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Practical **4^D** and Amateur Wireless

Vol. 7. No. 168. Dec. 7th, 1935.



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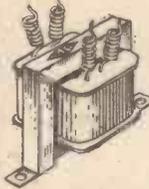
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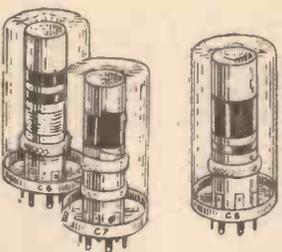
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 - C59. 455 Kc/s Oscillator 4/6

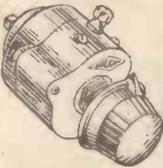
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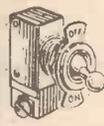
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These Reducing Adaptors are strongly made and finely finished. They are for use with the V.I. Tester and are supplied in two types: cable plug and socket, reducing to 7 or 5 pins. The socket adaptors similarly enable the insertion of five or seven-pin valves into the standard 9-pin socket of the Tester.

Plug Adaptors		Bulgin Reducing Adaptors.	Price 2/9 each.
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A.27	9 to 7		
A.28	9 to 4/5		
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A.29	9 to 7		
A.29	4/5 to 9		
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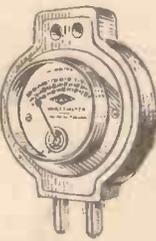
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THE "CENTAUR"—A RAPIDLY BUILT 3-VALVER

SEE
PAGE 376.

Practical and Amateur Wireless

Round

Edited by
F. J. CAMM.

Technical Staff:
W. J. Delaney, H. J. Barton Chapple, Wh. Sch.,
B.Sc., A.M.I.E.E., Frank Preston.
Vol. VII. No. 168. December 7th, 1935.

Wireless

Greetings!

ONCE again it gives us genuine pleasure to wish our readers the best possible Christmas. This special Christmas Number contains many features of seasonal interest, and we hope that our readers will enjoy the typographical Christmas Pudding, on the selection of the ingredients for which we have expended considerable care. Someone has ordained that the Christmas Number should appear several weeks before the actual festive day. None the less, it is not too early, for the spirit of Christmas is infectious, and it is well that Christmas issues should appear when they do, to start the ball rolling. That spirit will gather momentum as December 25th approaches. Most of our readers have loyally supported this paper from No. 1. We have met many hundreds of them personally, and in making our festive greeting there is something more than the hackneyed salutation behind it.

First French Television Station

THE first French public television broadcasting station has been officially opened in Paris. The transmissions, carried out from the top of the Eiffel Tower, are on 7 metres with a definition of 180 lines. Regular public broadcasts will be made daily from the end of November.

A Pleasant Surprise for Listeners

ALTHOUGH, following the reconstruction of the Radio Strasbourg transmitter, it was announced that the power had been raised to 100 kilowatts, according to a statement recently made by the Station Director, broadcasts are radiated with a power of 120 kilowatts, thus making Strasbourg the largest station in France.

Brasov Now Testing

ON 1,875 metres, the new 150-kilowatt Bod station, near Brasov (Romania), may now be heard carrying out experimental broadcasts daily between G.M.T. 08.00 and midday, and from G.M.T. 14.00—16.00. Announcements are made in both Romanian and English; the call is *Radio Romania*.

Radio Drive in Italy

NOTWITHSTANDING its thirteen transmitters, Italy possesses only roughly 450,000 licensed listeners. In order to make radio more popular the authorities are endeavouring to place on the home market a cheap three-valve set on the lines of the one adopted in Germany.

The Radio Fan's Dream Set!

THE Q motor patrol cars used by the Scotland Yard Flying Squads are to be equipped with more effective radio apparatus. The instruments are to cost between £150-£200 each.

the World of

Great Britain Still First

AT the end of October, registered listening licences in the British Isles numbered 7,274,482, representing an increase of 724,388 in the past twelve months.

Another Paris Station to Move

RADIO CITÉ, the 2-kilowatt transmitter run by the Paris daily *L'Intransigeant*, is shortly to be transferred to the outskirts of the capital, namely, Argenteuil. Although there is to be no alteration in wavelength (280.9 metres—1,068 kilocycles), it is expected that the power will be increased.

A Greenland Eldorado?

SEEKING the reason why the capture of radio transmissions is difficult in certain parts of Greenland, Danish engineers have discovered that the electro-magnetic waves are largely absorbed by metalliferous earths in these districts. Analysis carried out at Copenhagen have led to the discovery of important beds of nickel and copper ore.

Constantinople Seeks Freedom

SO far, sandwiched between Paris National and the Deutschlandsender, Istanbul has worked on 1,595.7 metres (188 kc/s); during the past week the wavelength has

been slightly increased, and the Turkish station now broadcasts on 1,621.6 metres (185 kc/s).

Soviet Radio Activities

NOTWITHSTANDING the general increase in the power of long-, medium-, and short-wave transmitters during the past two years, the Soviet Union has recently passed a plan for the amalgamation into one unit of a number of transmitters at Chadinka, lying some thirty miles to the east of Moscow. This scheme will permit the installation of a 2,500-kilowatt station which it is hoped may be ready by 1936.

Stand-by for Toulouse-Muret

THE 60-kilowatt transmitter which the French P.T.T. has erected at Muret for the Toulouse district is now testing nightly at the conclusion of the day's broadcasts by the older station, namely, after G.M.T. 23.00. The power eventually will be increased to 120 kilowatts. The wavelength is 386.6 metres (776 kc/s).

Better Signals from Oslo

IT is expected that the new high-power transmitter which the Norwegian authorities are erecting at Vigra, near the capital, will be ready to work by the beginning of the New Year. Possibly the station will provide the National programme whilst the old transmitter will be retained for an alternative broadcast. The Bergen 20-kilowatt will not be ready for another six months, but may work on 1,186 metres (253 kc/s) a channel which at present is being used by the Air Ministry's station at Borough Hill (Northants.) for weather reports destined to the aviation services.

Radio Jerusalem

EVERY effort is to be made to bring the first Palestine station into operation at Christmas, in order that a relay may be effected of the B.B.C. Empire programme, including the carillon from the Holy Church at Bethlehem.

French Raid on Radio Pirates

BACKED by dire threats the French post and telegraph authorities have succeeded in bringing some 460,000 radio pirates into the fold within thirty-five days. It is unofficially stated that France now numbers over two and a half million listeners.

Peggy Cochrane

THIS popular and versatile musician gives another of her quarter-hour programmes on December 11th. She sings and plays the piano and violin in these acts.

The Editor
and Staff Join
in Wishing
Every Reader
a Very
Happy Xmas

ROUND the WORLD of WIRELESS (Contd.)

Sonata Recital

MARIE HALL (violin) and Mary Ramsay (pianoforte) will give a Sonata Recital from the Bristol Studios on December 6th. They will play Mozart's Sonata in C major, and Grieg's Sonata in F major.

"Waltz Dream"

DIRECTOR of Variety, Eric Maschwitz, in the absence of Gordon McConnel, who is convalescing after his attack of influenza, has taken over the production of "Waltz Dream," scheduled for broadcasting on December 5th and 6th. This will be one of those delightful operettas with first-class artists. Already booked for the cast are Jan van der Gucht and Horace Percival.

Dancing Through

GERALDO and his Band are to be featured on December 14th in another instalment of "Dancing Through," for which he has enlisted a squad of vocalists in addition to his band. During this hour Geraldo will play something like a hundred and fifty popular numbers, one following the other in quick succession. Dance music "fans" will thus have their fill of rhythm melody by one of the best dance bands in London.

Celebrity Concert

A CELEBRITY Concert takes place on December 9th, featuring Harry Welchman and the male voice chorus, conducted by Stanford Robinson, who will have with him the B.B.C. Theatre Orchestra.

Subterranean Broadcast

DECEMBER 7th sees the beginning of a new series of feature Outside Broadcasts—"Outside Broadcast Cameos" they are called—and they will, in fact, be "Microphone Tours" in miniature. The opening instalment necessitates the Northern Outside Broadcast staff taking its microphone underground in order that listeners may hear a programme broadcast from a subterranean chamber forming part of the new reservoir at Wardle, near Bury, in Lancashire. This chamber, which will ultimately contain water, is remarkable for its echo, it being said that the reverberation period is similar to that of a cathedral. Various officials, municipal and otherwise, will tell listeners all about it, and in addition they will sing and go through other vocal exercises in order to demonstrate thoroughly the alleged acoustic phenomena.

"Lorna Doone"

THIS famous romance of Exmoor by R. D. Blackmore has been adapted as a radio play by Louise Drury and will

INTERESTING and TOPICAL PARAGRAPHS

be produced by Cyril Wood from the Bristol Studios in two parts, part one on December 7th, and part two on December 11th. Mr. Wood has held auditions in numerous districts all round the Doone Valley in order to select people living in that part of the country to take part in

MUSIC and CHARM



Diana Napier, the film star, tunes in some Viennese music on her Cossor Radiogram for Richard Tauber, the famous tenor. The model shown is the new table radiogram (Model 736) priced at 16 guineas.

this broadcast. Listeners may therefore be sure that the dialect will be authentic.

Organ Recital from Birmingham

REGINALD NEW, who made his name as a cinema organist at the Beaufort Cinema, Birmingham, returns periodically to the Midlands as guest organist at Cheltenham Town Hall, which has a very fine organ, designed in consultation with the late Sir Herbert Brewer. The programme Mr. New gives on this occasion includes some modern as well as classical works, and a piece of his own entitled "Memories."

The Boar's Head Ceremony

BROADCASTING has discovered these many years that listeners as a body like to hark back to the days of Merrie England. A proof of this is the popularity of Trooping the Colour, the Ceremony of the Keys, Beating the Bounds, and other such broadcasts. This opinion is strengthened by the flood of correspondence which after such transmissions pours into Broadcasting House from the Empire. On Christmas Day a new feature will be added to the annals of broadcasting by the introduction of the Boar's Head Ceremony.

Unrehearsed Debate

MIDLAND Talks Director has a fatherly interest in unrehearsed debates, because a year ago he organised the first—"Business Man v. Politician," with four speakers. Now they have become a National feature. Midland's second has for its theme the proposition "That Town Life Makes for the Deterioration of the Race." Oliver Baldwin, son of the Prime Minister and himself a countryman by choice, says "Yes"; and Geoffrey Bournemouth says "No." He gave the provocative series of talks on Midland town-planning last year, and lives near the Thames—at Maple Durham. It should be a hard-hitting debate. Sir Charles Grant Robertson, Principal of Birmingham University, will be the Chairman. Oliver Baldwin is Midland's Country Correspondent for Oxfordshire.

Variety from Coventry

NAT GONELLA who, with his Georgians, a quintet of instrumentalists, is the star attraction in a variety relay from the Coventry Hippodrome Theatre, is recognised as one of the leading British trumpeters. He began his musical career in a boys' band in an Archie Pitt revue, and subsequently played in the orchestras of Billy Cotton, Roy Fox, and Lew Stone. The Coventry Hippodrome had its first broadcast about three years ago when a revue was relayed. Its orchestra contributes regularly to broadcast programmes.

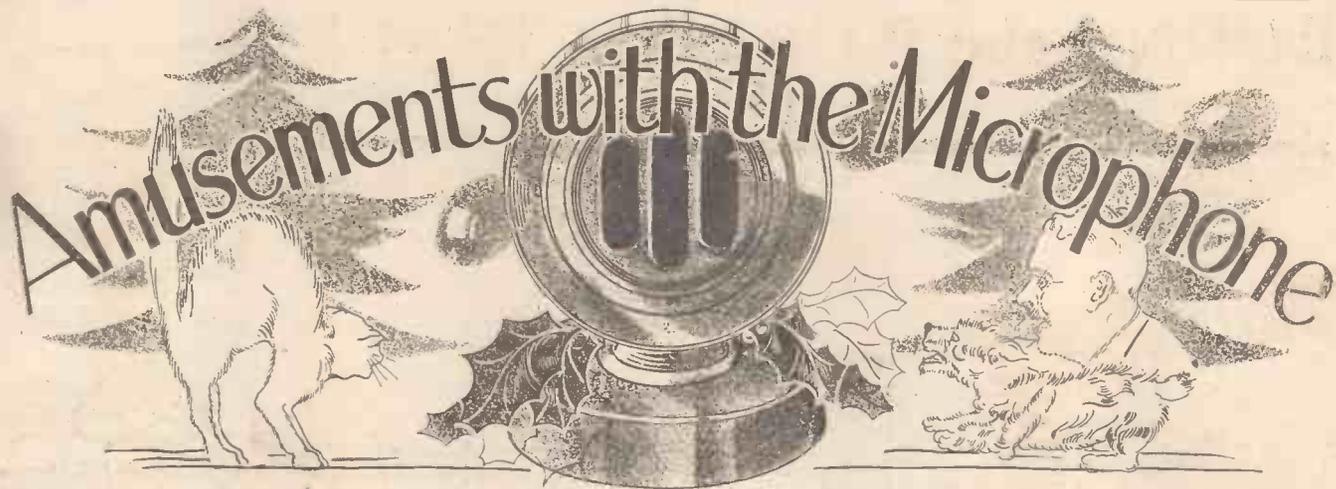
SOLVE THIS!

PROBLEM No. 168

Jenkins made up the 1936 Sonotone receiver (two H.F. stages, Westector, and output pentode) and found that the H.F. volume control would not function satisfactorily. He inserted a milliammeter in the H.T.—lead and was amazed to find that the consumption of the output pentode increased from the normal value of 15 u/A to 30 m/A as the volume control (which controlled the bias voltage of the Var. Mu H.F. pentodes in the normal manner) was rotated from maximum to minimum settings—30 m/A being consumed by the output pentode when the H.F. volume control was at minimum. What was the fault? Three books will be awarded for the first three correct solutions opened. Address your envelopes to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 168 in the bottom left-hand corner, and must be posted to reach this office not later than the first post on Monday, December 9th, 1935.

Solution to Problem No. 167

The additional current consumption of the Class B stage, together with the high peak current required by the Class B valve, prevented the small mains unit from giving sufficient voltage output. The following three readers successfully solved Problem No. 166 and books are accordingly being forwarded to them: J. Sharrock, 109, Furlong Road, Bolton-on-Dearne, Nr. Rotherham; G. T. Storey, 72, Market Street, Hoylake, Wirral; R. G. Egerton, 49, Alexandra Road, West Shore, Llandudno.



THE popularity of the microphone as a means of providing entertainment in conjunction with the broadcast receiver, or with an amplifier, has increased very considerably during the past couple of years. One reason for this is that there are so many really good microphones available at prices from as little as 5s., whilst complete with transformer and other necessities, the price need not exceed 10s. to 25s.

Microphone Connections

The method of using the microphone depends upon the type of instrument to be employed, but the principle is the same in all cases, and the general features are shown in Fig. 1. In this case the microphone illustrated is of the hand type, and it is fitted with a small horn mouthpiece, but there are types for attaching to the coat lapel, for standing on a table, and for suspending, and the reader can choose whichever he prefers. The microphone is connected in the primary circuit of a microphone transformer, this having a step-up ratio of about 1:100, and is in series with a battery and an on-off switch. The output from the secondary winding of the transformer is similar in character to the output from a gramophone pick-up, and the secondary terminals can thus be connected to the pick-up terminals on the receiver. In case your set is not provided with pick-up terminals, methods of connection are described on another page in this issue.

The Energising Battery

It is not proposed to specify any particular make of microphone and transformer, but the following makers and suppliers may be mentioned: G.E.C., Electradix, Scientific Supply Stores, T.M.C., and Grafton Electric Co. It is desirable, in every case, when a microphone is bought which is not fitted with its own transformer that this be obtained from the suppliers at the same time, so as to ensure that the most suitable type is obtained. With regard to the battery, this also is dependent to a certain extent upon the microphone, and may require to have a voltage between 1½ and 12, according to the resistance of the "mike." In general, however, a voltage of 3 is sufficient, even when a maximum of 6 or so may be used. If there is any doubt concerning the most suitable voltage it is a good plan to make a few tests with a G.B. battery, after which a larger capacity unit can be bought. On the other hand, provided that the microphone is not to be in use for long spells, a grid-bias battery of the better-class type may be used permanently.

Using the L.T. Accumulator

When using a battery set it is frequently possible to dispense with the battery and

The Christmas Party can be Considerably Brightened by Bringing a Microphone into Use. It provides an Interesting Diversion from Listening to Broadcasts

on-off switch shown in Fig. 1 by adopting the connections indicated in Fig. 2. In this case the microphone is energised from the L.T. accumulator by taking leads from the filament terminals on one of the valve-holders. By this means the microphone is automatically switched off at the same time as the receiver; it is important that the microphone be switched off when not in use, otherwise the energising battery may be exhausted too quickly. Fig. 2 also shows suitable connections for the secondary winding of the microphone transformer when pick-up terminals are not fitted to the set. It is important when using the method of energising just referred to that the microphone and transformer be kept near to the receiver, otherwise there will be too great a voltage drop along the L.T. leads, this resulting in the application of too low a voltage to the microphone.

Remote Operation and Screened Leads

In many respects the type of microphone having a transformer and battery mounted in its base is most convenient, since it is neat and compact, and can be mounted at almost any distance from the receiver. This kind of unit is

with a switch and built-in volume control in addition, so that complete control is available from the microphone itself. There is one important point to bear in mind when using a microphone more than a foot or two away from the set, which is that the leads to the pick-up terminals should be screened to avoid inter-action and low-frequency instability (generally indicated by a high-pitched whistle or a low howl). The leads from the secondary winding of the transformer may be covered with screening braid, this being joined to the earth terminal, or they may consist of a length of lead-covered cable. The latter is more expensive, and would probably be justified only when the microphone is to be installed permanently in a room away from the receiver. Only a single earth connection to the screen is shown in Fig. 3, but where the leads are more than, say, 10ft. in length it is wise to make an earth connection at each end of the cable; in some cases it is an advantage even to take two additional earth connections, these being made to convenient water pipes or other earthed objects.

Methods of Volume Control

When a volume control is not fitted to the microphone it is nearly always worth while to include one in circuit as shown in Fig. 4. It will be seen that a 100,000-ohm potentiometer is shown, and

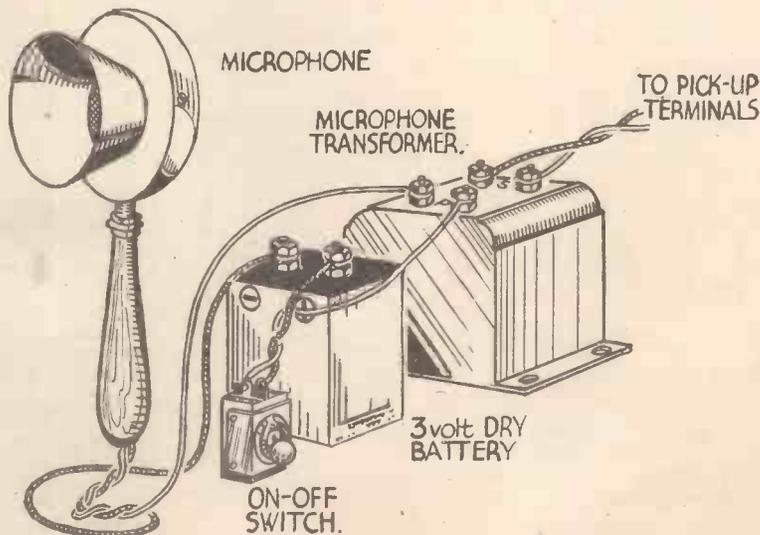


Fig. 1.—Showing how the simplest type of microphone is connected to the receiver or amplifier through a step-up transformer. Note the connections of the dry battery and microphone switch.

that the outside terminals of this are connected to the secondary winding of the microphone transformer, and that leads to the pick-up terminals are taken from one outside terminal and from the centre one. At low-volume settings of the potentiometer there is a risk of distortion being introduced due to the resistance of the part of the potentiometer element which is out of the pick-up circuit being in series with the transformer secondary; this trouble can be largely overcome by joining a .01-mfd. fixed condenser as shown in Fig. 4.

Although a 100,000-ohm potentiometer is shown it is sometimes better to employ a lower value than this, and a resistance down to 10,000 ohms can often be used to advantage. In any case the value depends upon the characteristics of the transformer and of the microphone, and if it is found that a high-pitched whistle is present at the same time as the speech or music a lower value should be tried. Alternatively, although this method restricts the useful output from the microphone, a fixed resistance of 20,000 ohms or so may be joined between the two outside terminals of the volume control.

In passing, another method of controlling the volume might be mentioned, since it is better in certain instances than that already referred to. The idea is to vary the voltage applied to the microphone from the battery or L.T. circuit, and this might be done simply by using a tapped battery and moving a wander plug or by including a variable resistance of about 10 ohms in series with the microphone and battery. The resistance may be of the type which used to be popular as filament rheostats in early receivers, and a suitable one can generally be bought from a "junk" shop, or even from some wireless dealers for a few coppers. The advantage of this system is that it restricts the actual output from the microphone, and thus prevents "blasting" (harshness on louder sounds), and, by reducing the sensitivity of the microphone, avoids troubles due to echo and sound-feed-back effects.

A Few Suitable Games

And now for the uses to which a microphone can be put in providing unusual and interesting forms of Christmas entertainment. First, there are such obvious uses as "fake" broadcasts—which are dealt with more fully in the article on another page, entitled "Broadcasting Your Own Programme"—

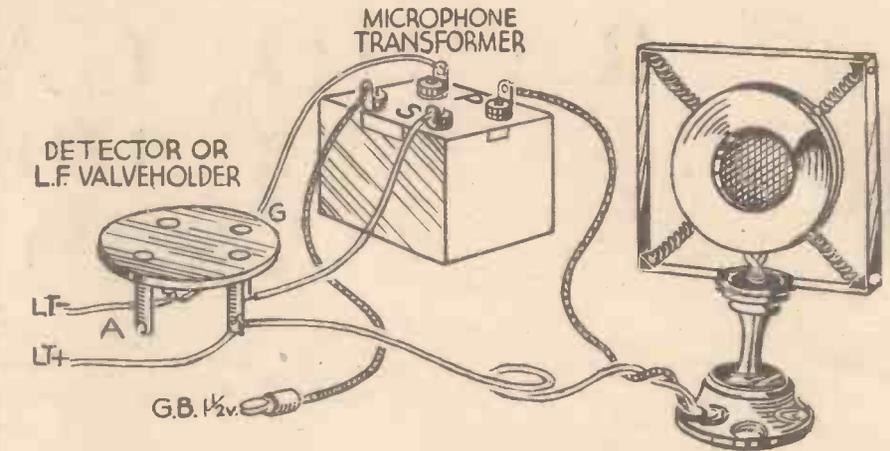


Fig. 2.—In some cases it is possible to energise the microphone by means of the L.T. battery if the connections are made, as shown, to the filament terminals of one of the valve-holders. In this case the receiver switch also acts on the microphone.

and relaying "ghost" sounds and moans in the production of a play or in conjunction with various conjuring and mystic tricks. Then there is an amusing game which might be called "auditions," in which each member of the party in turn retires to a room in which the microphone is situated and gives his or her own "turn"—which might comprise a song, a recitation,

sheet of paper, the mewing of a cat, the ring of a bicycle bell, and so on. It is important that the operator should keep an accurate list of the sounds "broadcast," so that this can be read out later, and the answers of the "competitors" checked; alternatively, each member of the party might be asked to read out in turn the answers written down before the correct solutions are given. The results invariably prove highly amusing, especially if the microphone is not a very good one or if it is so used that distortion is introduced.

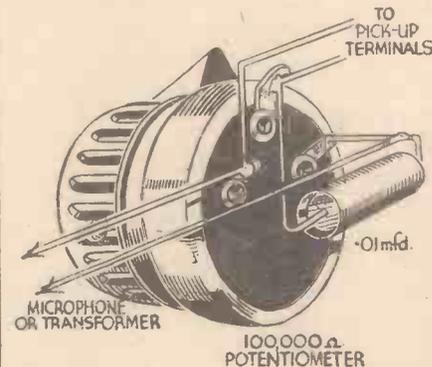


Fig. 4.—Connections for a volume control, which is required only when the microphone is not fitted with one.

or merely a little "back-chat"; other members of the party listen to the performance through the speaker and award marks according to the merits of the "broadcaster."

Another good game consists of identifying the sounds of various objects. For this each member of the party should be given a pencil and paper and asked to write down what is thought to be the origin of various sounds. The operator then rattles keys, crinkles paper, whistles, shakes a handful of coins, rubs his hand over a rubber balloon, and so on, while the "competitors" fill in their list. Amusing sounds which can be included in this scheme are those of a watch (the ticks can be made to sound almost like hammer blows), the beating of the heart by holding a hand microphone against the chest, the dropping of a pin on to a drum or

Tone Control and Echoes

Various weird effects can be produced by fitting some kind of tone control to the microphone circuit, so that reproduction can be made high- or low-pitched as required. The control may consist simply of a .01-mfd. condenser in series with a 10,000-ohm variable resistance, the two being joined to the pick-up terminals. Another effect which can be obtained, and which may be useful during the performance of a play, is by placing the microphone so that it picks up the indirect sounds from the loud-speaker, as well as the direct sounds applied to it. As a result of this various peculiar echo effects can be obtained or the "announcer" can produce the illusion that he is speaking in a large hall.

These, and many other entertainments, are yours if you buy a microphone.

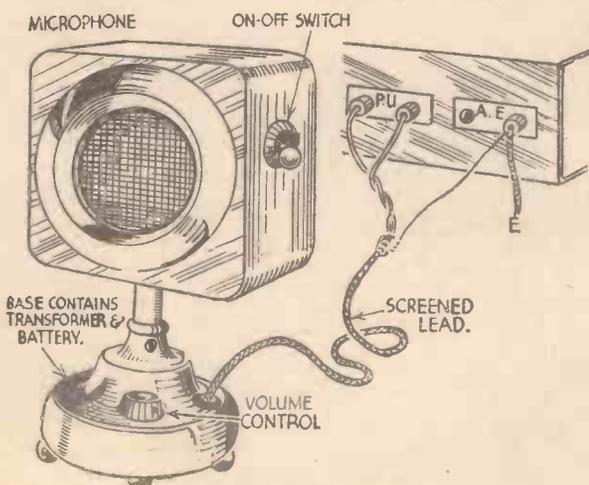


Fig. 3.—When using a microphone of the type which is supplied complete with transformer and battery the leads may be of almost any length, but must be screened.

GIVE BOOKS THIS CHRISTMAS!

The following standard works make ideal Christmas presents. They are all suitable for beginner and expert, lavishly illustrated, well-bound, and written by F. J. Camm. **WIRELESS CONSTRUCTOR'S ENCYCLOPEDIA.** 4th Edition, 392 pages, 490 illustrations, 5/-, or by post 5/6.

EVERYMAN'S WIRELESS BOOK. 2nd Edition, 288 pages, 243 illustrations, 3/6, or by post 3/10.

TELEVISION AND SHORT-WAVE HANDBOOK. 2nd Edition, 288 pages, 230 illustrations, 3/6, or by post 3/10.

HOME MECHANIC ENCYCLOPEDIA. 2nd Edition, 392 pages, 627 illustrations, 3/6, or 3/10 by post.

RADIO GAMES

FOR THE PARTY

THERE are many different methods of calling in the wireless receiver as an aid to the enjoyment of the party at Christmas time, and the following suggestions will give an indication of some of the ideas which are possible. First of all, at the usual Christmas party the Snowball is a prominent feature, not only where children are concerned, but also for the adults when a large collection of small presents is to be distributed. In the usual form this consists of an imitation snowball made from cotton-wool, inside which the presents are packed. To each present is attached a length of coloured ribbon, and these ribbons project and are of considerable length. When the appropriate time arrives each member of the party selects a ribbon, and when the host gives the signal, the ribbons are pulled, thus bringing out of the snowball the present to which the ribbon is attached. This idea may be adapted to the receiver by using in place of the ribbons lengths of insulated wire. The receiver should be fitted with an output filter and the lead to earth should be kept separate, whilst the lead from the other speaker terminal should be increased in length. Tied to this lead, but insulated from it, are the remaining insulated leads, as many as there are members at the party, and the game proceeds as follows. Each member selects a lead, and one member is chosen to stand in the centre. The ends of the leads are bared and each player holds the bare end of the wire towards the centre. The player at this point takes the earth lead and proceeds from one member to another, touching the wire which he carries against the bared wire held towards him. Obviously, when the lead from the receiver is touched, signals will be heard (provided the receiver is tuned to a station, or that a gramophone record is being played), and the game may be arranged so that only three choices are allowed, or that the search may continue for so many seconds.

Fault Finding

Another game which will appeal where a number of radio fans are present is rapid fault finding. Each member takes it in turn to introduce some fault in a receiver which will prevent it from working, and the remaining members then try to locate the fault. They may do this individually, each being allowed so long, or may all gather round and make suggestions. By allowing a time limit, the winner may be adjudged the one who produces the fault which takes longest to discover. Some hints in this direction may be offered: If the receiver is to be tuned to the local station, the tuning condenser or coil may be short-circuited. A coloured length of insulated wire should be used so as to enable it to be identified by the keenest player; otherwise, of course, it may take some minutes to discover. An anode coupling component may be similarly short-circuited, either on the primary or the secondary side. In general, it may be taken for certain that no fault involving the removal of grid bias or the application of wrong voltages should be adopted.

Charades

The old game of charades may be considerably improved by using the broadcast

How to Employ the Wireless Receiver or the Radiogram as an Addition to the Usual Type of Party Fun



Fig. 1.—Make your own sound effects as an aid to radio charades.



Fig. 2.—A match-box crushed in the hand will produce a very distinctive sound over a microphone circuit.

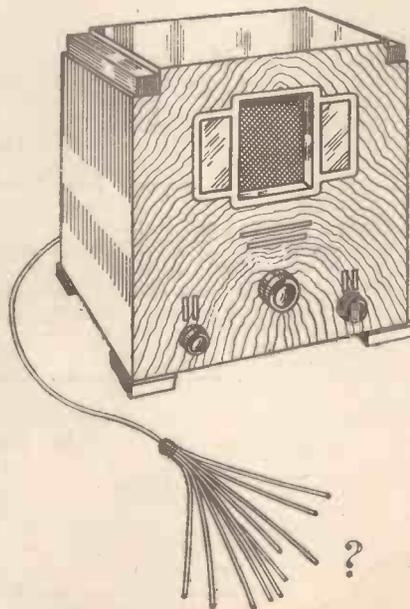


Fig. 3.—A simple but effective game, utilising the loud-speaker leads.

receiver and a microphone. The latter should be arranged in one room, with the loud-speaker in another. The actors go into the room containing the microphone and speak their words in front of the instrument. By including sound effects this game may be made very much more interesting than the old form. Some ingenuity will be required to produce suitable sounds, and there are various schemes for producing sounds which may at first seem to be beyond the ordinary amateur. For instance, the sound of an aeroplane crash, or the noise of a train smash or any similar sound, may be produced by crushing a match-box in the hands close up to the mike. A matchstick, broken suddenly close to the mike, will also produce a very life-like imitation of a branch of a tree snapping, or if the microphone and associated amplifier are of high quality, it may produce a totally different sound. The game may, of course, be played without the accompaniment of speech, and sound effects only may be relied upon.

A Novel Hunt

By adopting the extended loud-speaker leads from a filter circuit a novel hunt may be organised. It is obvious that the earth lead is needed to complete the loud-speaker circuit, and therefore the lead from the speaker may be joined to some metallic object in the room by one member of the party whilst the remainder are out of sight. When a suitable connection has been made, the members return to the room and take each an earth lead made up in the same manner as the arrangement illustrated in Fig. 3, but with this distinction. The bunched leads are now joined to an earthed point and thus each member proceeds about the room touching various metallic objects with the bare wire until a sound is produced from the loud-speaker. If there is no broadcasting available, or the receiver does not employ a pick-up, a simple arrangement for producing an audible signal for the purpose is to tighten up the reaction control until the receiver oscillates, removing the aerial in the case of a simple receiver to avoid interference with any neighbour who may be searching for distant stations. The reaction control may, of course, be adjusted so as to produce the most suitable musical note. In this game it is necessary for the players to remember that the signals will only be obtained when bare metallic objects are touched, insulation in the form of paint or lacquer preventing signals from being heard.

Radio Plays

With the aid of the microphone and the gramophone pick-up you may produce your own broadcast play, using the background from the records to augment the spoken word, and by purchasing suitable records a very realistic play may be produced. It is possible to obtain records giving all the well-known sounds, as well as all the instruments of the orchestra, and there is endless scope to the fun which may be obtained in this manner. On other pages will be found hints on connecting the microphone or pick-up, as well as a complete play, and with the aid of these, and the suggestions previously given, the Christmas party of to-day should be a very bright function.



Cyclona

A Christmas Radio Play for Amateurs,
specially written for Home Broadcasting
by ARTHUR ASHDOWN.



Fade in gramophone playing "Coal Black Mammy" for about thirty seconds. Fade out music whilst Announcer speaks.

Announcer. "Ladies and gentlemen, we present a farcical play, entitled 'Cyclona.' The characters are:—

Amelia Ankering, a maiden lady,
Flossie, her maid,
Mrs. Bullfinch, her cook,
Peter Peters,
Pete Peppercorn.

The action of the play takes place at Amelia Ankering's villa, 'The Aspens,' at Cosynook Garden Suburb, just outside London. It is a lovely summer afternoon, and the Scotch mist is gently swirling round the marigold. This gives a splash of colour to the front garden, and serves to distinguish it from the other front gardens in the road. Most of these, I might add, are sprouting builders' planks, old buckets, wheelbarrows, broken bricks, and rather battered paint-pots. But let us leave this riot of modern horticulture and step inside the lounge-hall of 'The Aspens.' Here we are immediately struck by the tasteful decorations and a smell of photograph albums. A natty what-not snuggles smugly against a very occasional chair with a plush seat and carved legs. A still more occasional table in fumed bamboo stands in majestic solitude in the centre of the room. The table, however, in spite of its isolated position, is not in the least lonely, for on its several decks are tastefully arranged three vases with everlasting flowers, a stuffed ferret in a glass case, a china mug bearing the slogan, 'A Present from Weston-super-Mare,' and nine photographs of the Ankering clan, both past and present, encased in frames cunningly wrought of dark blue plush, sea-shells, and glue.

"It is here, ladies and gentlemen, in this homely atmosphere of refined dignity, that our play opens, and the action of the play oscillates slightly between this room and the drawing-room. This latter room, need I add, contains further evidence of Miss Ankering's unerring sense of décor, and also a large tiger-skin rug. This was sent to Miss Ankering by her late step-uncle from the Punjab, and the story is told that he shot the beast at point blank range. The expression on the tiger's face, however, seems to bear out the theory that the animal died of fright. However, be that as it may, our play must start, and, having started, will relentlessly unfold before your tingling ears a tale of flaming passion and unrestricted emotion.

"So, ladies and gentlemen, grip the arms

of your chairs, tie knots in your handkerchiefs, and tighten your boot-laces whilst we present 'CYCLONA'!"

(Fade up music for a few seconds and then fade out completely. A loud knock is heard at the front door. A pause of a few seconds and the knock is repeated, but much more loudly.)

Flossie. "All right, all right—I'm coming. . . . Oh, a telegram! Now, look 'ere, my lad, next time you knock at this villa, knock more gentle or you'll 'ave another piece of stucco off the wall by the bathroom window. You'd better wait and I'll see if there's a h'answer. Miss h'Ankering, a telegram! Miss h'Ankering, a telegram!"

Amelia *(from a distance and gradually getting closer)*. "All right, Flossie, I'm coming! . . . I'm coming, Flossie, I'm coming! Ah! At last it has arrived. Yes, yes, it is from him! It is from Southampton. I'm so excited, I can hardly open it. . . . Oh, there! there. . . . I've opened it. . . . It's all right, Flossie, I can read it myself. . . . Will be parking with you at three, your lover, Pete." Think of it, Flossie, he'll be here at three."

Flossie. "Yes, ma'am, I'm thinking."

Amelia *(very excitedly)*. "What is the time now?"

Flossie. "Two fifty-five, ma'am!"

Amelia. "Then in five minutes he will be here to claim me."

Flossie. "Is there an answer, ma'am?"

Amelia. "Answer, girl! He is the answer to my dreams!"

Flossie. "Yes, ma'am, but I can't tell the boy that!"

Amelia. "What boy?"

Flossie *(fed up)*. "The telegraph boy, ma'am!"

Amelia. "Oh! No, no, Flossie, no answer!"

Flossie. "Right! Go on, son, 'op it! Nothing doin'!"

Amelia. "Mrs. Bullfinch! Mrs. Bullfinch!"

Flossie. "Do you want Mrs. Bullfinch, ma'am? . . . Right!" *(Shouting)* "Mrs. Bullfinch!"

Mrs. B. "Did someone call?"

Amelia. "Oh, there you are, Mrs. Bullfinch! Listen to this, 'Will be parking with you at three, your lover, Pete.' What do you think of that, Mrs. Bullfinch?"

Mrs. B. "Sounds neurotic to me, ma'am!"

Amelia. "Your lover, Pete! My lover, my Pete! . . . and all the way from Cyclona!"

Mrs. B. "From where, ma'am?"

Amelia. "From Cyclona!"

Mrs. B. "Wherever's that, ma'am?"

Amelia. "Why, it's a little state in Mexico, and Pete is a sheriff there. My Cyclona Pete!"

Mrs. B. "Sounds a bit dangerous to me, ma'am!"

Amelia *(laughing)*. "Yes, it's a man's country. . . . I can just picture him—tall, bronzed, muscular! A man's man, that's what he'll be! I can just picture him!"

Mrs. B. "Do you mean to say, ma'am, that you're going to marry him, and you've never even seen him?"

Amelia. "Ah, but I've written to him!"

Flossie. "Written to him, ma'am?"

Amelia. "Yes, it's a secret I've been keeping from everybody! I've been writing to him through the 'Lonely Hearts Correspondence Bureau.' For ten years I have been writing . . . for ten years our love has been growing! And now we are to meet . . . our lonely hearts are to be united!"

Mrs. B. "Sounds a bit risky to me, ma'am!"

Flossie. "Suppose he turns out to be one of them bandit blokes?"

Amelia. "No, his letters prove just what he is. They are the letters of a child. He is just a great big hungry baby. Hungering for a love to fill his empty life. He wants someone to comfort and cherish him! Someone to be a great, big, loving mammy to him."

(She starts crying.)

Flossie *(sobbing in sympathy)*. "Well, ma'am. . . . I think you've taken on a big job being a mammy to a six-foot bandit!"

Amelia *(sobbing)*. "I will cherish him—to the end!"

Mrs. B. *(also sobbing)*. "Well, ma'am, I 'opes as 'ow your married life will be 'appier than mine and that you'll be able to 'old 'im!"

Amelia. "I will hold him for ever!"

Mrs. B. *(brokenly)*. "Yes, ma'am, that's what I said, but my 'ubby 'opped it and left me!"

(They all sob heartily.)

Amelia. "Don't cry, Mrs. Bullfinch."

Mrs. B. "I'm not crying, it's the onions I was peeling this morning."

Flossie. "Where's your 'usband now, Mrs. Bullfinch?"

Mrs. B. "I don't know, but if ever I sets eyes on 'im, he's going to get what I've been saving up for 'im all these years,

and by the time I've finished with 'im 'is mind will be a blank!"

Amelia. "Oh, don't let us talk so harshly, Mrs. Bullfinch. Remember, to-day must be a happy day for everybody. We must have flowers, Flossie, lots of flowers!"

Flossie. "Oh, mum, you're not going to cut the marigold?"

Amelia. "No, you must rush off to the shops and buy some. There's the money."

Flossie. "Ninence, ma'am? What do you want—lilies?"

Amelia. "Yes, Flossie—tiger lilies!"

(A knock is heard at the front door.)

Amelia. "He's here! He's here! Do you hear, Flossie, he's here!"

Flossie. "Yes, ma'am, what shall I do?"

Amelia (very excitedly). "I don't know, I don't know! He mustn't see me yet. Show him into the drawing-room—and—and I will come into his life."

Flossie. "Very good, ma'am!"

Amelia. "Come, Mrs. Bullfinch, come and help me change my dress." (Getting softer as she departs.)

"I think I'll wear my sea-green organdie!"

(The knock is repeated.)

Flossie (simplering). "Good afternoon, sir."

Peter. "Er—good afternoon!"

Flossie. "Er—won't you come in?"

Peter. "Thanks!"

Flossie. "This way, sir, into the drawing-room."

Peter. "Thank you!"

Flossie. "There you are, sir. The mistress is expecting you."

Peter (slightly surprised). "She is?—er—that's fine!"

Flossie. "I've got to go now, sir, to get some tiger lilies."

Peter. "Oh, is that what you feed the rug on?"

Flossie. "I'll tell the mistress you're 'ere."

Peter. "Yes, right-ho! You seem to know who I am!"

Flossie. "Oh, yes, sir, you're Pete!"

Peter. "No, Peters—Peter Peters. I represent 'Cyclona' Vacuum Cleaners."

Flossie. "Vacuum cleaners?"

Oh—er!"

Peter. "Yes, 'Cyclona,' the king of cleaners."

Flossie. "Oh—er—yes. The mistress may see you—er—but I can't stop now because I've got to go and do some shopping or I'll be too late."

Peter. "Yes, well I'll wait and see your mistress and explain everything to her."

Flossie. "Yes, if you will, sir, only I must go now."

(The door shuts.)

Peter (sighs). "Oh, dear, dear, dear!"

(He whistles "Home, Sweet Home.")

Amelia. "Pete!"

Peter. "Er—er—good afternoon!"

Amelia. "At last you have come to me!"

Peter. "Er—yes, er—rather! You were expecting me?"

Amelia. "Expecting you? Longing for you to bring joy to my heart."

Peter. "It brings joy to the heart of every housewife."

Amelia. "What does?"

Peter. "Why, 'Cyclona'!"

Amelia. "Come, sit on the sofa and tell me all about it. There, that's better."

Peter (rather nervously). "Er—yes—rather!"

Amelia. "It is better here, isn't it?"

Peter. "Er—oh—definitely!"

Amelia. "Er—now—er—you make me

so bashful—haven't you forgotten something?"

Peter. "Oh, no, I have it in the bag."

Amelia. "No, you stupid boy, haven't you forgotten—er—er—a kiss?"

Peter (horrified). "Kiss?"

Amelia. "Er—well, isn't it usual in the circumstances?"

Peter. "Er, well, I've travelled a good bit, but I haven't done it before."

Amelia. "You have been faithful to me—and now you must be hungry for a kiss—a great big mammy kiss!"

Peter. "I—I—er—suppose you're going to order one?"

Amelia. "Sir, I command!"

Peter. "Well, here goes!"

(They kiss.)

Amelia. "More!"

Peter. "Perhaps you'd prefer it on the instalment plan?"

Amelia. "Come, you silly boy!"

(More kisses are heard.)

Peter. "I say—I say!"

Amelia. "There! We're getting to

that get under the tables and chairs—they're all dragged inside and whirled round and round—round and round!"

Amelia. "But Pete, er—er—you don't have anything to do with those little bits of fluff, do you?"

Peter. "Me? No, of course not!"

Amelia. "Ah, I ought to have known you wouldn't, have anything to do with another—little bit of fluff! Anyway, 'Cyclona' sounds very bright!"

Peter. "Bright? Oh yes, rather! It has chromium fittings."

Amelia. "Chromium fittings?"

Peter. "Yes, they resist the weather."

Amelia. "What a climate it must be. But, tell me, are there any whirlwinds?"

Peter. "Madam—'Cyclona' is a bottled whirlwind—it's a potted typhoon!"

Amelia. "But isn't that rather dangerous?"

Peter. "'Cyclona' stands for safety! Remember the slogan, 'Cyclona' gets the wind up—but never puts the wind up!"

Amelia. "What a quaint little saying."

Peter. "'Cyclona' is superb! It stands above everything!"

Amelia. "It's on a mountain then?"

Peter. "It is on the pinnacle of perfection!"

Amelia. "How nice! Now tell me, what are the housekeeping expenses?"

Peter. "Low, very low! You see, everything runs on ball-bearings."

Amelia. "Ball-bearings? How quaint! Now tell me, how many ball-bearings go to the shilling? You see, I always mix up the foreign currency."

Peter. "Currency? Oh—you mean current! It's consumption is the lowest of all, it has the market to itself."

Amelia. "How nice! A market place all of its own! Pete—you're sure that I'll never tire of 'Cyclona'?"

Peter. "You will never tire of it."

Amelia. "My love for it will never die?"

Peter. "Put it that way if you like!"

Amelia. "Then I'll live like the fairy princess—happily ever after!"

Peter. "When you've finished paying the instalments!"

(A door bangs.)

Amelia. "Pete!—my 'Cyclona' Pete!"

Peter. "Oh, my hat—she's off again—help—help!"

Pete Peppercorn. "Say, I'm sorry to butt in on the heavy sugar stuff—!"

Amelia (indignantly). "How dare you come in here? Who are you? What do you want?"

Pete P. "I guess I'm just Pete—'Cyclona' Pete!"

Amelia. "Why you must be mad!"

Pete P. "Oh yeah! Well, where can I find Miss Ankering—Miss Amelia Ankering?"

Amelia. "I am Miss Ankering."

Pete P. "So you're the great big loving mammy, are yer? Guess I'm sorter unexpected. The door was open so I just kinder strolled in, yer see."

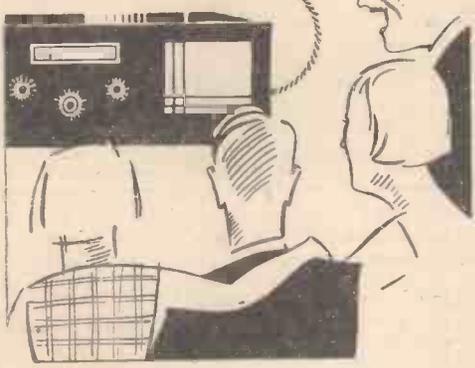
Amelia. "Who are you? Who are you?"

Pete P. "I tell yer—I'm Pete—Cyclona Pete!"

Amelia. "You must be drunk! This gentleman here is Cyclona Pete."

Pete P. "So you're Cyclona Pete, are yer? Please to have yer know me! I

(Continued on page 396)



know one another very quickly, aren't we?"

Peter. "Yes, aren't you!"

Amelia. "Now, tell me all about 'Cyclona'!"

Peter. "Er, yes—you seem to be interested!"

Amelia. "Interested? Why, I can think of nothing else, dream of nothing else but 'Cyclona.' Now—er—is it very large?"

Peter. "Oh, no! Compact, very compact."

Amelia. "And it is very dusty?"

Peter. "Oh dear no! Er—not on the outside, that is! You see all the little bits of fluff are dragged inside."

Amelia (horrified). "Pete!"

Peter. "Yes, all the bits of fluff



The New Constructor's GUIDE to SET BUILDING

The First of a New Series Planned to Assist the New Constructor in Making Better and More Efficient Receivers.

DESPITE the fact that there are many articles intended for beginners regularly appearing in this journal, it is evident from the large amount of correspondence received that there are many new readers who wish to be given an elementary progressive and exhaustive course of instruction in receiver construction. There is, naturally, a body of readers who have as yet had little experience in constructional work, and who require more detailed information than it is often possible to give in articles dealing with our new designs. It is in order to cater as fully as possible for people in this category that this series of articles is being prepared; it is hoped, however, that a good deal of the information supplied in covering the subject fully will also be of assistance to those who are not beginners but who, perhaps, have not been able to obtain as much practical experience as they would wish.

Progressive Construction

This series will cover all the practical points connected with the building of modern sets, after which progressive designs will be given in order to help those who wish to have a complete "course" in home construction. With this object in view, a complete superheterodyne receiver has been planned. Details for building this will not be given right away, however, but, instead, the first set-construction article will deal with the building of a type of "crystal" set embodying a "Westector." After that the original parts, with a few additions, will be employed in making a single-valve receiver with metal-oxide detector, the whole comprising an H.F.-det. receiver. Later, a low-frequency amplifier will be added, and then the frequency changer will form another addition. A complete receiver will be available at each stage, and none of the components will have to be discarded. Additionally, wherever possible, alternative components will be indicated and connections for them given; this will enable many of those who have spare parts available to make use of them, so saving a good deal of expense. It is also worthy of mention that the complete set of parts for the final receiver need cost no more than about four pounds.

Following the Blueprint

The first step, however, is to deal with the more important points of set construction in general, for the benefit of those who propose to make use of one of the many complete designs which have been published in these pages during the past several years. In working to a published

design, choose one for which a full-size blueprint is available, and take the greatest care to follow that design implicitly. This may appear to be a superfluous suggestion, but experience of the minor troubles met with by readers gives ample proof that it is not.

socket strips must first be made. The best type of tool for this is a centre bit (see Fig. 1) when a wooden chassis is used, while the same tool can be used for the larger holes even when the chassis is of aluminium. The method is first of all to run $\frac{1}{8}$ -in. holes through the centres of the

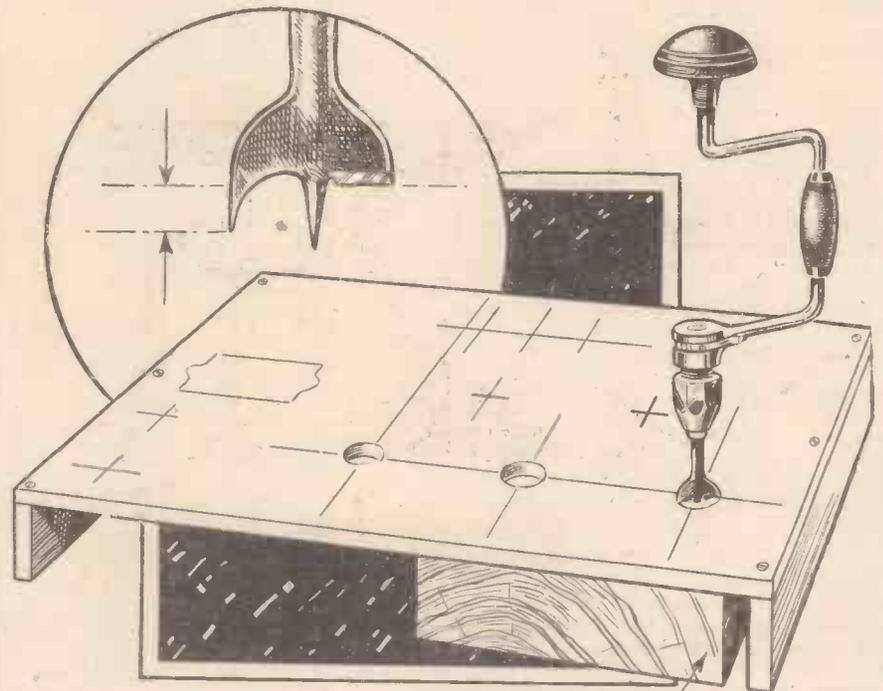


Fig. 1.—Showing the method of boring valve-holder holes with a centre bit. The bit must be sharp, and the tracing edge should project beyond the line of the cutter, as shown in inset.

No matter whether the receiver is built on a chassis or on a flat baseboard, the first step should be to space out the components as indicated on the blueprint. One very simple method of doing this is to place a sheet of carbon copying paper over the chassis or baseboard and then to lay the print over this, fastening it in place round the edges with drawing-pins. It is then a simple matter to trace round the components so as to leave an outline shape of them on the wooden surface. An alternative method is to prick through the print with the point of a bradawl or compass at the points where the holding-down screws for the various components will have to be inserted.

Valve-holder Holes

When this has been done the parts can be mounted at once in the case of a baseboard set, but where a chassis is employed the holes for the valve-holders and terminal

larger holes and then to place the baseboard on a block of waste hardwood and to bore

(Continued overleaf)

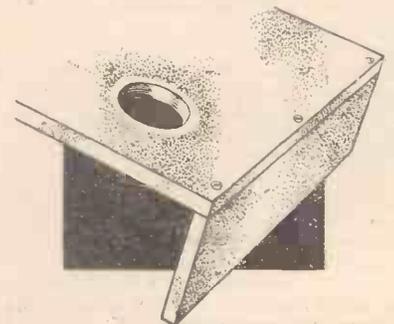


Fig. 2.—It is wise, after making the valve-holder holes in a metallised chassis, to file or scrape away the metallising round them so as to prevent possible short-circuiting of the sockets.

(Continued from previous page)

the holes about half-way through the wood. Next the wood should be turned over and a circle traced out with the tracer of the bit, which should, in a correctly sharpened tool project about $\frac{1}{16}$ in. beyond the cutter (see inset to Fig. 1). The hole can then be completed from the first side, and the circular cut will prevent splintering and ensure a clean hole. A similar procedure should be followed when working in aluminium except that the hole will be completed from the second side and the cutting edge will not touch the surface of the metal at all; this means that the bit must be quite sharp.

The size of the valve-holder holes depends partly upon the make of holders employed, but is nearly always $\frac{1}{16}$ in. for four- and five-pin holders, and $\frac{1}{8}$ in. for seven-pin holders; in any case the holes should be of such a size that they clear the sockets and at the same time allow the flange to overlap sufficiently to ensure that the holding-down screw hole does not break into the main hole and so fail to grip properly. It is also an excellent plan, when using a metallised chassis, to file away a little of the

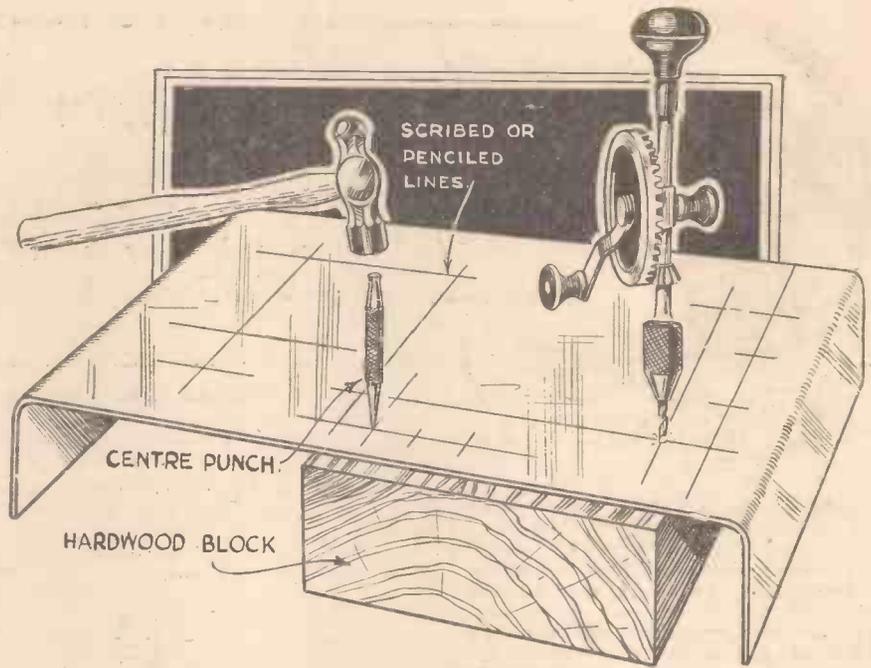


Fig. 3.—This illustration shows the steps in drilling a metal chassis. The positions are first marked with a scriber or pencil; next the centres are punched; finally, the holes are made with a twist drill.

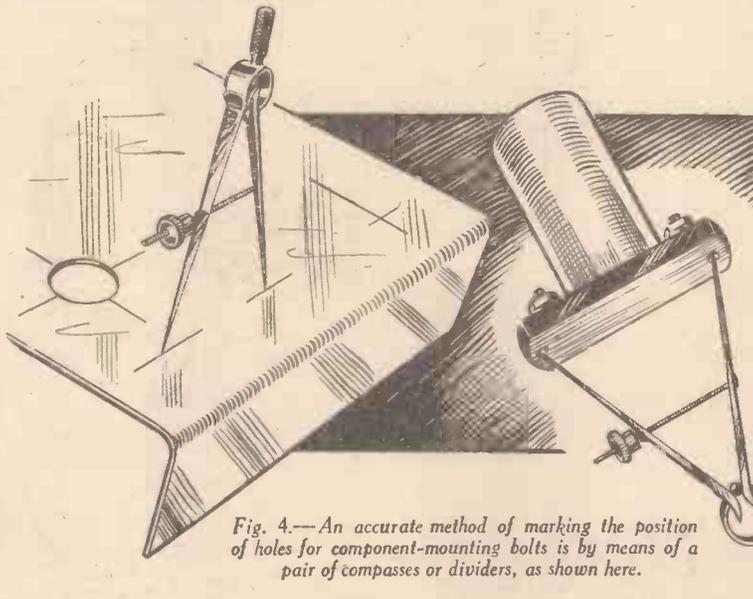


Fig. 4.—An accurate method of marking the position of holes for component-mounting bolts is by means of a pair of compasses or dividers, as shown here.

metallising round the hole, since this prevents the possibility of causing a short circuit due to the sockets touching loose metallised fibres. The idea is shown in Fig. 2.

Holes for such items as terminal-socket strips are generally $\frac{3}{16}$ in. in diameter, there being as many holes as there are sockets. These can be made with a centre bit in the case of a wooden chassis and, where possible, it will be found worth while to remove the side member so as to simplify the drilling from both sides. In the case of a metal chassis the centres of the holes should first be marked—a pencil is suitable, although a professional worker would use a sharp-pointed scriber—after which they should lightly be centre punched and an $\frac{1}{16}$ in. guide hole run through with a twist bit. The holes can then be drilled to correct size by using a twist bit (see Fig. 3).

Sequence of Operation

With a wooden chassis all the smaller holes can be made as the components are being assembled, or even after assembly and prior to wiring, but with a metal chassis they should all be made before assembly is commenced. In this respect, it is worth remembering that the components themselves form excellent guides or

templates, and that it is not wise to trust the blueprint implicitly because this may have shrunk or stretched to a very slight extent. Thus, after the outlines have

been traced on to the chassis each of the components in turn can be held in place, and the position of one of the holes marked by pressing the point of a scriber through the corresponding hole in the component. A centre-punch mark should next be made in the proper position, and the hole drilled. If the component is then temporarily mounted by means of one screw, there can be no doubt concerning the exact location of the other holes.

An alternative to this method is to draw a line through the positions of the holes—there are generally only two—and next to use a pair of dividers or compasses to find the exact distance which the holes are apart, as shown in Fig. 4. If the dividers are then applied to the chassis, accurate positioning will be ensured, and the holes can be punched and drilled. Yet another method, although one which is rather more tedious, is to cut a paper template to the approximate shape of the base of the component, and to locate the positions of

(Continued on page 411)

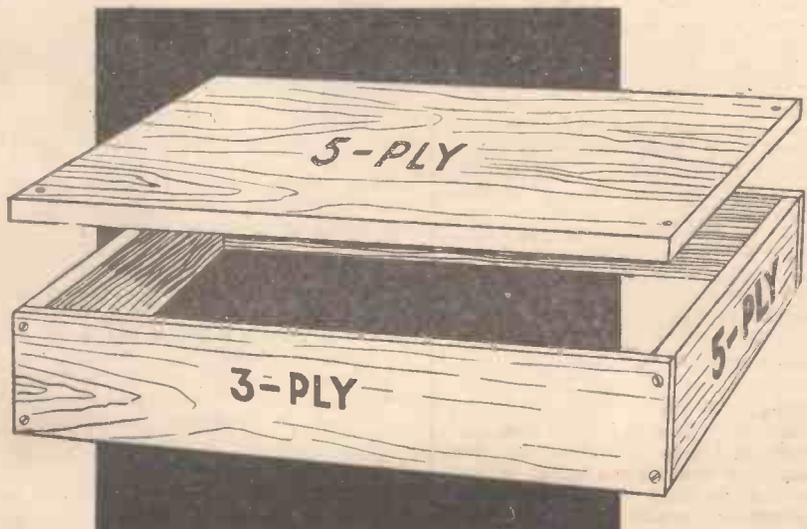


Fig. 5.—This shows a method of making a rigid and useful type of wooden chassis.

HOW TO USE EXTENSION SPEAKERS

An Extension Speaker May be Used with Practically Any Receiver, and the Precautions to be Observed, and the Method of Obtaining Maximum Results are Here Described



Fig. 1.—An excellent commercial speaker designed for use with any receiver to obtain correct matching.

THE average listener has a receiver installed in one room as a permanent fixture, generally on account of the aerial, which is erected in a garden and thus renders it simplest to bring in the aerial lead at the rear of the house. It is unwise to attempt to transport the receiver to the other side of the house by adopting a long lead-in wire, but it is a very simple matter to carry extension wires for the loud-speaker to any part of the house. In its simplest form this remote listening point will take the form of the present loud-speaker, which is removed from the ordinary listening room, and thus it will only be possible still to listen in one room. In the most ambitious scheme a separate listening point will be installed in every room in the house, each point containing a volume control and a switch by means of which the distant receiver may be switched off.

First of all it must be appreciated that the ordinary loud-speaker connection is as shown in Fig. 2, where it is seen that the anode current of the valve flows through the loud-speaker (or the primary of the loud-speaker transformer which, of course, amounts to the same thing).

Voltage Losses

It is now common knowledge that the flow of current through a resistance produces a voltage drop, and, therefore, there must be a voltage drop across the loud-speaker terminals. Obviously, therefore, the greater this resistance is made the greater will be the voltage drop and thus, should long extension leads be joined to the two terminals marked L.S. in Fig. 2, there will be a correspondingly greater drop in voltage and distortion will be introduced due to the lowered H.T. on the valve, and the uncompensated grid-bias voltage. It is therefore desirable that the extension leads shall be joined in such a manner that no direct current flows through them, and thus the standard filter circuit must be employed. This is shown in Fig. 2, and it is obvious that from the point A to B, the lead may be practically any length and no ill-effects will result. The D.C. passing through the iron-core choke will produce a constant voltage drop so far as the normal anode-current flow is concerned, and furthermore, any number of leads may be joined to the point A without affecting the results from the direct current point of view. In order to maintain quality, however, the

question of the correct matching of the valve must be taken into consideration.

Impedance Matching

If your receiver has no output filter

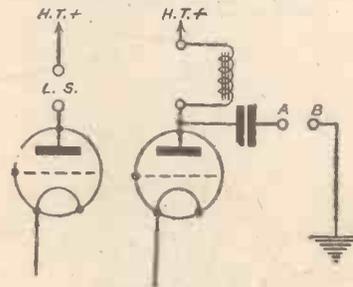


Fig. 2.—The ordinary types of loudspeaker connection.



This is the Blue Spot extension speaker.

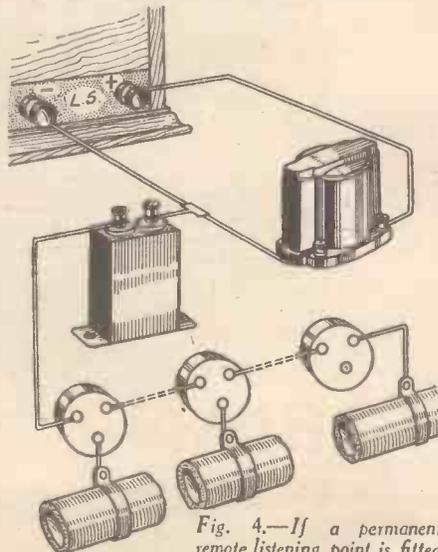


Fig. 4.—If a permanent remote listening point is fitted it should be of the commercial plug-and-socket type.



Fig. 5.—Another excellent speaker which employs an impedance-matching device, the R. & A.

arrangement, you will have to obtain a choke and a fixed condenser. Any good L.F. choke will suffice for the first mentioned component, and the second item may have any capacity from 1 mfd. upwards. In general 2 mfd. is found quite suitable, and only one is needed, no matter how many distant listening points are to be installed. If you do not wish to fit this additional filter arrangement, you can employ the existing loud-speaker transformer primary as the choke, but in such a case it will be necessary (or at least desirable), to fit a silencing switch on the secondary side of the loud-speaker so that it may be taken out of circuit whilst listening takes place at the distant point.

The question of matching which was previously mentioned is most easily accomplished by obtaining for the extension speaker one of the modern models to which a tapped transformer is fitted. These are generally referred to by the makers as extension models or have some proprietary name, which indicates that they are designed especially for the purpose. It is thus possible to connect the speaker and then to adjust the tapping so as to obtain the maximum undistorted output, and it is sufficient to carry out this operation by ear, without the necessity for going into accurate details concerning impedance, etc. Certain commercial models of extension speaker are also provided with special terminals to which a volume control may be fitted, but if this provision is not made, a control may be joined direct across the primary or secondary, and it may be desirable to obtain the maker's advice regarding the most suitable value for the particular speaker in use.

Plug-in Systems

If a permanent remote listening point is to be fitted one of the commercial plug-and-socket devices will be found most convenient, and as shown in Fig. 4, sockets are mounted on the walls and the loud-speakers are provided with a small plug. The insertion of the plug brings the speaker into circuit, and in a development of this scheme the first loud-speaker to be plugged in will switch the receiver on, and the last speaker plug to be removed will switch the receiver out of action. Various manufacturers advertise speakers and remote controls points in these pages from time to time, but we shall be pleased to advise concerning special arrangements upon receipt of details.

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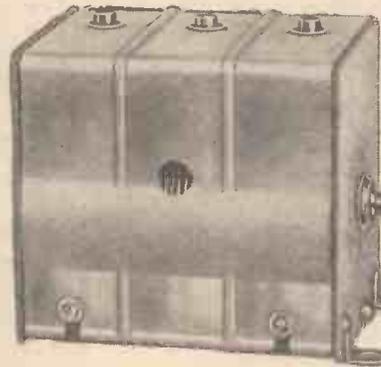
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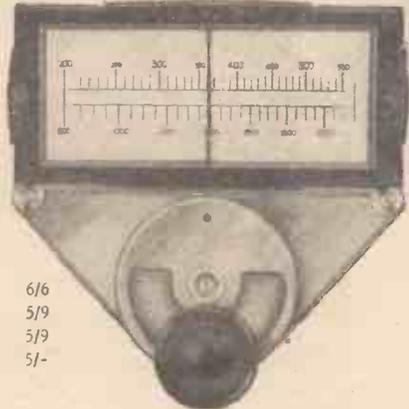
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PICK-UPS & AMPLIFIERS

It is Possible to Use a Pick-up with any Valve Receiver, and the Hints Given in this Article will Enable the Best Results to be Obtained from Records.

THE gramophone pick-up is joined between the grid and the earth of any standard valve circuit, and thus it is obvious that the sensitivity of the circuit must be considered in conjunction with the sensitivity of the pick-up. For instance, if a pick-up with a very small output is employed with a one-valve set, the resultant music will be hardly worth hearing, whilst on the other hand, if a very sensitive pick-up is employed in the grid circuit of a mains receiver employing two or three L.F. stages with very high gain, a great deal of volume will have to be wasted in volume control arrangements in order to avoid overloading the output stage. Thus, if you are going to purchase a pick-up you must consider the output which is given and choose an instrument which will suit your receiver. The majority of manufacturers state the output of their components, and if this is not already given they will supply the information upon request.

Switch or Plug

The pick-up may be brought into circuit by means of a switch (in which case it is always joined to a pair of terminals) or may be included when desired by means of a plug and jack. With a simple receiver the

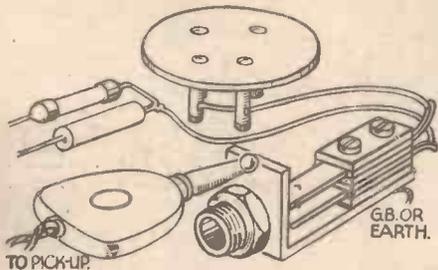


Fig. 2.—An alternative method of connecting the pick-up in circuit is to use a plug and jack.

pick-up may be left permanently connected across the grid circuit, but there will be the risk of radio breakthrough when using the pick-up, and in some cases poor results will be obtained on radio, due to the resistance of the pick-up and the length of the leads. Therefore either of the schemes shown in Figs. 1 or 2 should be adopted.

Volume Control

The pick-up may be supplied with a volume control already joined in circuit (usually this is mounted on the carrier-arm support), but if no such device is fitted, and it is found desirable that a control should be included to avoid overloading of the first valve, an ordinary potentiometer may be employed and the connections are as shown in Fig. 3. The value of the control may again be decided by consulting the makers of the pick-up. If it is found desirable to employ two separate turntables, together with two separate pick-ups, one volume control may be employed for both instruments, but in this case an extra terminal will be required. The compo-

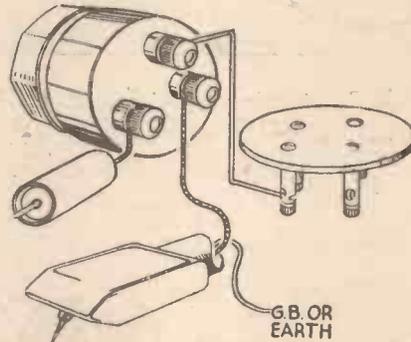


Fig. 1.—The pick-up may be joined in circuit by means of a switch as shown here.

nent is then known as a "fader" and the arrangement of the circuit is shown in Fig. 4. If the listener possesses sufficient skill, an ordinary control may be modified by fitting a separate contact in the centre of the control, but this will only be practicable when the control is of the ordinary type. To-day, most controls are graduated, and thus a good fader will be graduated on each half to produce the correct degree of control. If it is desired to employ both pick-ups at one time—for instance, for the purpose of mixing music with some sound effects, two separate controls must be used, and they will have to be connected in parallel.

Tone Control

The majority of modern pick-ups have the response curve so adjusted that the bass and treble are reproduced in the correct proportions, so that if the amplifier which is employed is correctly designed there will be no necessity for tone compensation. If desired, however, a special tone-compensating circuit may be used with the pick-up to increase the bass response, and the makers' instructions should be followed regarding the use of scratch filters or compensating devices.

The Amplifier

Normally, two good L.F. stages should produce ample volume for the ordinary

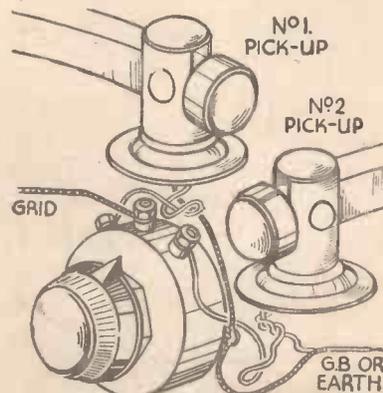


Fig. 4.—This arrangement is preferable when two pick-ups are to be used.

home. Coupling between the two valves should be carried out by means of a good transformer having a ratio of 5 to 1. If resistance-capacity coupling is to be used, then three L.F. stages should be employed, and the second stage should be provided with a variable grid-leak in the form of a volume control to avoid overloading on loud records. If the amplifier is operated from the mains two stages will be ample, and the second may be of the pentode type to produce sufficient volume for dancing. Care should be taken to make the amplifier characteristics as straight as possible, but there should be a cut off fairly low in the upper register in order to reduce needle scratch or surface noise. Where a pentode output valve is employed the ordinary tone control across the speaker should not be omitted, and no further filtering arrangements should be required. A scratch filter across the pick-up may be used if desired, but some manufacturers do not recommend the use of this device with their components, so that it is necessary again to be guided by the manufacturer according to the particular component which is selected.

Permanent Needles

Many listeners prefer to employ the permanent type of gramophone needle, but if this is adopted it is essential that the needle be left permanently in the pick-up

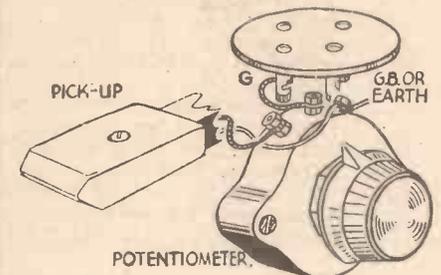


Fig. 3.—Simple volume control is carried out by means of a potentiometer.

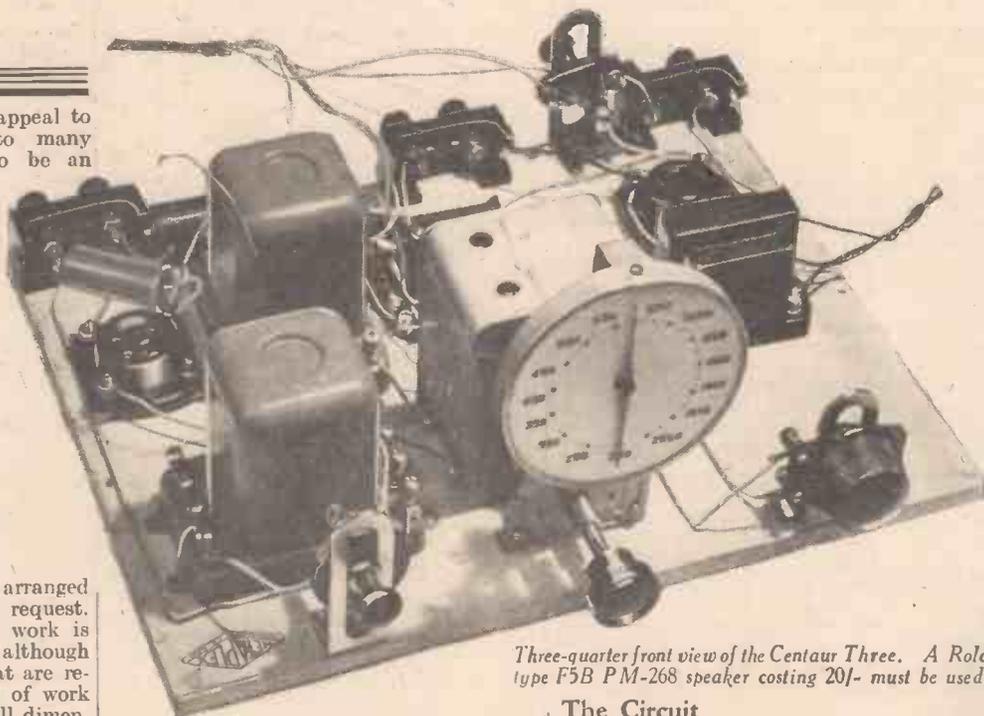
until the point is worn out or the recommended number of discs have been played. (In this connection, too, it must be remembered that generally the term "record" refers to only a single side.) This is important with any type of "permanent" needle, as there is a certain amount of wear, and, owing to the harder surface of the needle, if this is removed and then replaced in such a position that a flattened surface is presented to the side of the groove, serious damage will be caused—greater, in fact, than with an ordinary type of needle which is used on more than one occasion. If the type of permanent needle which employs a thin tungsten wire is employed, this also becomes slightly bent in the direction of movement, and thus, should this be replaced with the point in the opposite direction, it will not only dig into the soft surface of the disc but will probably then snap off, run across the surface and completely ruin the record.



The Centaur Three

Full Constructional Details of a Simple and Cheap-to-build Three-valve Receiver which will Specially Appeal to the Beginner or the Advanced Constructor. It May be Built in an Evening!

A STAND-BY receiver will appeal to every constructor, and to many beginners there will also be an appeal in a simple three-valve set which may be constructed in the shortest space of time and which may be relied upon to provide good reception of a number of stations without tricky adjustments or complicated trimming settings. The "Centaur" Three has been designed to fulfil these needs and, as will be seen from the illustrations, we have departed from our usual chassis form of construction. Many constructors have written to us asking for a design which could be built upon a normal flat baseboard, and we decided that the next simple receiver which we designed should be arranged on these lines to meet this request. Consequently, the constructional work is slightly simplified in this receiver, although in view of the very few wires that are required, there is not a great deal of work required in any case. The overall dimensions are naturally increased somewhat, but the layout is perfectly straightforward, and bearing in mind the fact that many beginners will be anxious to make up this receiver the parts have been so arranged

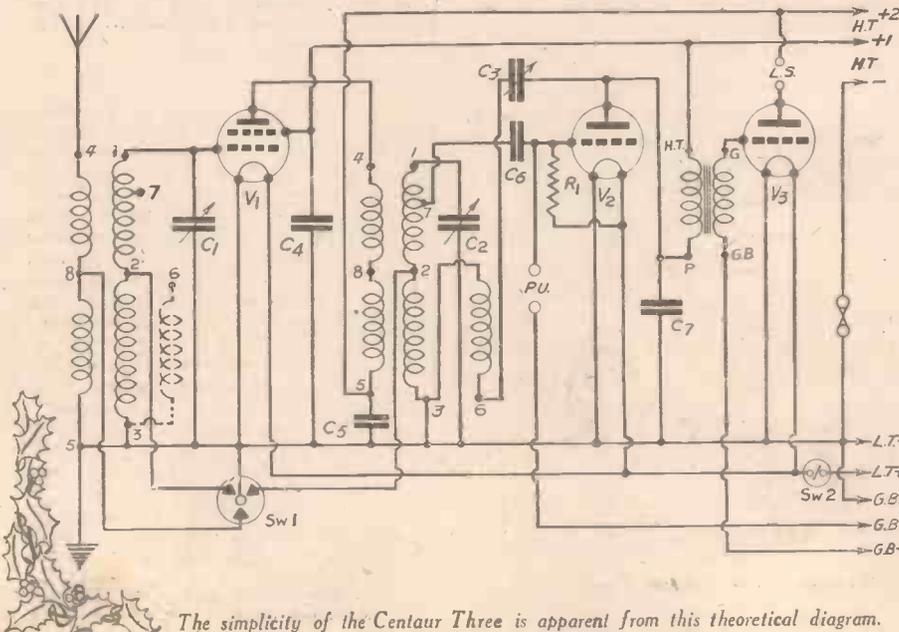


Three-quarter front view of the Centaur Three. A Rola type F5B PM-268 speaker costing 20/- must be used.

that every terminal is in an easy-to-get-at position, and every part is ready to hand for testing on future occasions should a fault develop.

The Circuit

As may be seen from the circuit the familiar S.G., detector, and output stage are employed, and tuning is accomplished by means of a two-gang condenser connected to two H.F. transformers. The



The simplicity of the Centaur Three is apparent from this theoretical diagram.

LIST OF COMPONENTS

- Two "Unigen" coils (Wearite).
- One Baby .0005 mfd. two-gang condenser (C1 and C2) (J.B.).
- One Airplane Dial (J.B.).
- One Dilecon .0002 mfd. reaction condenser (C3) (J.B.).
- One 5-1 L.F. transformer (L.T. 150) (B.T.S.).
- One .5 mfd. tubular condenser (C5); one .1 mfd. tubular condenser (C4); one .0001 mfd. tubular condenser (C6); one .0002 mfd. tubular condenser (C7) (Amplion).
- One 2-megohm grid-leak (R1) (Amplion).
- One five-way (30in.) battery cord; three terminal mounts; six Type "R" terminals (A, E, L.S., L.S., and two P.U.); three wander plugs (Bowspring) G.B.+ , 1 and 2 (Belling and Lee).
- One three-point wavechange switch (SW1) (B.T.S.).
- One on-off switch (SW2) (B.T.S.).
- Three component-mounting brackets (Peto-Scott).
- One Microfuse (100 mA) (Microfuse).
- Three Vibrolders (Benjamin Electric).
- One Metaplex baseboard, 12in. by 9in. (Peto-Scott).
- ACCESSORIES
- One S.G.215 valve (V1); one D.210 valve (V2); one P.220 valve (V3) (Hivac).
- One Rola type F5B. PM-268 Loud-speaker.
- One H.T. battery (120-volt) (Siemens).
- One L.T. accumulator (2-volt) (Exide).
- One 9-volt G.B. battery (Siemens).

latter are of an entirely new type, produced by Messrs. Wright and Weaire, and these are similar to the Universal coils previously on the market with the refinement of a tapping on the primary. In the circuit it will be seen that a switch is arranged in the aerial coil in order to short-circuit part of the primary, although in the H.F. transformer the switching has not been adopted. This simplifies the connection by enabling a simple three-point switch to be employed, and the results on both long and medium waves are almost as efficient as if the coil were switched.

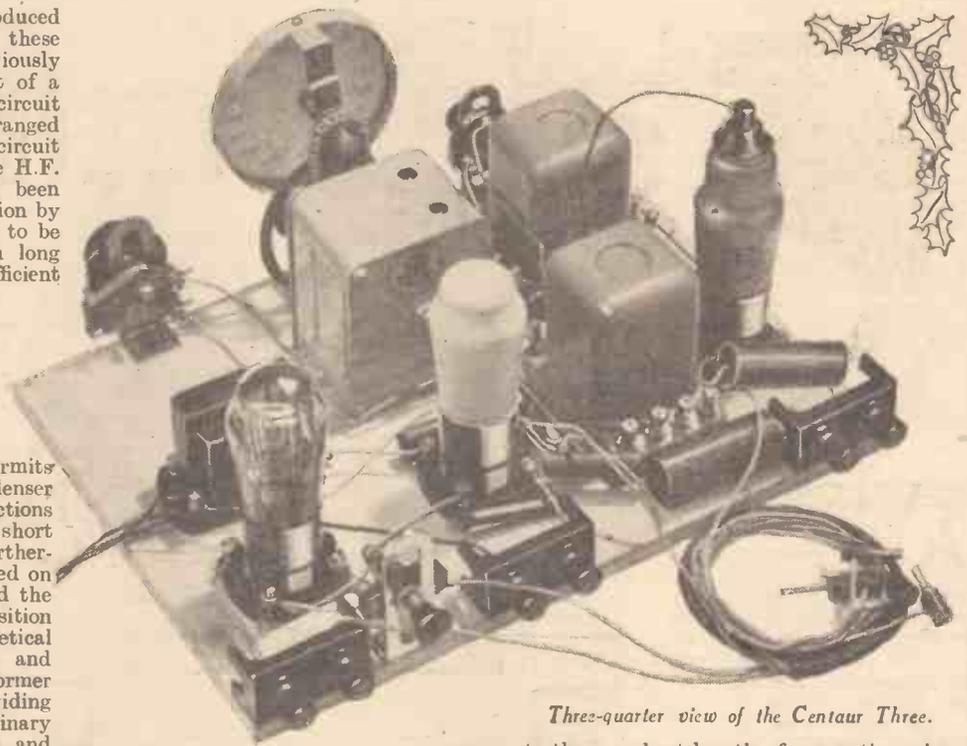
The Layout

To render the circuit perfectly stable the coils, which are of the screened type, are not arranged symmetrically. The method in which they have been arranged permits of a very short lead to the tuning condenser in each case, and the remaining connections to the terminals also become quite short and interaction is prevented. Furthermore, the screen-grid valve is arranged on one side of the H.F. transformer and the remaining valves are placed in the position which they occupy in the theoretical circuit. Coupling between detector and output valve is by means of a transformer which has a ratio of 5 to 1, thus providing a good stop up in strength. Ordinary leaky-grid rectification is employed and reaction is applied to the H.F. transformer. Pick-up connections are provided and the leads to the pick-up are left permanently in circuit, although, if desired, a switch may be incorporated at a later date in order to prevent radio break-through when records are being played. It will be noticed that the on-off switch has been mounted on the rear of the chassis, but this is no detriment as the majority of mains receivers have the on-off switch mounted in some position other than on the panel and the switch is only operated before and after listening. The remaining controls thus form a symmetrical layout, and there is no loss of balance due to the inclusion of an odd number of controls.

Constructing the Receiver

The baseboard which is specified is coated with the metallic coating which is adopted on the chassis which we normally employ, and this facilitates certain earth return connections. Before commencing construction, the various components should be placed in the position they are eventually to occupy, taking as your guide the illustrations and the wiring diagram. Having ascertained that every part is in its correct position the various screw fixing holes should be marked

through with a pointed instrument and the holes for the ganged condenser carefully set out by the aid of the makers' template. These holes should be drilled through the chassis with an $\frac{1}{16}$ in. drill, and the under surface should be recessed with a $\frac{1}{16}$ in. drill to approximately half the thickness of the baseboard to enable the screws to be countersunk. Now before mounting the condenser unit carefully tin the two connecting tags on the side and attach



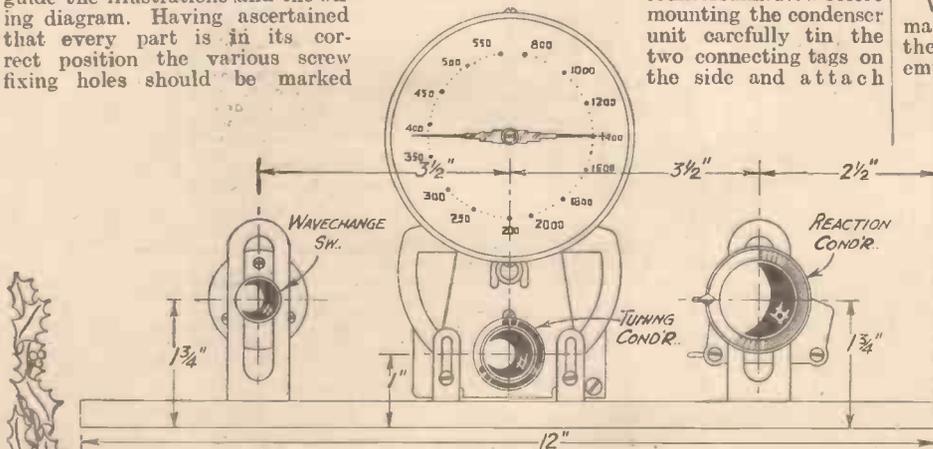
Three-quarter view of the Centaur Three.

**OUR SPECIAL
EASY-TO-BUILD
XMAS
RECEIVER—
CHEAP AND
EFFICIENT**

to these a short length of connecting wire. Mount the condenser and then screw down the valve-holders, transformer and terminal blocks. The left-hand component-mounting bracket is next attached, and when the position for the right-hand one is accurately located the metallised coating of the baseboard should be scraped away. An ordinary penknife will suffice for this operation and the area which is cleaned should be slightly greater than the foot of the bracket. Now mount this bracket and next mount the two coils. It will be seen in the wiring diagram that there are some wires attached to the terminals on the coils which are marked "M.B." These are short bare wires, attached to the terminals and turned underneath the coil base before tightening up the holding-down screws, and the wires are thus in contact with the metallic surface of the baseboard, which is earthed, and as the left-hand component bracket is also in contact with the surface the coil switch becomes automatically converted into a four-pole shorting switch and is placed across the coils in the correct manner.

Testing

When all parts are in position the wiring may be commenced, and for this purpose the ordinary type of covered wire should be employed, the covering at the ends being bared for a distance of about $\frac{1}{16}$ in. in order to permit the bare wire to make good contact beneath the terminal head. Remember to make the loop in a clockwise direction so that when the terminal head is tightened up the loop will be kept beneath it and not forced out. The tubular condensers are attached direct from terminal to terminal without the necessity for soldering, and the lengths of wire attached to these components may be cut to preserve a neat appearance. Each wire should be placed, as nearly as can be ascertained, in the position shown in the illustrations and wiring diagram. This applies especially to the lead from the reaction condenser to the coil



Cabinet drilling dimensions of the Centaur Three.

(Continued overleaf)

(Continued from previous page)

No. 2, and it should be noticed that this lead is joined to the terminal on the reaction condenser which is connected to the moving vanes. This precaution will avoid hand-capacity effects. Certain leads (those for the grid bias supply) are made from flex and wander plugs are attached to these. The length of these leads should be chosen so that the battery may be placed on the baseboard on the right. The remaining battery supply leads are contained in the battery cord which is specified, and the correct lead is easily identified by following the colouring of the lead and examining at the same time the plugs which are fitted at the other end. The cord may be attached to the chassis by means of a small wooden or ebonite cleat to avoid the lead being pulled off and a short-circuit resulting.

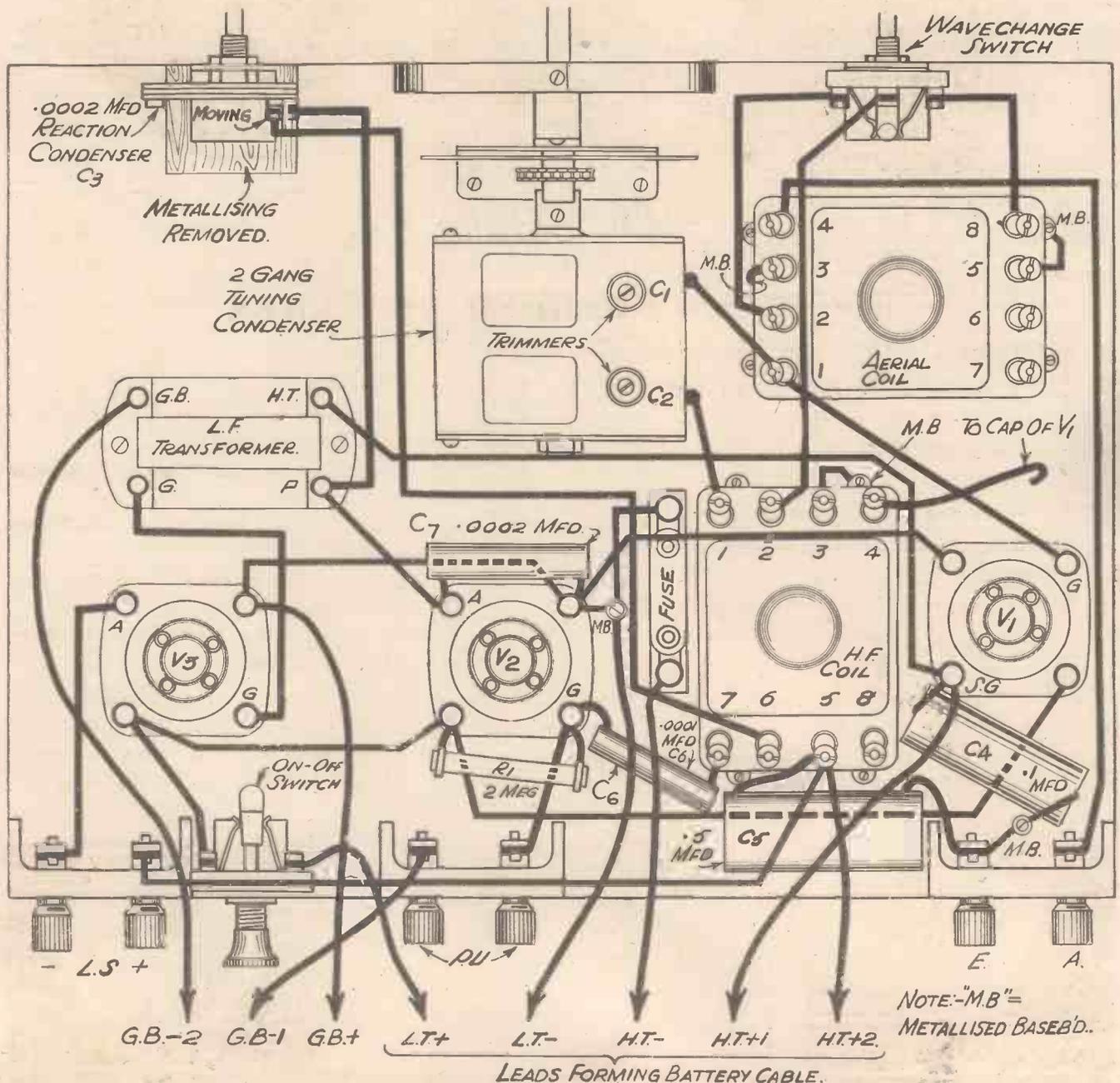
The three valves should be inserted in the order shown, the screen-grid on the left and the pentode on the right. The detector valve occupies the central position. The battery leads should be inserted into the H.T. battery, the positive 2 plug in the 120-volt socket, the positive 1 plug in the 60-volt socket, and the negative plug in the negative socket. The grid-bias plugs are inserted as follows: G.B.+ in the positive socket, G.B.1 in the 1.5-volt socket, and G.B.2 in the 9-volt socket. Pull out the left-hand switch (thus bringing the circuit into use on the medium-wave band), and set the reaction condenser to zero.

Operating Instructions

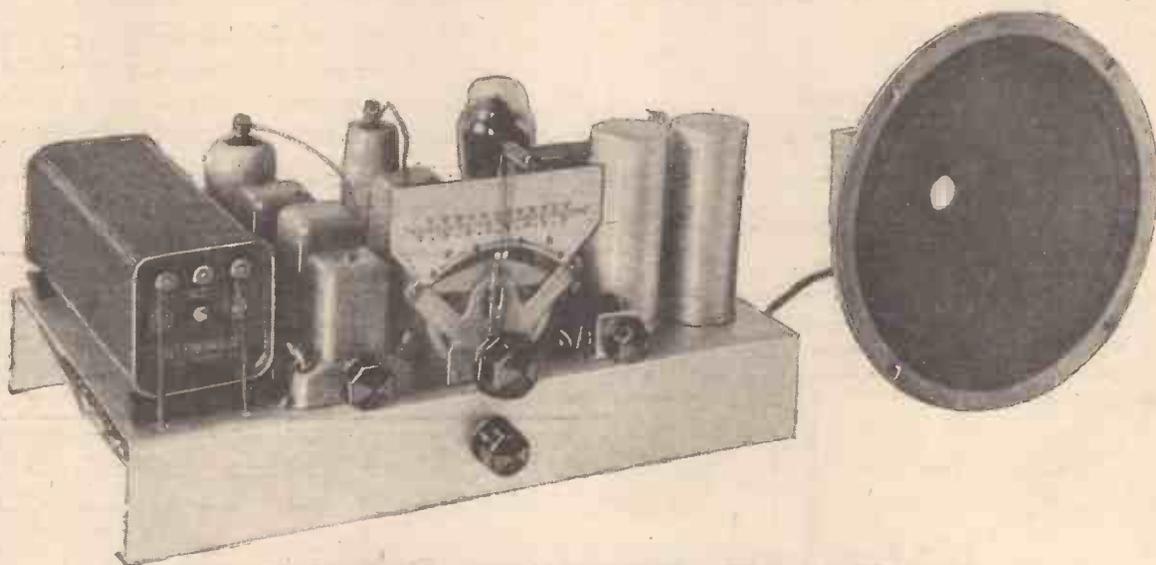
Pull out the switch at the rear of the chassis and the receiver is in working condition. Rotation of the tuning dial should

bring in the local station without any need of trimming, although to obtain maximum sensitivity it is essential that each of the circuits is correctly adjusted. With a screw-driver or similar implement carefully turn the trimming screw on the section farthest from the controls, carrying out this adjustment on a station at the lower end of the scale and then turning to the upper part of the medium-wave band. A slight readjustment may be required in order to enable maximum performance to be obtained throughout the waveband, and when switched to long waves (by pushing in the wave-change switch), results should be perfectly satisfactory at all settings. The use of a condenser in the aerial lead may facilitate accurate adjustment at all settings, but in the experimental model this was not found necessary.

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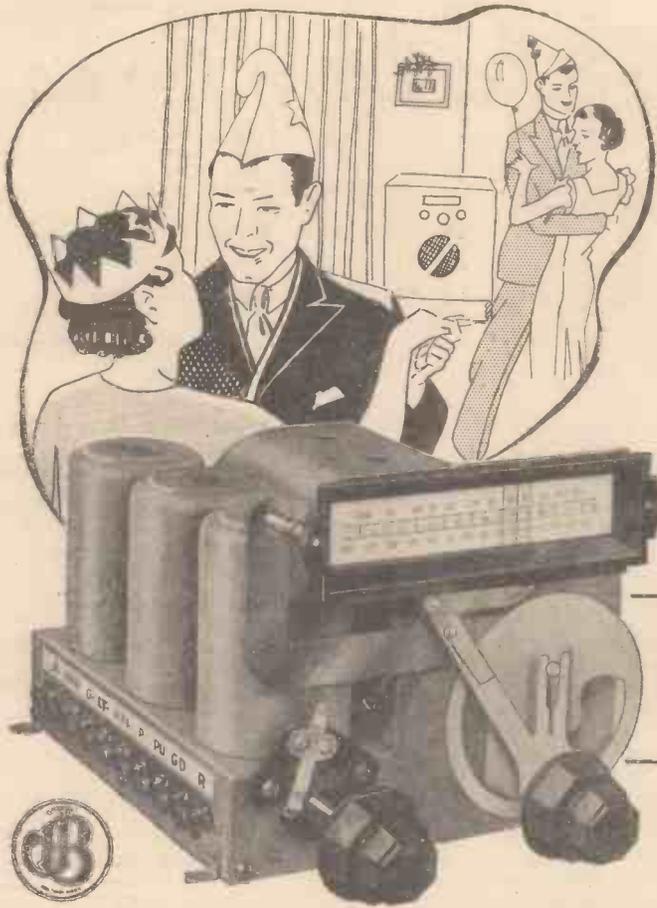
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Max. diode current	0.8 mA	0.8 mA
Max. triode anode voltage	250 volts	200 volts
Triode slope	3.8 mA/V	3.8 mA/V
Type of base	7-pin	7-pin or side contact
HIGH-SENSITIVITY PENTODE	P. 465	P. 2060
Heater voltage	4 volts	20 volts
Heater current	1.5 amp.	0.2 amp.
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A Dual-Purpose AMPLIFIER



An Article Describing the Construction and Operation of an Amplifier which can be Used for Various Purposes

ON such occasions as Christmas and parties there is often felt the need for a small amplifier, an amplifier apart from the normal receiver, which may be in a different and therefore inconvenient room. If this receiver is used it necessitates long wires which, being (in the case of a pick-up or microphone) in the grid circuit can be extremely troublesome, and it is also usual for the speaker to be extended either to the same or an adjacent room.

The receiver may, of course, be transported bodily to the scene of action, but if it is large it can prove both difficult and inconvenient, owing to the fact that in the majority of cases it becomes necessary

microphone, or both together, an undoubted asset when plays are being "broadcast."

The accompanying illustrations (Figs. 1 to 4) give details of the unit which was built to conform to these requirements, and it will be obvious that point number one has been satisfied. The circuit, Fig. 3, shows that it is a two-stage resistance-coupled amplifier, resistance coupling being used because of its low cost. Transformer coupling would certainly give greater volume, but is more expensive, and resistance coupling is a fair compromise between amplification and cost. Actually, the amplification is sufficient for normal requirements, and no trouble should be experienced either in building or in operation.

and therefore the grid is almost directly connected to the bias lead, with resultant loss of pick-up volume, irrespective of the setting of the volume control associated with that component. Under these circumstances there is no alternative but to leave it in the full volume position and fit both the specified controls.

The last paragraphs bring to notice another point, that of the microphone transformer. The amplifier is designed for the reader's own microphone and not for any special make, and no definite instructions can be given concerning the correct connections. In some instruments the transformer is built in the base, the latter also accommodating a battery. In others these two parts are separate, and where instruments of this type are used they can be fitted inside the amplifier as shown by the two dotted components. The appropriate connections are shown by thick dotted wiring lines in Fig. 4.

In the alternative case these dotted components are ignored, and the open line wiring followed.

The bias battery is fitted underneath, held in position by two clips, the external connections to L.T. and H.T. being taken

The Two Controls

Continuing with the circuit, two volume controls are used, one for pick-up and one for the microphone. Even if the pick-up has an integral volume control the one in the amplifier is still advisable, a point which may not be appreciated until it is in actual use. In the case of the microphone, if this has a volume control fitted in the base it would be superfluous to fit an additional one as, owing to the position of the microphone on the amplifier, its control should be within easy reach. In this case the first volume control (R1) is omitted, and it will be noted that under these circumstances one microphone lead (or transformer secondary lead) is taken direct to the grid of V1, the other lead being taken, as before, to G.B-1. A word of warning, however, concerning a point which is subtle but important. If the volume control fitted to the microphone is so wired that the moving arm goes to grid, in low volume positions, the arm

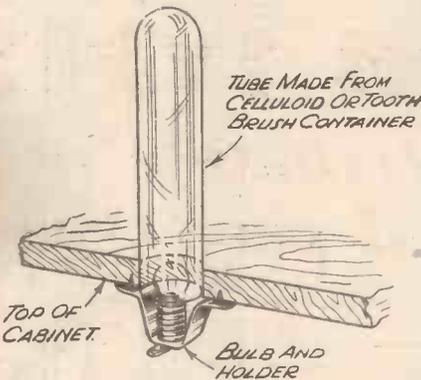


Fig. 1.—Method of fitting the bulb holders and covers to represent "neon" tubes.

to rig up another aerial and earth because in all probability the normal programmes will be required for at least part of the evening.

If normal programmes only are to be received it is obviously best to use one of the standard methods of fitting an extension speaker and leave it at that, but if a microphone and pick-up are to be used, the benefits to be derived from having such knobs as volume control and on/off switch close to hand need no emphasis.

On the other hand, it would seem extravagant to build an expensive amplifier for these occasions which are few and far between, and with this thought in mind it was decided to design a small amplifier which would have the advantages of (1) low initial cost, (2) a reasonable amount of amplification (not dance-hall volume), and (3) be suitable for pick-up,

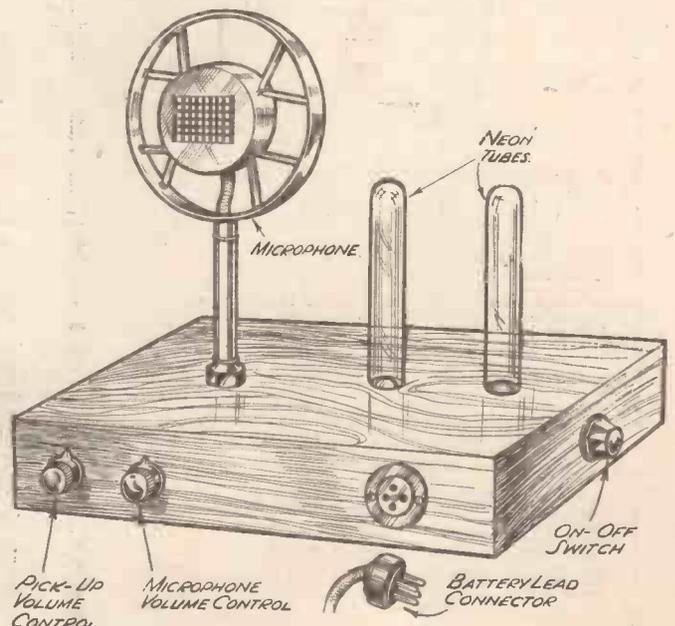


Fig. 2.—A front view of the finished amplifier.

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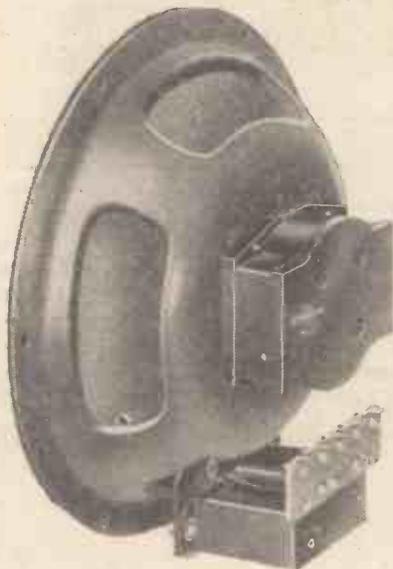
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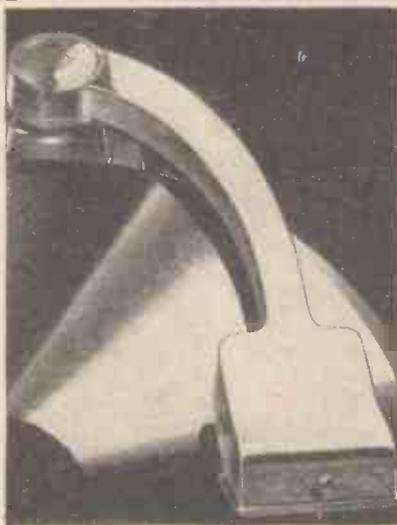
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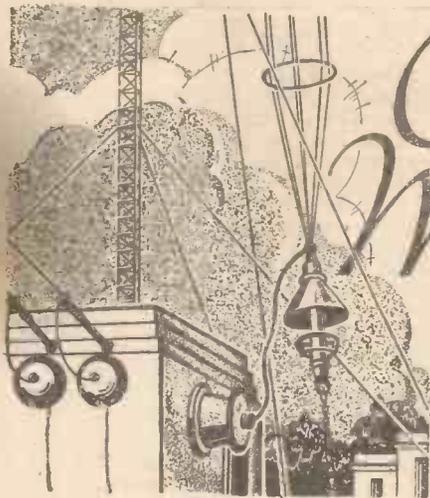


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On Your Wavelength



Greetings!

TO my readers, friends, enemies, countrymen, critics, and baiters, seasonal greetings, best wishes, good listening—in a word, a delightful Christmas to you all.

Thermion has occupied this platform



Knowledge is power.

for many years, and in that time I have received thousands of letters from the remotest parts of the earth—letters of criticism when my clowning has touched someone on the raw, letters of appreciation, letters containing news, letters asking for my advice, letters from Members of Parliament, policemen, postmen, solicitors, journalists, and from each rung of the social scale.

During the year it is my wont to express my thoughts sometimes jocularly, sometimes seriously, but in the main to provide the lighter side of the reading matter in this journal. I am naturally hurt when some of my banter is taken too seriously. Unfortunately, we are not all gifted with the same sense of humour, and what amuses some annoys others. So in the spirit of goodwill to all men, of which this issue is the harbinger, let me extend the typographical hand of friendship to all of my readers, even though in the New Year they make fresh onslaughts upon me. Uneasy lies the head which wields a pen, if I may mix my metaphor. Whatever is written may offend some and please others.

Retrospect

IT is but natural that at this time of the year one should reflect upon previous years from the radio point of view. Many Christmas Numbers of this journal have appeared, and a perusal of them (I am fortunate in having a complete set of bound volumes in my den) shows the changing fashions in radio and the changing interest. In the earliest issues, gramophone pick-ups are not mentioned, for the very good reason they had not been produced. Valves in

By Thermion

those days consisted of about three different sorts, and most people swore by the Dutch R type of valve as a detector, because it was "soft." It yielded a beautiful blue glow if you applied a voltage on the plate of more than about 40, and it burst into oscillation for no apparent reason. The only multiple valve in those days was that which was provided with a double filament, so that when one burnt out you could switch over to the second one. Those were the days of bright emitter valves, which greedily devoured the ampere hours stored in colossal 6-volt accumulators. Two of the earliest examples of what I may term "economy" valves where the Xtraudion and Dextraudion, and gradually the two-volt dull emitter types were produced. An inspection of the components which were used and sold at fabulous prices in those days indicates how far we have advanced to-day. Valves are only about half the size they formerly were. Ganged condensers were unheard of, tuning coils were of the uncanned type, and nearly always the entire set was mounted on a vertical panel.

The refining influence of amateur experiments has guided design along the right channels. We have portmanteau valves to-day, cheap but efficient components, and sets which are every bit as good and in many cases better than commercial receivers. Like two-headed Janus I advise all readers at this time of the year,

particularly those with back issues on file, to look back and to look forward. It makes radio more enjoyable when you consider the early sets, the present sets, and conjecture on the possibilities of sets of the future.

Small Iron-core Coils

ONE of my readers, Mr. I. C. Graves, of Bournemouth, reminds me that some time ago I deplored the fact that very small iron-core coils are not available. He sends me a truly Lilliputian example to let me see that tiny, efficient coils are procurable. In fact, readers may make as many as they care to at a cost of less than



Short-waves, a cause for divorce.

2d. each. The coil which my reader submits is no larger than $\frac{1}{4}$ in. in diameter, and about $\frac{3}{16}$ in. high. It is a medium-wave coil, the reaction winding being a liberal one which can be reduced if necessary. It consists of 50 turns, but would probably not require to be more than 25 or 30. He tells me that this type of coil has been



Father Christmas enjoys a brief respite from his labours with his own presents. A packet of cigarettes, a glass of whisky, and a new Corsor Radiogram.

on test ever since iron-core coils have been introduced, and he has not encountered any other coil which will give such good results with a straight set. Long-wave coils are a little longer, of course, but the thickness is the same. I have passed along this coil to our technical staff, and I have no doubt they will report upon it in due course.

To Knowing How

SCIENTIA est potentia. Knowledge is power, even with radio. A friend with whom I sometimes have brushing contacts shunned the skilled advice of Thermion, and went to a local dealer who was also the local electrician, the local plumber, and the local pram tyrer, although this has nothing to do with this story. As a matter of fact, I had correctly diagnosed the trouble as being due to a faulty switch, which, being made apparently of the best lead did not remain in contact for more than an evening without needing readjustment. My friend was, therefore, astonished to receive a bill for 10s. 6d., and asked for an itemised invoice from the dealer only to receive the sage answer that



The loud-speaker next door.

the sum was made up of 3d. for bending the switch-arm, and 10s. 3d. for knowing how. Had this reader invested in F. J. Camm's "Everyman's Wireless Book," or "The Wireless Constructor's Encyclopædia," he would have saved himself a number of shillings, and had as well two valuable guides in case of future trouble. If knowing how to rectify a defective switch is worth 10s. 3d., then, indeed, Mr. Camm's books are worth their weight in solid platinum studded with diamonds.

Could It Be Anywhere Else?

I HEAR that a woman in America, where divorces are easy, is endeavouring to untie the nuptial knot on the grounds of mental cruelty, the mental cruelty being that her husband keeps up late listening to short-wave transmissions and insists that she keeps up to make coffee and to enthuse when he receives a particularly good transmission. It is untrue that unhappy spouses in that most surprising of all countries in the world have created an enormous demand for short-wave receivers because they see therein a welcome means of escape from uncongenial connubial entanglements; but it is an idea!

Automatic Record Changers

I WENT to a friend's house the other evening, and as I had anticipated he had something new to show me. Not wishing to appear like a schoolboy with a new toy, he segregated me at the cocktail corner of his room just to have a couple, but I am sure inwardly hoping that my curiosity would be aroused by a



Those Foolish Faults

A QUERIST has just been telling me how foolish he felt a few days ago when he had asked a few friends round to hear the B.B.C.'s Gala Variety Programme. The friends duly arrived, were given a cigarette and a drink, and waited until it was time for the programme to commence, when the set was switched on—but nothing happened. The set was A.C. operated, and it was seen that the valve heaters were glowing, in addition to which there was a faint hiss from the speaker, suggesting that the high-tension circuits were in order. Even the volume and tone controls seemed to give some response, for the background noises varied as the controls were operated; despite this, however, the tuning knob appeared to have no effect whatever. The pointer moved over the scale, and the stiffness of operation was apparently as usual. What could be wrong?

A Thorough Examination

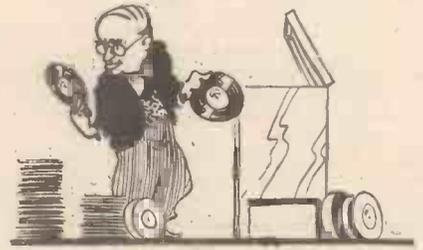
AERIAL and earth leads were examined; it was seen that the speaker leads were intact, and no broken or loose wires could be seen in the set. A gramophone pick-up was connected, and reproduction from this was perfectly satisfactory and quite up to normal standard. The problem seemed to be a baffling one and the experience was most humiliating, especially as my friend had rather a reputation for his wireless knowledge and skill.

It was not until the programme which was especially wanted was almost halfway through that the cause of trouble was detected. And what do you think it was? Very elementary, although rather involved—the cover of the gang condenser had been misplaced during experiments and the moving vanes had jammed against it, in addition to which the grub screws holding the condenser dial to the centre spindle had worked loose, so that the knob turned, and the pointer moved, but the vanes did not! Incidentally, this is not the first time I have heard of a similar happening, although in previous instances the set was newly constructed, and the builder had omitted to tighten the grub screws.

Speaker Matching

HERE is a seasonal hint which is by no means new, but which might save you some trouble when using an extension speaker. The methods of connecting extension speakers will no doubt be dealt with by other contributors to this issue, but the point I have in mind might be overlooked. In many cases the extension speaker is simply connected in parallel with the speaker built into the receiver cabinet, but when this is the case it is important that the extra speaker should be matched to the output stage and also to the built-in speaker. If the extension is of low resistance while the built-in unit has a high resistance, not only will quality suffer, but it might be found that the speaker in the set is almost completely "muted" although the other one functions reasonably well.

magnificent radiogram-hard by. With the perversity of genius for which I am renowned I did not do this, although my cockling optics took in the details. Like a good diplomat I knew that sooner or later he would unburden his soul, and when he could contain himself no longer he diverted my attention from the excellent array of bottles in the cocktail cabinet and asked what I thought of his latest acquisition. It was a radiogram with an automatic record changer, one of those devices with almost human gadgets which plonk and hum and grate and mop up the juice whilst robotlike they lift the records off or repeat the dose at will. As my friend does not dance, nor is the room large enough for him to do so, I wondered why it was that he had gone to this expense. Apparently it was to go one better than his neighbour, and so that he could hear a favourite piece repeated without removing himself from the cocktail cabinet. Personally I feel that automatic record changers are excellent devices for automatic company—those people who are always slipping in to see you uninvited, knowing that you keep an excellent wine cellar. By putting on a modern dance tune and setting it to repeat ad lib. you are



I like to choose my records.

assured that they will vanish and make their excuses after having only one.

The Loud-speaker Next Door

I WAS mildly astonished as well as amused to see that the loud-speaker next door is mentioned in the report of the Building Research Board. The modern builder has frequently been blamed for erecting walls so thin that they merely form supports for the wallpaper. But according to a report the builder is innocent. This source of annoyance has been investigated by scientists of the board who affirm that the sound does not come through the walls, but is influenced by the disposition of the beams supported by the walls. If, therefore, you want a particularly good bass response I invite readers to try fastening their loud-speakers to the ceiling and to let me know the results of their tests. If such tests prove satisfactory I will risk removing half the plaster from my ceiling by following the experiments.

An Aerial Point

I HEARD the other day of an enthusiastic amateur who had endeavoured to improve aerial efficiency by making up a special stranded aerial. Accordingly he cut this up into lengths approximately right for his aerial and twisted them together and erected the wire in place of his existing aerial.

There was no improvement, and after a day or two results were infinitely worse. The reason was not far to seek. The efficiency of the conductor depends upon surface area and although there were many more strands, the total surface area was no greater.

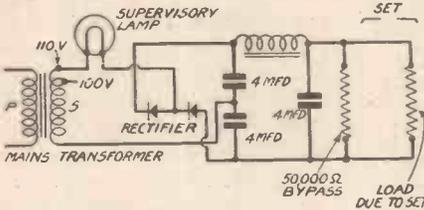
A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

Supervising a Radio via an Eliminator
WHILST building an eliminator using a voltage doubler circuit, I decided to incorporate a supervisory lamp in the transformer secondary to be illuminated



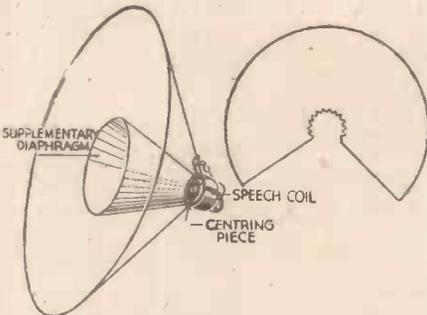
Method of incorporating a supervisory lamp in an eliminator circuit.

whilst the eliminator was upon load. The elements of the scheme are shown in the accompanying circuit diagram, and it is important to note that the lamp also acts as a fuse for the transformer secondary.

It is evident that the transformer secondary load is dependent upon the load across the eliminator output. Therefore, by using a slightly higher tapping upon the rectifier input secondary (to compensate for the voltage drop across the lamp) we can get a good visual indication upon the lamp when the set is placed across the output terminals of the eliminator. Should the set fail at its switching point (on-off) the lamp will only receive that current due to the by-pass resistance of the eliminator, and this is totally insufficient to cause any glow at all. Actually, I used the 110-volt tapping instead of the 80-volt tapping specified for the rectifier input, and placed a small resistance in series with a very low consumption lamp (.100 amp.) to dissipate the 30 volts excess.—WM. J. HAMILTON (Aintree).

Improving High-note Response

A VERY simple method of improving high-note response from any moving-coil speaker is that shown in the accom-



A simple dodge for improving high-note response in a moving-coil speaker.

panying illustration. A small paper diaphragm is attached by its smallest edge to the outer ring of the centring piece at the apex of the main diaphragm. It is made from a piece of light stiff paper cut, as shown, with the centre edge serrated and

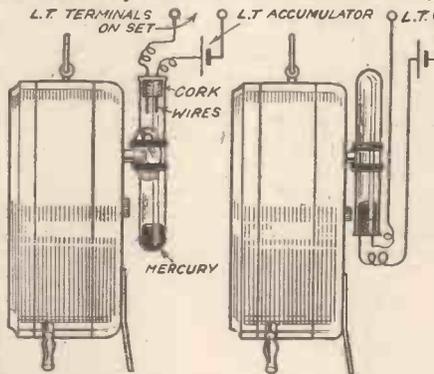
THAT DODGE OF YOURS!

Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

turned in slightly to allow it to be fastened by adhesive flush with the centring piece. The texture of the paper, its size and angle of diaphragm control the frequency, or band of frequencies, at which it will give additional response. A very marked improvement in tone is noticed with this device. After fixing, judicious cutting down of the outer edge will heighten the frequency response.—H. D. ALDRIDGE (London, W.C.).

A Simple Time Switch

THE following is a very simple method of making a time-switch for a wireless set. The parts required consist of an alarm clock, a small test-tube (from 2in. to 4in. long), a little mercury, and some wire. A little mercury is poured into the test-tube and a cork, with two pieces of wire inserted through it, is fitted tightly into the open end. The tube is then attached by wire to the alarm-winding

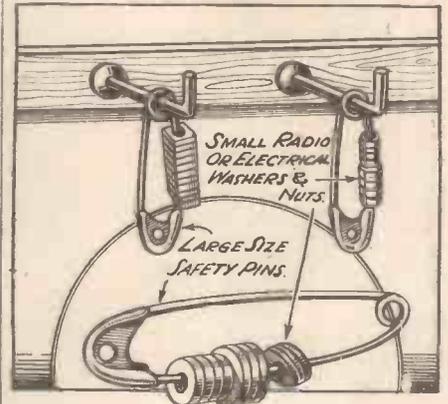


A simple mercury-operated time switch.

handle of the clock. Connect up as shown in the diagram, leaving sufficient wire to allow the test-tube to turn over. Set the alarm to the required time and give the alarm-winding handle a half-turn so that it is in the position shown in Fig. 1. When the alarm goes off the test-tube will be inverted so that the mercury falls and makes contact between the two wires as indicated in Fig. 2. This device can, of course, be used also for switching off the set at any required time.—H. B. KIRBY (Malvern).

A Safety-pin Filing System

MANY constructors will, at some time or other, have experienced the difficulty of finding a nut or a washer of

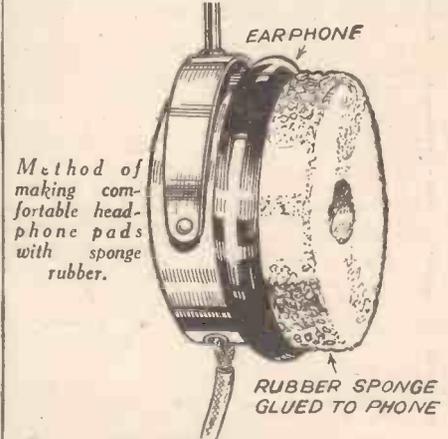


A novel use for safety-pins for keeping nuts, washers, etc., always at hand.

just the right size for the job in hand. An excellent "filing system" which immediately enables one to overcome this difficulty is shown in the accompanying sketch. Large safety pins are used to hold washers, nuts, split pins, etc., of various sizes, and if the pins are suspended by hooks in the tool chest, or from a shelf above the work bench, they are always at hand when required.—J. R. LANDELLS (Hendon, N.W.).

Easily-made Headphone Pads

HEADPHONES, when worn for a considerable time, cause the ears to be cramped and made uncomfortable, due to



Method of making comfortable headphone pads with sponge rubber.

the uneven contact with the ear and the hard material. This may be obviated in the following way. Obtain an old rubber sponge, cut the rubber into a circle or square about the size of the outside diameter of the 'phones and from 3/16 in. to 1/4 in. thick, one being cut for each 'phone. In the centre of each piece cut a hole the size of the one in the headphones. The holes may be lined with paper, which is glued to the rubber, to avoid sound absorption. The rubber pieces are now stuck to the 'phones with glue as indicated in the sketch. This gives a comfortable fitting to the head, and also keeps out outside noises.—A. SELBY (Plumstead).

The A.C. £4



Full Constructional and
A.C. Mains Version of his £4 Superhet 4
By F. J. Camm

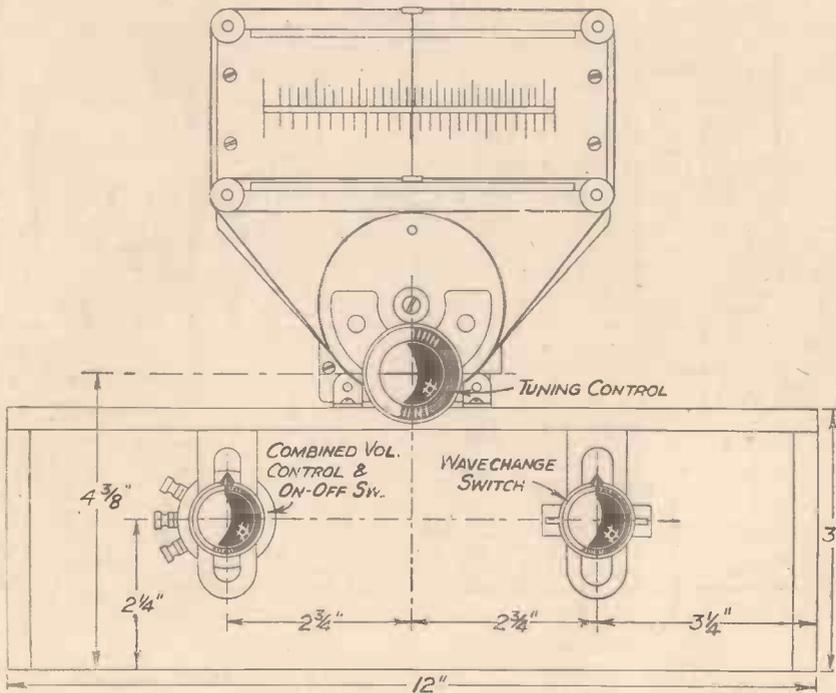
Note the Clean Layout!

I AM very gratified to learn that once again a receiver of my design has been accorded warm approval by discriminating constructors throughout the country. Here and there I have received mild criticism from those who would have preferred me to adopt the baseboard system of construction. Believe me,

if I thought that it would improve the performance of the £4 Superhet 4 I should not hesitate to adopt it. If I thought that it could function satisfactorily by eliminating ganged condensers I should do so. It is true that the constructor has to carry out a trimming operation on my £4 Superhet 4, but this can be undertaken by anyone having the mildest knowledge of radio. And, after all, design must progress beyond the separate tuning controls formerly employed. It will be remembered that with my well-known series of Fury Four Receivers I employed secondary tuning control, but components are far more accurately

made now even than they were then. After all, if we continue to use old methods design must stagnate and improvement will become impossible. I learn from my correspondents that they prefer simplicity of tuning control so that the receiver can be operated by any member of the family. The excellent adjustments now provided on variable condensers and I.F. transformers enable anyone to construct the superhet to-day and to obtain just as excellent results as they did with the old straight receiver. That I am right is evident by the fact that within ten days of publication of details of the battery version of my £4 Superhet 4 the supply of some of the key components used in it

Blueprint of Mains Version of £4 Superhet 4 and Constructional Details given with our November issue



Cabinet-drilling diagram of F. J. Camm's £4 Superhet 4.

- LIST OF COMPONENTS FOR A.C. £4 SUPERHET 4**
- COILS.**
Two Band Pass, type BP80; One Oscillator, type BP86 (Variable).
- CONDENSERS (VARIABLE).**
One Three-gang Midget Superhet, type 465 kc. with V.P.H. (C1, C2 and C3) (Polar).
One Compression, type F (.0001 mfd.) (C7); One Compression (mfd.) (C8) (Ward and Goldstone).
- CONDENSERS (FIXED).**
Two .0001 mfd., type 665 (C6 and C14); One .0003 mfd., type One .05 mfd., type 4512 (C17); Three .1 mfd., type 4513 (C5, C12 and C13); Two 2 mfd., type 9200 (C12 and C13); Two 4 mfd., type BB3 and 20); One 8 mfd., type 0281 (C18); Four 25 mfd. 25v., C11, C15 and C21) (Dubilier).
- RESISTANCES.**
Two 250 ohms, 1 watt type (R2 and R7); One 350 ohms, 1 watt type (R10); One 750 ohms, 1 watt type (R10); One 3,000 ohms, 1 watt type (R6); One 10,000 ohms, 1 watt type (R11); Two 20,000 ohms, 1 watt type (R5 and R12); One 30,000 ohms, 1 watt type (R5 and R12); One 75,000 ohms, 1 watt type (R3); One 250,000 ohms, 1 watt type (R13); One 500,000 ohms, 1 watt type (R9) (Dubilier).
- I.F. TRANSFORMERS.**
Two, type 674 (Eddystone).
- VOLUME CONTROL.**
One 2,000 ohm, type VS43, with Q.M.B. Switch (R1) (Bulgin).
- L.F. CHOKE.**
One, type L.F.14 (20H. 50 m/A, 400 ohms) (Bulgin).
- MAINS EQUIPMENT.**
One, type W31 Mains Transformer (Heayberd).
One, style H.T.8 Metal Rectifier (Westinghouse).
- SWITCH.**
One four-point type S.116 (Bulgin).
- CHASSIS.**
One Metaplex, 12in. by 12in., with 3 1/2 in. runners (Peto-Scott).
- VALVES.**
One 41 MPG (V1); One MVS-Pen (V2); One 41MHL (V3); One (V4) (Cossor).
- SUNDRIES.**
One 7-pin chassis mounting valveholder (Clix); Three 5-pin chassis mounting valveholders (Clix); Two component-mounting brackets (Peto-Scott); feet screened lead (Ward and Goldstone); Three terminal strips, A.E. and L.S. (Clix); One fuscholder with 500 m/A fuse (Microfuse).
- LOUD-SPEAKER.**
One Stentorian Senior (W.B.).

Superhet 4

Building Details of F. J. Camm's Efficient and Immensely Popular Superhet 4.

F. J. CAMM.

was exhausted. In order that constructors may not have to wait in order to build my receiver I have, as was also necessary in the case of my £5 Superhet, conducted tests with suitable alternatives, and I have instructed suppliers of kits as to what alternatives meet with my approval.

F. J. Camm's Superhet 4

Building Details were first issue dated 16th, 1935

hours. As regular readers of this journal know, it is against my policy to specify alternative components except when the specified parts are not available. Occasionally manufacturers are unable to cope with the demand.

Those who have delayed ordering parts for this receiver may therefore be assured that they will be able to obtain a complete set of parts approved by me within twenty-four



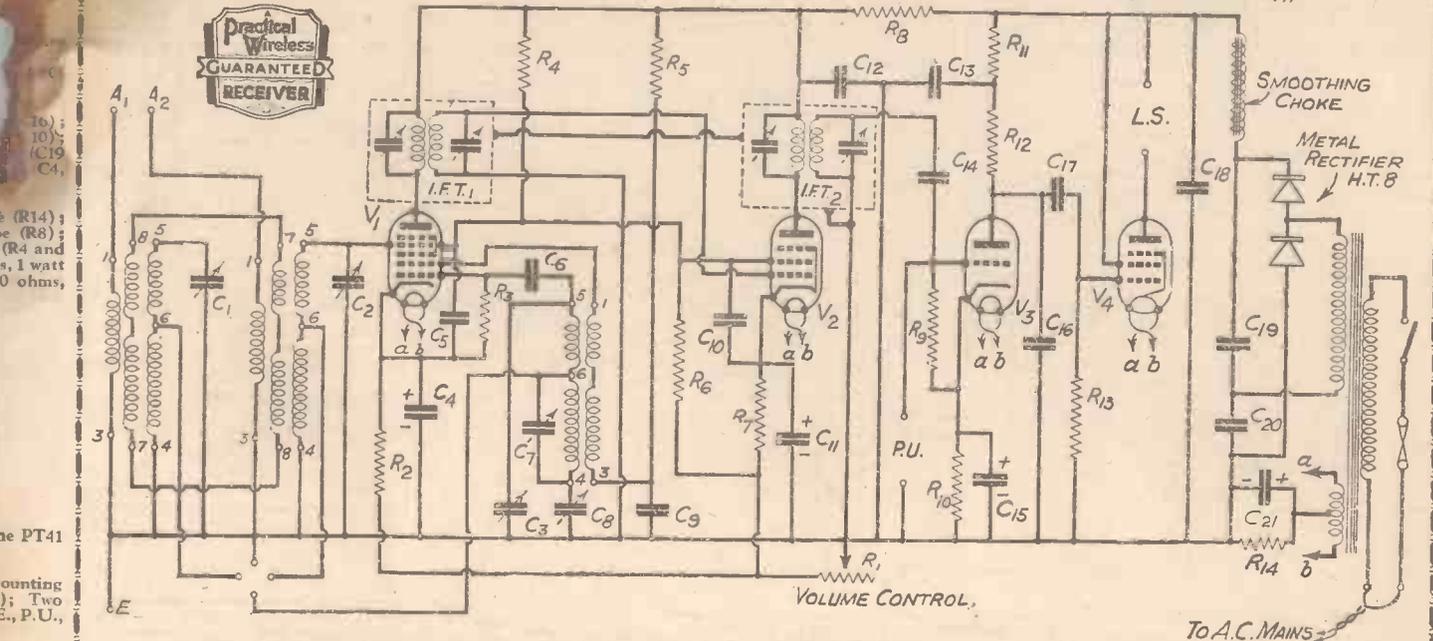
Three-quarter front view of the £4 Superhet 4.

MY correspondence indicates that thousands of battery models of the £4 Superhet 4 are being constructed, and considerable interest is already being evinced in the mains models. Many readers who are conversant with theoretical diagrams have commenced constructional work from the details and diagrams given last week, but most constructors will probably prefer to work from the wiring diagram which appears on page 390 of this issue. No difficulty whatever should be experienced in building this set, as the wiring is clearly shown on the diagram, and the components are so arranged that all the

leads and terminals are easily accessible.

Construction

It is advisable to commence the constructional work by marking out the chassis and drilling the valve-holder, terminal strip, and wiring holes. The hole for the seven-pin holder of V1 requires a 1 1/4 in. drill, but the other valve-holder holes need only be 1 in. in diameter. A 1/4 in. drill should be used for the terminal strip (Continued overleaf)



The theoretical circuit of F. J. Camm's A.C. Superhet 4.

sockets, and an $\frac{1}{16}$ in. size for the lead holes. It is advisable to mount the sub-baseboard components first, and complete the wiring of these in order to avoid possible damage to the components which are placed on the top surface of the chassis. When fixing the brackets for the wave-change switch and volume control, care should be taken to use short screws that will not pierce the metallised surface of the chassis. It is also emphasised that the sockets of the terminal strips and valve-holders must be kept clear from the chassis metallising, otherwise a serious short circuit may occur. To avoid this possibility, constructors are advised to remove the metallised coating around the edge of the holes by means of a penknife or file. There are certain components, however, that must make good contact with the metallised surface of the baseboard, namely, the chassis of the gang condenser, I.F. transformer cans, coil cans, mains transformer casing, electrolytic condenser casing, and the casing of the metal rectifier. All the bolts and screws marked M.B. must also make good contact with the earth socket through the metallising, and therefore it is advisable to place a washer between the loop of the lead and the chassis surface. It will be found that the edge of the cans of the I.F. transformers is rather sharp, and therefore constructors are warned not to screw these down too tightly, otherwise the edge may cut through the metallised coating. Another hint may also prove helpful; the gang condenser tuning drive is very difficult to fit after the condenser has been screwed down, and therefore this should be placed in position before mounting the condenser. The negative pole of the electrolytic condenser is the casing, and therefore effective contact must be made between this and the chassis; to avoid damage to the metal surface when the electrolytic is being mounted, the latter should be tightened down by means of the large nut at the bottom—it has been found in the past that constructors have made a practice of tightening these components by revolving the casing and keeping the nut stationary.

Wiring

As previously mentioned, it is advisable to complete the sub-baseboard wiring, as far as possible, before commencing to mount the surface components. No particular sequence need be adhered to, but perhaps it will be found advantageous to wire the heater sockets first. When doing this, care should be taken to twist the flexible leads tightly together, otherwise hum may be experienced; twisting the lead causes the lead fields to balance each other, thereby reducing the external field to a minimum.

It will be noted that the two 4-mfd. condensers are in the form of a block, and great care should be taken to connect the external leads to the correct tags on this. In some models the tags are in line, instead of in a triangular formation, and therefore it should be carefully ascertained that the lead shown connected to the tag marked Common on the diagram is joined to the tag marked C, and the other leads connected to the tags shown as 4 mfd. to those marked 4 on the block condenser. The fuse is indicated on the wiring diagram as it is actually placed underneath the outer casing of the mains transformer, and although this might lead constructors to think that it is inaccessible, it is actually in a very accessible position. It will be noted that the on-off switch is attached to the volume control; this method of switching has been adopted in order to reduce the number of controls. In practice

it is permissible to use a separate switch of the Q.M.B. type (e.g. Bulgin S.91 L.B.) fitted to the side of the cabinet near the mains transformer, if desired. The 350-ohms resistance and its associated 25-mfd. condenser should be mounted in an upright position and the upper extremities of these two components should be joined to the 5-amp. socket of the mains transformer by means of a short stiff lead in order that they may be kept quite rigid.

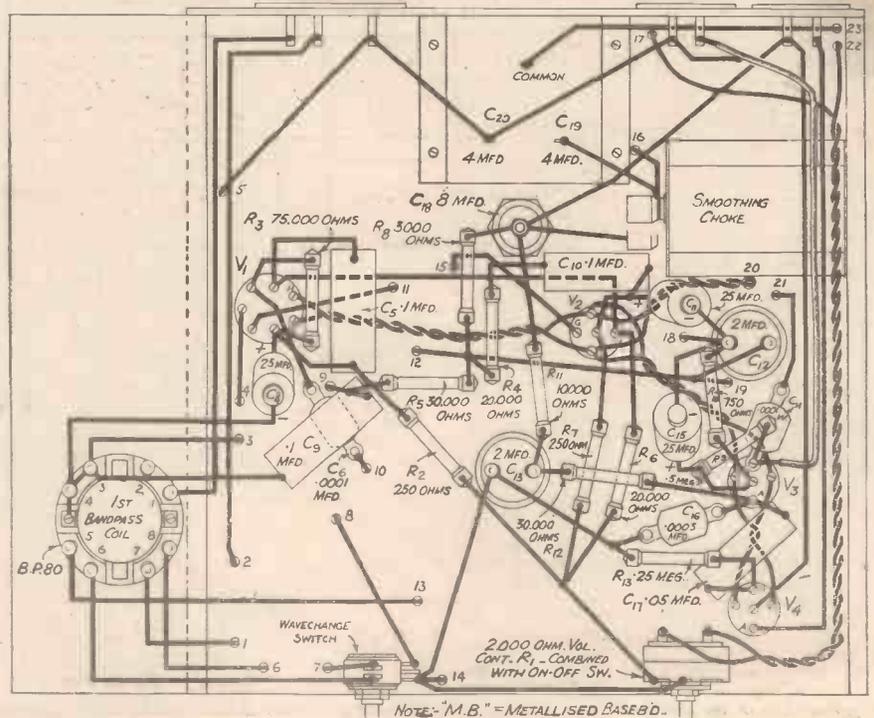
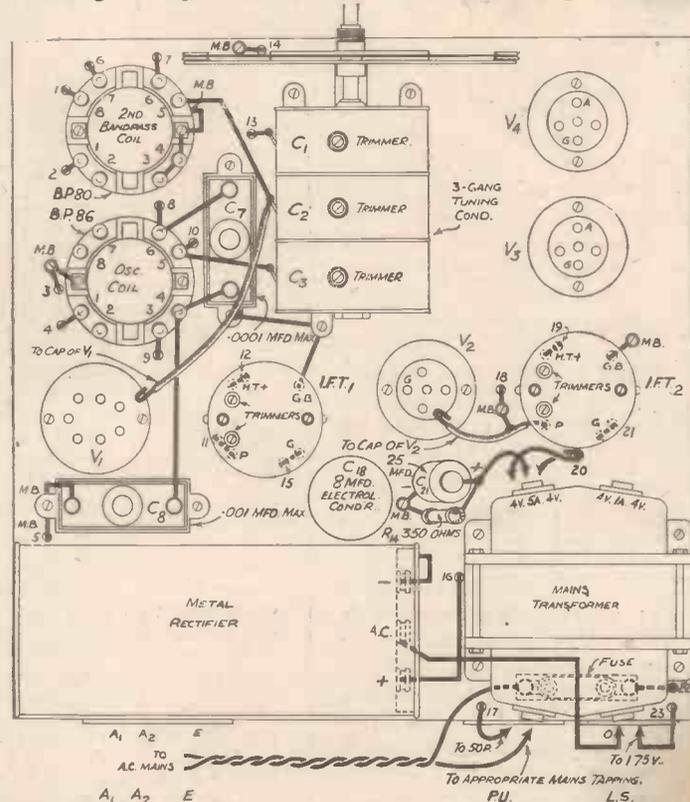
A tone-control condenser has not been fitted to the A.C. model as it was not found necessary with the specified output valve

and speaker. Constructors who favour a very mellow tone, however, may connect a fixed condenser of approximately .01 mfd. across the speaker terminals.

After the wiring has been carefully checked the speaker, aerial and earth, and mains leads may be plugged into their respective sockets and the receiver switched on by means of the on-off switch attached to the volume control. It is probable that stations will immediately be picked up but best results will not be obtained until trimming has been effected. This will be dealt with next week.

Wiring Diagram of the A.C. £4 Superhet 4

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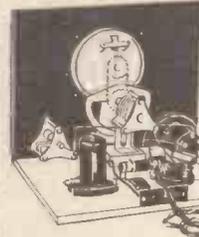
5/-
down
and 11 monthly payments of 7/9

A.C. MAINS MODEL STAND your Mains or Battery Set on this remarkable unit... give it all the qualities of a costly 1936 Radiogram. Simply connected. No alteration to your existing receiver. Incorporates Sensitive Pick-up, Volume Control, needle cups. Veneered Walnut Front, hand french polished.

BATTERY MODEL Similar specification, but with Garrard Double Spring Unit plate Motor. Same price and terms.
State which model required when ordering.

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COVERS 13-80 METRES. Converts your existing battery or A.C. Receiver for operation on short-waves, with no alterations, bringing you America direct programmes from all over the world. Two hours to build... a lifetime of world-wide radio entertainment!

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KIT "A" CASH OR C.O.D. £1:19:6
Carriage Paid.

Or 2/6 down and 10 monthly payments of 4/3.

Comprises all parts for building with full-size blueprint, assembly and operating instructions, less cabinet.

WITH CABINET. Cash or C.O.D. Carriage Paid, £2:10:0, or 12 monthly payments of 4/6.

Peto-Scott A.C./D.C. Short-Wave CONVERTER. For A.C. or D.C. Receivers. Tuning Range 13-80 metres. KIT "A," comprising all components, less valves and cabinet. Cash or C.O.D. Carriage Paid. £3/10/0, or 12 monthly payments of 6/6.

PILOT AUTHOR KITS CENTAUR 3

KIT "A" CASH OR C.O.D. £2/13/6
CARRIAGE PAID

Author's Kit of first specified parts, less valves and cabinet.

Balance in 11 monthly payments of 5/-.

5/-
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KIT "B" As for Kit "A" but including set of first specified valves, less cabinet. Cash or C.O.D. Carriage Paid. £3/13/6, or 12 monthly payments of 6/9.

KIT "C" As for Kit "A" but including valves and Peto-Scott Walnut Console Cabinet. Cash or C.O.D. Carriage Paid. £4/13/6, or 12 monthly payments of 8/9.

Set of 3 first specified valves .. 19/9
Peto-Scott Console Cabinet .. £1/1/0

£4 SUPERHET KIT "A" YOURS FOR

Author's Kit of first specified parts, including ready-drilled Metaplex Chassis, less valves, cabinet and speaker. Cash or C.O.D. Carriage Paid £4/4/0 or 7/6 deposit and 11 monthly payments of 7/9.

7/6
DOWN

KIT "B" As for Kit "A" but including set of 4 first specified valves, less cabinet and speaker. Cash or C.O.D. Carriage Paid. £6/15/0. Balance in 11 monthly payments of 12/6.

KIT "C" As for Kit "A" but including valves and Peto-Scott Recommended Vertical Walnut Console Cabinet. Cash or C.O.D. Carriage Paid. £7/16/0. Balance in 11 monthly payments of 14/6.

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• A.C. VERSION •

KIT "A" CASH OR C.O.D. £9/15/0
CARRIAGE PAID.

Author's Kit of first specified parts, less valves, speaker and cabinet.

Balance in 11 monthly payments of 17/9.

KIT "B" As for Kit "A" but including set of 4 first specified valves, less cabinet and speaker. Cash or C.O.D. Carriage Paid. £13/4/6, or 12 monthly payments of 24/6.

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Carriage Paid

- 6 B.V.A. Valves.
- Automatic Volume Control
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XMAS MAKESHIFTS AND REMEDIES

IT is very annoying to have the receiver break down when it is impossible to obtain any outside assistance, and, owing to the importance of the wireless receiver during the Christmas festival, it is at this time of the year more than at any other that the amateur should know how to make a quick test of the circuit and to adopt some makeshift arrangement to enable a programme to be heard. It is, of course, impossible to lay down rules which will apply to every receiver, but the following may be termed "general" hints and they will enable any type of receiver to be examined, and will, no doubt, also suggest methods of improvising repairs or adopting arrangements which will act as a standby until a correct remedy may be applied.

First of all, there is the fault which arises suddenly and is evidenced by the sudden cessation of signals with no previous warning. In a battery receiver this will not be due to the L.T. battery becoming discharged, as this will produce a gradually weakening signal and, therefore, it is possible to exclude this from any examination, together with the H.T. battery and G.B. battery. Unless the receiver has at the moment of breakdown (or immediately before) been subjected to a severe shock or blow the connections may also be excluded from a test in such a case.

Replacing Valves

Therefore, a valve or component may be considered to have broken down. The faulty stage may be located in most cases by tapping each valve, commencing from the output stage. If the glass is tapped with the finger-nail fairly forcibly, a ringing sound will be produced in the speaker, and if nothing is heard when the output valve is so tapped, then that or the speaker should be suspected. Check the speaker by changing round the last two valves. Do not leave them in the new positions for long, but simply switch off, change the valves, switch on and then tap the valve which is now in the output stage. If a sound is heard in the speaker, then the valve which was originally there has broken down. If, however, no sound is produced, then the speaker is at fault and the leads to it, as well as the speaker itself, should be examined. In general, the same procedure may be followed throughout the set, tapping each valve until no sound is heard, and then changing round the valve with the one in front. In view of circuit differences, however,

How to Make Rapid Tests for Breakdowns, Should Your Receiver Fail During the Holiday Period When the Shops Are Closed and No Replacements Are Obtainable

By W. J. DELANEY

the valves must not be left in circuit longer than is necessary to enable the tapping process to be carried out.

Finding the Fault

Having arrived at the valve where no sound is produced from the speaker, the fault may obviously be deemed to have arisen in the valve or coupling between this and the next stage. Supposing that we have got as far as the detector valve without finding trouble, and yet when tapping this valve no sound arises. Then this valve or the coupling between it and

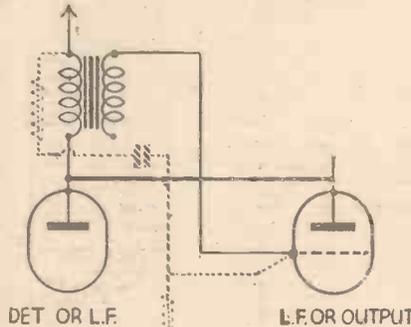


Fig. 1. — A coupling component may be eliminated in this manner.

the L.F. valve is at fault, and an S.G. valve may be temporarily plugged in in place of the detector or an ordinary triode may be used. If there is still silence, then the L.F. coupling may be temporarily short-circuited. It may be necessary to listen very carefully when this short circuit is carried out as the lack of step-up between the stages will only enable a weak signal to pass to the speaker, although if more than one L.F. stage is in use quite a reasonable "ping" should be heard. If this happens when the primary of the transformer or the coupling resistance in an R.C. stage is shorted, then the remedy is to replace the component or cut out that stage. If no replacement is on hand, the stage may be eliminated by joining the anode terminal of this valve to the anode terminal of the following valve. Obviously this will result in weaker signals than were formerly obtained, but then the weak signal will be preferable to no signal at all.

Eliminating the H.F. Stage

If the fault is traced in the above manner to the H.F. valve or H.F. coupling, a simpler scheme may be adopted. In practically every circuit (other than a superhet) the transference of the aerial lead to the detector tuning circuit may be adopted, and this may be carried out either by fitting a crocodile clip to the leading-in wire, or by

joining a short length of wire to the aerial terminal and attaching it to the junction of the tuning condenser and coil in the detector circuit. Where a ganged tuning unit is in use it will not be difficult to locate the appropriate point. To overcome the lack of selectivity when this scheme is adopted a small fixed condenser may be included in the aerial lead.

Valve Substitutes

Where a valve is found to be at fault some improvement in volume may be obtained if a valve of a different type is temporarily included in the holder. Thus, if when testing the valves as above mentioned it is found that the detector, for instance, is silent, but when the S.G. valve is plugged in its place the ringing sound may be heard when it is tapped, it is obvious that the valve is at fault and for the time being the S.G. valve may be left in this position with the aerial lead joined to the detector circuit as previously mentioned and thus there will be some signal obtainable, but the H.F. stage will be eliminated. If one of the L.F. valves is faulty, practically any type of valve may be used in the holder, provided that the makers' recommendations regarding bias are not overlooked.

Battery Failures

The faults just dealt with are all of the sudden type, but it is quite possible that signals will be found to weaken gradually and will eventually fade out entirely. The degree of rapidity will enable a fairly accurate diagnosis to be made. If, for instance, signals commence to weaken, become distorted, and in about half an hour have ceased, then the L.T. supply may be considered responsible. If, however, the period during which distorted and weak signals are heard, is a matter of some hours, the H.T. or G.B. may be considered responsible. In general the latter battery will not cause much weakening, but will only be responsible for distortion, but it should be examined should the above trouble be experienced. If the L.T. supply has failed, temporary use may be made of a bell cell of the large type, or for longer periods two such cells may be joined in series to produce a 3-volt cell and a resistance may be included in series to reduce the voltage to 2 volts. The value of the resistance will depend upon the current taken by the receiver.

If the H.T. has failed, temporary life may be instilled (for the purpose of hearing a news bulletin, for instance) by placing the battery in a warm oven. Do not put it in a very hot oven, and do not close the door. The extra supply obtained in this manner is only suitable for a short period of time, but it will enable the new bulletin to be followed. The G.B. battery may be similarly livened up for a short time.

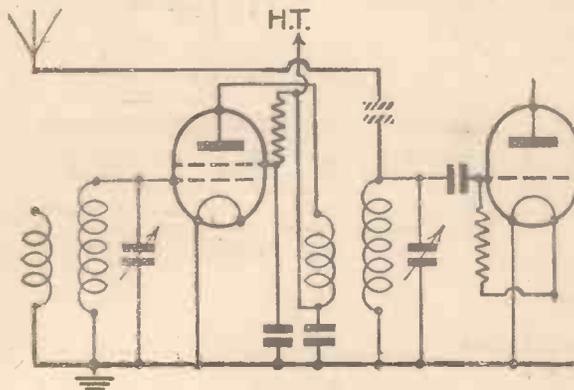


Fig. 2. — When H.F. stages break down the aerial may be transferred as shown here.

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SECRETS OF GOOD TONE

How Loud-speakers are Made in the H.M.V. Factories

THE majority of people, when they see a modern radio receiver in a shop window do not realise the careful attention that is paid during manufacture to ensure the purest possible tone. At the "His Master's Voice" factories at Hayes, Middlesex, many amazing processes are involved in the production of pure tone, and one of the most interesting is the making of loud-speakers.

structure, porosity, weight, and thickness. The thickness of the cone has to be accurate within three-thousandths of an inch, and the weight within 1-50th of an ounce. After being sprayed with shellac varnish and re-tested,



Removing a cone in a soft, pulpy state from a centrifugal spinner which revolves at 1,000 r.p.m.

Secret Process

Obviously the most important part, as far as acoustic efficiency is concerned, is the cone. It is of the greatest importance that this should be of the correct weight and thickness, and that it should not warp when subjected to varying atmospheric conditions. To meet these requirements, the H.M.V. people have developed a special process whereby the cone, instead of being made by merely folding a paper sheet, is made in one piece direct from pulp mixed to a secret formula. The exact quantity of pulp required to make one cone is carefully measured out and spread over a rough gauze mould. The greater part of the water in the pulp is then removed by suction, leaving the pulp evenly spread over the mould. After this rough shaping both mould and pulp are placed on a centrifugal spinner, which revolves at 1,000 r.p.m. The centrifugal force has the effect of throwing out all the water and spreading the pulp evenly over the surface of the mould.

"Bowler Hat" Process

The soft cone is then transferred to a press where it is subjected to a blocking process similar to that used in the manufacture of bowler hats. The tremendous heat of the press reduces the thick pulpy form down to a closely woven cone of the correct thickness. The cone then passes through a series of tests as to its fibrous

the cone is ready for mounting on to the loud-speaker chassis. In the case of the "Duo-Diffusion" loud-speakers used in the "His Master's Voice" High Fidelity instruments, a special alumi-

nium cone is fixed to the centre of the main cone. At least twice a day a cone is taken from every batch and sent to the Research Laboratories where they undergo exhaustive tests of their mechanical properties.

One Thousand Miles of Wire

The exciting coil for the magnet consists of seventy-three layers of wire, interleaved with paper. In all 22,000 turns of wire are wound on each coil, representing, roughly, three miles of wire. Each day over 1,000 miles of wire is used in the winding of these coils at the H.M.V. factories.

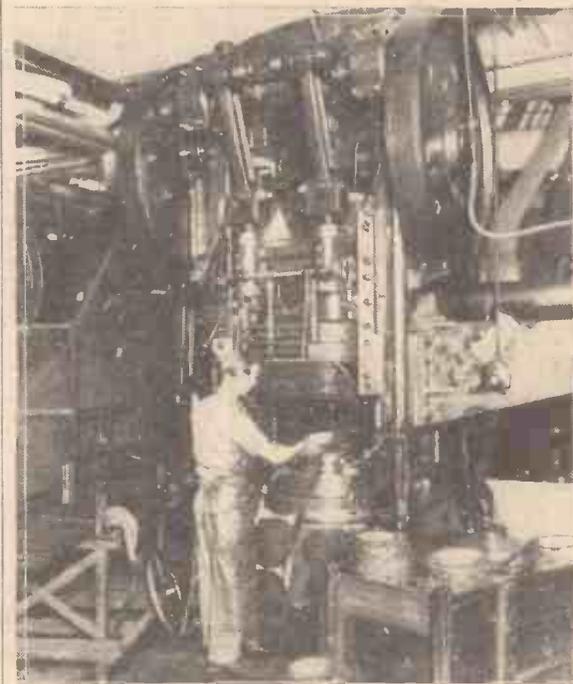
Exceptional care is necessary in the manufacture of speech coils, for when the coil is assembled, it has to move easily in an air gap with a clearance of only ten-thousandths of an inch. This gap is so narrow that if two hairs were inserted side by side the speech coil would be jammed. This coil, therefore, undergoes a special series of electrical and mechanical tests to verify its dimensions.

Final Test by Ear

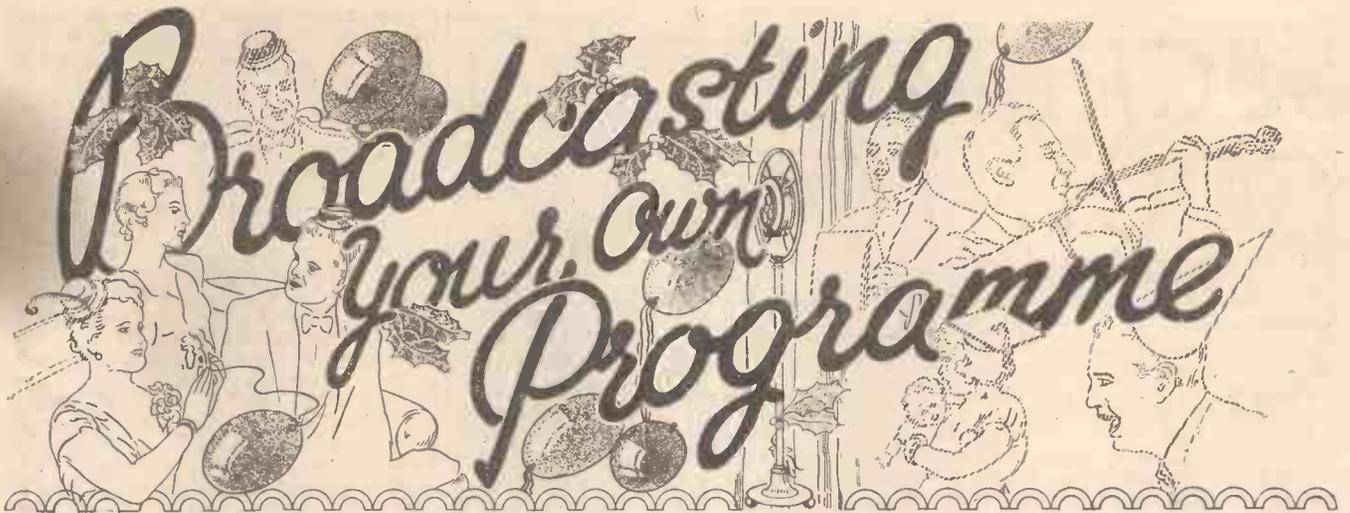
All the components are assembled in jigs. This is to ensure that every part fits closely, and that the pole piece is absolutely central. When the loud-speaker is complete, it is given a final listening test. This test consists of comparing each loud-speaker with a standard one, for which performance curves have been plotted and checked at regular intervals. The test is carried out in a soundproof room, and a special record is employed containing a variety of music, speech, and notes.



The final listening test for "His Master's Voice" loud-speakers. The loud-speaker which is being tested is compared with one of known performance.



Stamping out the "Pan," or metal chassis, for H.M.V. loud-speakers on a 200-ton press.



A GOOD deal of amusement is to be had from amateur home broadcasting, which consists of feeding the output from a microphone and/or gramophone pick-up into a receiver or amplifier which operates a loud-speaker situated in another room. Short dialogue plays, imitation foreign programmes, charades and (dare I write it, Thermion?) crooning solos can be "put over" excellently in this way, whilst dance music with suitable announcements between the records can be broadcast to another room in the house where dancing is in progress.

Very little apparatus is required, the main components being a microphone—complete with transformer, etc.—a pick-up, and a volume control connected as a "fader." The whole scheme is shown in the pictorial wiring plan reproduced on this page. Here, the microphone is shown as being of the type with built-in transformer,

the pick-up normally used is not provided with this refinement.

Pick-up and Microphone Fading

The pick-up and microphone circuits are combined through a 100,000-ohm potentiometer, by means of which either source of input can gradually be brought into circuit, the music from the pick-up being faded out as the speech from the microphone is faded in, and *vice versa*. In order to obtain

Methods of Using a Microphone and Pick-up together, of "mixing" Speech and Music, and of Providing Interesting Programmes

By FRANK PRESTON

time, so that the manipulation of the pick-up and records becomes rather awkward.

In connecting the microphone and pick-up to the pick-up terminals on the receiver, it should be noted that the two leads which are joined together should be taken to that pick-up terminal which is internally connected to grid-bias negative or earth, according to whether the set is battery or mains operated. The other pick-up terminal is then connected to the centre terminal (slider) of the potentiometer.

Use Short Connecting Leads

When using this arrangement it is almost essential to have the microphone and pick-up near to the receiver, which means that an extension speaker will probably be required to supply the output in the room where the listeners or dancers are situated. In any case, there need be no difficulty in moving the receiver, because aerial and earth leads are not strictly necessary; at the same time an earth lead is often desirable in the case of a battery receiver to maintain stability and avoid low-frequency instability, and in the case of a mains set to prevent mains hum being too pronounced. It is also a wise precaution to keep the leads from the two input instruments apart and at right angles to each other, and even to screen them; this prevents any action from taking place between them.

It might also be found best, in certain instances, to shield the microphone from the pick-up to prevent the needle scratch and "chatter" from reaching the former and causing a hissing sound to be heard during speech. This can be done quite effectively by placing a sheet of soft cardboard between the two instruments, or by fitting a small paper horn to the microphone.

Different Kinds Of "Broadcast"

Various uses can be found for the improvised broadcasting station, and competitions can be run in which each person gives a programme in turn. Here the broadcaster has the choice of using any available gramophone records, of speaking or singing into the microphone, or of playing the piano or other musical instrument. In the latter case the microphone can be stood on a table or it might be found better to suspend it from the ceiling or, in the case of a piano, to suspend it near the

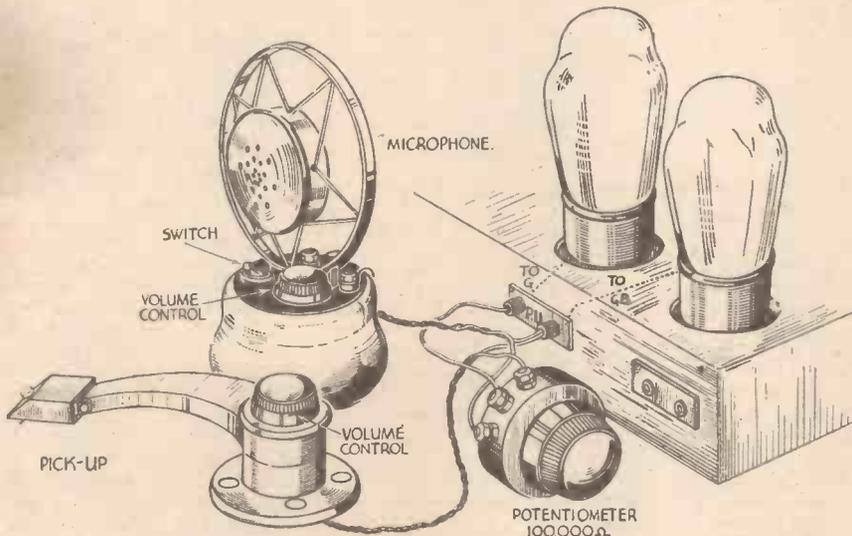


Fig. 1.—This shows the connections for a microphone and pick-up used together, and in conjunction with a potentiometer by means of which either can be faded in or out.

battery, and volume control, but this part of the equipment might consist of the separate parts wired together as shown in the article in this issue entitled "Amusements with the Microphone." The pick-up is also shown as being fitted with a built-in volume control, but this may be connected externally if

the most suitable "balance" between microphone and pick-up it is necessary to set the individual volume controls first of all, after which they can be left in those positions. Alternatively, the 100,000-ohm potentiometer shown for fading can be omitted and the two instruments controlled separately. This system is not so good, however, because two hands are required to operate the two controls at the same

(Continued from previous page)

open lid; it should not be placed too far into the piano, however, or else it will respond far too readily to the notes for which the corresponding strings are near to it, and may give scarcely any response to others.

Sometimes it might be possible to enjoy a gramophone record as an accompaniment to a song or piano recital, but in this case it will probably be found better to use a fader potentiometer of lower resistance than that mentioned above—a resistance of 20,000 ohms is generally satisfactory. When such a scheme is contemplated it will be necessary to have a speaker near to the microphone, or otherwise to connect a pair of 'phones which can be worn by the performer. Here, however, great care must be taken to prevent the sound from the speaker from striking the microphone, and this can generally be accomplished by placing the speaker in the remote corner of the room, arranging the microphone so that its back is towards the speaker, and placing a sheet of cardboard, felt, or wood between the two.

A "Silence" Light

In order to lend more realism to the

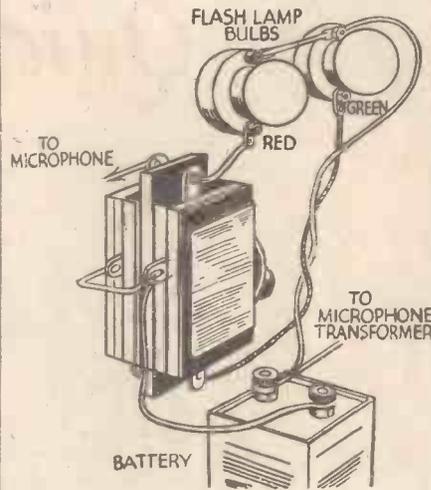


Fig. 2.—A simple method of connecting a microphone warning light is as shown here, where a two-pole change-over switch is used in the microphone-battery circuit.

"broadcasting studio" it is a good plan to arrange green and red lights so that the former is illuminated when the microphone is out of circuit, and the latter when it is connected. There are many methods of doing this, but one is to use a two-pole change-over switch in the microphone battery circuit as shown in Fig. 2, and to connect this to a pair of coloured flash-lamp bulbs of voltage rating appropriate to the voltage of the energising battery employed. Another method is simply to have a red light, and to connect this in series with the microphone and battery, so that it is illuminated as soon as the microphone is brought into circuit. This arrangement cannot always be applied, because the current taken by many modern microphones is insufficient to light even a small flash-lamp bulb or a 60-m/A fuse bulb; it can be tried quite easily, and if unsatisfactory it can be dispensed with and another method adopted, such as that of connecting the bulb to the L.T. terminals of one of the valve-holders in the set. The light will then show when the set is switched on, although it will not indicate whether the pick-up alone is in circuit or the pick-up and microphone together.

B.B.C. XMAS PROGRAMMES

THE B.B.C. announces that when His Majesty broadcasts a message to the Empire at approximately 3.0 p.m. on Christmas Day he will be introduced by a child in New Zealand who has stayed up late especially to hear the King. This child's talk from New Zealand will be the last speech in the programme entitled "This Great Family" in which typical homes scattered throughout the Empire will be linked together for an exchange of greetings.

At 2.30 p.m. the programme opens with carollers in London singing "God Bless the Ruler of This House." Then will follow ten sound pictures, five of them from points in England, Scotland, Ireland, and Wales, and alternating with them one each from Canada, South Africa, India, Australia, and New Zealand. These Empire relays will go right round the clock from breakfast time in Canada to 3.0 o'clock in the morning in New Zealand and in their organisation the B.B.C. acknowledges the close collaboration of the British General Post Office and of the Australian Broadcasting Commission; the New Zealand Broadcasting Board; the African Broadcasting Company, Limited; the Controller of Broadcasting, Government of India; and the Canadian Radio Broadcasting Commission.

Every Christmas since the first year of British broadcasting a carol service has been relayed from St. Mary's, Whitechapel, where the Rev. John A. Mayo gave the first sermon heard on the air in 1922. This year Leslie Woodgate, B.B.C. Chorus Master, has augmented the Male Voice Choir by the B.B.C. Military Band, and, weather permitting, they will take their stand on Christmas Eve in St. Mary's Churchyard for the annual carol service.

Earlier on Christmas Eve listeners will hear a carol service relayed from King's College, Cambridge, in which carols rendered by the Choir alternate with lessons.

Following the weather forecast for farmers and shipping, the National programme on Christmas Day opens with a service from Leicester Cathedral. Musical programmes continuing until 2.30 p.m. will be resumed at 3.15 p.m. and at 6.0 o'clock the first news will be broadcast. A religious pro-

gramme follows at 6.10. "Unto Thou" has been devised by Robin Whitworth, who has included extracts from the great poets and musicians in a framework of passages from the Old Testament story of the Creation. After a brief interval the Boar's Head Ceremony will be relayed for the first time from Queen's College, Oxford, at 7.15 p.m. From 7.30 for two hours the Director of Variety and his producers take charge of the microphone for the Christmas Party which is to be held in St. George's Hall, Clapham and Dwyer, Stainless Stephen, and many other radio favourites will be heard, not only as microphone artists, but participating in the games which are a feature of every Christmas party, and it is hoped that Gracie Fields may contribute to the programme from Johannesburg, where she will be spend-

ing Christmas. After a news summary at 9.30 p.m. an appeal will be made on behalf of the British Wireless for the Blind Fund, after which musical programmes continue, ending with Henry Hall's Hour from 11.0 p.m. to midnight.

On Monday, December 23rd, "The Stranger at St. Hilary," a new play by the Rev. Bernard Walke, produced by Filson Young, will be relayed from the Church of St. Hilary in the Cornish village of Marazion, and in the afternoon listeners will hear music, singing, and speeches from the Guildhall, where the Lord Mayor is entertaining little Londoners to an annual banquet.

Robert Loraine for the first time plays the part of Scrooge in a broadcast on Boxing Day, which will also be notable for a broadcast by the Kentucky Minstrels, produced by Harry Pepper. The Birmingham studios contribute a pantomime, "Dick Whittington," to the Children's Hour, broadcast from all Regional transmitters at 5.15 p.m.

CYCLONA

(Continued from page 369)

kinder guess this is goin' to be sorter interestin'!"

Peter. "Er—er, how do you do—er—er—I think there's been some mistake somewhere!"

Pete P. "So there's been a mistake, has there? Waal, I guess this little gun o' mine can soon put any mistakes right."

Amelia. "Mistake! But do you mean that you're not my Pete—Pete from Mexico?"

Peter. "Mexico? I've never been near Mexico! I'm Peter Peters of 'Cyclona' Vacuum Cleaners, Incorporated!"

Amelia. "Vacuum cleaners! Oh!" (She screams.)

Mrs. B. "Excuse me, ma'am, but I thought as 'ow you could do with a nice cup of tea—Pete!"

Pete P. "Martha! My wife!"

Mrs. B. "So you want a great big loving mammy, do you? Take that!"

(A crash of china is heard and a groan from Pete P.)

Flossie (out of breath). "Please, mum, I couldn't get the tiger sort, so I brought an arum lily."

(Fade in "Coal Black Mammy" music.)

NOTES ON PRODUCTION

In producing a radio play, it should be remembered that the whole action of the play is conveyed by the spoken word, and, therefore, it is as well for each character to adopt some distinctive manner of speech. In this way it is possible for the audience to tell immediately who is speaking. In the case of "Cyclona" the two male characters are "typed" widely apart, and no difficulty should present itself. Amelia's voice should be "fussy" and refined. In the case of Mrs. Bullfinch and Flossie, however, care should be taken to make them quite distinct from one another. Flossie, for instance, might adopt a real cockney accent, whilst Mrs. Bullfinch could get a north country intonation into her voice.

In the play there are one or two instances when the allusion has to be created that the characters are coming in or going out of the room. This effect is very simply reproduced by the speaker slowly turning towards or away from the microphone. The play should, of course, be thoroughly rehearsed beforehand, and for the final rehearsals the producer should hear the play in another room, through a loud-speaker. In this way he is putting himself in place of the audience, and will be able to clear up any faults which might not previously have been apparent to him.

Special Sets for Quick Assembly

Constructional Details of a Few Simple Receivers which can be Built very rapidly from Odd Parts

It is often required to make a receiver quickly, due to the normal broadcast set having developed a fault which cannot quickly be remedied, or because a receiver is being used for experimental work. There are other occasions when a set additional to that normally used for broadcast reception would be very useful, especially at Christmas time. For example, most members of the party may be listening to a variety programme when one or two members wish to hear the news.

An Ultra-simple Crystal Set

The latter requirement could well be catered for by having a crystal set with one or two pairs of 'phones; this could be used by those few who wished to hear the news bulletin, and the main broadcast receiver could then be left undisturbed. A simple, though reasonably effective, crystal set can be made in half an hour or so by following the connections shown in Fig. 1. It will be seen that the only parts required are: a hank-wound coil, of which details will be given later; a .0005-mfd. pre-set condenser; a crystal detector; and a .001-mfd. fixed condenser, and a pair of 'phones.

A little set like this can be used only for the two programmes from the local transmitters, since it does not possess any high degree of selectivity, besides which the tuning range is very narrow because of the small capacity-range of the pre-set which

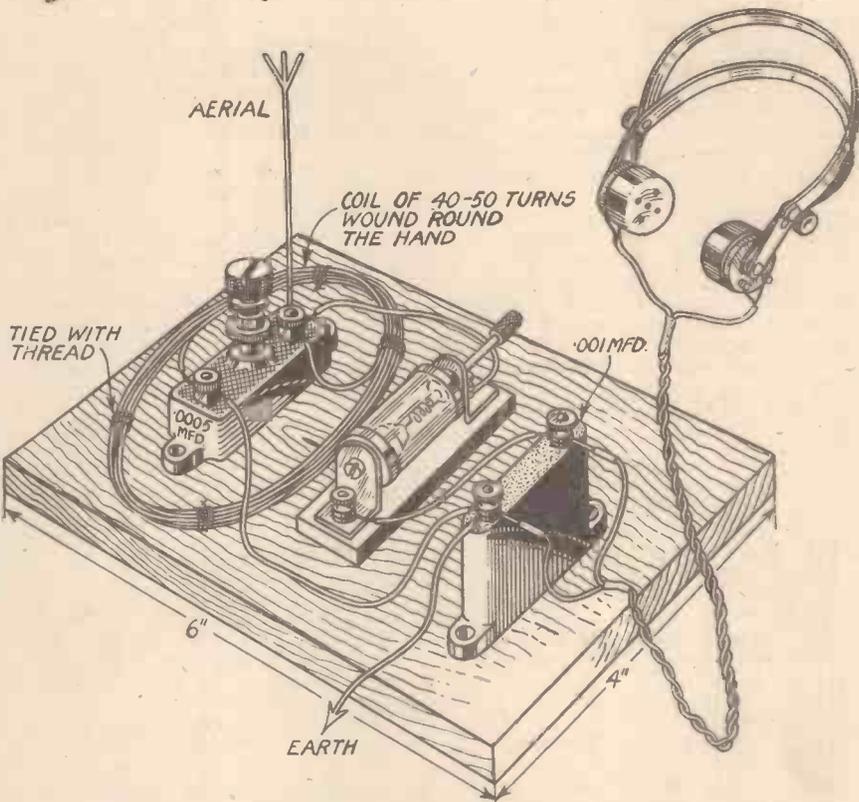


Fig. 1.—A simple crystal set which is suitable for reception of the local stations. It can be made in half an hour or less.

serves for tuning. The coil is made simply by winding about fifty turns of wire round the hand, making a rough hank, and then

binding the turns together by means of lengths of thread or string. The gauge of wire is not important, and anything between 22- and 36-gauge will serve almost equally well. The number of turns mentioned is approximate, and might require to be varied slightly according to the type of aerial in use, the wavelengths of the local stations, and the size of the hand on which the coil is wound. In most instances where an average type of outside or long inside aerial is employed, fifty turns will enable wavelengths up to nearly 500 metres to be reached, and the lowest wavelength covered will be about 350 metres.

The Coil and Detector

It will generally be found most convenient, therefore, to use fifty turns in the first place, and then to try the set. As long as the nearest transmitter is not more than twenty miles or so away it should be heard whether the coil is of perfectly correct size or not. If it is found that signal strength increases as the knob of the pre-set is screwed out (reducing the capacity) it will be a sign that a few turns should be removed from the coil. On the other hand, if signal strength continues to increase as the knob is screwed down it will be known that a few turns should be added.

It will be evident to most readers from Fig. 1 that the crystal detector shown is of the old-fashioned glass-tube type, and this will be found in the "junk box" of most amateurs. Those who require to buy a component, however, will find that most of the old-established wireless dealers can supply very cheaply. Alternatively, it might be preferred to obtain a detector of the semi-permanent type such as was referred to in the article in last week's issue

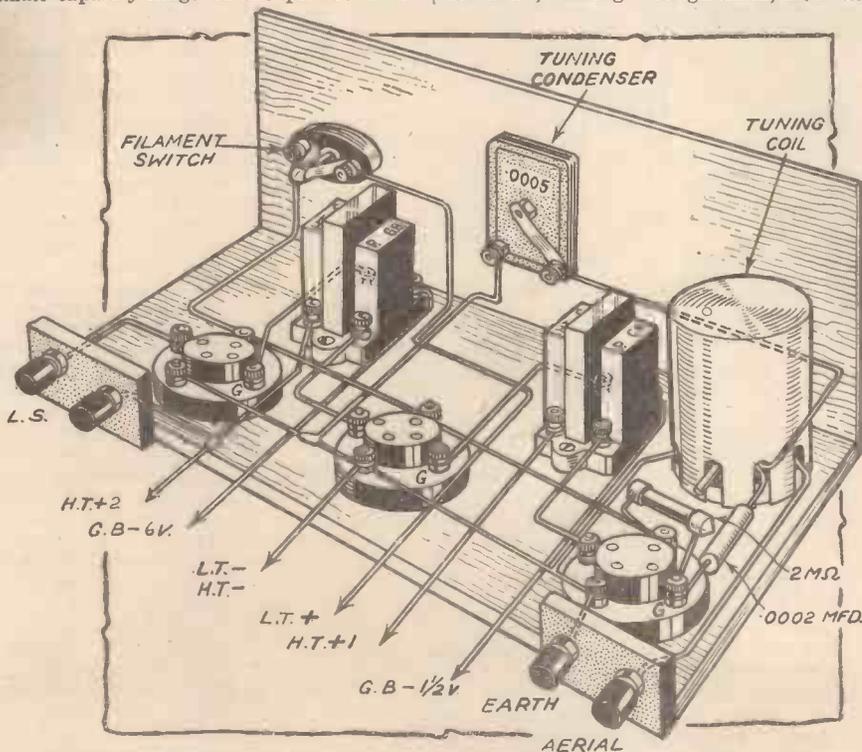


Fig. 2.—Here is a pictorial plan of the simplest type of Det. 2 L.F. receiver, which can be made from any odd components. Almost any coil may be used—even that shown in Fig. 1, when medium-wave reception only is required.

of this journal under the heading of "Finding and Making the Best Coil." Incidentally, it might be added that those who would like to make a rather more elaborate crystal set than that referred to above will find constructional details in the article just mentioned.

A One-hour Three-valver

When loud-speaker operation is desired—when the receiver is intended to give reception of a different station in a second room—a valve set is obviously required. Local station reception only will be necessary, because any distant stations can be received with the standard set, and so the simplest possible type of three-valver will fill the bill. Very few components are required to make a satisfactory instrument, as can be seen from Fig. 2, which is a pictorial wiring plan of a set of the type in question. The valves are arranged as a detector followed by two transformer-

more than 1 : 2 or 1 : 3 for the first position. Even then there might be some distortion if the second one has a ratio higher than 1 : 5, especially if the component is a cheap one; this trouble can be overcome most easily by connecting a fixed resistance of about 100,000 ohms between the two secondary terminals of the second transformer. The effect of reversing the connections to the primary winding of each of the transformers may also be tried if any difficulty is experienced.

A Two-valve Loud-speaker Set

If there are insufficient parts available for a three-valve set such as that dealt with it might be possible to make a two-valver by following the connections given in Fig. 2, but omitting the second transformer, the third valve-holder and the second G.B.—connection. When this is done the speaker, or a pair of 'phones, is simply connected in place of the primary

very small box—a fifty-size cigar box is generally suitable. Details of a suitable arrangement are shown in Fig. 3, where it will be seen that the valve-holder is of the five-pin type intended for a pentode, that a form of frame aerial takes the place of extended aerial and tuning coil, and that high- and low-tension supplies are obtained from dry batteries. Actually, a 16½-volt G.B. battery, or two 9-volt batteries in series, is suggested for H.T., and the L.T. current is taken from a small 3-volt battery such as is used for cycle lights and similar purposes.

Aerial-coil Details

Those who have not tried an arrangement such as this might think that it would not prove at all satisfactory, due to the extremely low voltage used for H.T. In practice, however, it works remarkably well, when the valve is of the high-efficiency low-frequency type, and is reasonably effective with an H.F. pentode. Dimensions are not given, because they will vary with the actual components used and with the type of box or attaché case into which the set is to be fitted. The main item is the frame aerial, which comprises both tuning and reaction windings. Both may consist of 28-gauge d.c.c. wire, and the tuning winding should comprise about 65ft. of wire in all, assuming the box round which it is wound to be such that each turn is about 2ft. long; if the box is smaller than this, the length of wire should be reduced, and if it is larger the length may be increased up to about 75ft. In any case, it will probably be necessary to adjust the exact number of turns by trial, after the receiver has been set into operation. The amount of wire used for the reaction winding should be between one quarter and one third of that used for the tuning winding, and the two windings should be placed about ¼ in. apart. The turns of wire should be placed side by side if possible, but otherwise they can be piled wound in sections; that is, five or six turns can be wound together in a bunch, after which another half-dozen can be wound in the same manner, and so on to the end. It will be understood that the frame aerial described is intended only for medium-wave reception, since the number of turns which would be required for long waves would be greater than could conveniently be crowded into the available space. As a 3-volt battery is used for L.T. supply and the valve filament requires a voltage of only 2, it is necessary to include a dropping resistance in the L.T. circuit, and this should have a value of 5 ohms for a .2-amp. valve. It can be made by winding about 18 yards of 32-gauge enamelled copper wire on a strip of ebonite or fibre, as shown. The wire is wound first in one direction of the strip and then in the opposite one so that the resulting coil is non-inductive—this is important. Resistance wire could, of course, be used, and a much shorter length would be required, but this is not so easily obtainable.

It is not necessary to describe the positioning of the parts in the containing case, since this is by no means important, and in any case it must vary with the size and shape of the container.

The range of the receiver described is not great, but it should give moderately good 'phone reception of three or four stations, and it can certainly be relied on to give very satisfactory results on the local stations up to thirty to fifty miles. When the set is being used at home its range can be increased by using an H.T. battery giving a voltage up to 100.

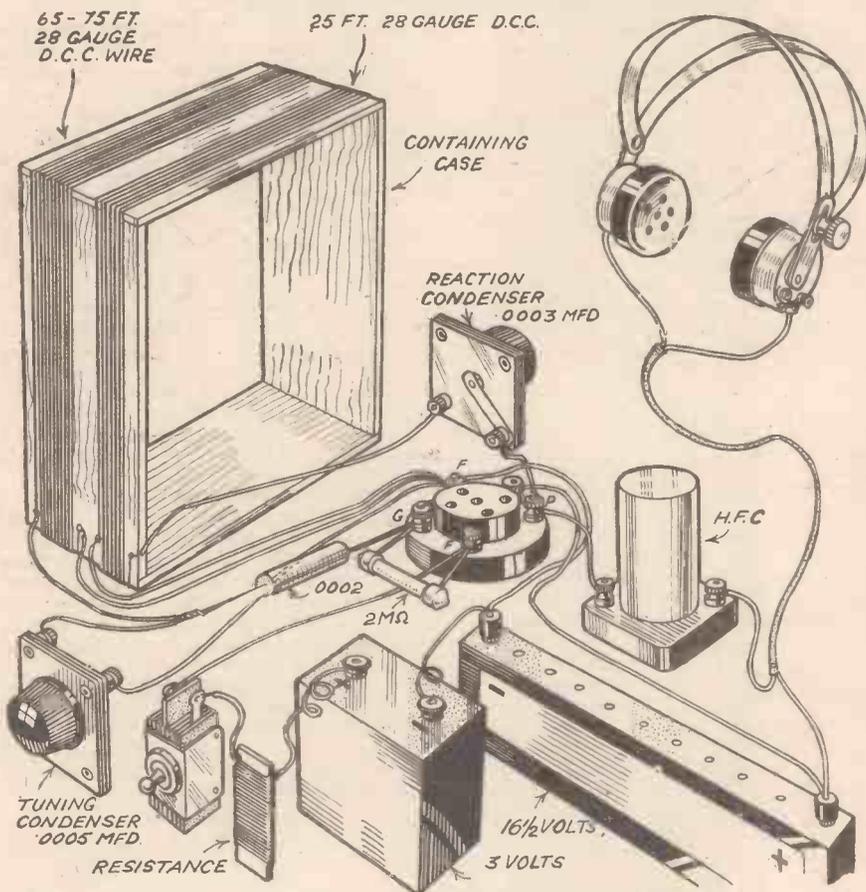


Fig. 3.—A reasonably efficient single valve pocket set can be made as shown here by using a pentode valve which may be fed from a 3-volt battery for L.T. and a 16½-volt G.B. battery for H.T.

coupled L.F. stages, and reaction is dispensed with in the interests of simplicity.

It is not necessary to detail all the components required, since these are shown clearly enough in the illustration; besides they are by no means critical as regards their make and exact type. Thus, the tuning coil may be of almost any kind intended to cover the medium- and long-wave bands, and it is tuned by a .0005-mfd. variable condenser which might be of either the bakelite or air-dielectric type. The two transformers are probably the most critical components of all, since if both are of the high-ratio kind it is not unlikely that distortion, and perhaps instability as well, will be troublesome. When a few transformers are available from which a choice can be made it is best to have one of not

winding of the second transformer. When using this arrangement it is preferable to have a pentode valve in the second holder, and this necessitates the use of a five-pin holder, of which the centre socket should be connected to the main H.T. + lead.

One-valve Pocket Portable

If it is proposed to go away for Christmas it might be thought worth while to take a small portable set which can be used for the reception of special items in conjunction with a pair of 'phones. A set of this nature is also useful as a stand-by for use in a room some distance away from that in which the standard receiver is installed, and therefore away from the aerial lead-in. A simple type of portable for use with a pair of 'phones can be made to fit into a

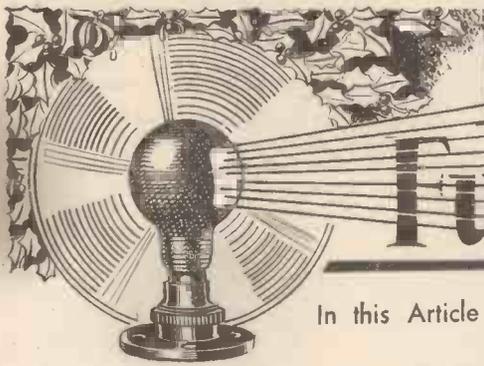


Photo-Electronic Fun for Christmas

In this Article some Suggestions for Interesting Experiments based on the Properties of Neon Lamps and Photo-electric Cells are given.

CHRISTMAS is the one season in the year when the scientific amateur, usually unhonoured and unsung in his own family, has an opportunity to shine for once, and to produce experiments and mysteries for the amusement of the family circle and guests. Quite apart from this aspect, however, it is both useful and instructive to try out a few novel and unconventional experiments for his own benefit.

Given a fairly comprehensive collection of apparatus, such as any serious amateur and particularly the television experimenter possesses, very much can be done in these directions. In most cases, if the experiments are to be performed before a small audience, a certain amount of preliminary rehearsal and preparation is necessary, and it is therefore better to try out each stunt first of all in the privacy of the "den."

Television transmissions are now not available for employing disc or mirror drum receivers, but some interest can be aroused by a rather crude method of home television transmission. Two disc scanners will be required, one complete with neon lamp and connected to the output of a low frequency amplifier, and the other "doctored" to contain a 100-watt projection-type lamp in a box having an aperture corresponding in size and position to the viewing tunnel of your television receiver. With this you can scan some simple object such as a bold black-and-white design drawn on thin frosted glass when the disc revolves. If, now, you have a sensitive photo-electric cell and fit it so that the light passing through the glass falls upon the cell and connect the cell to the input of the amplifier (preferably R.C. coupled), a televised reproduction of the object will be seen in the viewer. This should be tried in your den at first and, according to your success, you may give demonstrations to your friends, and it may even be possible to organise a guessing competition in which they are asked to recognise the drawings thus televised.

Televising Sound

In the days when low-definition television transmissions were broadcast from the B.B.C. stations, many listeners inadvertently tuned in the sound receiver to the "vision" transmission and heard that distressing noise which always resulted. It is rather amusing to reverse the process and to tune in a sound programme on a television receiver. The neon lamp must, of course, be connected to the output terminals of a receiver in place of the speaker, and the output voltage must be adequate to modulate the light in the ordinary way after it has been rendered incandescent from a D.C. source. Using the radio side of the complete equipment to pick up broadcast programmes, or the

pick-up circuit with musical records, you will see amazing and ever-changing patterns in the "viewer." Should you possess a set of the constant frequency records used for testing purposes, the pattern you will obtain will be a steady one, but the introduction of harmonics, due to either faulty recording or distortion in any part of the set, will cause the pattern to vary.

Even if you have not a disc scanner available, you can obtain a measure of amusement by connecting a neon lamp to the output of any ordinary radio receiver in place of a loud-speaker. The intensity of the light will vary in a most peculiar way, not only in accordance with the loudness of the item being broadcast, but also in time to the music. When using a gramophone pick-up instead of the radio side of the set, make your audience guess the tunes being played from the visual indication of the rhythm by the neon. The best way is to select, say, a dozen records of well-known and popular tunes, each with well-marked rhythm. Read over the titles slowly twice to your audience. Then "play" the records through in any jumbled order, asking the party to write down the titles in the order they are being played.

A small prize to the one who produces the most correct list will round off this game very well. It is really extraordinary how easily some people will identify tunes merely from the rhythm, which shows how much this particular characteristic of music plays a part in modern musical appreciation. By the way, be careful that the tune is not "given away" by the vibration of the pick-up itself. The lid of the gramophone should be closed during each performance, and if your pick-up is particularly bad in this respect it may be

necessary to place the gramophone in another room and "relay" the whole proceedings.

The Talking Ray

Have you ever tried modulating light by sound? It seems a queer idea, of course, but it is really quite easy and the experiment is not only interesting to the amateur but also impresses a non-technical audience. One has to remember that there is very little difference between the waves which we call light and those which we call radio waves, except in the matter of wavelength and carrying power, so that if the brightness of a beam of light can be varied in sympathy with, say, musical notes, and the varying light allowed to fall upon a sensitive photo-electric cell, it should be possible to reproduce music transmitted on a beam of light.

This has been done as a laboratory experiment, and also as an exhibition stunt. It is also quite within the capabilities of any amateur possessing a gramophone with pick-up, a photo-electric cell, and a low-frequency amplifier.

The "transmitting station" consists of the gramophone and pick-up as the modulating member, and a small flash-lamp bulb and battery, the lamp being fitted in a parabolic or approximately parabolic reflector. The output of the pick-up is led to the primary of an L.F. transformer, the secondary winding being connected in series with the lamp and battery. This is necessary for two reasons: first, because the winding of the pick-up is not designed to carry the current of even a small flash lamp, and second, because a certain amount of amplification is usually

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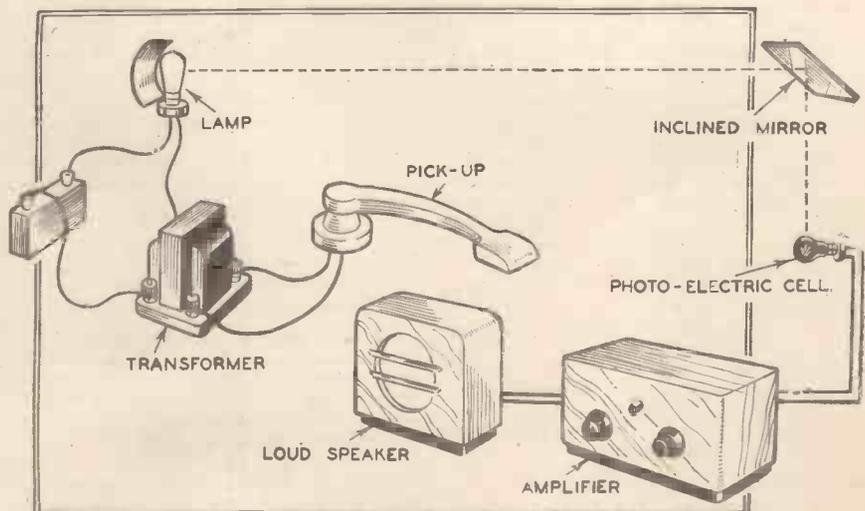


Fig. 1.—Using a beam of light for the transference of sound.

(Continued from previous page)

required to provide sufficient audio-frequency voltage to vary considerably the brightness of the lamp. When working, the lamp will flicker in a rather fascinating manner, but the full beauty of the experiment is only obtained when these flickerings are converted back into sound.

At the receiving end you must fit up some form of optical system to collect the "talking ray" and re-direct it on to the photo-electric cell. The simplest form is a piece of mirror fitted at an angle of 45 degrees (as shown in the sketch, or a "totally reflecting prism" may be used instead. The photo-electric cell will, of course, be connected in the grid circuit of the low-frequency amplifier and a loud-speaker used for the final reproduction of the sound.

You must not expect extraordinarily good quality from this method of transmission; in fact, the reproduction is apt to be rather woolly because the filament of the lamp is unable to follow in temperature variation the rapid current fluctuations corresponding to the higher audio frequencies, but speech and music will be quite recognisable. Instead of a pick-up, a microphone can be employed, and in any case preliminary experiments should be carried out to ascertain what degree of amplification is necessary, both prior to light modulation and in the receiving apparatus.

Useful experiments in this direction can also be done by modulating the light of a neon lamp instead of a flash-lamp bulb. In this case the lamp must be connected in the anode circuit of the output valve in an audio-frequency amplifier, the pick-up being joined in the grid circuit of the first amplifying valve. It is probable that far better quality will now be available, since the light of the neon lamp is not produced by raising the temperature of a filament, and the lamp is therefore much more sensitive to voltage variations.

Invisible Light

Experiments with photo-electric cells involving the use of a visible light source are apt to fall a little flat so far as mystery is concerned, because they are rather obvious, but it should be remembered that the more sensitive types of cell will work satisfactorily with infra-red or "invisible" rays. These rays can be produced conveniently by enclosing the light source in a light-tight box, the side of the box facing the photo-electric cell being composed of very thin sheet ebonite. This allows the infra-red light to pass through the ebonite and with such an invisible source of radiations many very mysterious tricks can be done.

For example, a fitting conclusion to a series of card tricks is to use a "magic light." You perform one of the usual types of trick in which you agree to find a card chosen by one of your audience, and you carry it to the point at which you have

actually found the card in question, but you conceal this fact from your audience. Then you point to some grotesque or comic figure which you have previously prepared and placed upon the table and explain that your "oracle" will reveal the card. You present the cards before this image one at a time until suddenly the image is suffused with an orange glow when you show the card which you are holding at the moment and it proves to be the chosen one. The method is very simple. You have already isolated the chosen card by the ordinary process of the trick, but in order to work the mysterious oracle you pass that particular card between a hidden invisible ray source and a photo-electric outfit which forms part of the paraphernalia on your table, this causing a relay to operate and to switch on one or more small neon lamps arranged in or around the oracle.

Photo-electric Cell Tricks

Although the commonest of the applications of a photo-electric cell, namely, the making or breaking of a circuit by the interruption of a beam of light falling upon a cell, has been given wide newspaper pub-

children are told that Father Christmas is about to enter. All the lights are switched off. Suddenly, the sound of sleigh bells is heard. They cease; there are steps on the stairs; the door opens, and the traditionally red-cloaked figure enters. He takes up his position near the Christmas tree, speaks his traditional words of greeting, makes a magic pass with his arm and, behold! the tree springs into light. The explanation is quite simple. The switch in the decoration lamp circuit is controlled by a relay and photo-electric cell, which is itself energised by a beam of infra-red light as already described. The positioning of the light source and cell is such that the beam cannot be interrupted by the ordinary activities of the guests. (The cell, for example, may be hidden by decorations hanging from the ceiling or curtain pelmet.) But Father Christmas, in his magic passes, reaches up and interrupts the invisible ray, and on come the lights.

A still more exciting game, something on the lines of the popular game of "murders," can also be organised by means of a photo-cell detector. The cell, light source, and also a small spot-light are installed in some remote part of the house—it might be under

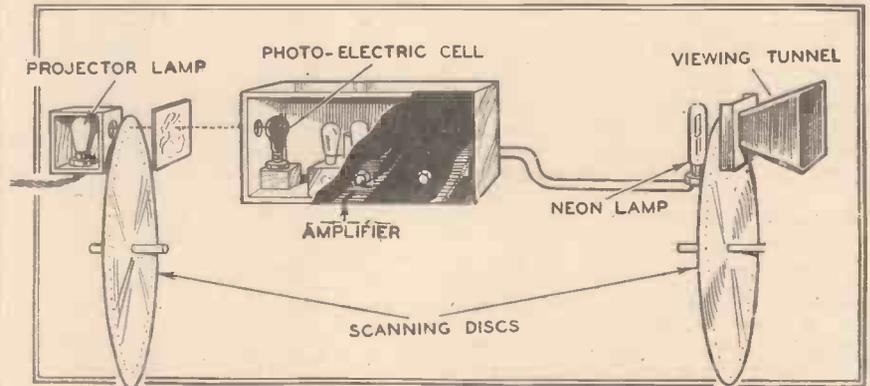


Fig. 2.—Simple television transmission and reception using disc scanners.

licity for many years, the average man in the street does not seem to have absorbed the idea, and many simple tricks can be given with this type of apparatus with very good effect.

A little imagination and ingenuity, together with the possession of one or two suitable relays, gives a very wide scope. One very effective device can be tried at that culminating point in a Christmas party for children when the Christmas tree is first illuminated. Usually the tree is hung with miniature electric lamps connected in a long series and worked from the house supply. The actual illumination ceremony is generally the prosaic one of switching off the room lights and switching on the decoration lamps.

Instead, an air of magic and mystery can be given to the proceedings in the following manner. At an appropriate moment the

one of the beds, in a cupboard, between two pieces of furniture—anywhere. This is fixed up by the arch-conspirator while the guests are assembled in one room. Then the organiser returns to the room after having carefully switched off every light in the house. He then sends the whole party out to scour the house in utter darkness, telling them that the one who is detected by his magic ray will be the winner of a prize. There will be much fun when a dozen or more excited people grope around in the dark and creep into all sorts of unlikely places until someone, quite suddenly, is spotted by the electric eye, and is illuminated by the spot-light. Many modifications of this stunt will no doubt suggest themselves, and the actual methods employed may be varied in accordance with local requirements and the actual apparatus available.

Bristol and West Country Listeners

WE learn that the controversy has again been raised in Bristol about the predominant Welsh character of the programmes broadcast from the West Regional station and the suggestion that they are of little interest to Bristol and West Country listeners.

Now that there are well-equipped studios in Bristol itself, it is maintained that Bristol artists and Bristol interests should be studied at greater length.

Car Radio in Paris

AT the request of *Le Petit Radio*, Paris, newspaper, the Paris Police Chief has

given the following opinion on car radio in taxicabs:—

"Investigations show that the presence of car radio in Paris taxicabs has had no

influence on the number of accidents, and there is no distraction of the driver." Over 2,500 Paris taxicabs are fitted with car radio.

Two Fine Annuals!
HOBBIES NEW ANNUAL
 and
MARVELS OF MODERN SCIENCE
 3/6 each, or 3/10 by post from Geo. Newnes, Ltd., 8-11, Southampton St., Strand, W.C.2.

Proposed High-power Station for North Africa

ALTHOUGH Radio-Maroc can be heard nightly, it is seldom that Radio Algiers can be picked up clear of interference, although both share channels with Swedish transmitters. However, in order to provide a service to Algeria, Morocco, and Tunisia, the French P.T.T. proposes to endow Algiers with a 200-kilowatt station in the course of 1936.

NOTES AND NEWS

C.C.4895

A Change of Address

OWING to the increasing demand for short-wave components, British Television Supplies, Ltd., have removed to larger premises. The new address is Faraday House, 8-10, Charing Cross Road, London, W.C.2. Their telephone number remains unchanged at Temple Bar 0134.

Further Television Difficulties

MORE television difficulties. . . . This time it is lack of money. The alterations to Alexandra Palace are proving costly. The installation of the plant alone will cost £120,000.

The B.B.C. grant from the Government for the provision of a service is £180,000, which leaves only £60,000 for building operations and for programmes. The position will be discussed when the Ullswater Committee sits again at the end of this month. The Committee will recommend more money for television. The extra cost will be defrayed by the treasury.

Until the recommendation has gone through—and the Committee's report is not expected now until January, 1936—the future of British television remains obscure.—(*Daily Express.*)

A Self-recording Disc

MARKETED under the name of "Simplat," a new type of self-recording disc has been produced by the V. G. Manufacturing Co., Ltd., of Gorst Road, Park Royal, London, N.W.10.

Details relating to the process involved in recording on the surface of the record are not available at the moment, but it is stated that it will appeal to all users of recorded music and speech.

"Cavalcade of Variety"

H.M.V. have recently released two records—H.M.V. 2795-6—of the Royal Command Performance, which was not broadcast this year.

We learn that the above firm's mobile recording unit managed to obtain the performances of Florrie Forde, Gus Elen, Kate Carney, Harry Champion, Arthur Reece and Alice Leamer. On these discs, the titles of which are "Cavalcade of Variety," has been obtained the atmosphere of the great occasion, even to the chuckles of the audience.

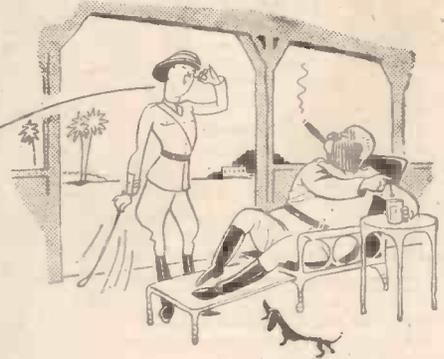
Profits from the sale of these records are to be handed by H.M.V. to the Variety Artistes' Benevolent Fund, while a special set of records in a royal blue album is to be presented to the King and Queen as a memento of the Royal Variety Performance in Jubilee year.

A Constant-frequency Disc

A CONSTANT-FREQUENCY record which should prove very useful for testing pick-ups, speakers, amplifiers, acoustic gramophones, etc., is included in the new list of Brunswick records.

It is calibrated from 250 to 6,000 c.p.s., with a rated accuracy of within one per cent. for frequencies and $\pm \frac{1}{2}$ db. It is a 12-in. disc, number EXP 55, and costs 4s.

As they say at the Outposts of Empire :



BETTER BUY CAPSTAN,

they're blended better

- they're Wills's!



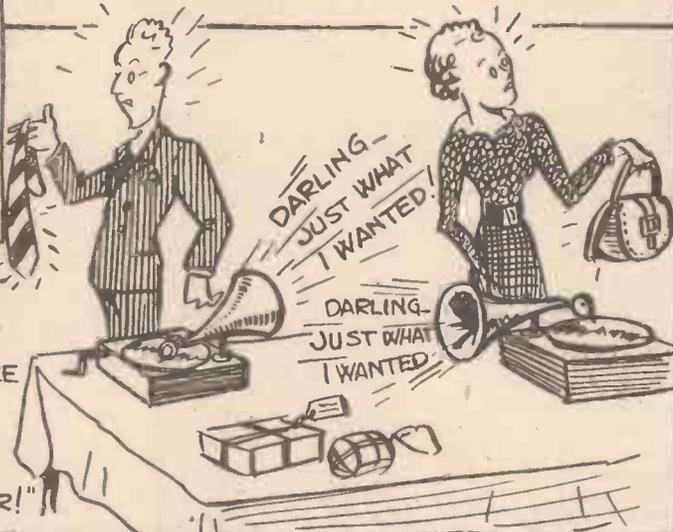
CAPSTAN CIGARETTES
PLAIN OR CORK TIPPED

10 for 6d.
20 for 11½d.

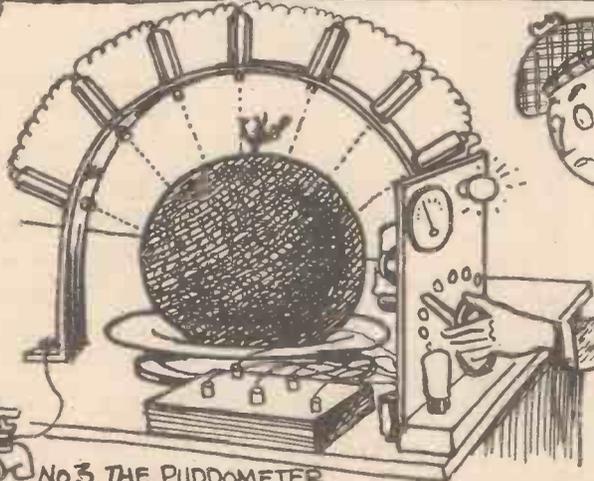
MASTER BATTISIN BELFRY, THE YOUTHFUL INVENTOR, WHOSE EPIC EXPERIMENTS LAST CHRISTMAS WITH THE "SANTA-TRAP" DEFINITELY PROVED TO A PERPLEXED WORLD THAT FATHER CHRISTMAS WAS A MYTH, A FRAUD & A DELUSION, ONCE AGAIN HITS THE SCIENTIFIC HIGH-SPOTS WITH INVENTIONS OF SEASONAL INTEREST.



No.1. THE HYPOCRITOGRAM
FOR USE WHEN OPENING CHRISTMAS PRESENTS. SAVES BREATH, CONSCIENCE & BLUSHING. OTHER RECORDS OBTAINABLE:- "WHO TOLD YOU?" "ISN'T IT SWEET!" & "WELL I NEVER!"



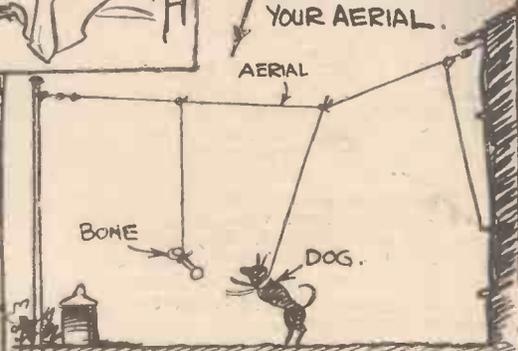
No.2. ALARM BELL.
A SIMPLE DEVICE WHICH WARNS PARENTS WHEN THEIR OFFSPRING HAVE HAD ENOUGH PUDDING. MODELS FOR ADULTS ARE SUPPLIED DISCONNECTED. (THIS ALLOWS FOR UNLIMITED EATING.)



No.3. THE PUDDOMETER.
ENABLES ONE TO FORECAST THE EXACT POSITION OF THE THREEPENNY PIECE & THUS ENSURES A HAPPY CHRISTMAS. NOTE:- COMMON SENSE DEMANDS THAT THE OPERATOR SHOULD BE IN A POSITION TO SERVE THE PUDDING HIMSELF!



No.4. THIS WILL KEEP THE SNOW OFF YOUR AERIAL.



TECHNICAL EXPLANATION:- ANCHOR A HUNGRY & HIGHLY-STRUNG DOG TO THE AERIAL WITH A PIECE OF INSULATED WIRE. SUSPEND A BONE JUST OUT OF ITS REACH. THE EFFORTS OF THE DOG WILL OSCILLATE THE AERIAL & PREVENT SNOW FROM REMAINING ON IT.

No.5. THE TELEPATHOGRAPH
WITH THE AID OF THIS SIMPLE LITTLE MACHINE ONE MAY READ BETWEEN THE LINES ON A CHRISTMAS CARD & OBTAIN ITS REAL MESSAGE. AN EXAMPLE IS GIVEN. (TOP) THE CARD AS RECEIVED. (BOTTOM) THE SAME CARD VIEWED THROUGH THE TELEPATHOGRAPH.



STOP PRESS:- MASTER BELFRY WISHES TO STATE THAT ANY OF THE ABOVE INVENTIONS WILL BE FORWARDED TO READERS ON RECEIPT OF A STAMPED, ADDRESSED PANTTECHNICON. WRITE B. BELFRY ESQ. CUCKOO KOT, SOLLIS ISLES.

ARTHUR ASHDOWN

TELENEWS

The Alexandra Palace

IT is understood that the B.B.C. have encountered a measure of difficulty in connection with the mast, and dual sound and vision aerial system, which is to be installed at the Alexandra Palace. The Air Ministry stipulated a maximum height which was less than that proposed originally by the B.B.C. An alteration to the original specifications had, therefore, to be made, and it is stated that the work is now well in hand. There seems little doubt that the early part of next year will see the first high-definition television signals radiated, and so stimulate activity among manufacturers and home constructors on the questions of suitable receiver designs.

New Television Service from Hayes

WE understand that the H.M.V. people are entering the television field in the near future with an experimental high-definition service. The transmitter will be similar to the one used by the B.B.C. for their new service commencing in March next year. In connection with the new service a 200ft. mast has been erected, and this carries red lights to warn aircraft at night.



The 200ft. mast to be used for the experimental television service from Hayes.

Cinema Television Developments

THAT work on television systems for use in cinemas is going ahead is borne out by details of patents relating to this work. For example, in one case it is proposed to change progressively the effective position of the scanning strips in a reverse direction to the film movement so that every film frame may be scanned, in, say, half the normal time taken for a picture frame to pass the gate. By this method it is claimed that the actual transmission channel is only used intermittently. Another idea is put forward in order to overcome any form of shutter loss when it is decided to scan a film passing through an intermittent type projector. For this purpose use will be made of a shutter disc and two half lenses. With this scheme

one lens remains stationary, while the second has a reciprocating movement in order to bring about a stationary image of the film, although the last named is in motion.

B.B.C. Television Plans

THE B.B.C.'s director of television, Mr. Gerald Cock, has recently been disclosing some of his plans for the new high-definition service. Owing to the new appeal to sight, it has been decided to have both a man and woman announcer of outstanding personality, who will not only televise well, but have good memories, for it will not be possible to read any announcements. The three separate daily transmissions are scheduled for 3 p.m., 6 p.m., and 9 p.m., subject to the approval of the Television Advisory Committee. Realising that initially it will not be possible to concentrate one's attention on the television receiving screen for long periods as far as each item is concerned, it is

proposed to limit the time of each turn to a maximum of fifteen minutes. A variety of subjects will be included, and among those mentioned as possibilities are excerpts from films, cabarets, variety turns, dances, descriptions of new inventions, or products (the subjects will actually be brought to the studio and televised), fashion parades, and possibly a special version of "In Town To-night." An orchestra numbering twenty is being formed and the individual members will be clothed in suits which televise well. For the interval signal a clock face will be faded into the screen. The question of programme relays is rather nebulous at present, owing to the high cost of the appropriate cable (about £1,000 per mile), but as an alternative it may be possible to use directional micro-waves. The first signal tests are scheduled for February and plans for expansion inside the Alexandra Palace are already being made.

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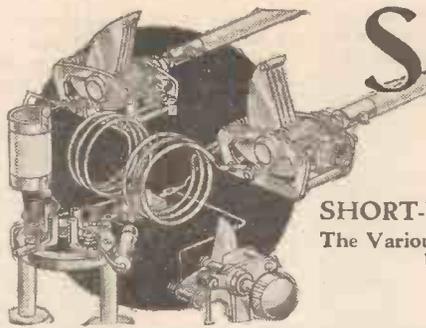
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Short Wave Section

SHORT-WAVE RECEIVER CALIBRATION
The Various Methods of Calibrating and the Instruments Used are Discussed in this Article.

By S. W. MANN

ALTHOUGH opinions differ concerning short-wave circuits, in one respect short-wave listeners, experimenters, and constructors are agreed with regard to receiver calibration. All realise that in order to derive the most satisfactory results from an adapter, converter or receiver, calibration in either wavelength, frequency, or megacycles is necessary.

There are various methods of calibrating. Known stations may be tuned in, the dial readings noted, and from data thus obtained graphs may be plotted. Alternatively a wave-meter may be built, calibrated, and used in conjunction with the receiving apparatus. The most suitable method to adopt depends upon circumstances, also the kind of receiving apparatus used.

If the receiver is a battery-operated detector-low-frequency combination, a fair measure of accuracy may be obtained. The application of reaction, however, is apt to call for a slight readjustment in tuning, and this brings to mind the fact that H.T. voltages, when varied, also affect tuning. To obtain at least a fair standard of accuracy, it is most desirable to check voltages and adhere to them.

It is appreciated that when a screen-grid valve is used as a detector, the relations between the plate and screen-grid voltages are critical, and careful adjustment is necessary in order to obtain smooth reaction and freedom from dead spots. From the foregoing it will be realised that direct calibration, whilst undoubtedly an advantage, must be carefully carried out in order to be a real help and not a hindrance when adapted to simple apparatus.

Applications

Now let us consider the application of this principle to mains or battery-operated T.R.F. receivers, in which one or more stages of screen-grid high, or radio, frequency are employed, together with the detector volume control.

The volume control is a variable potentiometer, which regulates or controls the screen voltage of the S.G. H.F. valves. When tuning for weak signals, sensitivity may be increased by reducing the screen voltage and readjusting the reaction control. These adjustments, however, cause a variation in dial readings, and it will be understood that dial readings will vary according to whether a given transmission is received at maximum or minimum volume, low and high sensitivity respectively.

Careful consideration of the various points outlined in the case of T.R.F. receivers clearly indicate that accurate calibration under varying conditions of operation, that is technical as well as climatic conditions, is more or less impossible using the direct dial reading to graph method.

We are aware that manufacturers calibrate their single control superheterodynes directly, i.e., the tuning scale is marked in frequencies, wavelengths, or megacycles.

Viewed from the constructor's point of view this is not a difficult undertaking, but for various reasons cannot be adopted by home-constructors. In any case a high standard of accuracy is difficult to obtain, errors of .05 megacycles on the six megacycles band are not unknown.

This discrepancy is indeed small, nevertheless it calls for correction. When tuning, the operator must take this error into account, in addition to similar ones on other bands. Thus direct calibration is not dead accurate, but is simply a means whereby an approximate idea of wavelength may be obtained without reference to graphs.

One thing must not be overlooked, namely, that the usefulness of signal measuring and checking apparatus is governed by the accuracy of its calibration.

Independent Measuring Apparatus

With this fact in mind, together with a definite and practical understanding of amateur working conditions and individual limitations, it is clear that, in order to achieve a reasonable standard of accuracy with reference to frequency measurement, the most satisfactory thing to do is to build independent measuring apparatus, check up on crystal or other drive controlled transmitters of known accuracy, and carefully plot suitable tuning graphs from the data thus obtained.

The triode and dynatron type wave-meters are gaining popularity. I do not propose to comment upon the comparative advantages of the respective types, but merely to point out to those who are interested that wave-meters of these types are ideal instruments for use in conjunction with modern short and all-wave receivers.

Irrespective of circuit considerations, the main feature is that a source of constant and modulated signal generation is always to hand, which, apart from frequency measuring, has many other applications.

Various factors must, however, be taken into consideration when constructing this type of wave-meter. For example, the valve used must be a good one, and new for preference. An old out-of-date valve on hand is no excuse for undertaking the construction of an oscillating wave-meter. When emission is faulty, calibration is difficult, inaccurate, and consequently useless.

The tuning dial and associated variable condenser must be of rigid construction and smooth in operation. Mechanical and electrical efficiency are most desirable, and special short-wave types should be used. Internal wiring should be carried out with heavy gauge wire, and thus ensure that accurate calibration will be maintained within reasonable limits.

Tuning Coil Windings

Tuning coils may be wound on standard commercial formers. Alternatively, valve bases or paxolin formers. Windings may

be spaced or close wound. The main point is to avoid any chance of coil windings being displaced due to constant handling.

Low-loss principles are quite unnecessary in wave-meter coil construction, and there is absolutely nothing against close winding of turns followed by the application of two or more coats of shellac varnish, in order to avoid displacement of windings.

Screening

Modern practice in wave-meter design favours complete screening, which is to be strongly recommended. Even though completely screened, a strong, sharply-tuned signal may be obtained, using but a comparatively low plate voltage on the plate of a triode valve. About 16 volts, and in some instances less, is all that is necessary, but this depends upon the relation of one winding to the other. One quarter-inch between grid and reaction is ample. A standard type power valve is also quite suitable; other types, of course, may be used if of comparatively low impedance.

A sheet metal or foil-lined cabinet can be made at low cost, and whilst it is common practice to include the coils inside, along with the other components, the writer favours the practice of mounting the coil base on top of the cabinet, and screening the coil with a standard screening can. If this procedure is adopted, the cabinet can be closed up once and for all, and thus the chances of altering the original calibration due to the displacement of internal wiring is avoided. Batteries may be accommodated in a separate compartment or clipped on the back of the cabinet. If copper foil is used to line the cabinet each piece should be bonded to the next by means of small screws and washers, so that good electrical contact exists throughout. After bonding, test for continuity throughout; the earth side of filament should be earthed to screening.

The use of long extension rods in S.W. receivers is not recommended, apart from the ultra high-frequency type as at present, the use of a four-inch condenser extension rod in an oscillating wave-meter being preferable.

The number of coils required will depend upon the method of calibration to be adopted, i.e., harmonic or fundamental methods respectively. In conclusion, irrespective of type, careful construction and careful calibration will prove to be worth while, because station finding and identification will be greatly facilitated.

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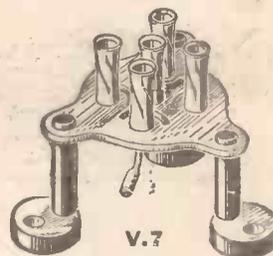
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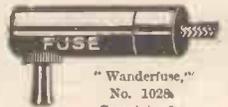


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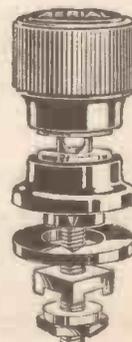
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Facts and Figures

Premier All-wave Coils

CONSTRUCTORS who are anxious to build an all-wave receiver will be interested in the all-wave coils which are obtainable from the Premier Supply Stores, and which are illustrated on this page. The coils are wound on a 2in. ribbed ebonite former and are wound in five separate sections, each section comprising a grid winding and a reaction winding, with provision for aerial tapping on the medium-wave band. A low-loss short-circuiting switch is mounted in the base, and this is provided with four contacts which operate as the control is rotated, bringing the various tuning ranges into operation in succession. A substantial polished aluminium screening can is provided, and, in view of the fact that the coils cover the very short wavelengths, the diameter of this can is made very large so as to avoid losses in the tuning circuit. It is actually 3in. in diameter and 5in. in height. The



The all-wave coils which may be obtained from the Premier Supply Stores.

coils are sold as a pair, with a calibrated control knob, marked S1, S2, L, M, and Off. The latter position may be made to indicate that a large ebonite cam mounted on the switch control rod operates an off-switch mounted between the coils. The wave ranges covered are as follows: S1, 12 to 23 metres; S2, 26 to 90 metres; L, 700 to 2,000 metres; and M, 175 to 560 metres. These wavelengths are approximate as they will vary according to the aerial and according to the aerial tapping which is employed. The price of the coils is 12s. 6d. the pair.

Wearite Test Instruments

THE service engineer will be interested in the latest range of test instruments from the Wearite range. In the illustration at the foot of this page may be seen the valve testing unit, the oscillator unit, the Multimeter, and the meter unit. As may be seen, the units are made to match up and they are easily portable, and may be used individually or as a group to form a complete radio test outfit. The oscillator unit, for instance, comprises a shielded, calibrated R.F. and A.F. signal generator covering the entire broadcast and intermediate-frequency range on the fundamental. The A.F. generator is entirely separate and may be used to modulate the R.F. signal or to supply a 1,000 cycle signal for testing various A.F. apparatus. The batteries are contained inside the case, which measures only 10in. by 7in. by 5½in.

The price of this unit is £6 15s. The meter unit has a very sensitive meter fitted and a number of separate calibrations are marked on the dial. These include A.C. and D.C. volts, resistances in ohms, inductance in henries, current and capacity in microfarads. The price is £6 17s. 6d. In the valve-testing unit every type of valve may be checked, no matter whether it is fitted with 4, 5, 7, 9 or side-pin contacts. No adaptors are necessary. The price is £4 17s. 6d. The smaller multimeter provides ranges of D.C. voltage, A.C. voltage, current (0.50 mA on A.C. or D.C.) and resistance. The sensitivity of this instrument is 500 ohms per volt, and the price is £4 5s. Further details of these instruments may be obtained by writing for the interesting book describing them, to Messrs. Wright and Weaire, 740, High Road, Tottenham, London, N.17.

Burgess Snaplite

A USEFUL electric pocket light is announced in the Burgess Snaplite. Unlike the majority of pocket electric torches, the bulb in this device cannot become broken, and thus it may be placed in a tool bag or amongst other loose apparatus without danger. There is no switch to wear or become loose, and the entire device is finished in a neat and distinctive design from which six different patterns may be selected. The batteries are of seamless drawn zinc and give long life and a bright light. The bulb is of the 2.5 type and costs 3d. whilst the batteries cost 9d.

each and the entire Snaplite, complete, costs only 1s. 6d. An improvement in design is found in the Keelite which comprises, in addition to the Snaplite, a useful key container in black, brown, or fancy leather, and the price of this is 3s. 6d., complete, in the "Popular" range, and 4s. 6d., complete, in the "Special" range.

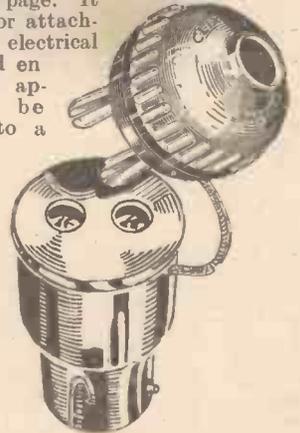
Erka Toroidal Transformers

FROM Messrs. F. W. Lechner and Co. comes the announcement of a new type of transformer, built in the form of a toroid. The core is in the form of a ring, and the various windings are wound round the core, thus producing a very novel and efficient type of transformer. The types at present designed include mains trans-

formers, intervalve transformers, output components, microphone transformers, and various forms of transformers and chokes for television purposes. At present these components are only made to order, but in view of the fact that there is practically no external field there should be a good demand for such a component. Further details concerning these components will be given at a later date, together with a test report.

Clix Combination Plug

A USEFUL two-purpose plug is introduced by Messrs. Lectrolinx, and is shown on this page. It is designed for attachment to any electrical apparatus and enables that apparatus to be plugged into a



A new combination plug introduced by Messrs. Lectrolinx. This enables apparatus to be used with any type of mains connection.

lamp-holder or a power socket. The pins are substantially designed and follow the usual Clix principle, maintaining perfect contact under varying conditions and causing no trouble when inserted into the adaptor itself or into a house socket. The device is neatly finished, the plug portion is attached to a short cord to prevent loss, and the price is only 9d.

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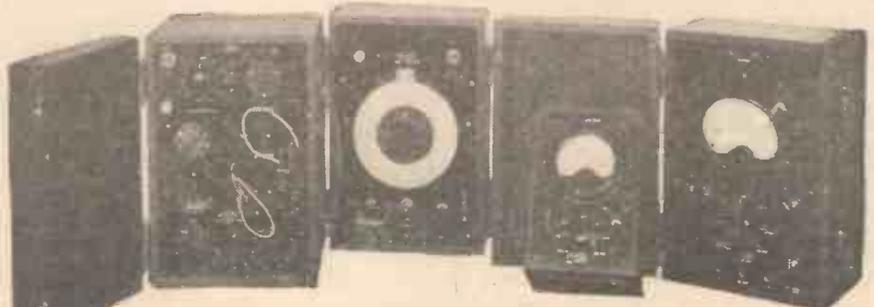
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Leaves from a Short-wave Log

THE radio fan who omits to keep a log misses many interesting items offered to him by the almost innumerable stations which can be tuned in on the three wavebands. It is not a mere question of jotting down the transmissions picked up, as the log should be used as a diary for noting in advance the various broadcasts one wishes to hear.

As an example, if it is known that a certain event will take place in a country on a given date—the information is usually published in the “dailies” or in specialised journals as news items—it is worth making a note in the log to this effect. If you carry out this practice you will find, in the course of a few weeks, a set programme of items to which you will want to listen for almost every day of the week. In this way you will have planned out the leisure hours devoted to searches of specially interesting items. Moreover, an entry in the log will furnish all data necessary for the reception of a broadcast from the same station at a later date. In addition, many studios—in particular for short-wave transmissions—announce their future programmes. It avoids haphazard twiddling of the condenser which seldom produces satisfactory results.

New Stations

Although recent conditions have not proved so favourable—on some nights transmissions have suffered from that irritating “wobbly” effect—it has been possible to pick up new stations. IRY, Rome-Torrenova, on 18.61 metres (16,120 kc/s), which so far has been working commercially, has been roped in by the Italian authorities for other duties. You will hear it testing speech and gramophone records at odd hours during the day; it has been used for the relay of special broadcasts, such as the embarking of troops, patriotic demonstrations, and so on. In addition, it works with the Italian colonies. IDU, Asmara, on the other hand, operating on 22.42 metres (13,380 kc/s), may be heard daily from about G.M.T. 14.00, when the Italian war correspondents dictate their reports to their respective papers. Between G.M.T. 16.30-16.50 both French and Italian running commentaries are relayed through this channel to Europe. The communication is prefaced by a call in both languages; it is to the effect that the experimental broadcast is made by the Asmara station of the Italian Navy, and is destined to certain newspapers.

The U.S.A. short wavers which you will find useful at times are WMA and WMN, Lawrenceville (New Jersey), on respectively 22.4 metres (13,390 kc/s) and 20.56 metres (14,590 kc/s), and WLL and WQP, Rocky Point (New York), on 16.74 metres (17,900 kc/s) and 21.58 metres (13,900 kc/s), as they are also used for the re-broadcast to Great Britain of the “Five Hours Back” programme transmitted by the B.B.C. National stations every Saturday afternoon. These are additional to W3XAL and W2XAD, given to you last week.

Havana

I gather from what I read in some publications that there is some confusion regarding two Cuban stations heard now and again in the British Isles. They are COCO, Havana, and COCD, Havana. The former

is on 49.92 metres (6,010 kc/s), the latter was last picked up on 48.94 metres (6,130 kc/s). To facilitate matters here are their times of transmission: COCO—weekdays, G.M.T. 21.00-23.00, 01.00-03.00; on Sundays from 04.30-05.15. As against this schedule, COCD is on the ether nightly from G.M.T. 23.00-05.00. It uses four chimes as an interval signal, and usually mentions in the call, when it is relaying, CMCD, the medium-wave station at Havana.

Schenectady Schedules

The Schenectady short-wave stations are romping in so very brilliantly every night that it is well worth making a special note of their new winter time schedules. W2XAD, on 19.56 metres (15,330 kc/s) on Wednesdays is heard from G.M.T. 19.00-20.00; on Sundays from 15.30-21.00 and on Saturdays from 18.00-21.00 or 22.30. W2XAF, on 31.48 metres (9,530

kc/s) is on the air on weekdays from 23.30-05.00; on Sundays from 21.15-05.00 and on Saturdays 18.00-05.00. On this day, therefore, for a portion of the programme, both channels are busy. When W2XAD closes down on both wavelengths you will pick up the strains of the *Stars and Stripes*.

Nazaki (Tokio)

If you care to hear a Japanese broadcast, try on Tuesdays or Fridays between G.M.T. 19.00-20.00 for either JVP, on 39.95 metres (7,510 kc/s) or JVN, 28.14 metres (10,660 kc/s). Both stations are at Nazaki, Tokio, and simultaneously broadcast the same programme. And lastly, I learn that PCJ, Eindhoven, the Philips 12 kilowatt, experimentally relays the PHI, Hilversum, broadcasts every Sunday from G.M.T. 13.40-16.10; on Tuesdays from G.M.T. 08.00-11.00, and on Wednesdays from noon to G.M.T. 16.00. The wavelength is 19.71 metres (15,220 kc/s).

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Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

THE CROYDON RADIO SOCIETY
MR. VALENTINE, of the Mullard Valve Company, who is regarded as an old friend of the Croydon Radio Society, gave members a most interesting lecture on the production of valves for the meeting on Tuesday, November 19th, in St. Peter's Hall, Leedbury Road, S. Croydon. He emphasised that his firm was concentrating on improving present valves, rather than inventing and producing new ones. The meeting soon had an insight into modern production methods, and excellent slides made the complicated processes very clear. Interesting was the description of a machine which supplied "backing" vacuum to twenty valve-making units, four hundred valves per hour being turned out.

With the octode valve, the system of belt manufacture was not employed, as here each grid was given a tray of parts and each valve was assembled in six minutes. Mr. Valentine went on to describe the many tests given to each stage of valve manufacture, valve testing gear handling 250,000 valves a week. On Tuesday, December 10th, the second talk in the series: "Elementary Aspects of Wireless Reception" will be given.

Hon. Pub. Secretary, E. L. Cumbers, Maycroft, Campden Road, S. Croydon.

SHEFFIELD AND DISTRICT SHORT-WAVE CLUB
THE Sheffield Short-wave Club has moved to new and larger rooms in the "Wharnciffe Hotel," corner of Holly Street and West Street, Sheffield, against the "Telephone Buildings." Meetings are as before—every Wednesday at 8 p.m.

During the last few weeks members have been constructing a club short-wave set and some interesting discussions on circuits have taken place.

Morse classes are held every week by experienced operators. Some station visits are being arranged in the near future.—Donald H. Tomlin (Hon. Sec.), 32, Moorside Avenue, Sheffield.

CROYDON WIRELESS AND PHYSICAL SOCIETY
THE second meeting of the Society's winter session took place at 5, Ayltore Road, Croydon, on November 18th, and members were again favoured with a further enjoyable and interesting chat, by Mr. C. Hayward, upon aeronautical instruments. The chair was taken by A. J. Webb, Esq., M.A., chairman of the society. This time, Mr. Hayward dealt with the various instruments employed for recording the revolutions of aircraft engines.

In view of the wealth of information at Mr. Hayward's disposal, the talk seemed all too short for his audience, but arrangements will doubtless be made to get Mr. Hayward to kindly address the society again some time during the next few months. The next, and Annual Meeting of the society, will take place at 5, Ayltore Road, East Croydon, on December 16th, 1935. A. J. Webb, Esq., M.A., will address the society, on that occasion on the subject of the Platinum Metals. Visitors are heartily welcomed at any of the meetings. Enquiries for membership, etc., to be addressed to Mr. H. T. P. Gee, Hon. Sec., Staple House, 51-52, Chancery Lane, London, W.C.2.

NORTH MANCHESTER RADIO SOCIETY
THE North Manchester Radio Society, which was inaugurated on October 25th, is now becoming very popular, and the membership is increasing. By the end of the year it is hoped that this will be one of the largest societies of its kind in this part of the country. Meetings are held every Friday at the British Legion, Elms Street, Bury New Road, Whitefield, near Manchester, commencing at 8 p.m. prompt; the room is open for the use of members from 7 p.m. For those interested, more instructions are being given before each meeting from 7.30 to 8 p.m. Lessons on receiver construction are also being given from time to time. Many attractive visits have been arranged for the near future, including visits to printing works, radio works, Kearsley Power Station, etc. At the meeting on December 6th a lecture is to be given by Mr. J. F. Vevers, Chief Radio Engineer of Messrs. H. Clarke and Co. (M/C), Ltd., entitled, "Mass Production Testing of Broadcast Receivers and their Components." Other lectures to be given in the near future are by representatives of Oldham and Co., Ltd.; L.E.P. Co.; Relay Services; W. B. Stratton and Co., etc., etc. All meetings are open to anyone interested in radio, the society is endeavouring to cater for the beginners as well as the keen "DX" and short-wave "fans." Particulars of membership, fees, etc., can be obtained at the meetings, or by sending 13d. in stamps to the secretary, Mr. B. Lawton, 10, Dalton Avenue, Thatch Leach Lane, Whitefield, near Manchester.

THE NORTH SHIELDS SHORT-WAVE CLUB
WE should like to say, through the medium of your very excellent paper, to the short-wave enthusiasts in this district, that there is a place where they can exchange ideas and mix with others who are interested in the same field. We have been in existence now for six months, and have been very successful indeed with lectures, demonstrations, etc.—Hon Secretary, G. A. Lee (2ARY), 41, West Avenue, Dalkwell, North Shields.

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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).

A Few Suggestions: S.W. Correspondents Wanted

SIR,—As a regular reader of your paper, particularly the "Letters from Readers" section, I would like to make a few remarks on the subject of short waves.

(1) In view of the various letters submitting logs, I would like to suggest that if this is to be of any value to anyone a page should be devoted to such reports, so that all logs and views of S.W. reception could be made much more interesting.

(2) With regard to jamming on the 40-m. band, I would suggest to anyone not knowing why the jamming occurs, to make further and very careful inquiries before passing any opinion. It is within my knowledge that the R.S.G.B. are taking every possible step in their power to have the band widened in the near future.

In conclusion, I would like to add that over four Sundays in September almost 400G calls were heard at this station. I would be pleased to correspond with any S.W. amateur in any part of the world.—F. W. BENSON (2BWF), 55, Corona Drive, Thorne, Doncaster.

Our Free Gift Short-wave Handbook

SIR,—I wish to point out to you a slip in the Short-wave Handbook which you issued a month back.

In the S.W.3 you specify 1 Hivac H.P.125. There is no valve of that number, but there is an H.P.215. I sent for this from Peto-Scott, but it was a 7-pin valve.

I called in at Peto-Scott's and they came to the conclusion that it was a V.P.215. I wish you could let me know if this is right.—G. E. TURNER (Beckton).

[The valve required is the V.P.215. We regret the slip.—ED.]

Congratulations

SIR,—Allow me to congratulate you on three or four different matters. First, your latest £4 Superhet. This proves what you can do free from padding and unnecessary detail. I wish you every success. Next, congratulations on the fact that new offices and a new laboratory are necessary, due to sheer merit of the fare offered. I sincerely hope you may keep the builders busy at intervals.

With reference to transmitting data, there appears to be a demand for it. I would suggest construction and lay-out articles of 5 to 10 watt crystal oscillators, etc., from simple to advanced.

I am also of the opinion that a complete work, incorporating every circuit published in PRACTICAL AND AMATEUR WIRELESS, would be very handy and a welcome addition to the bookcase. The all-wave receiver will be very popular in this country if the manufacturers are careful not to make the same mistakes as the Americans did. Some are going a long way towards that end.

For example. You ought to hear Australia to-night. A pretty problem for a demonstrator to explain when Australia is not receivable and a number of trans-

mitters much advertised but seldom heard even by old hands. I am wondering if a leader to the trade and public might help to a definite understanding.—A. W. MANN (Middlesbrough).

A Supreme Superhet

SIR,—Here is the inevitable request for a mains version of your "Superhet 4."

It is not always good policy to design a mains set down to a price, so why not make a splash and let us have a really good superhet, based on the following?

Superhet portion as "Superhet 4" (465 kc.).

A.V.C.
Visual tuning device.

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Pick-up.

Push-pull or Duophase output.

Power supply of 350 volts 120 mA.

Energised speaker.

Real selectivity and first-class reproduction would make a very wide appeal.

Please give this suggestion your earnest consideration. A set designed as above would be appreciated.—J. E. HIGGINS (Kings Langley).

[Are any other readers interested in such an ambitious type of receiver for home-construction?—ED.]

Wavelength Correction

SIR,—With reference to the "Leaves from a Short-wave Log," September 28th, 1935, Penang, our best local station, is on the air 7—9 p.m. all weekdays (F.M.S.).

CUT THIS OUT EACH WEEK.

Do you know

- THAT a water pipe is only efficient as an earth connection when it comes straight from the main supply.
- THAT on no account should gas pipes be used for earth connections.
- THAT the H.F. choke may sometimes be dispensed with—especially in the detector stage when a high-inductance primary is fitted to the L.F. transformer, or R.C. coupling is adopted.
- THAT a partially discharged H.T. battery should not be connected in series with a new battery in order to increase the output.
- THAT if an aerial is tapped for the lead-in connection, such tapping should be in the electrical centre.
- THAT hum may often be traced to a microphonic valve which picks up the vibrations from an inductive component which is not isolated from the baseboard or chassis.
- THAT in the above case rubber washers beneath the transformers and chokes will prove effective.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL AND AMATEUR 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 manuscripts, 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 AND AMATEUR WIRELESS, Geo. Neveles, 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, we give no warranty that apparatus described in our columns is not the subject of letters patent.

time 7hrs. 20 mins. ahead of G.M.T.), and radiates on ZHJ, 49.3 metres, 6,080 kc/s. You could try also for AVR.M, Medaw, DEL, on 63.7 metres daily, and Singapore, ZHI, on 49.9 metres, 6,012 kc/s, also at Penang strength.

Contrary to general belief, the B.B.C. here, when good conditions prevail, is very good. Usually, 13 metres is inaudible; 16 metres is killed by Bandoeng morse, and 19 metres is no good until 10 p.m. Zeesen and Paris are our best Europeans.—F. TREEBY (Sungei Siput, Perak).

A Local Worthing Club?

SIR,—I am interested in short waves and transmitting. I should greatly appreciate some data on this subject. I should also be greatly obliged if you could put me in touch with any amateurs who are keen to form a Radio Club.—R. L. EDGINTON (Worthing).

Results with a S.W. Adapter

SIR,—This is my first experience of S short waves, and the following may be of some interest to you. I recently built your short-wave adapter described in PRACTICAL AND AMATEUR WIRELESS (Sept. 14th, 1935), using the exact circuit on my straight three with eliminator. On Saturday, the 16th inst., I picked up Schenectady, U.S.A., at good loud-speaker strength, the time was 10.45 p.m.

I regularly get Zeesen, Moscow, Rome, and many others. Here are a few amateurs I picked up this morning: G5BS, G5RO, G2AD, G2IL, G2IC.

I work on a 20ft. indoor aerial and am unfortunate in having to use a 20ft. earth wire.—W. B. N. ALTHORP (Gillingham).

A Chemical Rectifier

SIR,—This being the first time I have written to you, I should like to thank you for the many hours of enjoyment I have obtained from your paper, not to mention many useful hints.

I built that excellent tantalum rectifier which was described in your pages some time ago, and must say it has been very satisfactory. After eight months I have found it necessary to renew the electrodes, whilst the acid has only been changed once previously. It has charged continuously at .7 amp. which is well over the estimated value. I found it unsatisfactory to pour oil on the acid, as this bubbled up owing to the gases escaping from the surface.

I have sent these notes in the hope that my experiences may be of interest to other readers.—J. D. MORRIS (Stockport).

From a Cambridge Reader

SIR,—Although I am a new reader of PRACTICAL AND AMATEUR WIRELESS may I take this opportunity of saying that I think it is an excellent radio magazine. The short-wave section is not very large, but has certainly increased in the last month or so, and I guess a separate journal dealing with short waves only would have a large sale in this country. I should like to know if any amateur or SWL could give any information regarding an amateur station near here. I often hear him contacting another amateur in Los Angeles, California. The amateur over here calls himself GINS in Cambridge. This call is not listed anywhere, but as he QSO's Los Angeles regularly on 'phones it certainly is an F.B. transmitter. The wavelength is about 17.5 metres.—WIN-FELD SALLADE (Cambridge).

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- EXAMINATION (state which)

Name..... Age.....

Address.....

REPLIES IN BRIEF

The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because the point raised is not of general interest.

S. J. (Eccles).—You cannot speed up the process as the rectifier which is fitted will not permit of it. By replacing the rectifier you would also have to modify the secondary winding of the transformer, and thus a completely new charger would be required.

W. B. (Old Hill).—The valve could be employed, and the makers' instructions regarding connections and voltages should be followed.

S. G. (Peterborough).—Your specification follows the lines of the Fury Super, but the modifications cannot be recommended as some considerable experiment would be needed in order to obtain satisfactory results and working values.

B. V. J. (Sherborne). The trouble may be L.F. instability of the type which is cured by reversing the connections to the primary of the L.F. transformer. No addition to the set should be considered until the whistic is cured.

S. G. (Glasgow). We think the acid has been considerably weakened due to the continued addition of distilled water. The accumulator should be taken to your charging station and instructions given for cleaning out and renewal of the acid.

J. M. (Manchester). Overheating may be due to the passage of too high a current or the wrong disposition of the windings. The figures given in the articles take account of current and no heating should take place. The cross-sectional area of the core is the most vital figure.

A. B. (N.W.5). Your circuit seems quite satisfactory and should make up into a good receiver. The layout may require slight modification in the event of H.F. instability.

H. F. R. (Kingsholm). The receiver was designed and the details published by the General Electric Company.

R. H. R. (Stamford). The S.G. valve is not essential and therefore the circuit cannot be blamed. Your aerial conditions are probably unsuitable for the short waves and some experiment should be carried out with varying lengths of wire, or a good series aerial condenser should be employed. Is your earth connection sound?

D. S. H. (N.W.11). Blueprint No. PW48A gives wiring details for a short-wave converter-adaptor which will suit your requirements. Constructional details of this adaptor are given in PRACTICAL AND AMATEUR WIRELESS dated 23.2.35.

T. P. D. (Winchester). The kit for the apparatus in question may be obtained from Messrs. Peto Scott, who can supply all details concerning price. It would not be satisfactory on the low wavelength you mention without special precautions and modifications in construction.

A. A. L. (Dagenham). The receiver is a commercial model and therefore we cannot supply a blueprint of it.

O. A. (Greenock). We shall be publishing details of a Universal version of the £4 Superhet Four at a later date.

J. L. (H.M.S. Sussex). As the L.F. section functions satisfactorily the trouble must rest with the coils, valves, or voltages applied to the valves. The latter could be checked with a suitable meter and if you have no facilities for checking the valves and coils the makers would be prepared to carry out a suitable test. The circuit as published was perfectly satisfactory.

E. T. O. (Manchester). We regret that we have no knowledge of the receiver you refer to and cannot therefore recommend any of our blueprints to enable you to utilise the parts from this receiver.

S. M. (Wrexham). The receiver in question is referred to as a two-valve set as it consists of a two-stage receiver—detector and output. The output stage employs two separate valves working in push-pull. A similar circuit, employing a single valve in this stage, has been published, but the issue describing the construction is now out of print. A blueprint is available and is No. AW305.

D. H. H. (Cambridge). We regret that the subject does not come under wireless construction and we have given no details concerning it.

J. L. (N.W.10). We cannot supply a blueprint for your purpose, as we do not recommend the use of old parts in circuits of our own design unless they conform to the specification.

R. H. G. (Forest Row). We cannot advise you concerning the proposed switching without details of the exact circuit which is employed. Various types of 3-pole switch are obtainable. If you refer to the sketch attached to your letter (which does not appear to be an all-wave arrangement) you would require a single-pole change-over switch.

J. B. (Dover). No harm should be done by your proposed arrangement.

H. A. B. (Radnor). The issues are out of print.

L. G. F. (Ruislip). The trouble may be due to the H. T. applied to the valve. Your adjustable resistance enabled a correct value to be applied and thus prevented oscillation, but the new fixed resistance was incorrect. Can you measure the value of the adjustment on your variable component?

P. S. (Norwich). The trouble is due to the size of the aerial and is a common fault on short waves. A good series aerial condenser will enable you to find an adjustment which will enable good results to be obtained on all bands, or a new aerial could be erected which will prove more satisfactory. The earth connection is also important.

(Continued on facing page)

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(Continued from previous page)

G. C. W. (West Wickham). We can give no details beyond those which were published in the issue in question.

J. W. S. (Worthing). The Leader Three or the Hall-Mark Three should prove suitable, but we cannot recommend the substitution of any of the components.

H. B. (Leeds). We have published a number of suggestions on the lines you mention, mostly in the form of Readers' Wrinkles. We cannot locate one exactly employing the scheme you outline.

R. W. (Guildford). Your components should be quite suitable, but it is not possible to advise definitely without experiment. It is for this reason that we advise strict adherence to the specified parts.

R. C. (Stockwell). We have various receivers which fulfil your requirements, and we should suggest that you go through the blueprint list published each week and select one which conforms to your ideas concerning number of valves, type of output, etc.

R. M. (Birkenhead). The reason for the arrangement of the circuit is to be found in the fact that the ganged condenser has the connections on the right and thus the circuit is arranged for short connections and this brings the aerial to the right-hand side. You could not reverse the blueprint, but your aerial lead may be brought to the correct position by making it sufficiently long to drop down and then rise to the terminal, thus keeping it clear of the loud-speaker leads. The panel dimensions were given on page 268 of our issue dated November 16th last, and this is a scale drawing. You can, therefore, obtain any desired dimension from this illustration.

H. B. (Leigh). The coil could be used in the manner you suggest. Details concerning the Q.S.L. cards have already been given, and we would suggest that you obtain a copy of the "Radio Amateurs' Call Book" from F. L. Postlethwaite, 41, Kinfauns Road, Goodmayes.

W. M. (Everton). You must make the set oscillate to receive continuous waves, and probably this point is misleading you. The converter must oscillate to produce the intermediate frequency beat note, and you could, of course, use the reaction control in the receiver to boost signals. Does this clear up your point?

P. J. T. (Cork). Your list contains valves only and thus we cannot make any recommendation concerning a blueprint. Our latest four-valve would be the most suitable receiver, but it would require new valves. All blueprints may be obtained from this office by post.

E. W. (W.12). The trouble may be due to the resistance, or the capacity of your body may be causing some effect. Try a new resistance, and also the effect of shunting a fixed condenser across the points which you touched. As reaction is not effective, it would appear more than likely that the H.T. is too low, and this may be due to the value of the resistance now being too high for your H.T. supply.

E. W. K. (Upper Helleston). Complete coil-winding details are beyond the scope of a reply, and we would refer you to the various articles which have been published on this subject.

H. G. (Goole). If the moving vanes are connected to earth there should be no difficulty. The panel may be screened by fitting a sheet of metal on the back, but it must be prevented from short-circuiting various components. A good earth is also essential.

H. A. S. McG. (Fife). The cards are obtained by writing to the station you have received and giving a full report. A complete article on the subject was given in our issue dated July 20th, 1935. A list of amateur stations is given in the "Radio Amateurs' Call Book," obtainable from F. L. Postlethwaite, 41, Kinfauns Road, Goodmayes.

I. I. D. (Ramsbottom). We cannot advise regarding the converter as yours is a commercial receiver. The makers should, therefore, be consulted.

H. F. M. (Forest Gate). We have given two or three suggestions concerning the use of the Ford Coil, but cannot advise you which article exactly meets your requirements. Can you supply exact details of the device you require?

C. H. J. (Hull). It is obvious that the speaker does not match the output circuit of your friend's set. This type of speaker is not suitable for use in conjunction with a moving-coil instrument.

W. G. P. (Southsea). Each anode must be joined to the speaker through a 2 mfd. condenser. The earth connection is, of course, ignored in this case. Any type of speaker should be suitable, but preferably one of the types having a matching transformer would enable accurate matching to be accomplished.

H. A. N. (Leytonstone). A simple A.V.C. unit should be the simplest method of introducing the scheme. Otherwise the entire receiver must be redesigned.

H. H. (Liverpool). We have no details of an amplifier of the type mentioned.

W. T. L. (Kempston). The idea is quite feasible, but the wire would require some form of support to prevent snapping. The outfit would consist of amplifier, two microphones, phones, and a change-over switch in each circuit. One amplifier would suffice, and preferably this should be operated from small dry batteries. We cannot give a circuit but it should not be difficult to build up from the above particulars.

F. J. W. (Leamington Spa). We regret that we cannot now include the identification of stations in our Query Service.

J. G. (Leigh). We cannot recommend the use of substitute parts in our receivers.

D. McG. (Gourcock). The trouble would appear to be in the wave-change circuit, either the switch or the long-wave windings of the coils. The circuit would

be in order if medium-wave results are up to standard, and thus the above details should receive your attention.

J. P. (E. 17). We regret that we have no details of the receiver, which is a commercial model.

F. P. D. (Huddersfield). Details concerning the use of a converter will be given at a later date. Details of an A.C. version of the receiver are given in this issue.

E. V. C. (Armsley). The trouble may be due to the actual station you receive at that point. There are one or two places on the medium-wave band where stations are cut up in this way, and it is known as heterodyning. As your long-wave performance is rather poor we would suggest that you obtain the correct valves and you will then be in a better position to trace the fault.

J. R. (Cheam). We have no blueprints of an amplifier of the type mentioned. We have published several articles on the design of amplifiers and probably the article published in our issue dated January 26th, 1935, would interest you.

P. R. H. (Sidmouth). The trouble must be due to your mains unit, but whether or not this is on account of the circuit or the unsuitability of the tapping schemes we cannot say. Decoupling each stage in the receiver may prove worth while, but it would be preferable to ascertain whether the unit itself is faulty.

L. S. B. (Wisbeck). We cannot advise the change of dial nor can we give instructions for modifying the circuit arrangements.

N. P. (Newcastle). It would appear that the trouble is due to some component which passes current. When a certain value is reached breakdown occurs, and this would be most likely to be found in a synthetic resistance. It is unlikely to occur in wire-wound components in view of the fact that it rights itself when current ceases. Perhaps this will enable you to trace the faulty part.

D. M. W. (Wolverley). From your description the trouble appears quite normal and is simply ordinary oscillation. You should not push the reaction control so far. You are apparently endeavouring to exceed the capacities of the circuit.

THE NEW CONSTRUCTORS' GUIDE TO SET CONSTRUCTION

(Continued from page 371)

the holes by rubbing a soft pencil over the paper in their approximate positions.

Making a Chassis

There are doubtless many readers who would prefer to make their own chassis, and this is not a difficult matter, although probably more costly than buying one ready made from Peto-Scott. A wooden chassis can be made from 5-ply, the front and back consisting of 3-ply, which is more suitable for receiving component bushes. The whole can be fastened together by means of thin (about 6-gauge is suitable) $\frac{1}{16}$ in. or lin. screws, as shown in Fig. 5. For the sake of efficiency, and to be in keeping with modern practice, the chassis must be metallised, and can be covered with metallised paper. This should not be applied, however until the larger holes have been made. The paper should be cut to such a size that it overhangs the top of the chassis all round, and should be coated on the white (paper) side with thin glue. It should next be pressed into place by using a flat iron or soft cloth, and the glue allowed to set. After that the holes can be formed by pressing the paper with the thumbs or by cutting it with a sharp knife.

A metal chassis can be made from a suitable sheet of 18-gauge aluminium, by gripping the edge which has to be turned over between two hardwood boards held in a vice. Bending can first of all be done by hand, after which the job should be completed by working along the bend with a wooden mallet. It is wise not to "force" the work by trying to make a right-angle bend right away; instead the bend should be formed gradually by working from end to end a number of times. It is, of course, possible to devise simple pieces of apparatus for simplifying the work, and for producing a rather more professional finish, but the construction of these would not be considered worth while by the average constructor, who may make only two or three chassis in the course of his experiments.

Wiring and other constructional details will be dealt with next week.



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Queries and Enquiries

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 cannot, for obvious reasons—

- (1) Supply circuit diagrams of complete multi-valve receivers.
- (2) Suggest alterations or modifications of receivers described in our contemporaries.
- (3) Suggest alterations or modifications to commercial receivers.
- (4) Answer queries over the telephone.
- (5) Grant interviews to querrists.

Please note also, that queries must be limited to two per reader, and all sketches and drawings which are sent to us should bear the name and address of the sender.

A Breakdown

"I built up your Superformer recently and after replacing a faulty valve I obtained really fine results. For at least two weeks results were fully up to expectation, and I thought I had at last found a receiver which I could rely upon. However, last week I thought reception was slightly poorer and during the week it has definitely got worse. Quality has fallen off and range is now very limited. Can you say what is wrong?"—E. W. (Claeton).

IT is obvious from your remarks that something has developed a fault, as the receiver gave satisfaction when first put into use. In view of the rather sudden appearance of the fault and the then gradual increase we would suspect the valve (or valves) and would, therefore, suggest that you have these tested by a local dealer who is provided with an emission tester. We presume, of course, that your H.T. battery is fully up to standard and that you are not endeavouring to operate the receiver from an old battery which has now become practically discharged.

Home-made Coils

"I have built a simple tuning coil wound on a 3in. diameter former to cover both broadcast wavebands and to include reaction. The circuit of the latter is troubling me at the moment as I cannot arrive at a suitable size of winding to get smooth reaction on both wavebands. Is there any formula which will enable me to get the exact winding correctly placed for this purpose?"—F. J. (Portsmouth).

THE simplest way out of your difficulty is to follow the scheme outlined in the article in last week's issue. That is, wind the medium- and long-wave windings one beside the other with a space of about $\frac{1}{4}$ to $\frac{3}{8}$ in. separating them, and then wind the

reaction coil on a smaller former and place this inside the main former. By adjusting the height it will be found that a position may be taken up which will provide smooth reaction on both bands. The wrinkle of standing the smaller coil on small pieces of wood to adjust for height may be adopted to prevent hand-capacity effects whilst trying the coil.

The Leader Three

"I have obtained all the parts for the Leader Three, but the coils are Universal Type A. I know that these are not the coils specified, but I bought them in order to obtain the advantage of the tapped primary should I at any time decide to modify the receiver. What is the best system of utilising these coils? I should like to incorporate a switch for both primary and secondary if this will prove advantageous."—G. P. O. (Leith).

YOU can fit a suitable switch to short-circuit both coils from terminal No. 8 as well as the present short-circuiting arrangement from terminal No. 2 to earth. This will enable both primary and secondary to be adjusted according to the waveband being used, but you should not find it essential to do this. The entire primary may be left in circuit on both bands without detriment. You must guard against the change of connection due to the different numbering of the terminals on the Type A coils.

Interchangeable I.F.

"I am going to build a superhet circuit, but should like an explanation of the following point. I believe that the most suitable I.F. for short-wave work is 465 kc/s and for broadcast work is 110 kc/s. Would it be feasible to mount the I.F. transformers on a small ebonite panel fitted with four pins and to use a valveholder for mounting them? In this way I could plug in the desired type of I.F. according to the waveband on which I was listening. The oscillator coil also would have to be changed, I know, and I thought of adopting a similar scheme here. Is there anything wrong with the idea?"—G. T. (Colwyn Bay).

THERE is nothing wrong with the scheme from a practical point of view, provided that you employ a separate tuning condenser for the oscillator coil. You will appreciate that the latter point is important, as the correct frequency difference will only be obtained on each type of coil when the condenser tuning the oscillator follows a certain "law." From the technical point of view, however, we do not favour the scheme as if you employ the 465 kc/s I.F. there will be no need to change for the broadcast band. You will see that we

employ this frequency in our latest broadcast superhet, and it is to be preferred to the 110 kc/s. You may thus adopt this frequency and make your receiver an "all-wave" design.

The Superformer

"I am in some doubt regarding connections in the Superformer. On the wiring plan there are two wires shown on the underside of the chassis passing to hole No. 24. On the top of the chassis there is only one wire emerging and this is joined to the coil terminal No. 5. What happens to the other wire? Secondly, there is a condenser on the wiring plan which is not on the theoretical diagram on page 114. This is reference C12. Also, what is condenser C6, as I cannot see this on the wiring plan?"—G. E. R. (York).

THE two wires which pass through hole No. 24 are both joined to terminal No. 5 on the coil. Condenser C6 is made by twisting together two lengths of wire and this is shown by the twisting indicated by the reference C6 on page 113. The ends of these wires must, of course, be left free and not permitted to touch anything. Condenser C12 was inserted as a precautionary measure, as it was found that certain types of valve had a tendency to oscillate unless biased and thus a bias circuit was introduced after the theoretical diagram was produced and it is a safeguard for the constructor. The wiring plan should, therefore, be followed.

Standard Inductances

"I have just purchased a wavelength calibrated dial and was going to use this in my set. I noticed engraved on it, 'For use with standard inductances,' and I should like to know what this is and whether it is essential to use a special inductance with it."—R. Mc. T. (Hove).

IT is certainly necessary to use the correct inductance if you wish to make use of the wavelength calibrations. Coil-makers have decided to adopt standard windings for broadcast coils, and for the medium waveband the inductance which has been standardised is 157 μ H and for the long-wave band the inductance is 2,200 μ H.

A Crystal Microphone

"I am thinking of obtaining a modern crystal microphone but am doubtful as to the method of joining this to my amplifier. At present I am using a well-known pick-up of standard type and this is joined to the input circuit of the amplifier direct. The valve is biased in the cathode lead. What changes would have to be made to use the new microphone?"—H. A. (Brierley).

IF you wish to use the pick-up or microphone you will, of course, have to fit some type of switch. The crystal microphone, according to the makers' instructions, must be joined between the grid and earth and a parallel resistance (grid leak) of not less than 5 megohms should be used.

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PIX

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WORLD Famous Continental Valves, mains type 4/6 each H.L., L.; screen grid; variable mu screen grid; 1, 3 and 4 watt A.C. output directly heated pentodes; 250-volt 60 m.a. full wave rectifiers, V.M.H.P., D.D.T., diode tetrodes; A.C. D.C. types, 20 volts, 0.18 amp., filaments; screen grid; variable mu screen grid; H. H.L., power and pentodes.

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THE Following American Types, 4/6: 250, 210, 245, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 27, 77, 78, 2A5, 2B1; all other American types, 6/6 each.

RELIABLE Soldering Irons, 200-250 volts, 2/6, consumes 0.2 amps.; super type, 3/0.

PREMIER Short-wave Tuning Condensers (S.L.F.), complete, ceramic insulation, silver sprayed, brass vanes, noiseless pigtails, 0.00015, 0.00016, 0.0001, 2/0; double spread 0.00005, 0.00015, 0.00025, 3/- each.

BRASS Reaction Condensers (S.L.C.), with integral B slow-motion, 2/0; mica condensers, 0.00002, 0.00005, 6d.

PREMIER Short-wave Coils, with circuit, 4- and 6-pin type, set of 4, 13-170 metres, 7/-; for either type; Lowloss formers, 4- and 6-pin ribbed, 1 1/2 in. diameter, 1/-; short-wave valve holders, 4-, 5- and 7-pin chassis type, 6d.

D.T.H. Moving Coil Speakers, matched pairs, 8in., 1,500 ohms, 7,500 ohms (1,500 speaker as choke, 7,500 speaker in parallel with H.T. supply), with output transformer for pentode, 15/6 per pair; A.C. kit for pair, 12/6.

MAGNAVOX Moving Coil Speakers, 6 volt fields, handles 5 watts, 12/6. State transformer required.

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PREMIER L.T. Charger Kits, input 200-250v. A.C., output 8v. 1/2 amp., 14/6; 8v. 1 amp., 17/6; 6v. 2 amp., 27/6; 30v. 1 amp., 37/6; 2v. 1/2 amp., 11/-.

D.T.H. Trusped Induction Type, A.C. only, gramophone motor, 100-250v., 30/-; ditto D.C., 42/6.

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DISON Bell Double Spring Gramophone Motors, including turntable and all fittings, 15/-.

WIRE-WOUND Resistances, 4 watts, any value up to 50,000 ohms, 1/-.

MAGNAVOX Speakers.—144 Magna, 25/-; 152 Magna, 37/6; 154, 12/6; 152, 17/6; all 2,500 ohms. Energising kits, 10/-; permanent magnet, 7in. cone, 16/6; permanent magnet, 9in. cone, 22/6; state transformer required; all other types in stock.

AMERICAN type, 250 valves, 0 watts, in push-pull; matched pairs, 9/-.

12-2,000 metres, without coil changing. Lissen All-band 2-gang screened coils, for screened grid H.F. stage (tuned), screened grid detector type receiver, circuit supplied, giving complete details, 12/6.

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(Continued at top of column three)

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(Continued from foot of column one)

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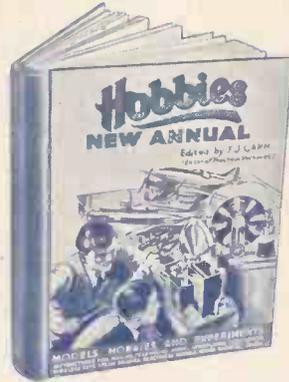
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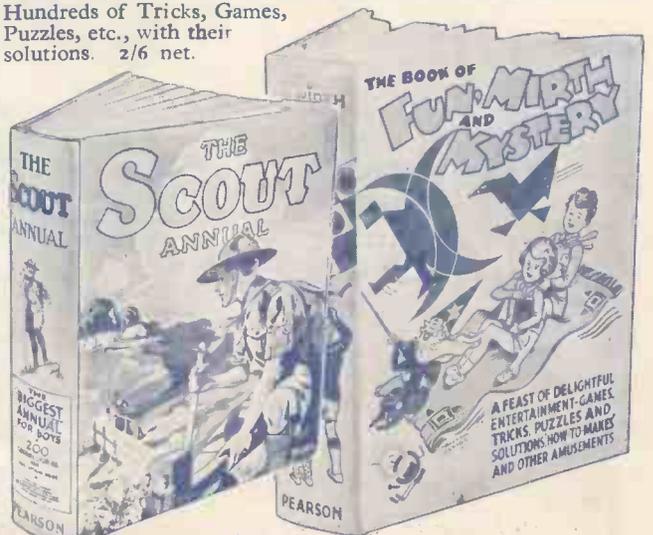
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