."
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DUBILIER 4 mfd. (2+1+1), 1,000v. for mains

C57, 2/9, 4 mfd. (2.25+2.25), 1,000v. for mains

SOUTHERN RADIO'S Bargains.—Manufacturer's
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Hydra block condenser, 16 mfd. (2+2+8+2+1+1+1),

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