Practical and Amateur Wireless, December 5th, 1936

Greatly Enlarged Xmas Number!

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

4D EVERY WEDNESDAY

Edited by F.J.CAMM

A GEORGE NEWNES Publication

Vol. 9. No. 220.
December 5th, 1936.



Special Xmas Features

A SOUND-SYNCHRONISED CINÉ
A RADIO PLAY FOR HOME BROADCASTING
FUN WITH MICROPHONES
RADIO THROUGHOUT THE HOUSE
SIMPLE SETS FOR TELEVISION SOUND
RAPID REMEDIES FOR RADIO FAULTS
A SIMPLE TRANSPORTABLE
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USING A PICK-UP, Etc., Etc.

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PRAG. 5/12/36.

THE COLT ALL-WAVE BATTERY THREE— See page 380

Practical and Amateur Wireless

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. IX. No. 220. December 5th, 1936.

Round the World of Wireless

Greetings!

THE time has come again for us to convey to all our readers the compliments of the season and our best wishes for a really enjoyable Christmas. Although it is still early in December, it is the custom for Christmas numbers to be published at this time of the year and this is just as well, as the many seasonal articles in this large issue will point the way to an improvement in the usual holiday festivities. There is ample time to make up the devices explained in this number so that when the festival arrives you may prove that your hobby is more than a mere interest in your life, and those who spend the holiday with you will benefit from your activities. All tastes are catered for in our feast of wireless articles, and in addition to the ordinary regular features which are found each week in our pages, you will this week find constructional articles for three separate receivers, hints on making receivers to pick up the television sound programmes, and other valuable articles. To all those who have been with us from No. 1, as well as to all new readers, we again repeat, a Merry Christmas.

American Programmes

IT is stated that the amount of programme time which is devoted in the U.S.A. to advertising is less than 40 per cent. In 1935 the Columbia chain broadcast a total of 18,372 programmes, of which 6,624 were sponsored by commercial firms. The Columbia network provides approximately sixteen hours' programme service each day.

Irish S.W. Station

IT now appears that the proposed short-wave transmitter for Ireland is off—at least for some time to come. The Minister of Posts and Telegraphs replied recently to a Deputy's question in the Dail in a manner which did not even provide a hope that the matter was to be regarded as important.

Automatic Receivers

THERE have been many suggestions for automatic receivers, the majority of devices taking the form of a time switch. It is now stated that a French inventor has succeeded in developing a relay which operates according to the call note of a station, and it will automatically switch on when the station starts up and tune the set to the correct wavelength. We await further details!

Radio Beacons

MORE beacons are to be used as a guide to aircraft, and certain countries are now suggesting that these should be compulsory along regular airways. These beacons operate on different systems, but in general are of a similar type. They give either an audible or a visual indication when the pilot leaves the correct course.

Unbreakable Valves

IN a railway crash recently a receiver was completely demolished, but when examined the debris was found to be in such a peculiar condition that certain coil leads were still intact and as a test the makers connected batteries and found that the set worked. It was afterwards stated that the condenser was completely crushed, but the breaking of a lead prevented a short circuit, and the local station was heard from the remnants of the speaker.

Television Systems

IT is now announced that a further manufacturer is to place on the English market a mechanical television receiver. This is to give a projected picture, approximately 12in. by 15in., in black and white. No price has been fixed and no other details are available.

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

Radio Flagship

THE United States Air Force has established the latest thing in flying headquarters. This is a completely-equipped Douglas Monoplane in which is installed transmitting and direction-finding apparatus in addition to the receiver, and the 'plane is fully equipped so that a superior air officer could give instructions over a wide area and keep in touch with ship, shore and air stations.

Electronic Nose

THE General Electric Company of America announced last month that they had developed an electronic nose having a sensitivity about one-fifth that of the human nose. It was developed for detecting minute traces of mercury vapour in the air, and consists of a photo-electric cell and associated apparatus.

More Uses for Radio

TO add to the various uses of radio which have been given on this page from time to time we are now able to mention the tuning of an organ. This is the new Westminster Abbey organ, and in order to tune the various pipes, which are obviously situated at some distance, the tuner wears headphones connected to an amplifier which is fed with the signals picked up by a microphone, and in this way he can hear the notes which would otherwise be inaudible at a distance.

Mr. J. F. G. Troughton

THE B.B.C. announces that Mr. J. F. G. Troughton has accepted the appointment of Empire News Editor and took up his new duties on November 30th. Since 1926 Mr. Troughton has been a member of the Colonial Administrative Service.

After service as a District Officer in Central Kavirondo, Kenya, Northern Turkana and Digo, he was seconded in 1933 for special duty with the Carter Land Commission. Later he became District Commissioner, Kitui, then Clerk to the Executive Council and Acting Clerk of the Legislative Council. This year he was awarded the M.B.E. and seconded to the Colonial Office in London.

THE PICK of the PROGRAMMES

"When Day is Done"

ANOTHER programme in the popular series "When Day is Done" will be broadcast on December 11th. The artists, as usual, will be Esther Coleman, Mai Jones, and Haydn Adams. The B.B.C. Welsh Singers will also take part in the programme, and the Variety Orchestra will be conducted by Idris Lewis. Glyn Jones will produce the show.

Christmas Music

A CONCERT of Christmas Music by the Bristol University Madrigal Singers, conducted by Arthur Warrell, will be broadcast from the Western Regional studios on December 7th. The programme will contain works new and old, grave and gay. Among the old are English, French, and German carols—the last will be sung in German. The arrangements of the English and French carols are by Arnold Foster, Vaughan Williams, and Kennedy Scott.

Darvel Burgh Band

ON December 8th the Darvel Burgh Band, conducted by Frederick Rogan, will broadcast a programme of popular music. James Mason (baritone) will sing "The Grenadier," "Susette," "Galloping Dick," "The Old Farmhouse," and "The Pride of Tipperary." The history of Darvel Burgh Band goes back to 1840, and indeed is the oldest institution in the town. It has been very successful in band competitions.

Badminton Broadcast

BADMINTON enthusiasts will be interested to know that an eye-witness account of the International Badminton Match between Wales and Scotland will be broadcast by E. Trevor Williams from the Craigside Hydro Hotel, Llandudno, on December 4th.

City of Birmingham Orchestra

IN the concert on December 10th from the Town Hall, Birmingham, Leslie Heward will conduct the City of Birmingham Orchestra. The principal work is to be Handel's Organ Concerto with G. D. Cunningham as organist.

Gypsy Band Concert from Cardiff

WALDINI'S Gypsy Band will come to the Cardiff studio once again on December 4th to entertain listeners. With him will be Little Joan (the personality girl), the Sisters Pereira (vocalists), Mervin Morris (impressionist), Charles Gordon, who plays the hand-bells, the Tricity Four (harmonisers), Sylvester Stuart (entertainer), and Hughes and Taylor (comedians). Waldini's Park Hall Concerts have been a popular feature in Cardiff for the last two or three years, and it may be of interest to Welsh people to know that his band is practically entirely composed of Cardiff players.

MAKE THESE DATES WITH YOUR RADIO

Ballet Music and Folk Dances

ON December 4th (Regional) there will be a concert of British Ballet Music in which Philip Sainton will conduct his "Dream of a Marionette" and Clarence Raybould will conduct "Douanes" by Geoffrey Toye and Holst's Ballet Music to "The Perfect Fool." On the same day Folk Dances from Rumania, Japan, Poland, Ireland, Sardinia, Hungary and England will be broadcast by Edmund Rubbra in his pianoforte recital. Edmund Rubbra is known both as pianist and composer, and a choral work of his—"Five Motets"—was performed at a B.B.C. Contemporary Music Concert last season.

THE FESTIVE SPIRIT



The receiver seen in this illustration is the Marconiphone, model 382, four-valve AC/DC all-wave superhet—price 13½ guineas.

"Swift Serenade"

THIS is the title of a new series of concerts starting on December 9th. They will be presented by Tommy Matthews and his Concert Orchestra, which is the new name for the Northern Revue Orchestra formed in December last. The composition of the orchestra remains unchanged and the new series of concerts will have much in common with those broadcast in the past under the heading "Swing Low Sweet Music." Denise and Dale Smith will be soloists in the opening concert by the new orchestra.

Harry Tate

ALWAYS popular with Midland listeners, Harry Tate, the comedian, will come to Birmingham on December 8th for a studio engagement. He is to give his sketch on gardening.

The Cardiff Ensemble

THE Cardiff Ensemble Chamber Orchestra, conducted by Ronald Harding, will broadcast a concert from the Reardon Smith Lecture Theatre of the National Museum of Wales on December 5th. The programme will include Bach's Brandenburg Concerto No. 6, "An Old Song," by Peter Warlock, and "Three Poems of Li-Po," by Constant Lambert. The vocalist in this work of Constant Lambert will be Magdaline Jones (soprano).

Royal Marines Band Concert

JANE VOWLES (soprano) will be the soloist in a concert by the Band of His Majesty's Royal Marines, Plymouth Division (by permission of Brigadier H. G. Grant), conducted by F. J. Ricketts, Director of Music, Royal Marines, to be broadcast from the Abbey Hall, Plymouth, on December 10th.

A Nottingham Quartet

THE Angelus Male Voice Singers and Harold Gray (pianoforte) are to give a recital in the Midland programme on December 7th. The quartet is well known in Nottinghamshire, and consists of R. H. Clarke, G. Hodgett, P. Riley, and S. Jeacocke. Mr. Gray is conductor of the Choral Societies at Derby and Sutton-Coldfield.

SOLVE THIS!

PROBLEM No. 220.

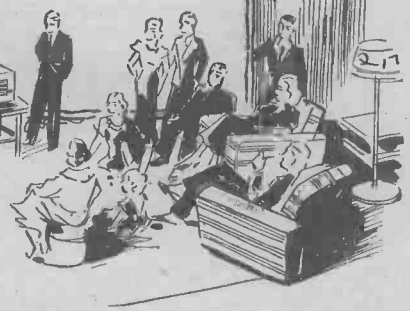
Watkins built a simple battery, S.G. three valve receiver using tuned-anode coupling between the S.G. and Detector valves and a transformer Coupled L.F. stage. London National tuned in at good volume, but when reception of London Regional was tried the fuse blew. What was the fault? Three books will be awarded for the first three correct Solutions opened. Address your Solutions to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2. Envelopes must be marked Problem No. 220 in the bottom left-hand corner and must be posted to reach this office not later than the first post on Monday, December 7th, 1936.

Solution to Problem No. 219.

The Cathode bias resistance in Wyndham's receiver was burnt out.

The following three readers successfully solved Problem No. 218, and books are accordingly being forwarded to them: J. Whitten, 81, Fernlea Rd., Balham, S.W.12; John Robertson, Ankengill, Wick, Scotland; Ernest Hewitt, 6, Lincoln Ave., Bournemouth.

Producing Your Own Programmes



Some Ideas for "Home Broadcasting" with a Description of Different Methods of Connecting a Microphone and Pick-up, and Using a "Fader"

THERE is a considerable amount of entertainment to be had from so-called "home broadcasting," and the essential apparatus need not be expensive. Moreover, this form of scientific amusement will be found an ideal addition to the games played at Christmas parties. The scheme can be varied in a number of different ways, but the main idea is that members are invited, in turn, to put on their own "show." A time allowance of, say, five minutes can be made, and the "producer" takes his or her place before a microphone in a room away from that in which the loudspeaker is installed. Those who sing or recite can give their "turns" in one of these forms, whilst those who are good at telling yarns or making witty remarks can "broadcast" in this form.

The Microphone

The first requirement is a microphone, and this is connected to the pick-up terminals of the receiver. By making use of the volume control, a variety of effects can be given. Additionally, a good deal of fun can be had by making various noises in front of the microphone and asking members of the party to identify the sounds. Rustling paper, rattling keys, bursting balloons, and so forth provide good tests and cause many laughs. If desired, the effect can be improved still further by using a gramophone pick-up and records in addition to the microphone and using a "fader" to bring the pick-up and microphone into circuit as desired. As B.B.C. listeners are aware, remarkably interesting programmes can be produced by mixing speech and excerpts from records.

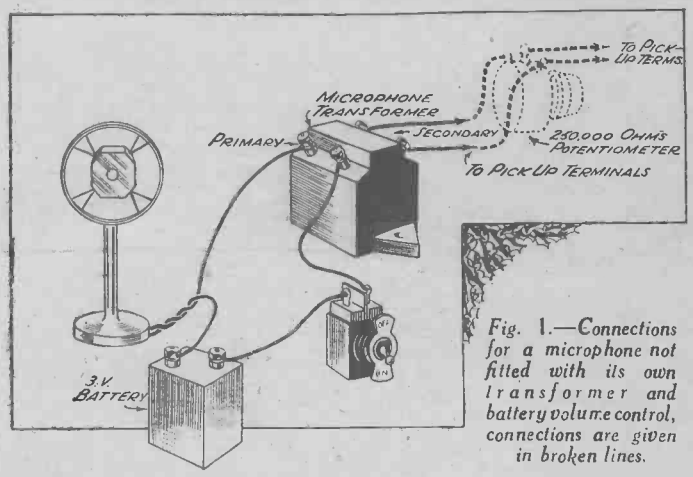


Fig. 1.—Connections for a microphone not fitted with its own transformer and battery volume control, connections are given in broken lines.

But let us consider the more practical aspects of the question. The choice of a microphone must be the first step, unless the reader already has one. There are numerous types on the market, and they can be obtained at prices from a few shillings to several pounds. For present requirements,

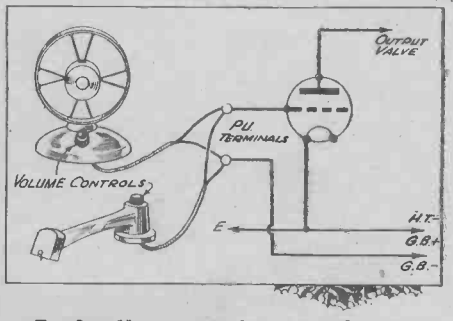


Fig. 2.—How a microphone and pick-up can be used together when each has its own volume control.

a microphone costing up to about a pound is adequate, since perfect reproduction is by no means essential. It is most convenient to obtain a microphone of the table type which is supplied complete with transformer, switch, volume control, and battery. This can be joined directly to the pick-up terminals of the receiver by means of the leads supplied with the unit. When such terminals are not already fitted to the receiver, they can easily be added as explained in another article in this issue entitled "The Pick-up and the Party."

It is generally best to place the microphone fairly near to the receiver so that the connections to it are short, but if this is

(Continued overleaf)

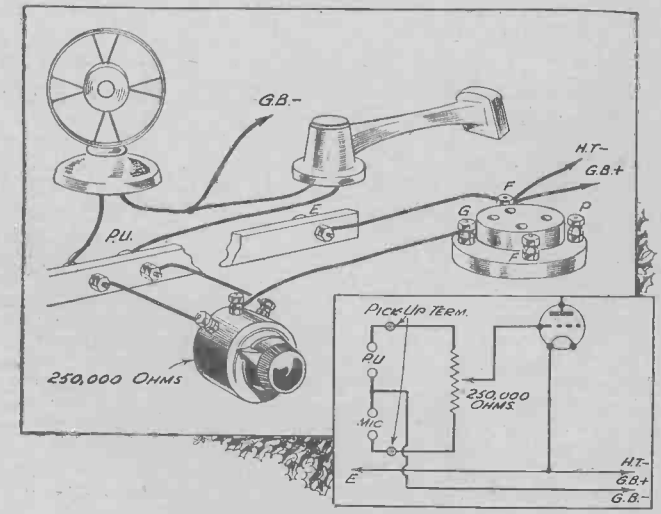


Fig. 3.—Using a simple potentiometer as dual volume control.

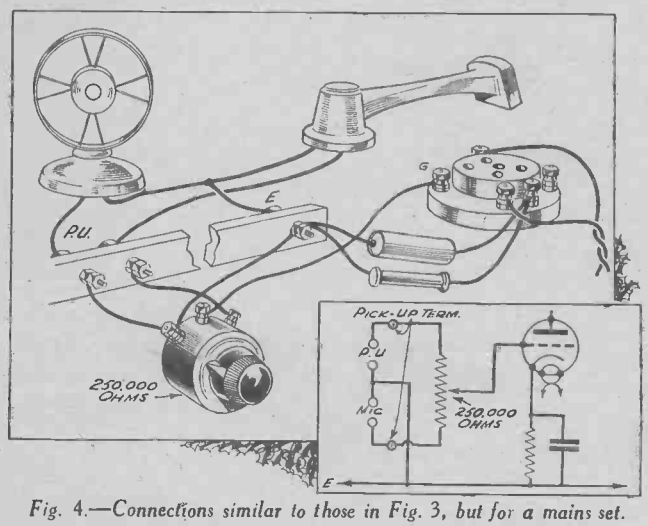


Fig. 4.—Connections similar to those in Fig. 3, but for a mains set.

PRODUCING YOUR OWN PROGRAMMES

(*Continued from previous page*)

not convenient the leads should be of screened wire, the screening being earth-connected. The speaker should be in another room if possible. If it is in the same room the microphone should be shielded from it by means of a cardboard box or sheet of non-resonant material. The reason for this is that should the sound from the speaker reach the microphone a peculiar form of instability will be noticed, which will result in a low-pitched "howl."

Microphone Connections

When using a microphone which is not provided with its own transformer and other "etceteras," the connections shown in Fig. 1 should be followed. It can be seen that there is a microphone transformer (ratio about 1 to 100), an off-on switch, and a 3-volt dry battery. The last-named is generally satisfactory, but with some microphones a higher voltage is required. As the current consumption is low, however, quite an inexpensive battery can be used. A volume control is not shown in Fig. 1, but is always desirable. In some cases the low-frequency volume control in the set can be used, but the voltage of the microphone-energising battery should first be adjusted to the most suitable value. This should be such that there is no appreciable distortion or "blasting" when speaking into the microphone with the control set to its "full-on" position. When an external volume control is required, it can be connected between the transformer secondary and the pick-up terminals, as shown in broken lines in Fig. 1.

Combining Pick-Up and "Mike"

As was suggested earlier, a better effect can be obtained by using a pick-up in conjunction with the microphone, when the "broadcaster" can try his skill at compering a programme. Assuming the use of microphone and pick-up, each having their own volume controls (and when the microphone has built-in transformer and battery), the connections can be as shown in Fig. 2, where both instruments are joined to the pick-up terminals of the receiver. When both volume controls are turned full on the outputs of the microphone and pick-up will be reproduced at about equal strength by the speaker, but by turning down one of the controls the relative strengths can be varied over wide limits. This arrangement is not ideal, and is incorrect in theory because the two volume controls are in parallel, so that the total resistance in the grid circuit of the input valve is too low. The arrangement is, nevertheless, good enough for many requirements, especially after a little experience has been gained in operating the two knobs.

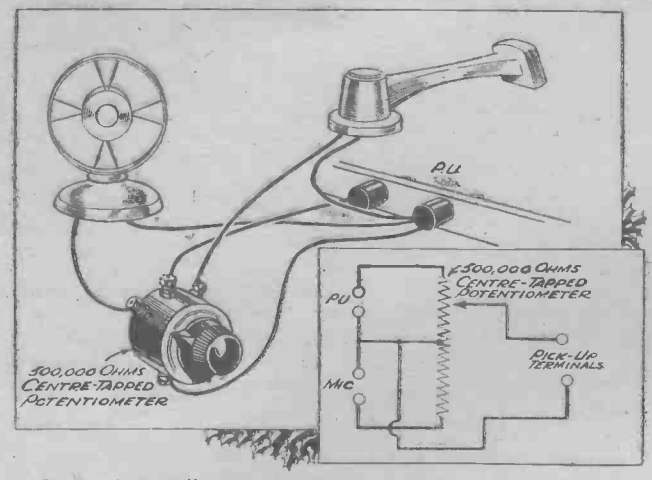


Fig. 5.—"Fader" connections, using a centre-tapped potentiometer.

Dual Volume Controls

Another arrangement which is better in some respects is shown in Fig. 3. In this case a 250,000-ohm potentiometer (preferably of the ungraded type) is used as a simple "fader," the pick-up and microphone being connected in series. In speaking of the microphone in this case, it is assumed that it is attached to the appropriate transformer and battery, of course. When the slider is moved to one end the pick-up is in circuit, and when moved to the other the microphone is in circuit; between these two extreme positions a certain proportion of the output from each is applied to the amplifier. The connections shown apply to a battery-operated set, but corresponding connections for a mains receiver are given in Fig. 4.

This general system of connections is fairly satisfactory when it is preferred to use ordinary components which will probably be to hand, but somewhat better results can be obtained by using a special centre-tapped potentiometer, as shown in Fig. 5. This is more effective because the pick-up and microphone do not require to be in series with each other, so that one connection from each is always "in the air." In this case, both instruments are definitely cut out of circuit when the slider is moved to its central position, and either can be brought into use by moving it in one direction or the other from the midway setting. If a centre-tapped potentiometer is not readily available, the same result can be obtained by using two separate 250,000 ohm components in series and joining together their sliders, as shown in Fig. 6. The two potentiometers must be of such a type that they can be ganged together and operated by means of a single knob. This system of connection gives very smooth control and an effective method of "fading out" the microphone or pick-up whilst the other is "faded in."

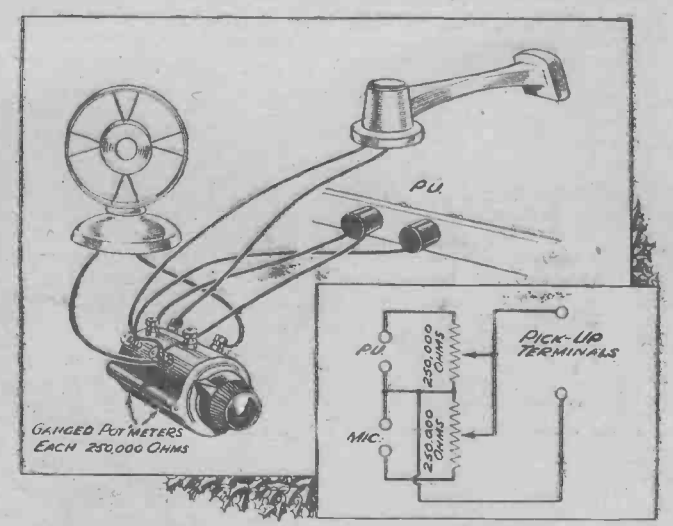


Fig. 6.—An alternative arrangement to that shown in Fig. 5, where two ganged potentiometers are used.

International Table Tennis

THE Hungarian Table Tennis team, consisting of Barna, Bellak, and Szabados, began a seven-weeks tour of the country early in November. Several matches have been arranged, and A. A. Haydon, of Birmingham, is captain for those in London and Birmingham. The latter is to be played at the Central Hall, Birmingham, and a twenty-minutes running commentary will be broadcast on December 8th.

Police Band Concert

ON December 7th Birmingham City Police Band, conducted by Richard Wassell, with Doris Watkins (soprano) as the vocalist, is to give a Town Hall concert, which will be broadcast from the Midland Regional. There is to be a popular programme including a selection from "H.M.S. Pinafore" and Chabrier's "Suite de Valses," arranged by Dan Godfrey.

PROGRAMME NOTES

Press Gang Play

ARTHUR MACFARLAND, a new Liverpool author, has written a play about Liverpool in the eighteenth century, called "Hawks Abroad," which is to be broadcast on December 4th. "Hawks Abroad" was the warning cry uttered when the Press Gang men were seen in the streets of Liverpool. The action takes place in the year 1778, at the crisis of the American War of Independence, when England found herself faced not only with the newly-formed United States but also with France. The difficulty in obtaining willing recruits in the British Navy stimulated the activities of the Press Gang in all the sea-port towns.

B.B.C. Scottish Orchestra

ON December 3rd the B.B.C. Scottish Orchestra, led by J. Mouland Begbie and conducted by Guy Warrack, will play Overture to "Mason and Locksmith," by Auber; Suite by Cedric Thorpe Davie; and Waltz "The Blue Danube," by Strauss. Mae Johnston (soprano) will sing with orchestra "Jewel Song" from "Faust," by Gounod; "Ciribiribin," by Pestalezza; "As through the Street," from "La Bohème," by Puccini; "Bird Songs at Eventide," by Eric Coates; "I hear a Thrush at Eve," by Cadman; and "Only a Rose," from "The Vagabond King," by Friml.



MUSIC throughout the HOUSE

This Article Explains How Extension Speakers Can be Connected to Different Types of Receiver, and Also Describes Methods of Remote Volume Control and Receiver Switching.

AT the festive season in particular, it is very desirable that a loudspeaker should be available in almost every room in the house. "Overflow" parties generally call for the use of a speaker in both dining and drawing rooms at the same time, and there are many who like to have music in the hall, bedroom and other parts of the house.

Every year, in our Christmas Number, we have published an article on the use of extension speakers, but this is an "evergreen" subject, as well as one which is changing to a certain extent. In changing, the matter is becoming increasingly simplified, because manufacturers almost without exception are introducing new and improved speakers with special easy-matching devices for extension use. It is not essential that a special type of speaker be used, but it is certainly desirable if good quality is required—and who does not insist upon this to-day?

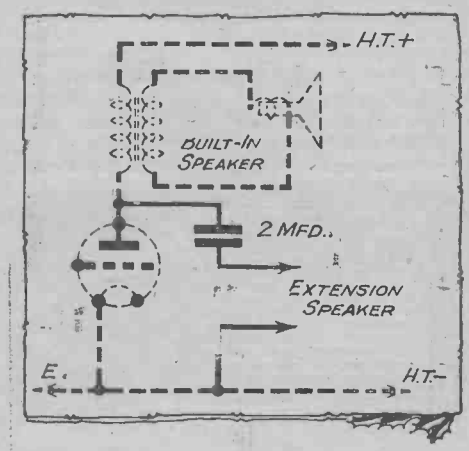


Fig. 1.—The best general method of attaching an external speaker.

"Extension" Terminals

When it was the custom to have the normal loudspeaker separate from the receiver, it could be moved into any convenient position, and even carried to the next room without much trouble, but when the speaker is built-in it is better not to disturb it, and to obtain another for use away from the set. If terminals are provided on the receiver for an extension speaker, it is necessary only to connect the new speaker to them by means of a length of ordinary twin flex which will reach to the remote point. There is one slight difficulty here, however, which is that quality might suffer if the length of wire exceeds about 15ft., and if the speaker is of an earlier type not fitted with a matching device. In a case such as that an improvement can be obtained by using two separate wires and keeping these a short distance apart. When this is done it might be necessary to try two or three different positions for the leads if the house is wired for electricity. This is because if the leads run parallel to the mains wiring within a wall a certain amount of "hum" might be induced.

Low-resistance Speakers

There is one other point which applies to commercial receivers; some of them require a low-resistance external speaker. This generally means that the speaker must be of the type not fitted with its own input transformer. This point should be borne in mind, and the makers' recommendations followed with regard to the correct type of speaker for use. It is also very important in these instances that the connecting wires should not be unduly long, and that they should be a stout gauge or of good-quality multi-strand cable. If several yards of ordinary thin flex were employed there would be a pronounced loss of signal strength. Good "power" flex is suitable, or as an alternative 18-gauge bell-wire can be used.

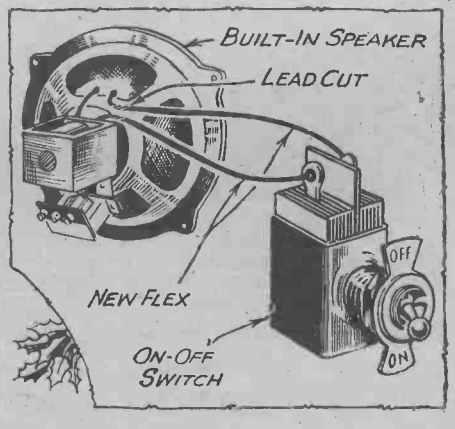


Fig. 2.—Method of fitting a switch to "mute" the built-in speaker when using the connection shown in Fig. 1.

When using a special extension speaker it is necessary only to experiment with the different connections or matching-switch positions until the most suitable are found. Instructions are generally supplied with the speaker.

One Method of Connection

When terminals or sockets for an extra speaker are not provided on the set, there are various alternative methods of connection which can be employed. That which is generally most suitable is shown in Fig. 1. It will be seen that one speaker lead is attached to one side of a 2-mfd. (approx.) fixed condenser of which the other terminal is connected to the anode terminal of the output valve, whilst the second speaker lead is earth-connected. The primary winding of the transformer attached to the built-in speaker is used as an output choke, and this with the condenser provides choke-capacity output coupling. An advantage of this is that the earth-return connection can be made either to the receiver (using twin connecting wires), or to any convenient earthing point near the speaker. The latter might be a water pipe, gas pipe

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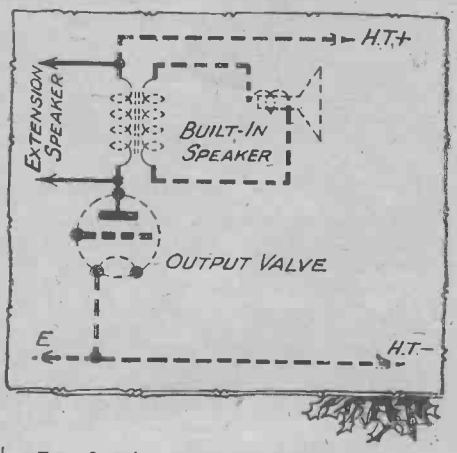

Fig. 3.—Another method of connecting an external speaker, which is fairly satisfactory, although not usually as good as that in Fig. 1.

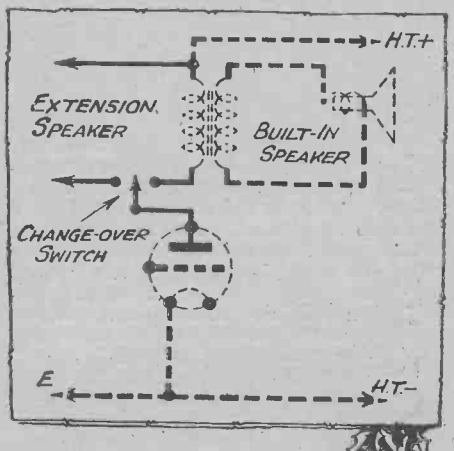

Fig. 4.—How a change-over switch can be used when employing the arrangement shown in Fig. 3.

MUSIC THROUGHOUT THE HOUSE

(Continued from previous page)

or earth spike driven into the ground just outside a nearby window.

"Muting" the Built-in Speaker

In using this system there is sometimes a difficulty in silencing the built-in speaker when necessary. Obviously, the speaker cannot be disconnected completely, and the best method is to disconnect one end of the speech coil from the transformer secondary. This is not easy in most cases, because the speech-coil leads are usually soldered to tags on the transformer. Where the leads are fairly accessible, however, the arrangement shown in Fig. 2 can be followed. One of the leads is cut, and two short lengths of insulated flex are soldered to the two ends. The lengths of flex are then attached to the terminals of an ordinary on-off switch. When the switch is in the on position the built-in speaker is in circuit, and when it is turned off the speaker is "muted." It will be found worth while to make these connections permanent, mounting the switch on the back or side of the cabinet, as near to the speaker transformer as possible.

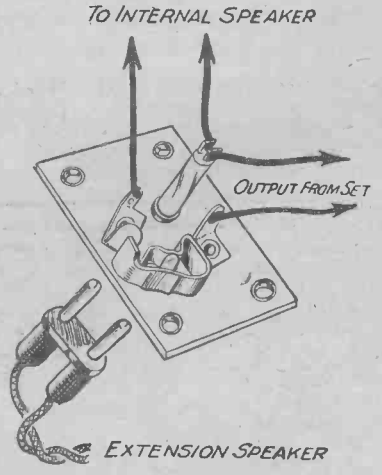

Fig. 5.—This illustration shows how the special "Clix" plug switch can be used as an alternative and safer arrangement than that in Fig. 4.

Alternative Connections

Another method of connecting the extra speaker, which is not generally as satisfactory, is as shown in Fig. 3, where it is simply in parallel with the built-in unit. In this case it is generally a convenience to employ a change-over switch for bringing either one speaker or the other into operation. An ordinary single-pole-change-over switch could be used as shown in Fig. 4, but this is not ideal. The reason is that if the switch were operated while the set were switched on there would be a voltage surge in the anode circuit of the output valve, and this might cause serious damage to the valve and other components. An excellent and inexpensive way out of this difficulty is by using the special plug switch which was recently introduced by the makers of the famous "Clix" connectors. This switch, along with the connections, is shown in Fig. 5.

Remote Control

One of the objections to the use of an extension speaker is that it is sometimes impossible to control the volume at the speaker. This does not apply, of course, in the case of extension speakers such as many of those in the W/B range which have a built-in volume control. When this is not fitted to the speaker which it is proposed to use, a potentiometer volume control can be added as shown in Fig. 6. The .01-mfd. fixed condenser shown in Fig. 6 is not essential, but it is desirable in the interests of quality at low volume levels. It is worth mentioning that a special graded volume control for this purpose is made by W/B. Another method is to connect a variable resistance in parallel with the speaker; a value of about 50,000 ohms is suitable.

Another difficulty which presents itself when using an extension speaker is that the receiver cannot normally be switched off from the remote point. This is not impossible of solution to-day because special relays are available at reasonable cost. One of these is made by Bulgin, and typical connections are given in Fig. 7, where it will be seen

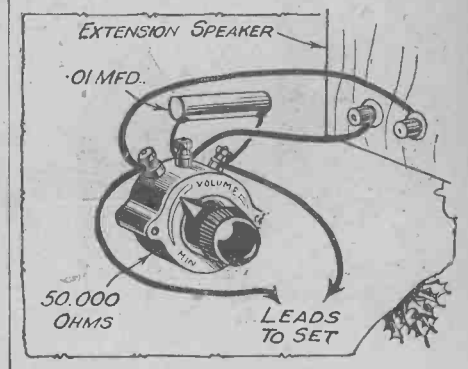

Fig. 6.—A useful volume control for an extension speaker.

that double-push switches are used for on-off control; these are supplied by the makers of the relay. Another model is the W/B "Long Arm," and this is used in conjunction with the adiabatic volume control-switch unit which is fitted to some of the extension speakers of this make, and which can be obtained separately for connecting to existing speakers. The connections are given in Fig. 8.

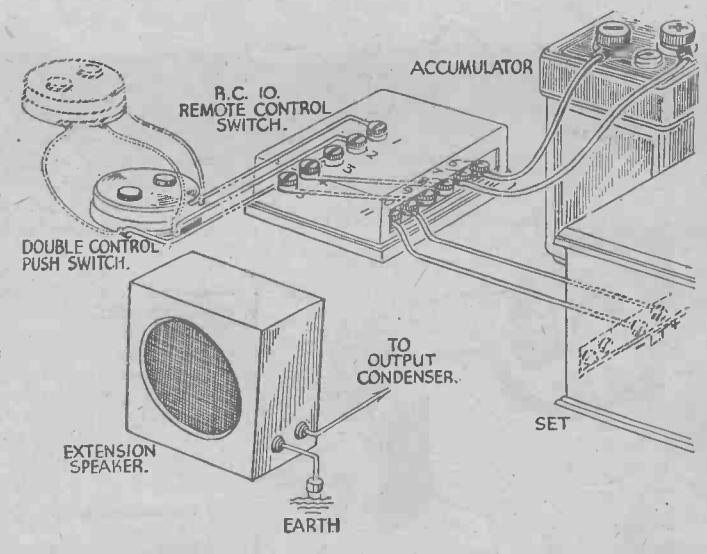

Fig. 7.—How the Bulgin remote control relay can be used for switching the set on and off from a distant point. Connections are for a battery set, but the device can also be used with a mains receiver.

MARVELS OF MODERN SCIENCE
By F. J. Camm
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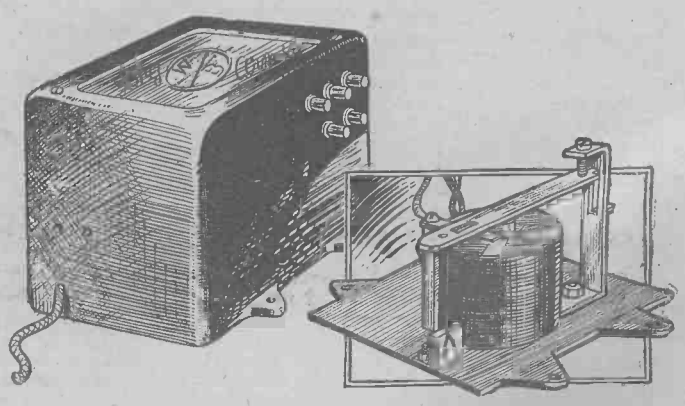

Fig. 8.—Connections for the W/B "Long Arm" used in conjunction with a W/B extension speaker having a special combined volume-control-switch.

The Pick-up and the Party



How to Connect and Use the Gramophone Pick-up with Any Existing Receiver, and Suggestions for Increasing the Entertainment Provided by Gramophone Records with Various Devices—by W. J. DELANEY

THERE are occasions when the broadcast material does not provide the necessary entertainment, and in the ordinary way this would mean that at a party or family gathering a sudden lull descends upon the proceedings. The usual problem then arises as to what to do next. Some would like to play games, others want to do something else, and so on. Where, however, a gramophone pick-up is fitted as part of the radio equipment no such problem can arise, as the vast variety of gramophone records which is available will enable any desired programme to be given to your guests. You can have any of your favourite radio stars, instrumentalists, or dance bands, and there is no need for any dull moment when you possess a radiogram. Contrary to the views held by many listeners, it is not necessary to have access to the electric-supply mains before you can use a radiogram. Although the majority of radiograms on the market are designed for mains operation this does not indicate that mains are essential, and this point seems to have prevented many listeners from obtaining a pick-up and converting their receiver into a radiogram. Provided that the volume delivered by your receiver on the radio programmes is ample for your normal listening needs without the necessity for using excessive reaction, then you can obtain a similar volume from a gramophone pick-up.

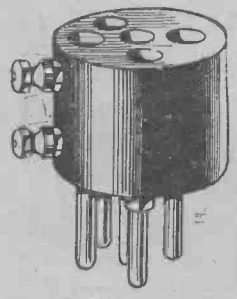

Fig. 1.—This adapter enables the pick-up to be used with any receiver which is not already provided with pick-up terminals or sockets

Fitting a Pick-up

To explain the last point it may be mentioned, for those who are not familiar with the subject, that the gramophone pick-up operates at low frequency, or audio frequency, and the reaction control operates at high frequency. Therefore, the high-frequency portion of the receiver is out of action when a pick-up is being used, and although you can use the detector valve in addition to your L.F. stages, you cannot employ the reaction control. The pick-up may be used with any receiver without the need for breaking or disconnecting a single wire, and it is possible to purchase a special plug to which the pick-up may be joined, and this plug is inserted into the valve-holder beneath the valve. That is to say, the valve is pulled out of its holder in the set, the plug inserted in its place, and then the valve is put back on top of the plug. The pick-up is then in position and may be used in the usual way. From what has been said previously, it is obvious that an H.F. valve must not be removed, and thus the pick-up plug or adapter is inserted only in the detector or L.F. valveholders. If there is no volume control on the L.F. side of the receiver it may be found with some pick-ups that overloading and consequent distortion will take place if the pick-up is used with the detector valve, due to the fact that the amplification is too great to enable the output valve to handle the signal. In such a case the pick-up would be joined to the L.F. valve.

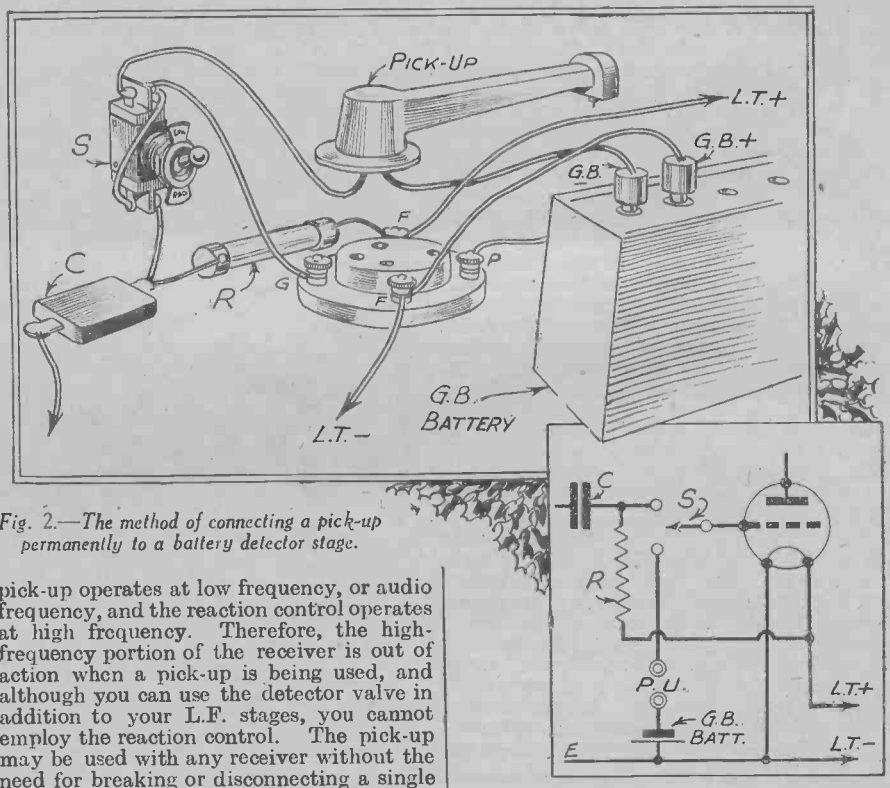

Fig. 2.—The method of connecting a pick-up permanently to a battery detector stage.

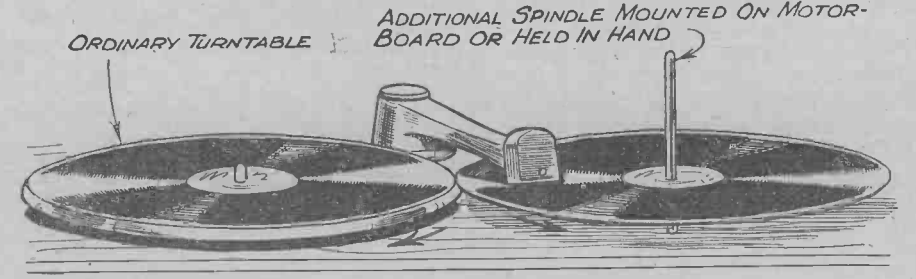

Fig. 3.—By playing a record backwards as shown here, you can obtain some very weird effects.

Choosing a Pick-up

When obtaining your pick-up, therefore, you must first consider your circuit. If

there is only one L.F. stage, you can only use the detector with that stage and this will provide quite a good degree of amplification. Consequently you should obtain a pick-up with a moderate voltage output. Similarly if your receiver employs a metal rectifier feeding the output stage, you can only use one stage of L.F. amplification, and a very sensitive pick-up would be needed to obtain sufficient volume. You can obtain a pick-up for as low as 5s., or if



Fig. 4.— Adding to the fun by playing a record eccentrically.

you have no portable gramophone with which to use this simple type of instrument, you may obtain one complete with a carrier arm. As a motor has to be used to turn the record, however, a simple portable gramophone of the standard type may be obtained quite cheaply and will enable you to make your receiver into a radiogram at the minimum of expense. If you desire to redesign your present receiver to make it into one of the modern types of radiogram, you can obtain a clockwork or electric motor to mount on the top of the cabinet, and fit a standard pick-up with arm and volume control. In this case the makers will supply a template showing the correct position for the carrier arm to ensure that the tracking is correct. That is to say, if not correctly mounted, the angle of the needle in respect to the sound grooves on the record will change and this may result in the records being damaged owing to the sides being scraped. The position varies according to the type of pick-up and, therefore, you should follow the makers' instructions on this particular point.

Correct Motor Speed

If you use a clockwork motor, or an electric one with speed control, you will only obtain the correct musical pitch when the turntable turns at the correct speed. With the majority of modern records this speed is seventy-eight revolutions per minute, and if the speed regulator is marked in revolutions per minute it is a simple matter to set the indicator to the correct position. If no indication is provided or you wish to check the speed you can use a stroboscope (provided you have A.C. lighting mains available). This consists of a disc having black and white markings round the edge and these are in such a position that when the disc rotates at the correct speed, and it is viewed in the light from an ordinary 50-cycle A.C. lighting supply, the markings appear to remain stationary. Such a speed indicator may be obtained free on application to the Cosmocord Company whose advertisement appears from time to time in this journal.

If the motor runs slowly the pitch of the music will fall and you can add to the amusement of your guests by playing a record at half-speed. It is interesting to note the effect of this arrangement, as the instruments which have few harmonics (such as the saxophone, trumpet, etc.) do not sound much altered, but the piano, which is rich in harmonics, has a most weird tone and you will find that many people cannot identify it as a piano. Similarly, by running at a very high speed the pitch is raised and the human voice becomes very squeaky, producing an effect similar to the old-fashioned gramophone, owing to the apparent elimination of the lower frequencies. A further scheme to add to the liveliness of a party is to play records backwards, or by the use of an eccentric hole. For the latter another hole should be drilled (or burnt with the aid of a cigarette end) about ¼in. from the correct hole. As the record then rotates eccentrically it is not possible to start it, and then place the needle on the groove. The needle must, therefore, be placed into position first, and the motor started up, spinning the record so as to obtain the correct speed as soon as possible. (Fig. 4.)

To play a record backwards, a separate spindle should be mounted on the motor-board, and the record may then be placed on this with its edge resting against the edge of the turntable.(Fig. 3.) Alternatively, you can hold the record on a pencil or similar round object, resting the under surface on your thumb, and can then press the edge of the turntable giving the required pressure to prevent the record from slipping.

A Permanent Connection

If you require the pick-up to be a permanent connection, a simple single-pole change-over switch may be fitted as shown in Fig. 2. The grid condenser and grid leak are disconnected from the grid terminal of the valveholder and are connected to one side of the change-over switch. The grid is joined to the arm of the switch, and the other side of the switch is joined to the grid bias battery. If the receiver is of the mains type the grid-bias connection is ignored, and that side of the switch is joined direct to earth. To provide the bias for the detector valve (which, you will remember, is not operating as an L.F. valve), a suitable resistor is joined in the cathode lead and by-passed by a suitable condenser. The grid leak is then joined direct to the cathode. The arrangement is shown in Fig. 5, and in the majority of cases a resistor of 1,000 ohms would be needed for the bias circuit and a 25-mfd. electrolytic condenser may be used for by-pass purposes.

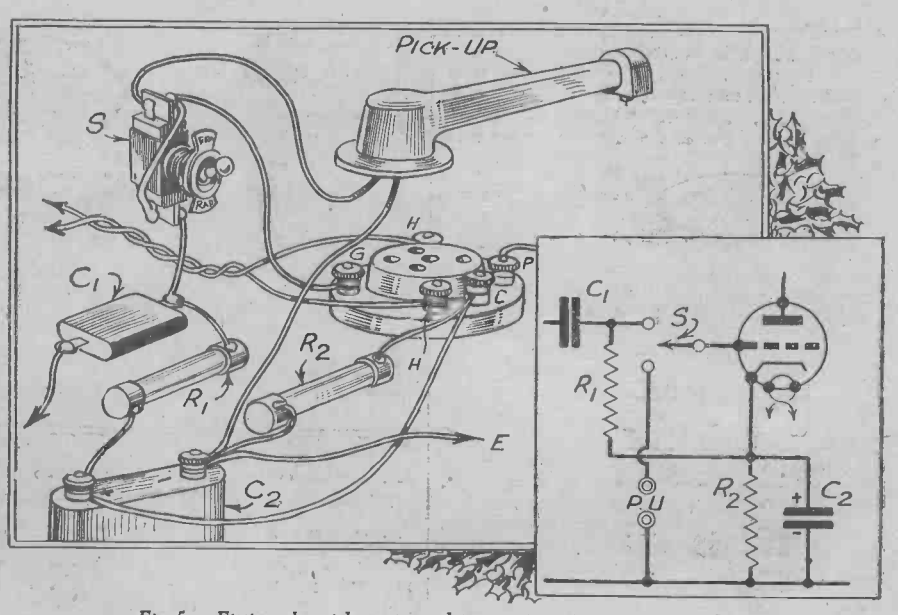

Fig. 5.—Fitting the pick-up to a detector stage in a mains receiver.

PLAYER'S FOR XMAS

GAILY decorated Christmas packings are again a feature which the manufacturers of the famous Player's Navy Cut Cigarettes offer to smokers for the Christmas Season.

Printed with an appropriate greeting, these packings containing 50, 100, or 150 Player's Navy Cut Cigarettes supply the happiest of all solutions to the gift problem. They are available in tins of 150 for 7/3, 100 for 4/10, 50 for 2-6, and in card boxes of 100 for 4/8 and 50 for 2/5; having address space they can be dropped straight into the post with just the addition of recipient's name and address.

For smokers who prefer the ordinary 20's packets there are postal cartons containing five packets of 20 for 4/9½.

Player's "Weights" in Christmas cartons containing 4 packets of 15 for 2/- are an inexpensive, yet always welcome, gift. Player's "Gold Leaf" decorated tins of 50 for 2/11 are just right where a higher grade cigarette is required.

As for the ladies, Player's Cork Tipped "Bachelor" Cigarettes, in flat tins of 50 for 2/6, always make an acceptable gift. Then there are those generous size Player's No. 3 Virginias in flat pocket tins of 50 for 3/4 for smokers who appreciate a cigarette of extra quality.

Player's Whiffs—those delightful little cigars with the real Havana flavour—cost 10d. for five, while a more ample smoke is available in Player's "La Doncella" Cigars which sell in packets of 5 for 2/6 or in boxes of 25 and 50.

Nor has the pipe smoker been forgotten. Player's "Medium" Navy Cut Tobacco in ¼-lb. tins at 4/4 is always a favourite at Christmas time. Equally popular are "Airman" Mixture in ¼-lb. tins 3/4. "No Name" in ¼-lb. tins 5/-, and the "Digger" range of all Empire Tobaccos at 2/8 per ¼-lb. tin.

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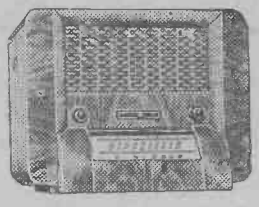
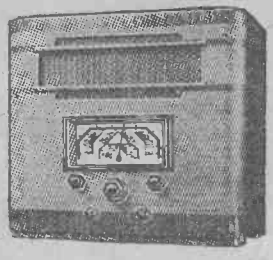
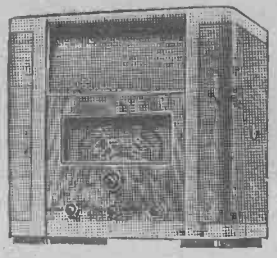


486AC/DC. All-Wave Superhet. 4 valves (plus detector) with AVC. 16-50, 198-580, 750-2000 metres. **13½ GNS.**



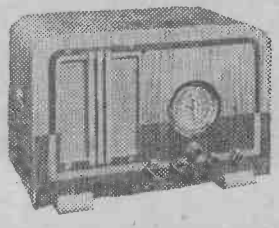
491AC. All-Wave Superhet. 5 valves (plus detector) with AVC. 16.5-52, 195-575, 725-2000 metres. **13½ GNS.**



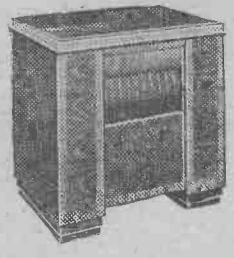
482AC. All-Wave Superhet. 6 valves (plus detector) with AVC. 16.5-51.5, 200-580, 725-2000 metres. **16 GNS.**



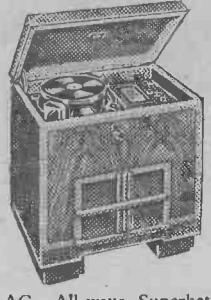
481AC. All-Wave superhet. 6 valves with AVC. 7-16 (covers Television Sound Transmission), 16.7-53, 46-140, 185-560, 750-2200 metres. **18½ GNS.**



480AC. All-Wave Superhet. 6 valves with AVC. 16.7-53, 46-140, 185-560, 750-2200 metres. **17½ GNS.**



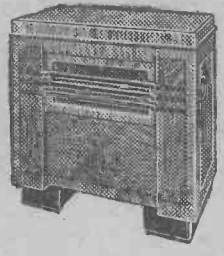
488AC. All-Wave Superhet Radiogram. 6 valves with AVC. 7-16 (covers Television Sound Transmission), 16.7-53, 46-140, 185-560, 750-2200 metres. **29½ GNS.**



485A-AC. All-wave Superhet Autoradiogram. 6 valves with AVC. 7-16 (covers Television Sound Transmission), 16.7-53, 46-140, 185-560, 750-2200 metres. **38 GNS.**



487AC/DC. Universal All-Wave Superhet Radiogram. 4 valves (plus detector) with AVC. 16-50, 195-580, 750-2000 metres. **25 GNS.**



492AC. All-Wave Superhet Radiogram. 5 valves (plus detector) with AVC. 16.5-52, 195-575, 725-2000 metres. **25 GNS.**

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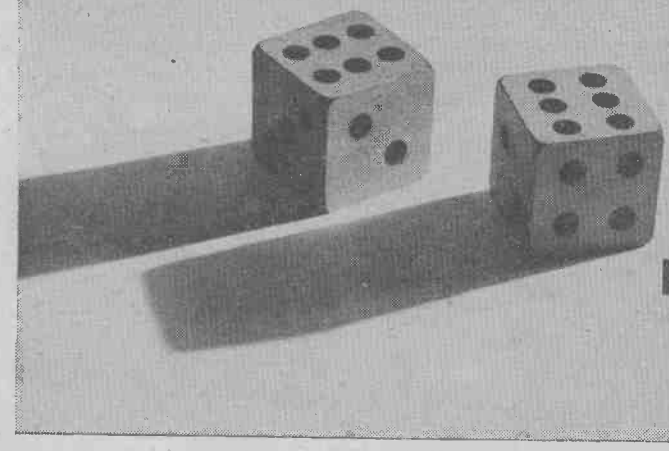

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ANNOUNCER'S OPENING REMARKS

Fade in gramophone playing "In an Old-fashioned Town" for about 30 seconds. Fade out music whilst Announcer speaks.

Announcer. "Ladies and gentlemen, we present a comedy entitled, 'Genuine Frauds'. The characters in order of 'appearance' are:—

Sadie Gullhiemer.
Cyrus Gullhiemer.
John Marlow.
Jane Marlow.

The action of the play takes place at the "Lilac Cottage Tea Rooms" at Chancton, a charming old-world village nestling in a hollow of the Sussex Downs.

Imagine, Ladies and Gentlemen, a beautiful summer afternoon; a gentle breeze lightly sways the lilac, clustering so thickly by the garden-gate and swings the newly-painted sign which invites the passer-by to wander up the garden-path and have a home-made tea at "Lilac Cottage."

Let us wander up that cobbled path and push open the front door of the cottage. A quaint, low-ceilinged, cool, little room invites us to step inside and the gaily-coloured curtains and polished brass ornaments make the invitation irresistible.

Three small tables are laid for tea and it is at the one near the window that we find Sadie and Cyrus just finishing their tea and discussing a pair of quaint old candlesticks on the table in front of them. (Announce the following quietly and confidentially.)

Keep very quiet, everybody! Let us hide behind this screen and listen to "Genuine Frauds."

Fade in music for a few seconds and then fade out completely.

Sadie. "Oh geo!... But Cyrus, they're just too *wonderful!*"

Cyrus. "Yeah, Sadie, it's beginning to dawn on me that they *are* too wonderful. You've told me that eight times and described every square inch of them to me in detail. Personally, I'm more interested in that quaint little teapot at the moment. Could you just tear yourself away from those candlesticks for just one moment, darling, and pour me out another cup of tea."

Sadie. "Aw, you've got no art in you ... no understandin' ... no soul!... Momma was right. I shouldn't have married you. All you're interested in is concrete-mixers. Ever since we started on our honeymoon, I've had nothing but concrete, concrete ... and then more concrete!"

Cyrus. "Waal, what did they build the Statue of Liberty with?... Glucose?"

Sadie. "I'm not interested in the Statue of Liberty!... You can't call that art ... it's not old enough!"

Cyrus. "Oh, so it's not old enough! Waal, what about that cigarette box I've got way back home; the one with 'Mayflower' stamped on it?... Is that art?"

Sadie. "Yeah, but that's different. What I mean ..."

Cyrus. "And what about the fourteen carat gold salt cellar used by Louis Fifteen?... Is that art?"

Sadie. "Yeah, sure, Cyrus, that's all right but I do wish you wouldn't mix history with concrete!"

Cyrus. "Say, kiddie, if I didn't mix concrete, we wouldn't be here to-day in this quaint little shack. Aw, don't get me wrong, kid! Gee, I'm kinder sorry I've bin talking shop too much but you know I'm all for history as much as you are. Tell you what I'll do, Sadie! Do you like those candlesticks?"

Sadie. "Do I like 'em?... I'll say I do!"

Cyrus. "Right! (*Bangs table.*) I'll buy 'em for you!"

Sadie. "You mean that, Cyrus?"

Cyrus. "Sure I mean it, kiddie! They're as good as yours ... history and all!"

Sadie. "Aw, gee, Cyrus ... why they must be years old."..

Cyrus. "More like centuries."

Sadie. "Centuries? Do you mean ... do you mean seventeen hundred and something?"

Cyrus. "Waal, I'm not a bad judge and I'll say sixteen hundred and something. Anyway, I'm goin' to buy 'em for you."

Sadie. "But... but supposin' they won't part with 'em, Cyrus?"

Cyrus. "Say, you just leave this to Cyrus Q. Gullhiemer!... Remember what Julius Caesar said, Sadie ... 'Every gink's got his price.' Remember that! If I leave this house without 'em ... waal, I'll give up sellin' concrete-mixers!"

John. "Er ... good afternoon ... I'm not intruding, I hope?"

Cyrus. "No, stranger! Welcome! Come right in and sit down."

John. "Thanks! By Jove it's warm to-day ... especially carrying this suitcase all the way from the station."

Cyrus. "Sure thing! It looks a heavy case, too. Sit down, stranger, and take a breather."

John. "Er ... thanks ... it's nice to feel at home."

Cyrus. "Sure it's nice to feel at home. Do you know, we like this little island of yours?"

John (*with forced surprise*). "Do you! Er, that's splendid!"

Sadie. "Yeah, it's just too cute! We've bin lookin' around a bit and we're real glad we came over."

John. "That *is* a relief!"

Cyrus. "Yeah, we've bin lookin' around and do you know what tickles Sadie most of all?"

John. "My dear sir, as the novelists would say, I am all agog!"

Cyrus. "Waal, of all the big sights you've got, the things which get her most are your old-fashioned houses and curios and things. Mind you, I appreciate art, too, and I'm a pretty shrewd judge."

John (*earnestly*). "Yes, by Jove, I'll bet you are."

Cyrus. "Do you know, I'd rather ship this little cottage across the Atlantic than Buckingham Palace."

John (*in awed tone*). "Just fancy that ... and I don't suppose that it's worth half as much!"

Cyrus. "I see by the date over the door that this little shack goes back to fifteen twenty-three."

John. "So you're fond of antiques, eh?"

Sadie. "Fair crazy! Why, just before you came in Cyrus was saying that he was going to buy these old candlesticks."

John. "Is that so?"

Cyrus. "Yeah! Sadie, here, fell for 'em, and, believe me, they'll look just great way back home with my 'Mayflower' cigarette casket."

John. "Yes, no doubt! But I don't think you'll be able to buy them."

Cyrus. "Eh? What's that?"

John. "I simply said, Mr.—er—I don't think I know your name."

Cyrus. "Gullhiemer! Cyrus Q. Gullhiemer, of New York City!"

John. "Well, Mr. Gullhiemer. I don't think that you'll be able to buy them."

Cyrus. "Oh! Is that so! Well, Mr. er—I don't think I know *your* name."

John. "Marlow! John Marlow, of London Town!"

Cyrus. "Well, Mr. Marlow, I just think you've slipped there. If there's something I want—real bad, that is—I buy it."

John. "Is that so, Mr. Gullhiemer. But perhaps you've forgotten that there are some things which you *can't* buy."

Sadie. "Are you trying to say that Cyrus couldn't afford to buy them. Why, when we were in Berlin——"

John. "I have no doubt that Mr. Gullhiemer's dollars could purchase a fair

amount of antiquity, but I merely remarked that there were some things which could not be bought—not even with dollars."

Cyrus. "Waal! Waal! Waal! Now this is becoming real interestin'! You're trying to tell me, Mr. Marlow, that if I really wanted these candlesticks I couldn't buy 'em?"

John. "That's what I said."

Cyrus. "Waal—we'll just settle that. (*Rings handbell on table*). "Now, in Stratford-on-Avon, we did that the other day, there was a guy there in a little cottage we had tea in. Now, he wasn't going to part with an old oak workbox that he had kickin' around. But do you think we came away without it? No sir! I just rustled the bills and he forgot all his objections. When we got back to the hotel, and Sadie took out the old lining and put in a swell satin affair, it looks just great now!"

Sadie (*sentimentally*). "Yeah—that's romance!"

(*Bell Rings*).

Jane. "Did you ring, sir?"

Cyrus. "Now, look here, girlie, just run along to your grandfather and ask him how much he wants for the old candlesticks. And make it snappy!"

Jane. "I haven't got a grandfather, sir."

Cyrus. "Waal, it doesn't matter—whoever these belong to."

Jane. "Well, you'll have to ask my husband here, sir.

Cyrus (*surprised*). "Eh, what's that?"

John. "Yes—they belong to me."

Cyrus. "Waal, waal, waal. And here have I bin wasting my time. That's not like me—wasting my time over a deal."

John. "I'm afraid you're wasting your time altogether over this deal, Mr. Gullhiemer."

Cyrus. "Now, look here, Mr. Marlow. I want these sticks. How much?"

John. "Mr. Gullhiemer . . . I . . . I quite appreciate your desire to . . . to . . . acquire *Romance*, but, as I said before, there are some things which are not for sale and these candlesticks happen to be amongst those things."

Cyrus. "I'll give you twenty dollars."

John. "There is a certain sentimental value attached to these candlesticks. They've been in the family for many centuries! In fact, they're older than this cottage."

Sadie. "What? Older than one, five, two, three."

John. "As a matter of fact they go back to the thirteenth century."

Sadie. "Do you hear that Cyrus? Thirteenth century!"

Cyrus. "Yeah! Well, I'm always willing to pay for age. Mr. Marlow I guess fifty dollars will close the deal then!"

John. "Your knowledge of market values on Wall Street, Mr. Gullhiemer, is no doubt very thorough, but I'm afraid that your appreciation of antique values is rather hazy. Why, I could take them into any curio shop in London and get ten pounds apiece for them."

Cyrus. "Waal! If that's the case—what about twenty-five pounds the pair."

Sadie. "Thirty pounds, Mr. Marlow."

Jane. "Thirty pounds . . . John . . . think . . . what we could . . ."

John. "No Jane . . . it's no good. I can't sell the things."

Cyrus. "Come now, Mr. Marlow. You see, even your wife advises you to sell."

John. "Hang it all, I can't. Why! as I said before, they've been in the family for all those years. Why—dash it all—I can get twenty for them anywhere and you're wanting to give me a miserable ten pounds for the sentimental value. Why! that's worth more than the candlesticks to me."

Jane. "Yes, but John, we could have that summer-house built . . . for teas in the garden."

Cyrus. "There you are, a summer-house for teas, Mr. Marlow—that will bring in more money than the candlesticks."

John. "I can't. No, I can't."

Sadie. "Thirty-five pounds, Mr. Marlow."

Cyrus. "Yes, we'll jump to thirty-five."

Jane. "Take it John."

John (*after a pause*). "All right! Only . . . only . . . it . . . it seems like losing something that's part of you."

Cyrus. "Waal, now, that's real sensible of you. There you are, Mr. Marlow, everything's got its price. Here's the cash. Ten, twenty, thirty, thirty-five! Now if you want a business deal put over, just get on that little Atlantic telephone. I'll fix you up!"

Sadie (*in awed whisper*). "Gee, Cyrus. Thirteen hundred A.D., isn't that great?"

Cyrus. "Sure, kiddie, it's great."

Sadie. "I'll run along and put 'em in the car and I'm going to drive you back to London like I promised."

Cyrus. "Right you are, Sadie. Now you just try and back the car out of the lane."

Sadie. "Yes—big boy—leave that to me!" (*A door shuts.*)

John. "Your wife must be very proud of your being such a cute business man."

Cyrus. "Waal, yes, I guess she may be."

John. "Well, now she's gone. . . I'll let you into a little secret. What do you think of the curios in this suitcase, Mr. Gullhiemer?"

Cyrus (*puzzled*). "Gee, what are they?"

John. "Why, they're 11th century antiques."

Cyrus. "What? Older than the other?"



"What will you give me for this bag full of Romance, *Mr. Gullhiemer?"*

John. "Yes, sir! And these are B.C., guaranteed by the makers."

Cyrus (*seeing light*). "What the . . . do you mean?"

John. "Sh! Not so loud! Now, you're a cute business man, Mr. Gullhiemer. What'll you give me for this bag full of *Romance?*"

Cyrus (*shouting*). "Waal, of all the. . . *Why, it's stark, raving, daylight robbery.*"

John "Sh! Not so loud! Your wife will hear you and she thinks the world of you as a business man."

Cyrus. "Well. . . I'll be . . ."

John. "Say, Mr. Gullhiemer! If ever you want any genuine antiques—just you get on to that little Atlantic telephone—I'll fix you up! (*A door slams.*)

Fade in gramophone playing "Old-fashioned Town."

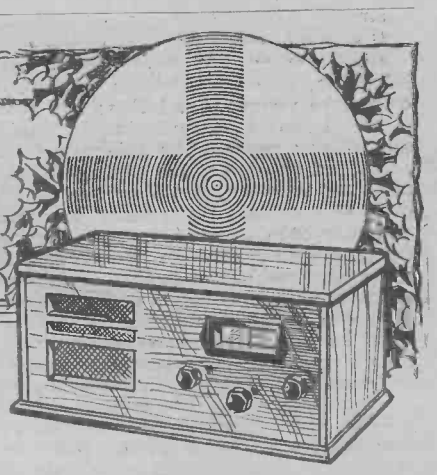
HOW TO PRODUCE A RADIO PLAY

It must be remembered, when presenting a radio play, that the whole plot depends upon the spoken word. Great care should therefore be taken to study the script so that the correct inflections of the voice will convey the meaning of the lines to the audience quickly and clearly. No doubt must be left in the minds of the listeners as to which character is speaking. In the case of "Genuine Frauds," this danger is automatically obviated by the fact that "Sadie" and "Cyrus" naturally adopt an American accent whilst "John" and "Jane" speak ordinary English.

It is helpful for the producer, when rehearsing his cast, to close his eyes, for in this way he is able to put himself in the place of the listener, and for the final rehearsals he should hear the play in another room through a loudspeaker. He will then be able to judge any phonetical ambiguities and clear them up.

Unfortunately, the average listener to a B.B.C. play does not realise that to be thoroughly appreciated it must be taken quite as seriously and attentively as a production in a theatre.

Rapid RADIO FIRST-AIDS



What to Do When Your Set Goes Wrong and the Shops Are Not Open, or You Are Unable to Obtain Spares and Replacements

IT is one of the perversities of nature that everything goes wrong when least expected and at an awkward time. It is as well, therefore, to be prepared for a temporary breakdown during the Christmas festivities, as no matter how careful you are beforehand to make certain that everything will be all right, it will be found that if anything does break down it will be on Christmas Day, when all the shops are shut. To be forewarned is to be forearmed, and therefore the following hints should be studied before the festival arrives and then you will be able to take the necessary steps to avoid a complete stoppage of the radio entertainment during this period.

For the battery user, the sudden breakdown of the battery supplies is the most likely defect which may arise, but the majority of listeners will no doubt make quite certain that a spare H.T. and accumulator is available, or at least will measure the batteries in order to be certain that they will last out over the holiday. If the unforeseen happens and this point is overlooked, a breakdown in the H.T. supply will be indicated by a gradually fading signal accompanied by distortion, the latter being due to the fact that the grid bias will remain unaltered. If, therefore, signals begin to get weaker, reaction becomes difficult to obtain, and distortion sets in, you may look to the H.T., and if no replacement is available, a temporary aid, where a special item must be heard, is to heat the battery. Place it in the oven for a few minutes with the door *open*, and do not make it so hot that the sealing compound runs. This will often give sufficient power to enable a complete musical item to be heard, but, naturally, it will not last very long.

The L.T. Supply

If the accumulator runs out, this will be indicated by a weakening signal, without distortion, and again the reaction control will be found to fail in most circuits. You cannot boost up the accumulator, and the only alternative is to use another source of supply. In the majority of small battery receivers the L.T. supply for, say, a news bulletin may be obtained from a dry battery, and perhaps a bell battery may be in use and may be removed for the purpose. Make quite certain, however, that it is not a 3-volt cell, in which case the filaments may be over-run. The condition of the battery will determine this, but it is desirable in such a case to include a resistance in series to ensure that only 2 volts are applied to the L.T. terminals.

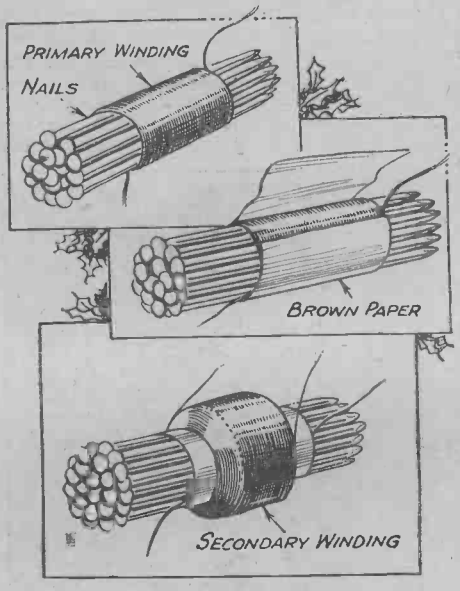


Fig. 1.—A quickly-made L.F. transformer.

Component Replacements

Should a component fail, this may be difficult to locate quickly, and, therefore, the simplest "first-aid remedy" in such a case is to eliminate stage after stage in the receiver. Such a fault would generally arise suddenly and no warning would be given. A resistor which is becoming faulty would perhaps give rise to crackling or other similar noises, whilst a leaky condenser would probably give rise to distortion. By joining the anode of one valve to the anode of the next but one a stage is completely cut out, and this will answer in the majority of circuits. If the receiver employs H.F. amplification, the aerial may be removed and connected to the grid condenser in the detector grid circuit, whilst if two L.F. stages are employed, the lead from the detector reaction choke may be taken over to the anode of the next valve. If the output stage has gone, the loudspeaker or filter choke may be connected in the anode circuit of the valve preceding it, and even if this is the detector stage it will function. Obviously, however, if the receiver is of a very simple nature, headphones would be preferable in such a case, as signals would no doubt be very weak with such an arrangement.

Making Components

If the fault may definitely be identified there are one or two simple schemes which may be adopted to effect temporary replacements. For instance, if a resistor is found to have broken down, a temporary one may be taken from the junk box even if not of the correct value, and some sort of signal will be obtained in most cases. If no spare is available, one may be made by soaking a piece of blotting paper in ordinary Indian ink. A high resistance may be made by rubbing ordinary soft lead pencil between two terminals, or at a pinch in some cases an ordinary piece of wet blotting paper may answer. It must, of course, be kept wet or it will fail to function as a resistor.

A temporary condenser may be made up in several ways. Two pieces of metal may be connected to the terminals of the faulty component (unless it has short-circuited

(*Continued overleaf*)

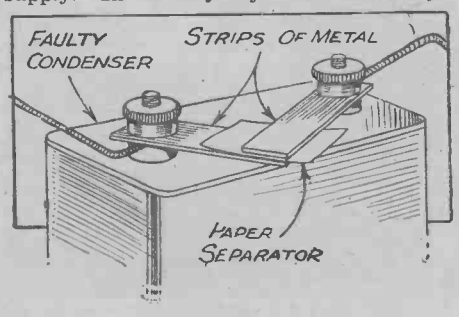


Fig. 2 left.—An improvised condenser, which can, of course, only be adopted if the component is not internally short-circuited.

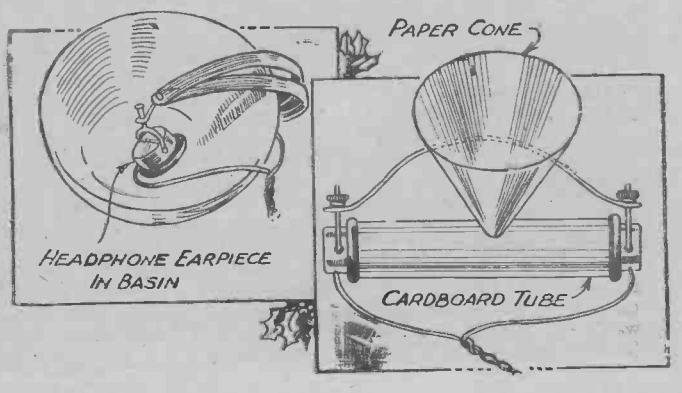


Fig. 3 right.—Improvised loudspeakers in which ordinary headphones are employed.

RAPID RADIO FIRST-AIDS

(*Continued from previous page*)

internally, when the leads should, of course, be removed) and these two pieces of metal should be separated by a thickness of dry paper. The thickness of the paper and the size of the metal will determine the capacity, but they may be slid over one another to modify the value and may even be used, in an emergency, for tuning or reaction purposes. An alternative method of making a condenser is to take two lengths of wire and double each one back upon itself. One should then be coiled round an ordinary lead pencil, each turn lying close up against its neighbour. When one layer has been wound a layer of paper should be over-wound upon it, and the other length of similar wire wound on top of the paper. If the wire is not first doubled back upon itself, the turns of wire must be soldered together.

A very temporary transformer may be constructed for the L.F. side of the receiver by winding a coil of wire for the primary over a handful of ordinary iron nails. Count the number of turns of wire, overlay a strip of brown paper and then wind a further coil of wire on top, the relationship between the two separate sections governing the ratio of transformation. That is, if 100 turns are wound over the nails, and then 500 turns are wound on top of the paper, the transformer would have a ratio of 5 to 1. The smaller or inner winding is the primary, and the outer and larger winding the secondary.

A Temporary Loudspeaker

Should the loudspeaker fail, and the defect be of a type which cannot be repaired quickly, a temporary speaker may be made up from a pair of ordinary headphones. The simplest idea is to place the earpiece inside an ordinary china basin, the sound being reflected from the inner surface with quite good volume, provided the initial signal is loud enough. Alternatively, a tube of cardboard may be constructed about 6ins. in length and placed inside the two earpieces, and a hole cut into the side of this tube and a trumpet made from paper or thin card inserted into the hole.

If the aerial collapses, due to strong winds or broken supporting rope, any indoor aerial may be used temporarily, but a better scheme is to pin the aerial wire along the top of a wooden fence, or simply stretch it from one end of the garden to the other. Temporary indoor aerials may be arranged in many ways, a short wire twisted round an existing bell-wiring system being quite good, provided that no electrical connection is made.

Radio Among the Pygmies!

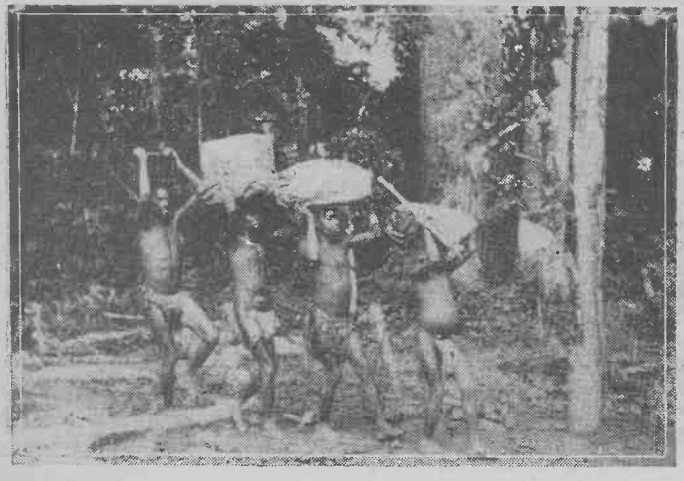
McMICHAEL sets have probably found their way into more strange corners of the world than even their manufacturers have ever heard of, and the files at Slough contain many records from explorers and big-game hunters of satisfactory reception in the most difficult places. Nevertheless, the latest adventure to be recorded makes most interesting reading, in addition to providing a wonderful testimony to the value of radio in remote places and the reliability of modern productions.

Some two years back Commander Attilio Gatti, the well-known Italian explorer and big-game hunter, began his eighth expedition into the Belgian Congo in search of okapi and pygmy elephant for zoological purposes, and knowing full well the lengthy nature of such an enterprise, and the monotony of the rain-soaked African forests, decided to take with him a radio equipment. His choice fell upon a McMichael Colonial receiver, which duly departed with the expedition for the Belgian Ituri Forest, complete with large reserves of batteries, tropical coverings, etc. Nothing was heard from the expedition until a few weeks ago when Commander Gatti arrived back in Europe with his mission duly completed.

Chimpanzees versus the Earth Connection

The difficulties of operating a radio set in virgin forests such as these are many, but very largely compensated for by the numerous and interesting sidelights which are secured on the effect of this latest development of the modern world on the entirely uncivilised denizens of these parts. Aerial and earth, which to us seem easy to erect in the middle of a forest, were a continual source of petty trouble. The earth connection was time and again removed entirely by mischievous chimpanzees during the daytime, and prowling leopards at night; the aerial was attached to a 150ft. tree in the centre of the clearing where the base camp was established, but one of the terrific storms which sweep the jungle forest daily during the rainy season soon proved too much for the forest giant, and down it crashed carrying the aerial with it. The aerial was re-erected frequently, but the earth connection proved more obstinate; eventually a palisade of small sticks was built round it with the result that the chimpanzees, at least, tired of their destructive amusements before the wire itself was reached. This arrangement brought unexpected advantages to the camp; the natives in this part of Ituri are pygmies and worship their gods by little temples of leaves, twigs, and so forth built on the ground. The earth protection was obviously a temple to the white men's god whose powerful voice could often be heard coming from a box in the camp.



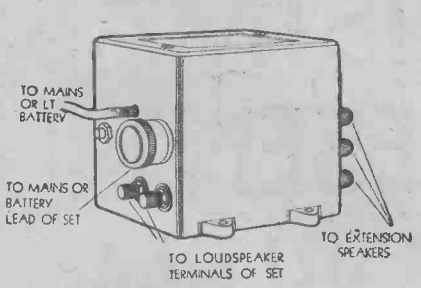




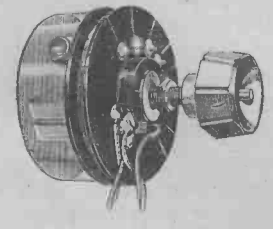
These illustrations show Commander Gatti assembling the aerial, and the pygmy bearers carrying the McMichael receiver through the jungle and erecting the aerial.



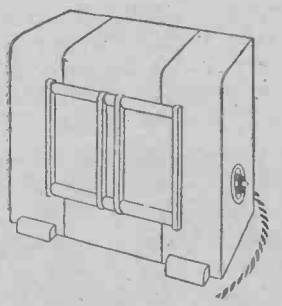
1937 *Stentorian chassis, for better Christmas radio. Wider response—less colouration—greater realism. Matches to any set. Prices from* 23/6 *upwards.*



"Long Arm" remote control, for switching **the set** *on or off from any extension point. One "Long Arm" serves any number of* 1937 *Stentorian extension speakers. Price* 15/6.



Volume control, type R/C—for use in conjunction with the "Long Arm" and 1937 *Stentorian chassis models. Price* 5/6.



1937. *Stentorian cabinet model. All models except the "Baby"* (29/6) *incorporate volume control type R/C. Prices* 29/6, 39/6, 49/6, 63/-.

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1937 STENTORIAN

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Synchronising Sound with your Cine

How Gramophone Records Can Be Made for Use in Conjunction with Cinematograph Films.

By FRANK PRESTON

THE home ciné may frequently be used to provide considerably better entertainment if it can be converted to a form of "talkie." Of course, it is now possible to obtain a complete "home talkie" outfit, but the price is very high. Even when cost does not prohibit its use, it is seldom that suitable sound-picture scenes can be "shot." As an alternative, the ciné enthusiast might consider the possibilities of making gramophone records to synchronise with the reproduced pictures. Briefly, the idea is that the film should be thrown on to the screen at the same time as a gramophone record is being made. If both film and record are started together, they can later be reproduced at the same time to give the same effect as a sound film.

Question of Cost

The method of procedure can be either simple or fairly complex, cheap or rather costly, according to the amount which can be spent and the quality of reproduction demanded. When it is not proposed to spend more than a few shillings an ordinary gramophone pick-up can be used as a recording head in conjunction with a loud-tone needle; it might be found necessary to weight the pick-up head in order to ensure a better "cut" in the record blank. As to the latter, it might be possible to obtain a few aluminium blanks very cheaply, although it appears that there are not now many of these on the market. There are many other types, however, although many of them cannot be used satisfactorily, except in conjunction with a complete recording and tracking head—which costs something like four guineas on the average. One well-known type of record blank is the "Musikon"; this requires a proper recording head and has to be "processed" after recording. The "processing" consists of baking the comparatively soft original record. The baking makes it quite hard and reasonably permanent. Makers of the blanks, which cost 1s. 6d., 3s., and 4s. 6d., according to size, will do the "processing" quite cheaply, whilst they can also supply an electric oven of special type at 27s. 6d. With this the amateur can bake his own blanks cheaply and effectively.

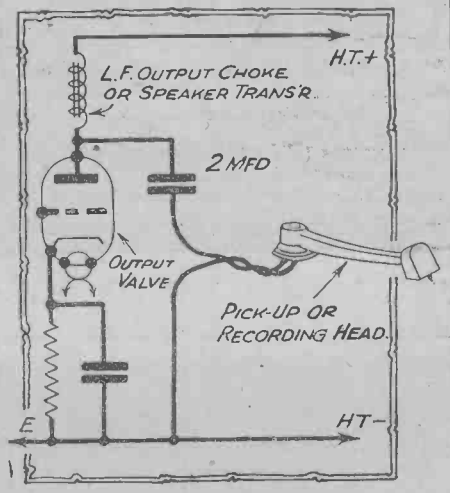


Fig. 1.—Connections suitable for a pick-up used as a recording head. A mains set is assumed, but the method is the same for a battery receiver.

Another Record Blank

There is another type of record blank available which does not require to be baked. This is similar in appearance to the normal type of record and must be used in conjunction with a tracking head. After recording, a small amount of special chemical is applied to the surface with a wad of cotton wool, and then the surface is polished by applying a second solution in a similar manner. This simple treatment renders the record perfectly hard and suitable for use time after time. Yet another pattern is of semi-transparent material, rather like celluloid in appearance. With this record no processing is necessary, but it is not as permanent as the others.

There are several points to watch when making records, and it is not proposed to deal with them here, since space does not permit. Most of the suppliers of record blanks, however, will provide the necessary instructions for their efficient use.

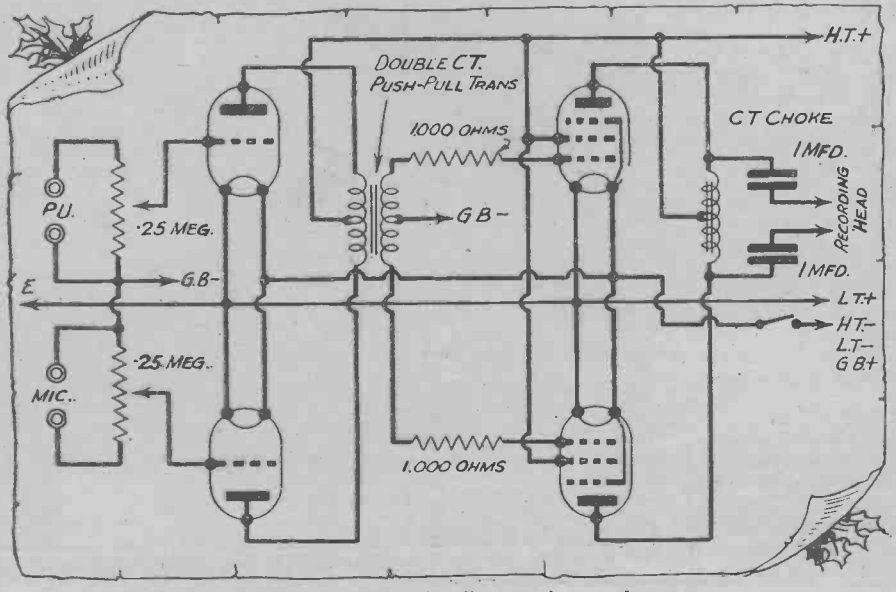


Fig. 2.—A useful type of double-push-pull circuit for recording

Recording

In the first place, it will be assumed that aluminium blanks are being used, these being ready tracked and requiring only a recording head or pick-up. The recording pick-up can be connected as shown in Fig. 1, where it takes the place of the loudspeaker in a choke-capacity output circuit of the broadcast receiver, which is to be used as an amplifier. When choke-capacity output is not used, the speaker being connected directly between the anode of

(Continued overleaf)

SYNCHRONISING SOUND WITH YOUR CINÉ

(Continued from previous page)

the output valve and H.T.—, the pick-up can be connected as shown in Fig. 1, but using the speaker in place of the choke. In that case it will be desirable to disconnect one of the secondary terminals on the transformer from the speech coil, but this is not essential when the set provides upwards of 2 watts output. Incidentally, an output of at least ¼ watt is needed for good results.

A microphone should be connected to the pick-up terminals of the receiver or amplifier as explained in the article in this issue, entitled "Producing Your Own Programmes." Then, with the film running and the pick-up on the record, it is necessary only to speak, play, sing, etc., into the microphone, making the sounds coincide with the pictorial events.

Preliminary Experiments

It might be necessary to make a few experiments before the desired results are obtained, for which reason it is suggested that the record be stopped every half-minute or so and "played back." This will enable the operator to judge the best positions for the microphone volume control for certain kinds of sound, and will necessitate the waste of only a single record blank. Before commencing the "full dress" performance it will be helpful to run through the film three or four times, making notes of the best sound accompaniment and of the number of words which can be spoken in connection with the various scenes. Those who are able to write shorthand will probably write out the script, correcting and "cutting" it each time the film is shown through as a preliminary to recording.

Input Connections

In many cases it will be found better to record both speech and music, "fading in" either as required. Gramophone records will be useful for the musical portions, and so both a pick-up and microphone will be required. These may be connected by one of the methods described in the article "Producing Your Own Programmes," although a better system is as shown in Fig. 3. In this case there are two triode-

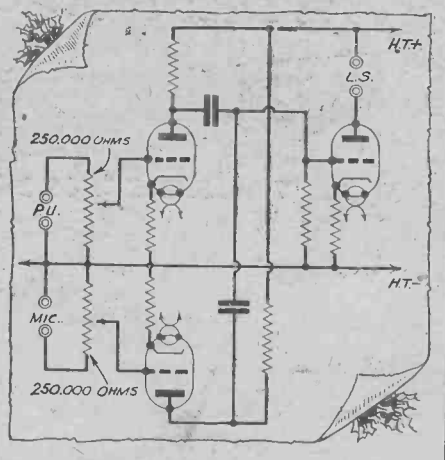


Fig. 3.—Method of using two input valves for the pick-up and microphone. Both feed into a single amplifier valve.

input valves (H.L. type are suitable), the output from these being fed into a common output valve, or into a pre-output amplifier. Two separate volume controls are used, and these might be either on the microphone and pick-up respectively, or mounted separately near the amplifier. The latter arrangement is better, since they are then more accessible and can be operated simultaneously without difficulty. The connections given are for resistance-capacity coupling, but transformer coupling can be employed by using a push-pull transformer with centre-tapped primary, and by employing the centre-tapping and one end connection only of the secondary.

A Simple Amplifier

Another method is to use a double-push-pull amplifier, of the general form shown in Fig. 2. This is for a battery-fed amplifier using two triodes and two high-efficiency pentode valves. Those who propose to build an amplifier especially for recording or low-power public-address use will find that one based on this general circuit is very satisfactory. Of course, the output, when using battery valves, will not be more than 1 watt for an H.T. current consumption of about 20 mA. But by using a mains-operated amplifier a much greater output could be obtained. It would not be possible to give full constructional details here, but the brief particulars supplied by the circuit diagram will be sufficient for the guidance of experienced constructors.

After the records have been made they can be played through in exactly the same manner as commercially-made records, using a pick-up, amplifier and speaker. If they are labelled to agree with the title of the film to which they are appropriate, a complete album of sound-ciné combinations can be built up.

ITEMS OF INTEREST

"Warbled Watts"!

FERRANTI, LTD., the well-known radio manufacturers, sent us the following amusing letter recently received by them from a prospective customer in Belgium:

"Sir,—I take the freedom to ask you if you will be so kind to send me a quite complete documentation of your alimentation-transformers suitable to strong and quite powerful receptors and also microphonical amplificators reaching 20 warbled watt with their price.

Thanks befor,
my very respectful salutations."

Trinity House Broadcast

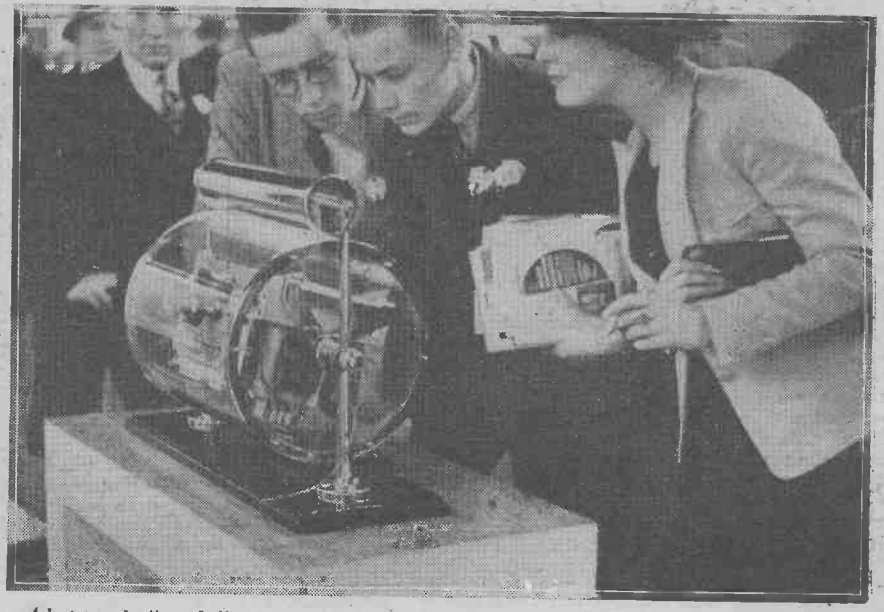
AN interesting broadcast will be given from the National on December 16th, and Regional on December 18th, when H. L. Morrow will introduce listeners to the workings of Trinity House, the institution controlling navigation round the British Isles.

The early history of Trinity House, a Corporation responsible for maintaining lighthouses, lightships and pilot services, is lost in the obscurity of the late Middle Ages. Its history becomes clear only from the reign of Henry VIII. Originally a charitable institution, it has grown into the most important maritime organisation of the British Isles.

Listeners will be introduced to light-house-keepers, officers and crews of several east coast lightships, and pilots of the Ports of London and Southampton. At both these ports the microphone will "board" an incoming ship and listeners will be able to hear what actually happens on the bridge of a great liner as the Trinity House pilot takes command.

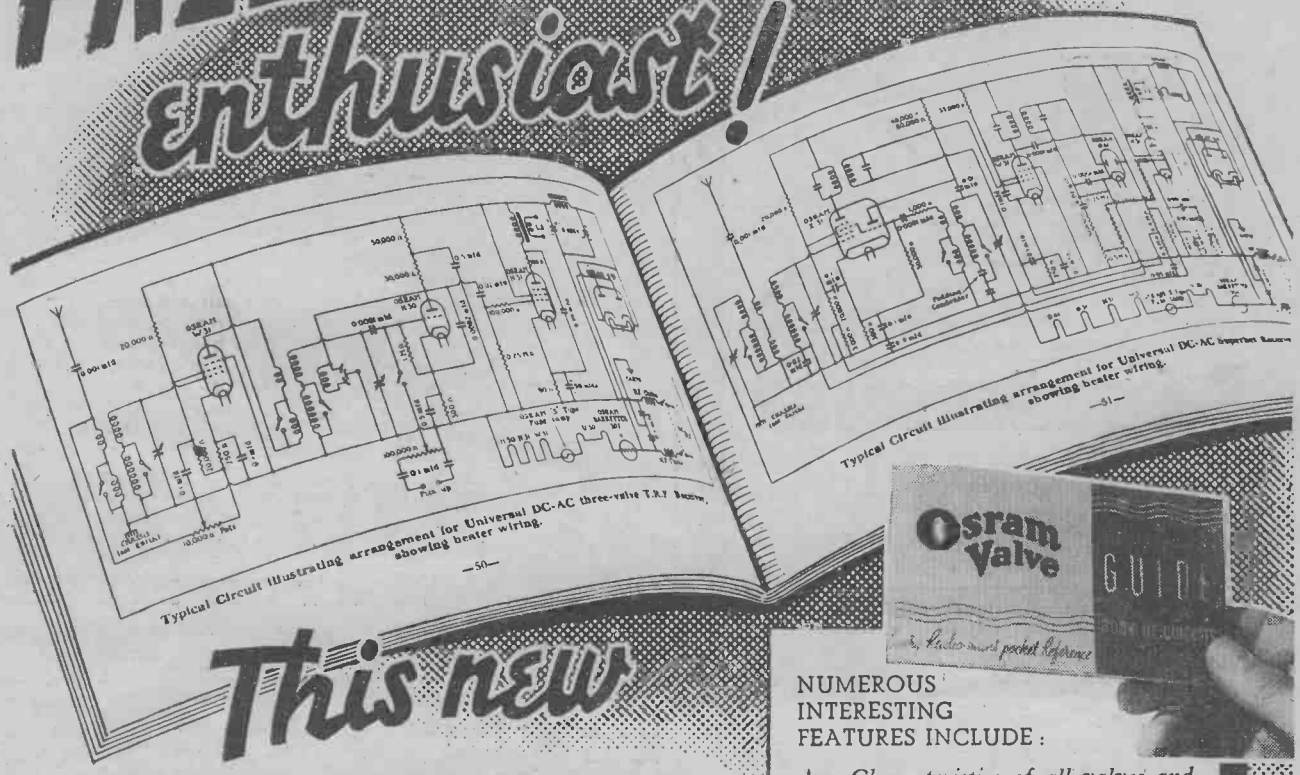
"The Sea"

ON December 8th, from Northern Ireland, a programme will be given of selected prose, poetry and music, which has been chosen and linked together to present the sea in symbolical aspect. It is another example of the creation of a charming cameo by the judicious use of gramophone records and appropriate linking narrative. These programmes of gramophone records, for the production of which a special department exists at Broadcasting House, have lately proved extremely popular.



Admiring the "works" of one of the latest Ferranti receivers which is conveniently mounted in a revolving glass case.

FREE - to every Radio enthusiast!



This new POCKET REFERENCE GUIDE OF PRACTICAL circuit SUGGESTIONS

Whether you build your own set or possess a commercial receiver you will find this pocket reference guide of inestimable value. Its 64 pages contain over 20 working circuits with comprehensive and up-to-the-minute information on the latest Osram Valves—their characteristics and working data. A comparative table enables you to see quickly the correct valve for replacement purposes in any make of Receiver. Ask your local Radio Dealer for a copy or write direct.

NUMEROUS INTERESTING FEATURES INCLUDE:

- ★ *Characteristics of all valves and working data.*
- ★ *Common Technical Terms relative to valves.*
- ★ *16 pages of typical operating Circuits.*
- ★ *Comparative Types.*
- ★ *Base-pin connections in diagrammatic form.*
- ★ *Complete Price List, etc.*

Osram Valves

MADE IN ENGLAND

Write for your FREE copy without delay

Advt. of The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2

Why use Dubilier Condensers?

You may answer—" because they're specified for F. J. Camm's A.C. Record 3." But we hope you won't. We hope you'll say like thousands of other successful constructors—" because the best set manufacturers fit them—because I can trust Dubilier—because Dubilier have shown the way in condenser design—because I want to be sure that my set will give the best possible results."

But if you can't give those reasons yet, then we hope in the meantime you'll use these Dubilier Condensers because they have been specified by PRACTICAL AND AMATEUR WIRELESS.

1 8μF type F2920, 4 + 4μF Block type BE355, 1 2μF type BB, 1 .02μF, 1 .005μF, 1 .0003μF, 2 .0001μF type 4421/E, 3 1μF type 4423/S, 1 25μF 25 volts type 3016.

DUBILIER

DUBILIER CONDENSER CO. (1925), LTD.,
DUCON WORKS, VICTORIA ROAD, NORTH ACTON, LONDON, W.3.

R. Cassom

Do you smoke a DE LUXE TOBACCO?

Airman Navy Cut De Luxe appeals to the particular smoker who wants a luxury tobacco at a moderate price. Essentially a Navy Cut it is ready for the pipe and requires no 'rubbing.'



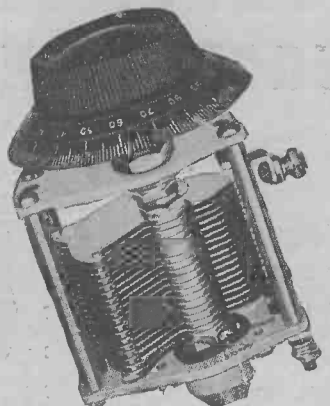
PLAYER'S
AIRMAN
NAVY CUT DE LUXE

11D PER OZ.

P.A.49.B AIRMAN MIXTURE, FLAKE & NAVY CUT ARE 10d. AN OZ.

POLAR

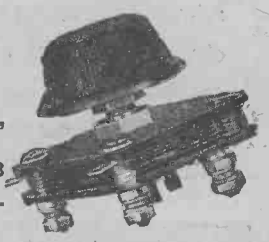
CONDENSERS SPECIFIED FOR THE
'COLT BATTERY ALL-WAVE 3'



POLAR No. 2. S.M.

FAST and slow motion condenser. Aluminium vanes, with brass pillars. Ball bearings. Robust construction.

ONE ·0005 REQUIRED.
Price - - - - **6/6**



POLAR 'DIFFERENTIAL'
SOLID dielectric. Insulated spindle. Complete with knob. **ONE ·0003 REQUIRED.**
Price - - - - **3/-**

POLAR 'COMPAX'
SOLID dielectric condenser for tuning or reaction. One hole fixing. Complete with knob. **ONE ·0001 REQUIRED.**
Price - - - - **2/6**

WINGROVE & ROGERS, Ltd.
188/189 Strand, London, W.C.2.
Phone: Temple Bar 2244.
Works: Old Swan, Liverpool.



On Your Wavelength

By THERMION

The Festive Season.

NOT the least important part of the festive season is the attention which the Press devotes to it. The Special Christmas Numbers produced by publishers help to inculcate that *joie de vivre* which is so much a part of the English Christmas. Now shall we have a spate of Christmas cards showing round plum pudding, dripping with ice which no one has ever seen; snowbound houses which we do not have in England, and the usual sickly sentiments in the form of doggerel printed on cards because people are so speech-bound to-day that they cannot find words to express the filial feelings they have towards you. As with crooners, I dislike Christmas cards. You know the sort of things you are going to get :—

"Here's lot of joy and lots of wealth,
Here's wishing you the best of health;
May skies be blue and friendship true,
For you love me and me loves you."

Or again, here is another gem which I offer free of charge to these putrid poetasters who earn their sickly living writing tripe of this sort for the best part of the year :—

"Peace on earth, goodwill to men,
The clock struck one, the clock struck ten,
Whate'er befall we ne'er must part,
For you are mine my own sweetheart."

You see how easy it is. Anyone can do it, and I think it is the quintessence of bad taste to visit the stores about a week before Christmas and sort over the fourpennies, envelopes supplied free, in order to find some piece of childish nonsense in the form of manufactured sentiments which you think will apply to the recipient. I preface my remarks with this because I feel that sincerity is the very soul and fabric of English life, and owing to the difficulties of our language it is a most difficult thing to find words with sufficient warmth which will express our feelings when sincere. I have a feeling of extreme gratitude for my readers in all parts of the world. We agree to differ on many things; we differ to agree on many others. When I wish with every sincerity and from the bottom of my heart every reader a cordial, convivial, and right Royal Christmas, I mean it, and I mean it in a sense which cold print cannot convey. So, my masters, I ask you to be upstanding, to charge your glasses, and to drink any merry old toast to fit the occasion. I drink to you, my readers, to you! For Christmas comes but once a year, when we can bury the old hatchet, forget our differences, and meet on the common platform of kindred feeling and let the jolly old world go by. For me it marks another milestone in my life. The years roll on, leaving me the memory of former days, and the age creepeth on apace, alack-a-day. Anyhow, what I mean to say is cordial greetings to all of you. May your brickbats be gilded, thus making the pill easier to swallow, if you get me. May home-construction flourish, if you follow me; may we all be together when the next Christmas Number goes to press, if you get my meaning. This journal has seen just a few Christmases go by. In the early years there was the glorious uncertainty of whether the set would be finished by Christmas, the greater uncertainty of whether it would work. Now we take wireless very much for granted. Perhaps by next year we shall enjoy those glorious uncertainties when we commence to dabble with television; I hope so, for there is greater pleasure in the doing than in the eating, if I may mix my metaphor. The Editor, like a good housewife, mixes his typographical pudding well in advance of the glorious 25th. He chooses his ingredients, stones the plums, and guides the erring hand of his contributors, so that the issue shall have the necessary gala effect. I suppose it is necessary to adopt this warming-up process so long before Christmas. Directly the holiday is over we go back to our offices and to our appointed places, and, like the witches in "Macbeth," we bubble, bubble, toil and trouble. It is good for us that once a year we bear feelings of goodwill to our enemies.

And now to business!

The Component Shortage.

ANOTHER reader adds his quota to my growing dossier on the component shortage. J. H. McK., of Pitlochry, says: "I am a good distance from my local dealer, and I usually first send straight to the manufacturers for components. About a year ago I asked my dealer to obtain a J. B. two-ganged condenser, and I had to wait about three or four weeks for it. When I asked him about the delay he said that so few people were building sets that the firms did not make components for them. This autumn I sent to a well-known mail-order house for components for Mr. Camm's Superhet receiver, and I had to wait three weeks for them. Last month I sent to the same firm for a Westector and fixed condenser, and it was three weeks before I received them. Messrs. Hivac, however, were able to supply me with valves by return. I look forward to PRACTICAL AND AMATEUR WIRELESS every week and think it would be a good idea to have a weekly crossword puzzle." Constructors are really having a bad time of it at the hands of dealers. Can something be done about it?

Here is a chance for the Radio Component Manufacturers' Federation to show a leg and do some really useful work.

Worms Driven to Suicide.

A DURBAN reader, C. H. J., sends me a cutting from a foreign paper which says: "Jazz music will rid the Japanese silkworm industry of a parasitical worm which causes losses at present of 15,000,000 yen annually, according to the claims of Dr. Yoshimasa Yagi, a parasitologist. The doctor states that he has found that jazz music from phonographs drives the kyochu variety of maggot deep into the body of the silkworm, where it dies of asphyxiation in less than half an hour."

This reader naively adds the pious hope that this quotation will prove another hefty nail in the coffin of wild and woolly jazz. He says: "Even here in Australia jazz is prominent on the air, damn it! More power to your elbow, Thermion, and continue your hammer blows on the jazz fiend."

Another Raw Deal

H. R. P. (Bellingham) writes: "Seven weeks ago I ordered some short-wave gear. After waiting five weeks I received two parts, one of which proved to be the wrong type. Of course this had to go back. After waiting six weeks I lost my temper, then my interest in the set. After seven weeks I received the rest of the parts, three of which had to go back as they were the wrong type. This is the eighth week and I am still waiting for three parts to finish the set. Now that I have pen in hand I will tell you about three dealers I visited for a coil of connecting wire, two of which didn't stock it; the third, after ten minutes waiting, brought out a box in which was about six coils, three of which I purchased. It seems that in my district (Catford) the dealers don't care two beans about us constructors any more; in fact, I think that they get so much profit from commercial sets that they can't be bothered with sixpenny articles on which they make about twopence or threepence. Well, I hope you will excuse my letter as I am not much good at this sort of thing. Hoping you get many letters on this subject so that you can send them to the firms concerned and get something done about it."

Cabaret Cartoons

I SEE that "Cabaret Cartoons" is the title of a television show on December 7th, which will develop an ingenious idea of Cecil Madden, the producer. The cartoonist will be Harry Rutherford, and his cartoons will be presented in a novel fashion. Televiewers will first see the names of the artists pencilled in bold characters; then, as the show proceeds, the camera will be faded over at intervals to Harry Rutherford's rapid sketches of each turn in succession. Artists on the bill will be Janet Lind, in songs and tap dancing; Levanda, foot juggler; Leona and de Leon, acrobatic dancers; and Chaz Chase, the American "silent comic."



Notes from the Test Bench

Hall Mark Extension Speaker

NUMEROUS readers have written to ask us for a diagram indicating the best method of connecting an extension speaker to this popular receiver. The Hall Mark has a push-pull output stage and therefore constructors are in doubt concerning the type of extension speaker required—most of them have been under the impression that a special push-pull extension is necessary. This is not so, however, any reliable type of P.M. speaker having tappings for pentode and power valves may be used. Its two leads should be joined via 1 mfd. 300 volt condensers to the anodes of the two output valves respectively. Alternatively the leads from these two condensers may be joined to speaker leads A and B.

Eliminating L.F. Oscillation

IN some cases readers have complained of a high-pitched whistle from the A.C. Hall Mark. This is commonly experienced in push-pull receivers, and is generally due to incorrect matching of the output valves or the two halves of the push-pull transformer. It can easily be cured by connecting a resistance in the grid circuit of the output stage. In the case of the Hall Mark 4 this resistance can have a value of approximately 50,000 ohms, and should be connected between the GB terminal of the push-pull input transformer and the leads at present joined to this terminal.

I.H. Output Valves

A READER complained to us the other day that he had experienced a good deal of trouble with the smoothing condensers in the A.C. Silver Souvenir. He admitted, however, that he had used an indirectly heated output pentode in place of the specified type in the output stage. This was the cause of his trouble. The voltage surge which occurred before the output valve became heated caused the condenser breakdowns. When a metal rectifier is used in conjunction with an indirectly-heated output valve the voltage across the smoothing condensers will be very high during the first 15 seconds after switching on—in the case of the Silver Souvenir it will be approximately 550 volts. This is too high for the condensers normally fitted in table model receivers, the average working voltage being 350 volts.

Everyman's Wireless Book
2nd Edition
3/6, by post 3/10 from George Newnes, Ltd., 8-11 Southampton Street, London, W.C.2.

"The Tragedy of Nan"

AS for the radio production of "The Campden Wonder" last year, I understand that a company of Cotswold Players have been engaged for Masefield's more famous work "The Tragedy of Nan," which has its scene in a farmhouse within sight of the Cotswolds. Grace Wright plays Nan, and other important parts are taken by Percy Dewey, Minnie Nichols, Margaret Benfield, William Payne, and Garnet Keyte, who come from Chipping Campden and district. Owen Reed is the producer, and the broadcast will be given in the Midland Regional programme on December 14th.

Radio Engineering

I FREQUENTLY receive letters from youths and their parents asking how boys can enter the wireless profession. It is not easy to give an answer, especially since so many appear to think that the work consists of twiddling knobs, assembling parts, and looking intelligent. The work is just as highly-skilled as that required in any other form of engineering, with the addition that it might sometimes prove more tedious.

The prospective radio engineer should have a good general education, have a respectable knowledge of physics and mathematics, and be accustomed to thinking and working systematically. If he does not possess these qualifications he should be prepared to attend a wireless college, technical school or evening school, or take a correspondence course, until he does.

In the meantime he should seek to obtain work as an assistant in a reputable firm of service engineers or manufacturers, and be prepared for hard work and regular study. He must not expect a high salary until he can prove that he has mastered the science and craft of his job; by that time he should be able to command good pay.

A SIMPLE TRANSPORTABLE

Let Your Guests have the Choice of Alternative Programmes by Arranging to have Two Receivers Working at the Party. No Extra Licence is Required for This Receiver

ALTHOUGH no doubt the majority of listeners now have loudspeaker extension points in various rooms, or will arrange to do so as described in another part of this issue, there are occasions when this arrangement is not all that can be desired. When a large crowd is gathered you will always find mixed likes and dislikes, and it may often happen that the programme from one station is not appreciated by quite a number of people, and this means that they either have to put up with it, or the set is switched off and the remainder have to miss an item or programme in which they are interested. A portable or transportable will enable his difficulty to be overcome, and the choice of programmes which is now provided will enable the main receiver to be kept going in one room, and, if necessary, feeding several distant listening points through extension loudspeakers, whilst a separate programme may be provided in another room through the medium of this simple receiver.

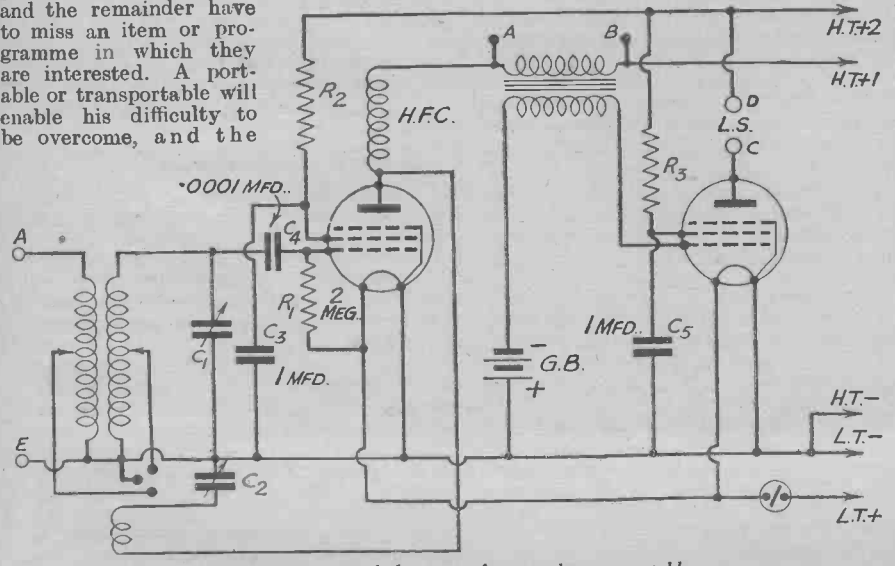


Fig. 1.—Theoretical diagram of a simple transportable.

In the design now given, arrangements have been made to couple the speaker, or one stage of L.F. amplification, to a standard listening point so that when the main programme is suitable, it will only be necessary to switch off the transportable and connect the extension listening point, and thus the purchase of a separate extension speaker will be avoided.

The Circuit

As it will be assumed that a rough aerial will be erected, the design of the circuit may be considerably simplified, and this enables any spare parts which the constructor has available to be used. Similarly, spare valves may be used in this receiver, and this is preferable to the building of a receiver containing a frame aerial. The construction of such a receiver would be rendered more difficult, and the layout would require more care. The signal picked up by a wire arranged round the picture rail, or by one of the special indoor aerials, such as the Pix, is greater than that obtained from a small frame, and results in a lower expenditure for the complete equipment. Consequently, a two-valver may be considered adequate, as it will be assumed that this will be employed for the local programme, while any alternative from a more distant station will be picked up on the main receiver. To ensure a high gain in the detector stage an H.F. pentode is employed, but if you do not have one of these valves by you and do not wish to go to the expense of buying one, an ordinary S.G. valve may be employed. Fig. 3 shows the modifications required according to the type of detector valve base which is used. An ordinary pentode is employed in the output stage and further to ensure a good step up a high-ratio L.F. transformer should be used. One of the special Q.P.P. or Class B transformers may be employed for this purpose, or alternatively a simple 5 to 1 component of standard type. The tuning may be quite simple, as the problem of selectivity should not arise, and therefore a standard single coil is employed with a single tuning condenser. There are now several suitable coils on the market, but the coil shown in the diagrams and recommended is the Bulgin type C20. The wiring at this part of the receiver may, of course, be modified to suit any particular coil you have handy.

Construction

The receiver may be built on quite a small baseboard, and this should be of such a size that it fits neatly into the cabinet housing your extension loudspeaker. If you do not possess one at the moment, you can, of course, construct the cabinet to suit. The receiver should be on the bottom of the cabinet, and the batteries may then be accommodated upon a shelf across the centre behind the loudspeaker. There are only four controls, and these are quite simple to arrange for; the opening for the tuning scale may be reduced to a mere circle if the J.B. dial is employed. A full-vision component is not required as the receiver will be more or less a local station set.

The wiring is clearly shown in the wiring diagram, and may be carried out without the aid of soldering, thus making the apparatus still simpler to build up, and wiring should be carried out with the standard insulated connecting wire, scraping

(Continued overleaf)

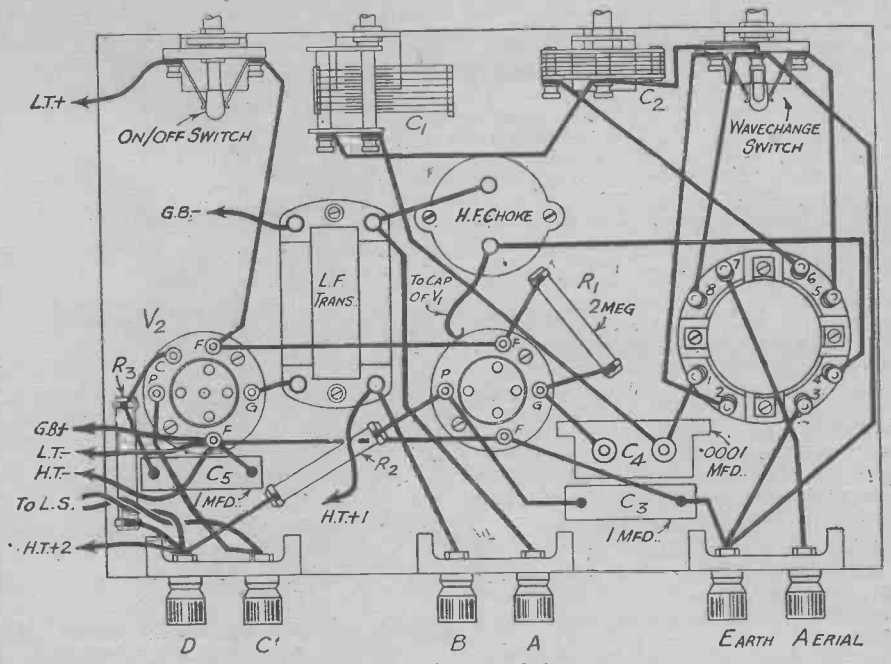


Fig. 2.—Wiring diagram of the receiver.

(Continued from previous page)

away the insulation at the end before attempting to join it to the terminals.

For temporary use such as this receiver is intended to provide, a small capacity L.T. and H.T. battery may be utilised and this enables the overall size to be kept within reasonable limits. It also reduces the weight and makes it more convenient to carry from room to room. A 9-volt grid bias battery will be required.

Operation

The operation is extremely simple, it being only necessary to switch on and turn the single condenser to the required station. Signal strength may be boosted by the reaction control, and it will probably be found that an earth connection will enable slightly greater signal strength to be obtained. As, however, the receiver is intended for room-to-room use, it will be assumed that an earth is not always available, and thus it may be ignored. Where, however, a convenient earth is available (such as a water pipe or radiator system), a lead may be joined from this to the L.T. negative terminal on the accumulator.

When not required as a complete receiver the two points A and B should be connected to the extension speaker sockets in the room, and the transportable switched off. It is assumed, of course, that the extension point is taken from an output filter circuit in the usual way (See Fig. 1 on page 357). Alternatively, if the additional amplification is not required at this point, the two points C and D may be joined to the extension speaker sockets in the room, and this connects with the speaker alone.

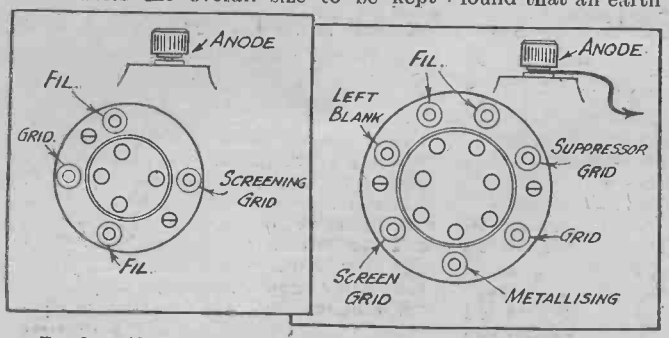


Fig. 3.—Alternative connections for 5 and 7-pin base for battery H.F. Pentodes.

COMPONENTS REQUIRED FOR THE TRANSPORTABLE.

One tuning coil, Type C20 (Bulgin).
One .0005 mfd. tuning condenser and dial (C1) J.B.).
One .00025 mfd. reaction condenser (C2) (J.B.).
One L.F. transformer
One 2-point switch (Bulgin).
One 3-point switch (Bulgin).
Three terminal mounting blocks (Belling-Lee).
Six terminals (Belling-Lee).
One H.F. choke (Bulgin).
One .0001 mfd. fixed condenser (C4).
Two 1 mfd. fixed condensers (C3 and C5).
One 2 megohm grid leak (R1).
One 2,000 ohm resistor (R3), 1 watt type.
One 20,000 ohm resistor (R2).
Two baseboard mounting valve-holders, one 4-pin and one 5-pin.
One S.G. or H.F. pentode valve.
One L.F. pentode valve.

NOTES & NEWS

Television Trade Activity

WITH the official television programmes only in their third week the response of the public has already led to considerable trade organisation for the production of receivers. The experience gained from years of development and research has now been applied to the production of home sets of a high order and the initial sales have amply justified the preparations made by the large manufacturing concerns.

Already a considerable proportion of the 3,000 employees at the Coventry radio works of the G.E.C., whose experts have from the earliest days of television been carrying out intensive research in both transmission and reception, are engaged in the development, production and sales of receivers to meet the present demand.

Receiver has 3,980 Parts

SOME idea of the work and material involved in the manufacture of a single television receiver will be gained from the fact that the standard twenty-three-valve G.E.C. set contains 3,980 parts. The alternative set, incorporating an eight-valve all-wave sound receiver, carries a further 2,000 pieces. All these parts are made by the company themselves, mostly from the raw materials.

Some of the most highly qualified technicians in the world are engaged in the research and development laboratories of the G.E.C. The researchers at Wembley have their own high-definition transmitters, enabling them to experiment at all times of the day. At the Coventry factory, which is at present outside the Alexandra Palace radius, the development and testing staff have produced their own test equipment, remarkable apparatus which even gives visual reproductions of the characteristics and efficiency of the many components, both before and after final assembly of the receiver.

First Television Parties

A SERIES of television parties, probably the first of their kind ever to be organised, were held recently in North-west London.

They were arranged by a member of the G.E.C. research laboratories at Northway, N.W.11, on a standard production model G.E.C. receiver for the purpose of experimenting on receiving conditions in the garden suburb. The visitors, both young and old, were invited to give their unqualified criticism.

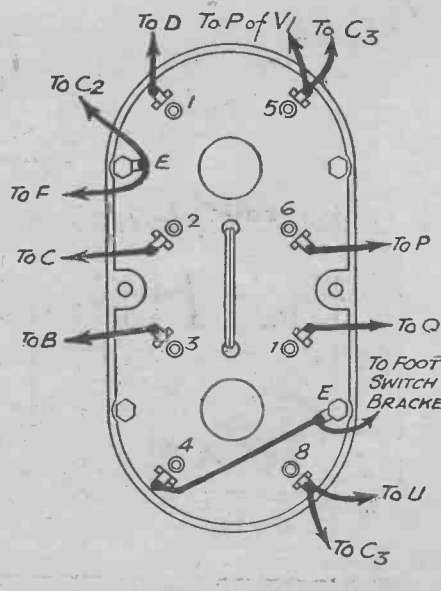
Receiving conditions were consistently good. There was exceptional freedom from motor-car interference, and the use of a D.C. converter on the Finchley mains was found easily practicable. The six-foot wire aerial gave a very strong signal.

The visitors were much impressed with the quality and clarity of reception and the programmes themselves were greatly enjoyed. The composition of the Armistice Day film was adjudged excellent, while a party of schoolboys got a special thrill from the parade of pioneer cars.

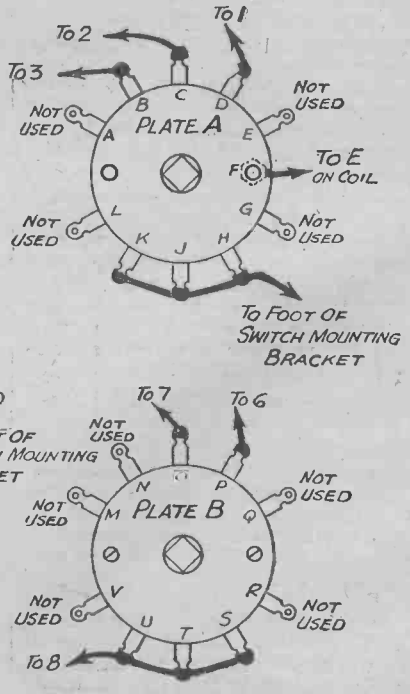
LATEST TELEVISION NEWS

TELEVIEWERS may be forgiven on December 3rd for imagining that they are seeing the Crown Jewels as displayed in the Tower of London. In actual fact, full-size replicas of the Crown Jewels are being taken to Alexandra Palace to be televised in the afternoon and evening transmissions, with an historical commentary by Mr. Kenneth L. Davy, who has spent many years in making "jewels," swords and similar theatrical properties. He will show and describe five crowns copied from originals in the Regalia. Of these the most important is, of course, the Coronation Crown, sometimes known as St. Edward's Crown, fashioned in gold and used only for the actual coronation ceremony. The original was made for Charles II.

Coil and Switch Connections for the "Colt" All-wave Battery Three Described on Pages 380 and 381 of this Issue.



CONNECTIONS TO COIL UNIT



CONNECTIONS TO SWITCH PLATES
N.B. MARKINGS SHOWN ABOVE ARE FOR REFERENCE ONLY & DO NOT APPEAR ON SW.

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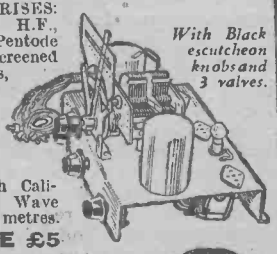
● AMAZING PRICE REDUCTIONS ● WONDERFUL VALUE ● BRITISH MADE ●

Two Guinea S.G.3 CHASSIS

Including 3 British Valves with Screened Wave-Wound Coils.

Each chassis brand new and tested on British and Foreign Broadcasts before dispatched to you. CIRCUIT COMPRISES: Screened-Grid H.F., Detector and Pentode Output Valves, Screened wave-wound coils, 2-Gang Air Dielectric Condenser. Metal Chassis. Only 9 m.a. H.T. consumption. Illuminated and Wavelength Calibrated Dial. Wave range 200-2,100 metres.



With Black escutcheon knobs and 3 valves.

LIST PRICE £5

BARGAIN 42/-

Cash or C.O.D. Carriage Paid. Or 2/6 down and 12 monthly payments of 4/-.

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Recommended P.M. Moving Coil Speaker, 15/-.

Walnut finished Consolette Cabinet, 10/-

COMPLETE RECEIVER

comprising above chassis housed in walnut-finished Consolette Cabinet with valves and P.M. speaker, less batteries. Cash or C.O.D. Carriage Paid £3 : 7 : 6 or 5/- down and 12 monthly payments of 5/9.

COLT ALL-WAVE 3

DESCRIBED IN THIS ISSUE

Every part guaranteed Matched-Proved-Tested

KIT "A" Cash or C.O.D. Carriage Paid. **47/6**

Comprising N.T.S. Kit of Matched components, including exclusively specified BULGIN COIL, CLIX S.W. VALVEHOLDERS, PETO-SCOTT BASEBOARD AND PETO-SCOTT COMPONENT BRACKETS, less valves, cabinet and speaker.

5/- DOWN

Balance in 11 monthly payments of 4/3

THESE ARE THE PARTS CONTAINED IN KIT "A"

Any part available separately. Orders over 5/- carriage paid. C.O.D. extra.

	£	s.	d.
3 CLIX 4-pin S.W. type baseboard mounting valve-holders		5	3
1 BULGIN 4-range coil type C.56		8	9
1 PETO-SCOTT Baseboard 12" x 8", with condenser support		1	0
6 PETO-SCOTT Component brackets		2	3
1 N.T.S. Rotary switch		3	0
1 N.T.S. .0005 mfd. slow motion condenser		4	6
1 N.T.S. .0003 mfd. differential reaction condenser		2	0
1 N.T.S. .0001 mfd. solid dielectric reaction condenser		2	0
4 N.T.S. fixed condensers		4	0
3 N.T.S. 1-watt fixed resistances		1	6
1 N.T.S. 1 meg. potentiometer with 2-point switch		5	0
1 N.T.S. L.F. Transformer ratio 3 : 1		4	6
1 N.T.S. All-Wave screened choke		2	6
2 N.T.S. Terminal strips with terminals		1	6
6 Wander Plugs		0	9
2 Spade Terminals		0	4
Connecting wire, screws, flex		1	6
KIT "A" CASH or C.O.D. CARRIAGE PAID	**£2**	**7**	**6**
3 Specified Valves		12	3
1 W.B. Stentorian 37J Speaker	£1	12	6

or 2/6 deposit and 11 monthly payments of 3/-.

KIT B. As for Kit A, but including set of 3 specified valves only. Cash or C.O.D. Carriage Paid £2 19 9, or 12 monthly payments of 5/6.

KIT C. As for Kit A but including set of valves and cabinet. Cash or C.O.D. Carriage Paid £3 19 3, or 12 monthly payments of 7/3.

BATTERY CLASS B4

INCLUDES 4 BRITISH VALVES

Amazing purity of tone and volume rivalling that of powerful all-mains models. Wide choice of foreign stations. The perfect mains quality battery receiver. Four matched British valves of guaranteed life. Moving-Coil Speaker. Single knob slow motion tuning, bronzed escutcheon. Illuminated circular aeroplane dial. New type switch. Combined volume control and on-off switch. Sensitivity and graded volume control. Wavelengths 200-350 and 900 - 2100 metres. Oldham Long-life 120-volt H.T. and 2-volt L.T. Accumulator and G.B. Batteries. Output 1½ watts at 120 volts. Exquisite Walnut Veneered Cabinet illustrated above. Absolutely complete with aerial equipment ready to play.



5/- DOWN

List Price £8 : 8 : 0

BARGAIN £4:19:6

Cash or C.O.D. Carriage Paid or 5/- down and 12 monthly payments of 8/9

A.C. BANDPASS S.G.4

INCLUDING 4 BRITISH VALVES

Wonderful sensitivity and selectivity. Simplified operation. a bandpass circuit of advanced design . . . the greatest All-Electric receiver value obtainable.

4 British Valves, Screened Bandpass Tuning Coils, M.C. Speaker, S.M. tuning. Airplane dial wavelength calibrated, Triple gang wavechange and radiogram switch, volume control with on-off switch, Gramo. sockets, 3 watts output. 200-550 and 900-2,100 metres. A.C. 200-250 volts, 40-100 cycles. Walnut-veneered cabinet, as illustrated above. Aerial equipment.

LIST PRICE £8 : 12 : 6

BARGAIN £5 : 12 : 6

5/- DOWN

Cash or C.O.D. Carriage Paid. Or 5/- down and 12 monthly payments of 10/-.

N.T.S. S. W. ADAPTOR

12-94 METRES



Hear America and all the World DIRECT on your present set, for only 17 6. Complete Kit of parts to build a reliable short-wave adaptor for use with any BATTERY receiver. Kit comprises all parts for instant assembly including metal-sprayed base-board, 2 variable condensers, .00016, .0001 MFD., 2 base-board mounting 4-pin holders, short-wave H.F. choke, grid leak, fixed condenser, adaptor plug, terminal mount, two terminals, 3 4-pin plug-in coils, 12/26, 22/47, and 41/94 metres, 1 component bracket, slow-motion drive, trimming condenser, connecting wire and wiring diagram. Built in one evening.

2/6 DOWN

Cash or C.O.D. Carriage Paid 17/6 or 2/6 down and 7 monthly payments of 2/6.

STRAIGHT 3v. BATTERY RECEIVER

INCLUDES 3 BRITISH VALVES



A wonderful opportunity.

New type highly selective circuit. Slow-motion illuminated dial. Pick-up sockets. Metal chassis. Low H.T. consumption. Complete in cabinet, illustrated, with valves and speaker, less batteries.

LIST PRICE £4 : 19 : 6

BARGAIN 35/-

2/6 DOWN

Cash or C.O.D. Carriage Paid. Or 2/6 down and 9 monthly payments of 4/-.

RECORD BATTERY ALL-WAVE 3

KIT "A" Cash or C.O.D. Carriage Paid **63/-**

Comprising N.T.S. Kit of matched parts, less valves, cabinet, and speaker.

5/- DOWN

Balance in 11 monthly payments of 5/9.

With 3 specified valves, Cash or C.O.D. Carriage Paid £4.9.9 or 12 monthly payments of 8/3.

N.T.S. SHORT WAVE 2

12-94 METRES



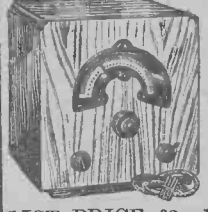
Two-Valve Short-Wave Set of remarkable range that will give you hours of entertainment on the fascinating short-wave bands. **Kit comprises** all necessary components, including metal-sprayed baseboard, three variable condensers, .0001, .0002 and .00016 MFD., on/off switch. L.F. Transformer, three baseboard mounting four-pin holders, short-wave H.F. choke, two terminal mounts, four terminals, three fixed condensers, slow-motion drive, grid leak, connecting wire, three 4-pin short-wave coils, 12/26, 22/47, and 41/94 metres, 2 component brackets, and wiring diagram.

2/6 DOWN

Cash or C.O.D. Carriage Paid 27/6, or 2/6 down and 11 monthly payments of 2/6.

AMAZING BARGAIN

THE FAMOUS 1937 SHORT-WAVE B.T.S. ADAPTOR



BRAND NEW AND GENUINE.

Simply plugs into your battery or A.C. Mains set. No alterations necessary. 100-1 ratio aerial tuning and slow-motion reaction: for use either as Plug-in or Superhet Adaptor. Walnut finished Cabinet (illustrated). With 2 plug-in coils, 12-26, 22-47 metres. Ready assembled.

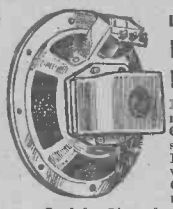
LIST PRICE £2 : 12 : 6

BARGAIN 39/6

2/6 DOWN

Balance in 10 monthly payments of 4/-.

N.T.S. Moving Coil SPEAKERS



LIST PRICE 27/6

BARGAIN PRICE 10/-

2/6 DOWN

High fidelity permanent magnet Moving Coil speakers, slightly shop soiled only. Models suitable for Power, Super Power or Pentode. (State which when ordering.) Cash or C.O.D. Carriage Paid 10/- or 2/6 down and 4 monthly payments of 2/6.

Send for Lists of well-known manufacturers' speakers (last year's models) at half price.

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Radio Games for Xmas

Some Suggestions for Using the Standard Wireless Receiver as an Accessory to Various Games

THERE are dozens of interesting party games in which the wireless receiver may be introduced. No doubt many readers have already devised ideas of their own, and the following notes give some of the lines which may be followed during the festive season in adding to the enjoyment of your guests. Firstly, it should be emphasised that any receiver, other than a simple crystal or one-valver which will not operate a loudspeaker, may be used. Secondly, if the following notes are followed, there is no risk of damage to any part of

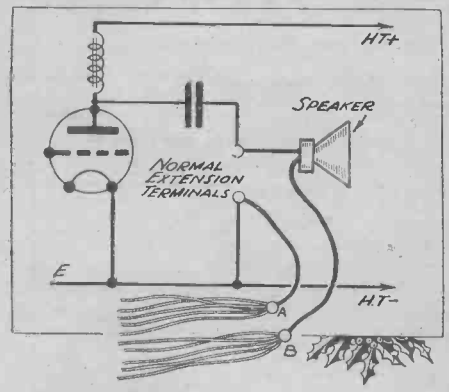


Fig. 1. How to arrange the output circuit for radio games.

the apparatus and no risk of electric shocks, even although a mains receiver is employed.

As a first essential in the employment of the ordinary receiver, an output filter circuit must be used. This is now standardised in the majority of commercial receivers, and many home-constructors, too, have fitted this in order to feed extension listening points. If one is not already fitted, the instructions given in this issue on page 357 should be followed.

Completing the Circuit

As a basis for the majority of the games in which the receiver is used, the completion of the speaker circuit may be taken as standard. Instead of two leads from the speaker point, a multiplicity of leads must be fitted as shown in Fig. 1. In some cases all of the leads on the earth side will be required, whilst in others only a single lead from this point will be employed. The simplest of games calling for no additional apparatus is a form of "Blind Man's Buff," where the players stand in a circle holding the leads from the point marked A in the diagram. Interspersed in these leads are a number of blanks or dummies. These may be any odd pieces of wire, and it is obvious that the numbers of "live" and "dead" leads may be varied according to the requirements of the game. A single lead from point B (the earth side) is then held by another player who stands in the centre of the ring and proceeds from one player to another, touching the bared end of the wire he carries against the bared end of one of the wires being held by the players. The receiver is switched on and tuned to a station, or if there is no broadcasting available, a gramophone record may be played through the pick-up. Failing the use of a pick-up, the aerial may be disconnected and the reaction control tuned up until the set howls, the removal of the aerial acting as a safeguard in the prevention of interference with other listeners who may be attempting to receive some distant station. It is true that some circuits will not radiate such oscillation into the aerial system, but the simple precaution of removing the aerial avoids the necessity of studying the circuit in order to find out whether or not it is of a suitable type. If there is a self-contained speaker in the anode-circuit of the valve this should be silenced by means of an appropriate switch, whilst if no switch is fitted, the speaker should be replaced by an iron-core choke.

Other Schemes

It will now be obvious that when the single player completes the speaker circuit by touching the wire he carried against a "live" wire (from the point A) the signal being received by the receiver, or the reaction howl or gramophone record, will immediately be heard through the speaker. A time limit may be set upon the game, and the player finding the greatest number of "live" points in that time may be declared the winner. Alternatives will suggest themselves to the reader.

An alternative arrangement employing the same system may be built up upon a piece of plywood, covered by a piece of American cloth such as may be obtained from the popular stores at a very nominal figure. That marked in squares and used for shelves is preferable and the size of the square should be just larger than a penny. The cloth may be pinned to the board by ordinary drawing-pins at the edges, and then drawing-pins should be inserted at all the square centres. Now, going round the board, holes should be pierced at various adjacent pins, and through these holes the bared ends of the leads from the extension point already referred to should be threaded. A single loop should then be placed beneath the head of the drawing-pin and it should be pressed firmly home. In Fig. 2 it will be noted that various pins are left blank, but as the wire will no doubt show and indicate to the players the correct point, short lengths of wire should be placed beneath the remaining pins to act as a misdirection. The game is played with pennies, or discs of metal of a similar size, and the board should be laid upon a table at a distance of about 3ft. from the player. The receiver is set into operation as already mentioned and

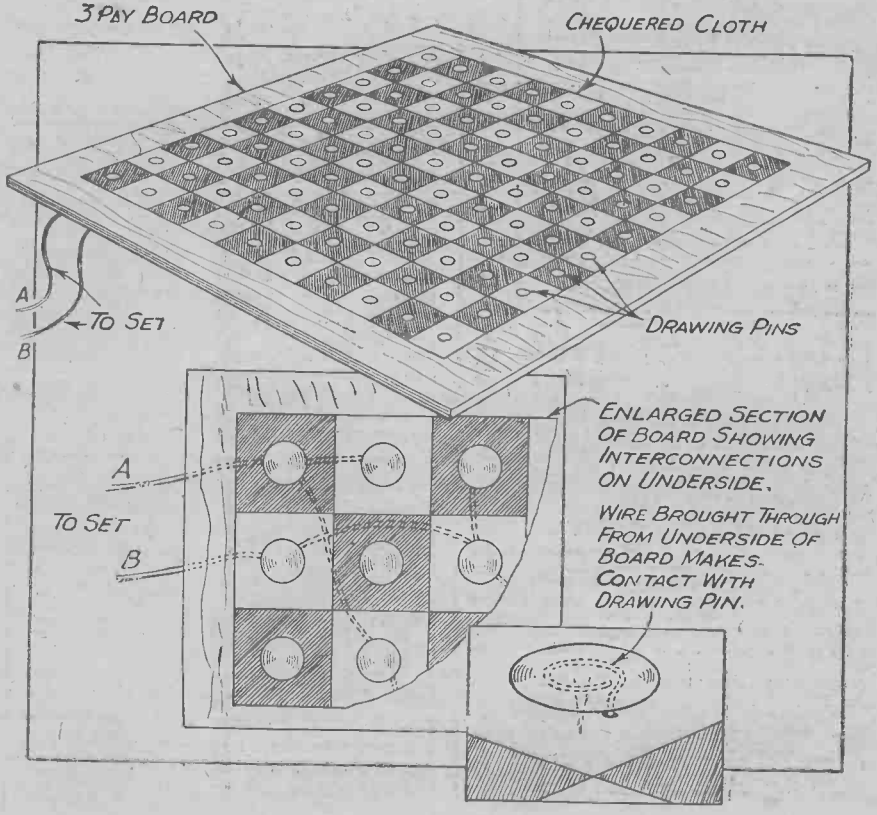


Fig. 2. An easily made electrical board which can be used with the wireless set to provide entertainment and amusement.

the players throw the pennies on to the board. When a coin rests upon two adjacent drawing pins and these are connected respectively to the output terminals, the speaker will be brought into action. The game may be played with borrowed money, or the banker may take all the coins which fail to operate the speaker. Alternatively, the squares may be marked in ink on white cloth and numbered to indicate the number of coins which are paid out in the event of a successful throw.

Adding to the Fun

The interest of these two games and others in which the circuit to the speaker is completed is increased when a talk is being received, as the completion of the circuit results in a few words being heard from the speaker and these disjointed sayings very often sound most incongruous, or may have some direct bearing upon something that has just happened or been said by the players. With musical items, of course, this additional fun does not enter into the game. Other modifications of these schemes will be obvious to the handyman, but there are other ideas which may now be mentioned in brief.

Fault Finding

For the gathering where a number of keen wireless fans are present, fault finding may be arranged. Here one player goes to the receiver and in a given time has to introduce some fault to prevent the receiver from functioning. The other players then enter one at a time and are given a time period in order to locate the fault. The winner is the one who locates it in the shortest time. Alternatively, all the players may enter together and a scramble then ensues in an endeavour to be first to find the fault. In this case, of course, it should be some fairly obvious defect and not an obscure fault. For instance, a valve pulled out of the holder, or a wire removed from a component, but in the latter case care must be taken not to disconnect some point which may result in damage, such as the anode circuit of an output valve.

Station location, simple repairs, simple improvements, and other similar schemes may also be adopted where the players understand the subject, and no doubt these ideas will enable the members of a local Radio Club to enliven the Christmas meetings.

B.B.C. XMAS PROGRAMMES

AT the time of going to press full details of the arrangements made by the B.B.C. are not available. As is already known, certain major changes had to be made in the tentative programmes which had already been prepared, and this has led to some difficulty at the moment in producing a suitable programme. We are, however, in receipt of information which shows that many popular items will be included this season, and some of the more important of these are given below.

On Christmas Eve we have a feature in the afternoon which has been regularly heard since the year 1928. This is a Carol Service from King's College, Cambridge, and this will be broadcast from 3.30 to 4.45. Later in the day there will be the Kentucky Minstrels, who need no introduction, and on the National programme a seasonable thriller, "Strange to Relate," featuring Charles Brewer and Leslie Bailey.

On Christmas Day there will be a morning service from St. George's Chapel, Windsor, from 10.45 to 11.30, and a Christmas Party later in the day. This will include the old gang, Tommy Handley, Clapham and Dwyer, etc., and although the broadcast may make this sound a spontaneous affair, it is actually a very carefully rehearsed broadcast, and it owes its success to this fact.



A Marconiphone radiogram acting as commander-in-chief at a happy Christmas party.

On Boxing Day there will be the usual Music-hall programme and the In Town To-night feature will on this occasion include a "behind stage" broadcast from a circus. This topical feature promises to be really good, and will no doubt be appreciated by young and old.

Pre-Xmas Broadcasts

Earlier in the week the programmes will naturally take on the Christmas atmosphere, and on the 21st there will be an interesting broadcast entitled "Street Show." The recording van is now busy touring the streets getting material for this interesting item and it will endeavour to provide a composite picture of the seasonal hustle. A sound picture of the activities in the big stores, at the toy bazaars, and the thousands of shoppers busy examining the multitudinous goods offered in the shop windows should provide an interesting background for this item.

On the following day, December 22nd, the December Review will be revived on the National programme. In this the music will be directed by Charles Shadwell, who came from the Coventry Hippodrome to direct the B.B.C Variety Orchestra.

Dance Music

For those whose main interest is dance music there is ample material available. On the eve of Christmas there is an afternoon session by Joe Loss, and in the early evening Van Philipps and his Two Orchestras. Late music will be provided by Charlie Kunz and his Casani Club Orchestra.

On Christmas Day the B.B.C. Dance Orchestra will play from 12.30 to 1.15 p.m. on the National, and Bram Martin and his band will provide the music from 5.15 to 5.55. An interesting broadcast from 9.20 to 11 p.m. will be provided by Henry Hall and the B.B.C. Dance Orchestra, in which a special programme of seasonal music will be given to which listeners can dance or play games. From 11 to 12 midnight Joe Loss will take over the dance music.

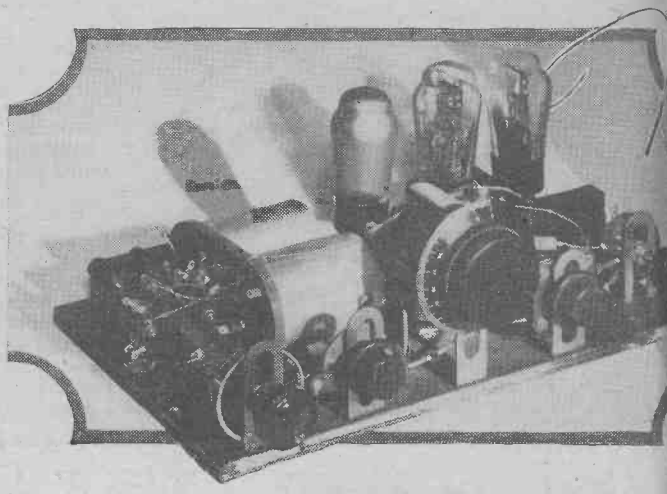
On Boxing Day Henry Hall will again be heard in two separate broadcasts, from 5.15 to 6 and from 8.30 to 9.30. The late music on this day will be by Jack Jackson and his Band from the Dorchester.

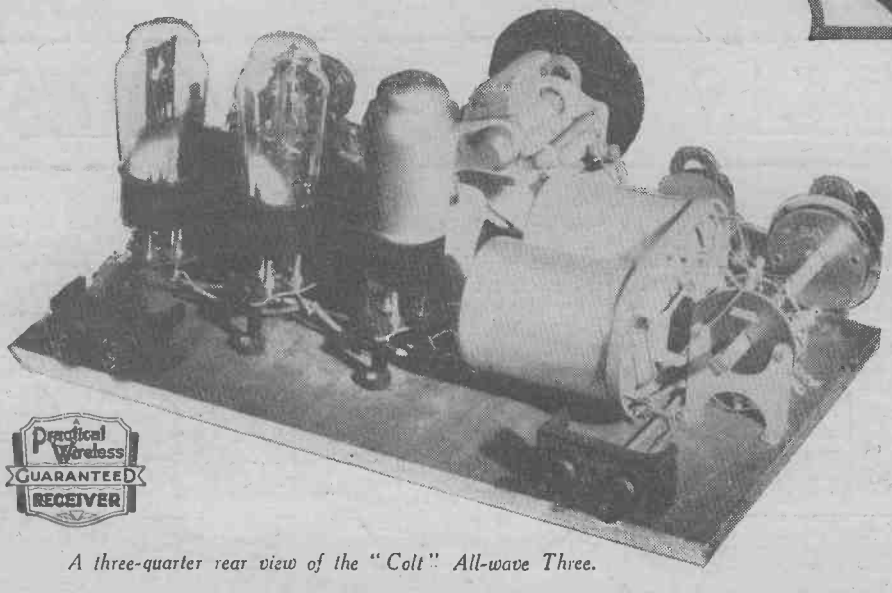
Television

The Television director is now busy at work arranging for the television transmissions, and it is unfortunately impossible at the time of going to press to give any details of the broadcasts. We are assured, however, that it will be a real television Christmas, and special programmes will be given from the Monday in Christmas week.

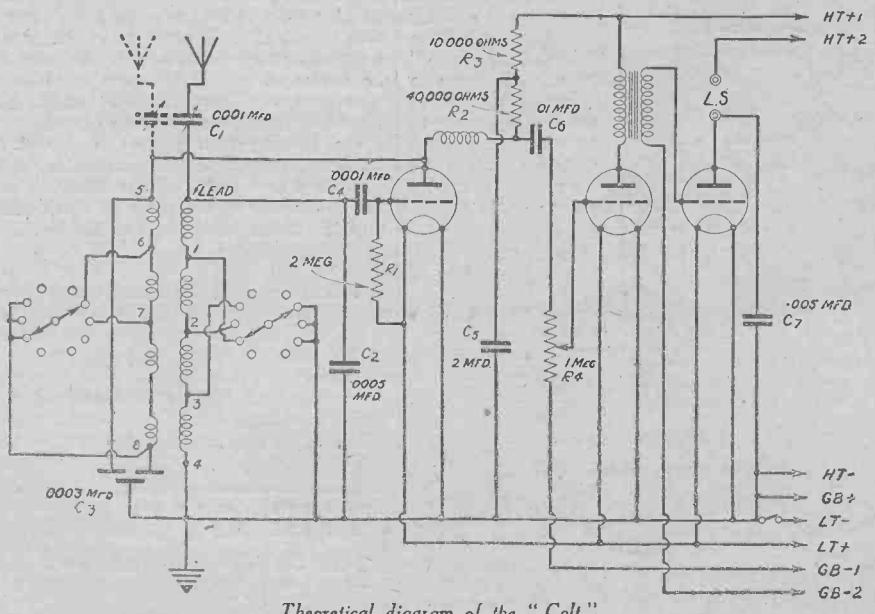
THE CYCLIST
2d. EVERY WEDNESDAY
THE CHRISTMAS NUMBER of this fine journal is packed with special seasonal articles and illustrations.

THE tremendous popularity of the Record Three which employed the baseboard method of construction has led other readers to request that further designs on similar lines be produced. Accordingly, we present the "Colt," a similar type of receiver, covering four separate wavebands, and embodying the simplest of circuits. The main features are to be found in the initial stage, which is a simple detector in the grid circuit of which a pair of Bulgin coils are fitted. These consist of the broadcast and short-wave coils arranged on separate formers and in separate cans, the connections being brought out to soldering tags on a special insulating base. As these are designed for chassis construction, however, they are used in this receiver in a rather different manner, and the illustrations on this page will show that the coil unit is mounted on its side, by the aid of an ordinary component-mounting bracket, and this results in two important features. Firstly, the connections are rendered perfectly accessible, even whilst the receiver is working, and it is thus a simple matter to carry out tests or measurements in this part of the circuit. Secondly, the overall height of the receiver is reduced and this results in a much more compact layout.





A three-quarter rear view of the "Colt" All-wave Three.

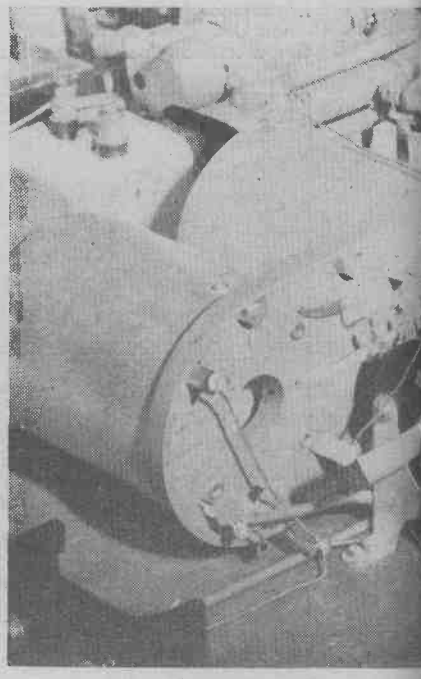


Theoretical diagram of the "Colt".

A Simple Three-valve All-wa Employing Screened Coils ar Constr

The Circuit

The aerial is normally connected to a lead on the coil unit through a series aerial condenser, whilst a reaction winding on each coil section is employed in the usual manner through a differential reaction con-



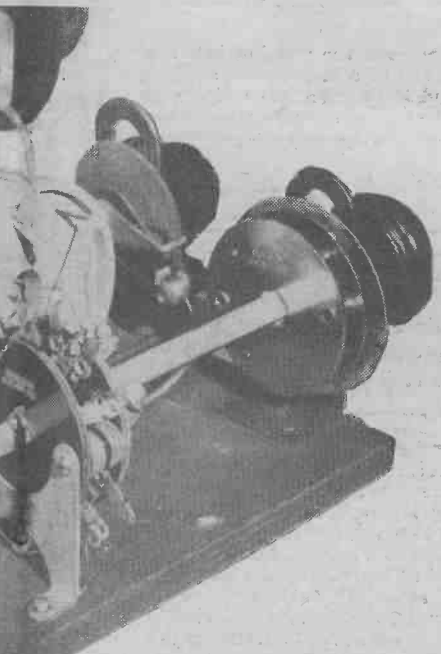
This illustration shows the method

denser. However, an alternative scheme is made available and the aerial lead may be transferred to point No. 5 on the coil, thus providing a combined aerial coupling coil and reaction circuit, and in some cases it may be found that this offers better results. However, this point will be explained more fully in the operating

The "COLT" All-Wave 3

ave Receiver for Battery Use, nd the Baseboard Method of uction

notes. In the anode circuit of the detector valve the usual H.F. choke is connected, but connection between this stage and the first L.F. stage is by means of resistance-capacity components, and this enables the grid leak to be used in the form of a poten-



of wiring the coils and switch units.

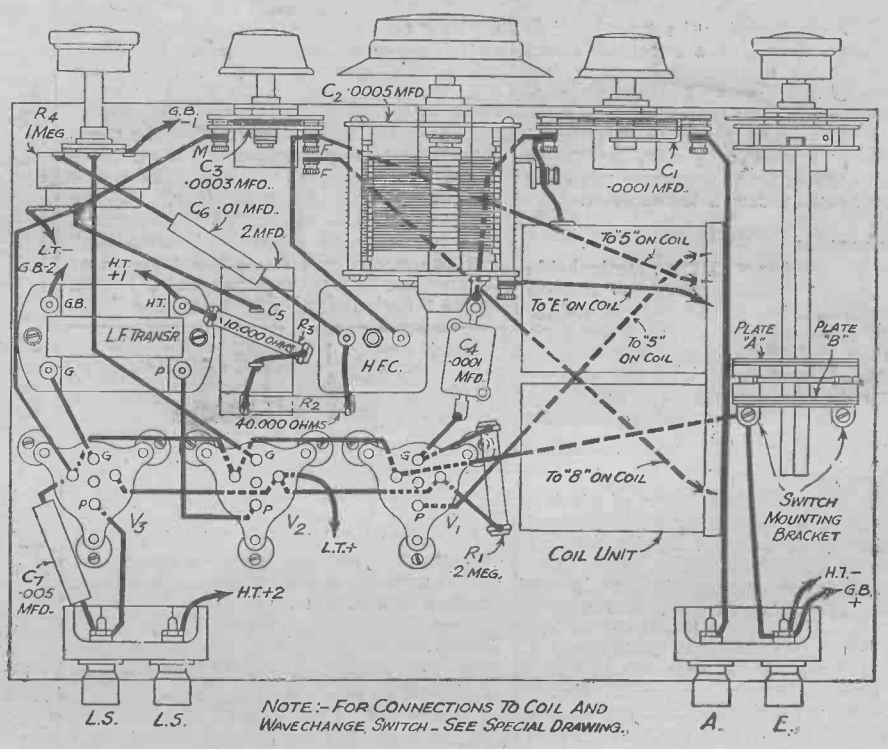
tiometer so that the input to this valve may be controlled. The result is that a most effective volume control is formed for use when headphones are employed for searching, and this avoids the sudden bursts of volume which are liable to be met when no such control is fitted. Ordinary transformer coupling is employed between the L.F. and output stage, and for the latter a Power valve is used in preference to a pentode, both in the interests of economy and simplicity.

All the other usual circuit refinements which may be fitted to this type of receiver are to be found, and the illustrations give a good idea of the neat layout which has been adopted. The List of Components is published on this page, and the Wiring Diagram is also given so that those who are anxious to make a start can go right ahead. The main features are made clear by the illustrations, and the only point which requires any considerable care is the wiring to the coil units. The illustration in the centre of this page should make this point clear, however, but on page 376 of this issue we give a further diagram in which all of the connections are clearly shown. It will be noted that two of the special Bulgin coil switch units are employed, and the method in which these operate is clearly shown in the theoretical diagram.

The four ranges covered by the receiver are approximately from 15 to 35 metres, 30 to 85 metres, 200 to 550 metres and 1,000 to 2,100 metres.

Construction

The baseboard should preferably be of the polished type to avoid risk of losses, and if ordinary plywood is used it should be painted with shellac or varnish.



Wiring diagram of the receiver, with the switch connections omitted for clarity. They are shown on page 376.

LIST OF COMPONENTS FOR THE "COLT" ALL-WAVE THREE

One four-range coil, No. C56 (Bulgin).
One driver-locator unit, No. S150 (Bulgin).
One five-way contact unit, No. S153 (Bulgin).
One .0005 mfd. condenser, No. 2SM (C2) (Polar).
One .0003 mfd. diff. reaction condenser (C3) (Polar).
One .0001 mfd. Compax condenser (C1) (Polar)
Four fixed condensers: .0001 mfd. (type M) (C4), .005 mfd. (C7), .01 mfd. (C6) (type 300 tubular), 2 mfd. (type 65) (C5) (T.C.C.).
Three fixed resistors: 2 meg. (R1), 40,000 (R2), 10,000 (R3) (1 watt type) (Erie).
One potentiometer, 1 meg. with two-point switch (R4) (Erie).
One L.F. transformer, 3/1, No. LT135 (B.T.S.).
One all-wave choke, No. A.W.C1 (B.T.S.).
Three four-pin S.W. type baseboard mounting valveholders (Clix).
Two terminal blocks with A.E. and L.S. terminals (Belling-Lee).
Six plugs: H.T.-, H.T.1, H.T.2, G.B.+, G.B.-1, G.B.-2 (Belling-Lee).
Two spades: L.T.-, L.T.+ (Belling-Lee).
One baseboard, 12in. by 8in. (Peto-Scott).
Six component brackets (Peto-Scott).
Three valves: D210, L210, P215 (Hivac).
One speaker, type 37J (W.B.).
H.T. Battery, 120 volts (Drydex).
G.B. battery, 9 volts (Drydex).
L.T. accumulator (Exide).
One tin Filt (G. Farish).
One slot aerial filter (G. Farish).



NEW SERIES

Amateur Transmitting

The Fundamentals of Electricity, Periodicity and Frequency are Among the Subjects Herein Discussed

By L. O. SPARKS

BEFORE commencing the second article of this series, just a few words about the Morse Code, mentioned in last week's issue. How many hours of practice have you had? Can you write down, in code, the Test Block given on this page? You should be able to by now, but if you can't, then get busy, as you must master it before you can become a transmitter.

Fundamentals

Before proceeding with the practical side of the work, it is important to discuss fundamentals. However, I will make all the details as short as possible, with the hope that readers will refer to past comprehensive articles which have appeared in these pages from time to time, dealing with most of the items, and thus secure a wider appreciation of the various subjects.

Electricity

Electricity is the vital factor of wireless transmissions. Without it, broadcasting and the radiating of wireless signals, in any form, would be impossible.

It is not made or generated, as in the case of, say, gas, glass or soap. It is present in all "matter," but, in a latent or inactive form, and it is not until it is made to get a "move on," that it indicates its presence by one or more of its many applications.

All "matter" is formed by a mixture of what scientists call "*electrons*" and "*protons*." An "electron" is the smallest possible quantity of "*negative electricity*."

If, by some means or another, the electrons can be made to move, it is said that an electric current has been set up; or, if you like to put it another way, an electric current is nothing more than a movement of electrons which are present in all "matter." It is necessary, of course, to provide some means to create the stress or strain in the matter to cause the movement of electrons. Dynamos and batteries are two of the most common means, but they do not generate or make the electricity.

Unit of Measurement

As the stress or strain can be a variable quantity, some Unit of measurement had to be adopted, so it is usual to refer to it as the "Electro-Motive-Force," written E.M.F. or just plain "E," and use the name "Volt" for the units of force or pressure.

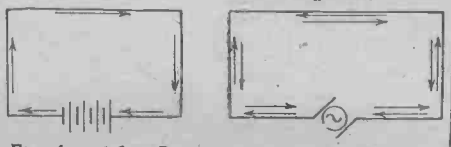
Direct Current

Every constructor is familiar with the terms A.C. and D.C., which are abbreviations of "alternating current" and "direct current," both of which are used in radio and domestic work.

If conditions are so arranged, that the electrons move in *one direction only* (Fig. 1), like a long procession, then it is said that a "direct current" is flowing.

Alternating Current

If, however, the source creating the stress is such that the movement of the electrons is *not* continuously in one direction, but backwards and forwards (Fig. 2), the reversal of direction taking place frequently, then the resultant current is "*alternating*," and the number of times the reversal or alternations take place per second is known as the "periodicity" or "frequency."



Figs. 1 and 2.—Diagrams showing the movement of electrons in a D.C. and an A.C. circuit.

It is essential that these brief details are remembered, as they play an important part in wireless, and they will be elaborated on from time to time.

Conductors

Electricity has to be provided with a path to allow it to reach the point to which it is to be applied. Such paths are called conductors, and they are usually formed from metal, although certain liquids and gaseous substances will also serve.

Some materials allow the electricity to flow without any appreciable hindrance, while others will offer sufficient opposition to stop the flow. The first types are good conductors, the others, if no current flows, are known as "insulators."

Resistance

The opposition to D.C. is always called "resistance," and denoted by the letter "R." A perfect insulator has, of course, infinite resistance. The Unit of measurement is the "Ohm."

The resistance of a conductor depends on its size, i.e., its cross-sectional area, the material of which it is formed, and its length.

The formula can be written: $R = p \frac{L}{A}$

where p is a constant depending on the material, and known as the "specific resistance," L, the length of the conductor, and A, the cross-sectional area. L and A must be in the same units of measurement. The "specific resistance" of a material will be found in most electrical text-books. The accompanying table shows the values of the more common metals.

Morse Test Block

N O A T
S M B H
D V I R
E C L U
P G K J
Y Q F W

SPECIFIC RESISTANCES in MICROHMS

Copper (annealed)	1.561.
Copper (hard drawn)	1.647.
Aluminium (annealed)	2.665.
" (hard drawn)	3.160.
Iron (annealed)	9.065.
Zinc	5.751.

Ohm's Law

This Law concerns the relation between the resistance (R) of a circuit, the applied E.M.F. (E) and the current (I) which will be set up. The relation can be written:—



Figs. 3 and 4.—The difference between series and parallel connections.

$$I = \frac{E}{R} \quad \text{or} \quad E = I \times R \quad \text{or} \quad R = \frac{E}{I}$$

where I is in Amperes (the Unit of Current), E in Volts and R in Ohms. If the above is memorised as $\frac{E}{I \times R}$ it is always very easy to determine one unknown quantity. For example, if the item under consideration is covered, the remaining formula is correct for calculating the unknown value.

It must be remembered that the above law only applies to direct current.

Resistances in "series," as in Fig. 3 and in "parallel," as in Fig. 4, are quite usual in wireless circuits, therefore, it is advisable to be quite clear on how to determine the resultant resistance.

When they are in series, R=R.1+R.2+R.3+R.4, etc., but when they are in parallel, the calculation is a little more complicated.

$$R = \frac{1}{\frac{1}{R.1} + \frac{1}{R.2} + \frac{1}{R.3} + \frac{1}{R.4} \text{ etc.}}$$

Power (Watts)

When a current flows in a circuit possessing resistance, a certain amount of power is lost through being dissipated in the form of heat. It is possible to calculate the power or

(*Continued on facing page*)

(*Continued from facing page*)

wattage from the formula $W=I \times E$, but from Ohm's Law it is known that $E=I \times R$, therefore, it can be re-written :— $W=(I \times I) \times R$, or more correctly :

$$W=I^2 \times R$$

By further substitution, it will be seen that still another method of expressing it can be obtained, namely :—

$$W=\frac{E \times E}{R} \text{ or } \frac{E^2}{R}$$

Later on, it will be a question of considering or calculating the input and output of valves, and as such quantities are usually measured in watts, readers should get familiar with the above methods.

Periods and Frequencies

I have mentioned "periodicity or frequency" or an alternating current, but I did not give any indication of the characteristics of such current.

It is usual to speak of a "period," during which the current starts, reverses and returns to starting point again, as a "cycle," i.e., cycle of operations, and the average frequency of commercial electricity supplies is 50 cycles per second. With wireless, however, the frequencies of the alternating currents can be anything between 30 and several millions c.p.s.; in fact, the figures become so large that the terms "kilocycle" and "megacycle" are used. Kilo meaning 1,000, and Mega 1,000,000. For example, a wavelength of 1,500 metres is equal to 200,000 cycles or 200 kilocycles per second, while a wavelength on the short-wave band of, say, 30 metres, has a frequency of 10,000,000 cycles which is equal to 10 megacycles.

Those frequencies which correspond to the frequency of sounds audible to the human ear, are usually referred to as "low-frequencies," while those outside the range of hearing are known as "high or radio frequencies."

The low-frequency range is from 30 cycles to 10,000 cycles per second, approximately, although it is not always possible to reproduce the entire range, owing to other limiting factors. When a current is alternating at the frequencies met with in wireless work, it produces certain effects which have to receive special consideration.

With D.C. it is quite an easy matter to determine the behaviour of a current in a circuit, but, in the case of A.C. it is not just a question of the material and size of the conductor, especially where high-frequencies are concerned.

Oppositions

From the formula for D.C. resistance it can be seen that the current is concerned with the whole conductor, whereas, with A.C. currents, above the low-frequency range, they tend to travel on the surface of the conductor, producing what is known as the "skin effect" which produces further opposition to the current flow. The higher the frequency, the more pronounced the effect, therefore it is usual to use conductors offering large surface areas, often hollow, like copper tubing, for coils carrying the higher, or radio frequencies.

Eddy Currents

When a conductor is carrying a current, a magnetic field is produced around it, and if the current is alternating, then the magnetic field will also be alternating.

Now, if a metal object is within this alternating magnetic field, currents will be *induced* in it, such currents being called "eddy currents."

(*To be continued*)

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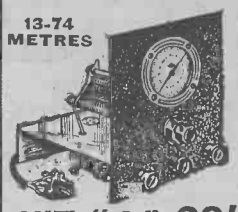

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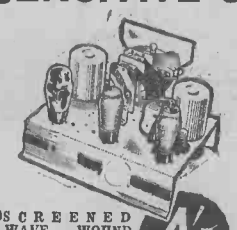

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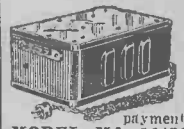

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1 Bulgin 5-way Contact unit S.153		2	9
1 Polar .0005 mfd condenser type 2.SM		6	6
1 Polar .0003 mfd differential reaction condenser		3	0
1 Polar .0001 mfd compax condenser		2	6
4 T.C.C. fixed condensers		5	4
3 Erie 1-watt fixed resistances		3	0
1 Erie 1 meg. potentiometer with 2-point switch		7	6
1 B.T.S. L.F. Transformer type LT. 135		4	6
1 B.T.S. All Wave Choke A.W.C.1		3	0
3 Clix 4-pin S.W. type baseboard mounting valve-holders		5	3
2 Belling Lee terminal blocks, with terms.		2	0
6 Belling Lee plugs		1	0
2 Belling Lee spades			4
1 Peto-Scott Baseboard and condenser support		1	0
6 Peto-Scott Component brackets		2	6
Connecting wire, screws, flex		1	9
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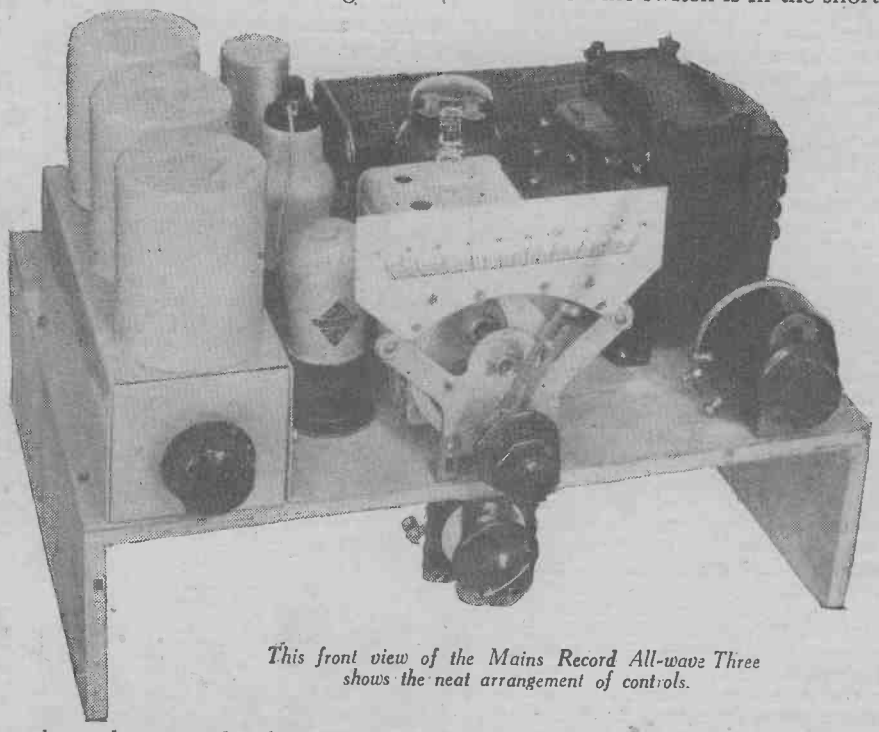
J. J. Camm's "Mains RECORD" All-Wave 3

Preliminary Details

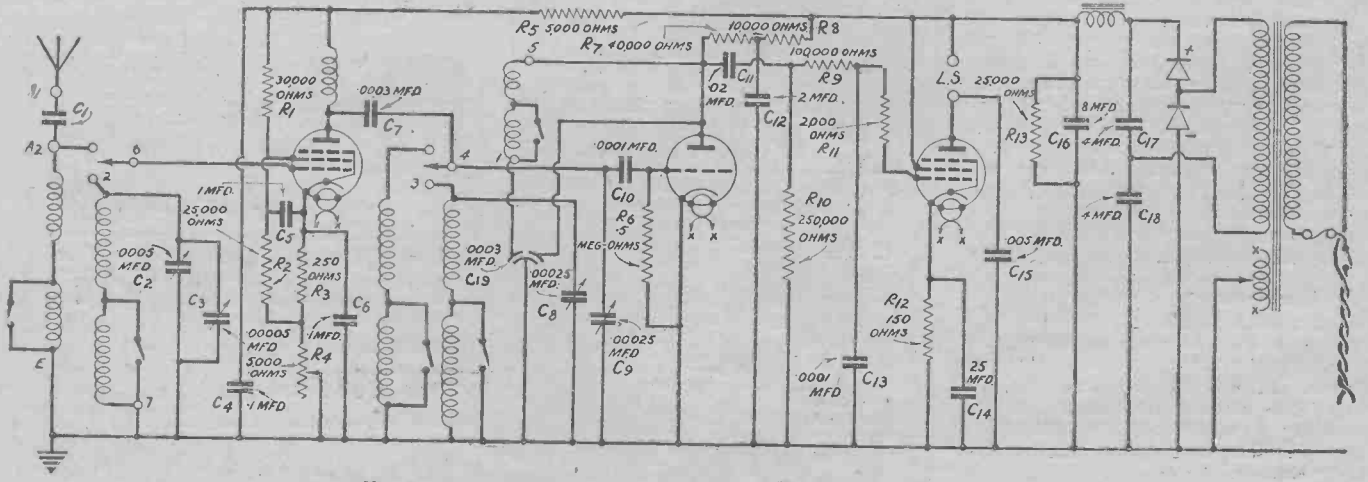
THE Battery Record Three, described in recent issues of PRACTICAL AND AMATEUR WIRELESS, has proved to be one of the most popular sets of the year. The modern, yet simple all-wave design has appealed to the beginner and advanced constructor alike, and satisfactory reports are pouring in from all parts of the country. A large proportion of our readers have A.C. mains available, however, and do not feel disposed to rely on a battery H.T. and L.T. supply. Owing to the phenomenal success of the battery version we therefore decided to experiment with an all-mains design, using the main components incorporated in the battery version. The A.C. Record presented in this issue is the outcome of these experiments, and readers may rest assured that results will be even better than those obtainable from the battery receiver owing to the high efficiency of the mains valves used.

The Circuit Arrangement

The circuit arrangement is the H.F., detector, L.F. type, using pentode valves in the H.F. and L.F. stages and a triode detector. A study of the theoretical diagram will indicate that the aerial circuit is tuned on the medium and long wavebands and untuned when switched to the short wavebands. The primary winding of the medium-long-wave coil acts as an effective H.F. choke when the switch is in the short-wave position. The switch is, of course, incorporated in the coil unit



This front view of the Mains Record All-wave Three shows the neat arrangement of controls.



The theoretical circuit diagram of the Mains Record All-wave Three.

and has been completely wired by the manufacturers. In the past we have found that more trouble has been experienced by beginners in wiring multi-contact switches than any other components, and it was this fact that prompted us to use a coil unit with an integral switch for the Record. The use of this type of unit also ensures correct disposition of the switch plates and connecting leads.

H.F. Stage

The H.F. valve is of the modern variable-mu pentode type, having seven pins, and volume is controlled by means of a 5,000 ohms potentiometer connected in series with its cathode resistance. The coupling between the H.F. and detector valves is of the tuned grid type, the H.F. choke being of a modern screened type. It will be noted that the tuning arrangement in this stage is of a novel type. The wave-change switch connects two .00025 mfd. sections of the gang condenser in parallel on the medium and long wavebands thus forming a capacity of .0005 mfd. On the short wavebands one of these .00025 mfd. sections is disconnected leaving a tuning condenser of .00025 mfd.

The L.F. Amplifier

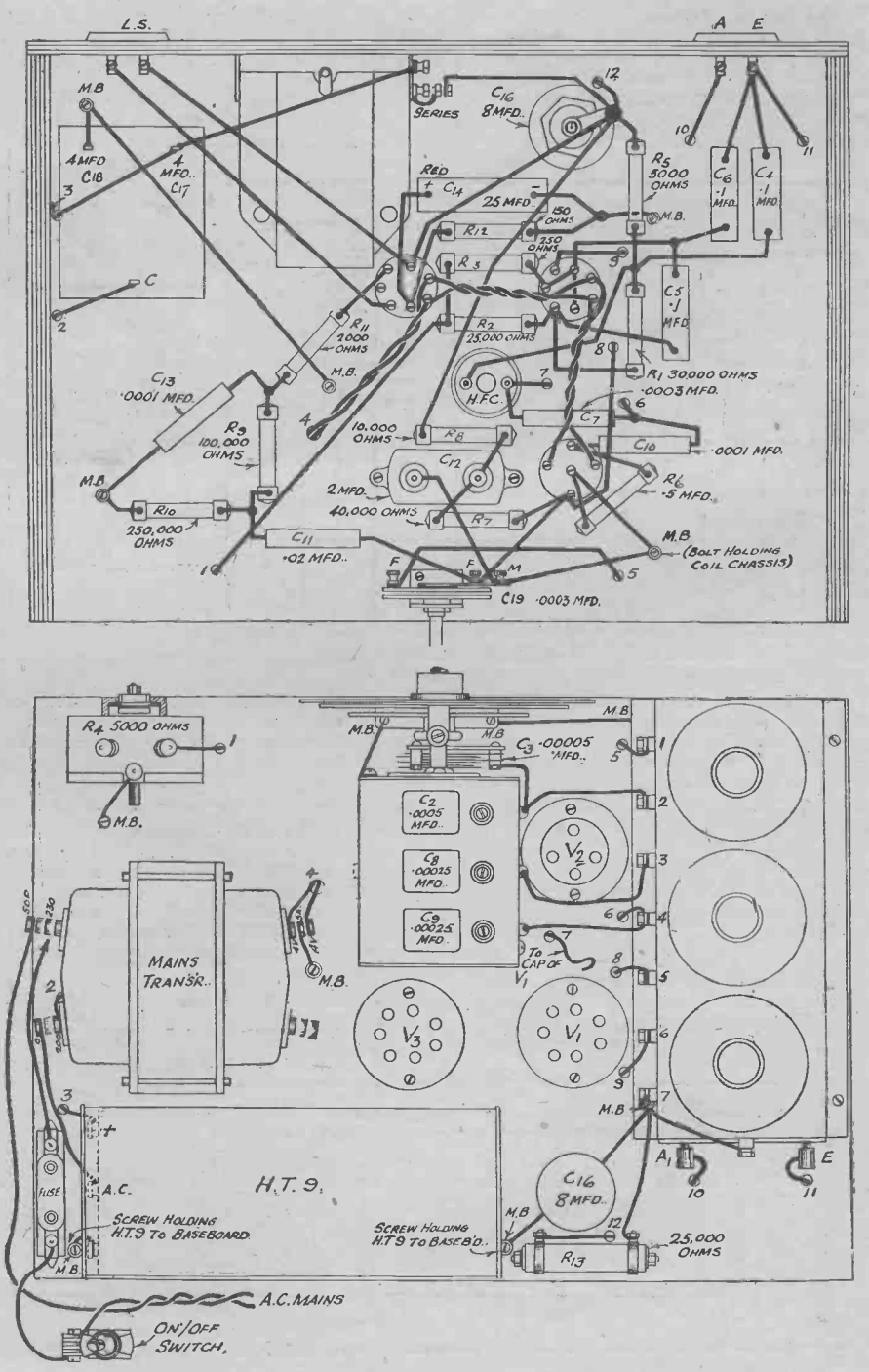
It was decided to use resistance-capacity coupling between the detector and output valves, in order to avoid the possibility of mains hum occurring due to interaction between the L.F. amplifier and mains unit. Resistance coupling also ensures good quality reproduction, and by using a high efficiency pentode in the output stage adequate volume is obtained. Constructional details of this interesting receiver will be given next week.

The rectifier used in the Mains Unit is of the Westinghouse metal type. This was chosen owing to its reliability and consequent popularity amongst home-constructors. Style HT9 rectifier is specified, but Style HT8 may be used if one of these is on hand. The HT8 has now been discontinued, Style HT9 taking its place. An explanation of the function of resistance R13 is probably called for. This has been added owing to the use of an indirectly-heated output valve. It acts as a loading resistance and prevents damage occurring to the rectifier and smoothing condensers during the time the output valve is heating up.

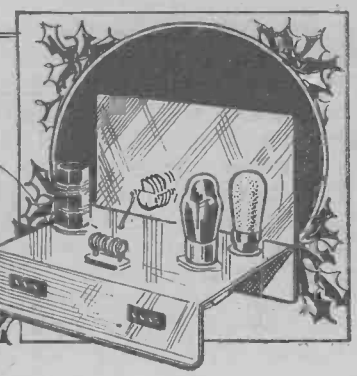
LIST OF COMPONENTS

One all-wave coil unit (No. 4BTU) (B.T.S.).
One 3-gang (.0005+.00025+.00025) condenser (C2, C8, C9) (J.B.).
One drive with trimmer (SL9) (C3) (J.B.)
Twelve fixed condensers: 8 mfd. (F2920) (C16), 4/4 mfd. block (BE355) (C17, C18), 2 mfd. (BB) (C12), .02 mfd. (C11), .005 mfd. (C15), .0003 mfd. (C7), two .0001 mfd. (4421/E) (C10, C13), three .1 mfd. (4423/S) (C4, C5, C6), 25 mfd. (3016/25v.) (C14) (Dubilier).
Eleven fixed Resistors: 40,000 (R7), 30,000 (R1), 25,000 (R2), 10,000 (R8), 5,000 (R5), 250 (R3), 150 (R12) (F1), 500,000 (R6), 250,000 (R10), 100,000 (R9), 2,000 (R11) (F½) (Dubilier).
One all-wave H.F. choke (HF15) (Bulgin).
One power Resistor, 25,000 ohms (R13) (PR14) (Bulgin).
One Potentiometer, 5,000 ohms (R4) (CP157) (Varley).
One L.F. choke (DP11) (Varley).
One metal rectifier (HT9) (Westinghouse).
One mains transformer (W31) (Heayberd).
One fuseholder with 1 amp. fuse (Microfuse).
One Q.M.B. switch (S80)(Bulgin).
Two terminal sockets L.S. and A.E. (Belling-Lee).
Two component brackets (Peto-Scott).
Three valveholders: Two 7-pin, One 5-pin (Standard) (Clix).
One metallised chassis 14 in. by 10 in. with 3½ in. runners (Peto-Scott).
Two ft. length metal screened lead (Ward and Goldstone).
Three valves: MVS/Pen 7-pin, 41MHL, 42MP/Pen (Cossor).
One P.M. speaker (37S) (W.B.).

WIRING DIAGRAM OF THE MAINS RECORD ALL-WAVE THREE



Simple Sets for Television Sound



Some Circuit Suggestions Which Will Interest Those Constructors Who Wish to Experiment with Ultra-short-wave Reception

COMPLETE television receivers, even if home-made, are still too expensive to be found in many homes, but a good deal of interest is to be found in listening to the "sound" portion of the television transmissions. Apart from the entertainment value of the programmes—and the quality is excellent—the constructor has an excellent opportunity of becoming familiar with ultra-short-wave technique. It must be remembered, of course, that the television transmissions cannot normally be received outside a circle of twenty-five miles from Alexandra Palace, but listeners outside this area will often find that there are now a number of amateur transmissions available.

Simple Det.-L.F.

A sound-and-vision receiver is a rather complicated affair, but a television sound receiver can be even simpler than the average broadcast set, whilst the cost is very low. The old and tried "straight" detector-L.F. circuit can be used with fair success, and a two-valve circuit such as that shown in Fig. 1 provides a good "starting point." A set of three 7-metre coils is used in the input circuit, one being used for aerial coupling, another for tuning the grid circuit, and the third for reaction

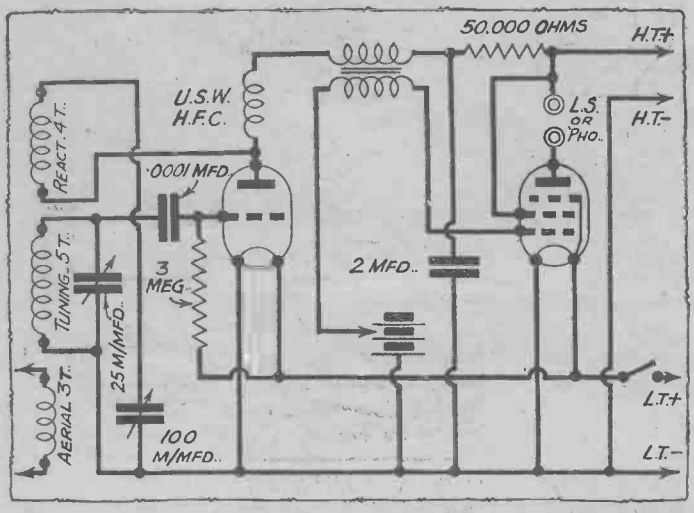


Fig. 1.—Circuit for a simple two-valve "straight" set for 6-10 metre reception.

There are plenty of ready-made coils available, and the three should be mounted in line, as indicated in the circuit, and separated by about half an inch.

The tuning condenser should be of good make and have a capacity of approximately 25 m.mfd. It should be used in conjunction with a 3-in. extension spindle and a really good slow-motion drive. The reaction condenser should have a capacity of approximately 100 m.mfd., and should also have a reduction drive, although this need not be geared down more than about ten to one.

The other components are of usual type, with the exception of the H.F. choke, which should, naturally, be of a pattern intended for use on wavelengths below 10 metres. Construction and use of the receiver will follow normal short-wave lines.

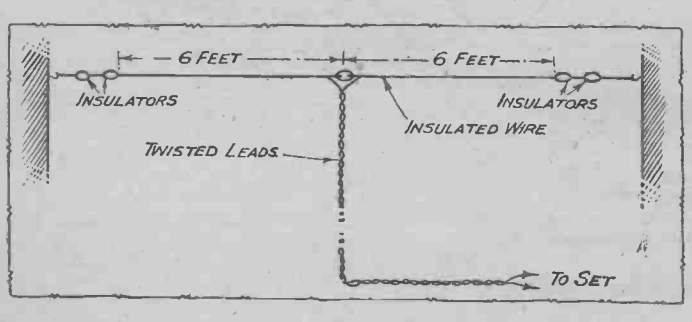


Fig. 2.—A suitable doublet aerial for use below 10 metres.

The Aerial System

For best results a simple form of dipole or doublet aerial should be employed, the two leads being connected to the ends of the aerial-coupling coil. A vertical dipole aerial is best, but for experimental purposes the constructor can use a horizontal doublet similar to the arrangement shown in Fig. 2. This consists of two lengths of rubber-covered flex, with the ends 6ft. long arranged in line. The remainder of the wire is twisted together to form a double lead-in. Theoretically, the length of the lead-in should be about 12ft., but this can be provided only when the aerial is an inside one in the same room as the receiver. Actually it will generally be found that results can be obtained over a wide range of lead-in lengths.

Super-regenerative

Those who want something rather better than the "straight" circuit described above will find a super-regenerative system very efficient, although not quite as selective. With reasonable care, however, the selectivity should be quite high enough to prevent the picture signals from interfering with the sound. A typical and useful circuit is given in Fig. 4, from which it will be seen that three valves are used. One of these is the normal regenerative detector, the second is the "quench" valve, and the third the low-frequency

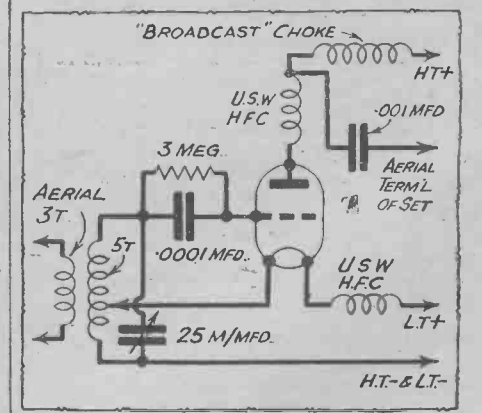


Fig. 3.—Circuit for an electron-coupled oscillator type of superhet converter.

(Continued on page 389)

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Compact unit with high efficiency air trimmer and genuine litz wound coils. Total tuning coverage 400 to 500 Kc/s. Gives high stage gain with approximately 9 Kc/s band-width. No. 1014. 450 Kc/s. Price 13/6.



ULTRA SHORT-WAVE H.F. CHOKES
These chokes are single layer space wound on DL-9 formers, and have an exceedingly low self-capacity. 2½-10 metres.
No. 1011. D.C. Resistance 1.3 ohms. Price 1/3
No. 1021. D.C. Resistance 0.4 ohms. Price 1/3



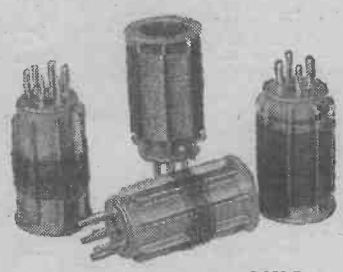
MIDGET INSULATOR
Made from Frequentite for high frequency work, with N.P. metal parts. 1" overall height. No. 1019. Price 4½d. each.



POINTER KNOB AND DIAL
A direct control comprising satin finish aluminium dial engraved 0-100°, with elegant shaped bakelite pointer knob. For ¼" spindles only. No. 1027. Price 1/3.



IMPROVED MICRODENSER No. 900.
For ultra H.F. and general S.W. use CALIT insulation, low series resistance, noiseless movement, extended ¼" spindle for ganging. 20 m.mfd., 3/9; 40 m.mfd. 4/3; 100 m.mfd., 5/-.

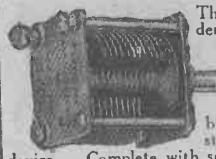


INTERCHANGEABLE COILS
New low loss formers of DL-9 high-frequency insulation. Rigidly made and each coil matched. First-class results assured. 4-pin coils have two windings, 6-pin three windings.
No. 959 6-pin Set of 4 12-170 metres Price 16/-
No. 932 4-pin .. .. .. Price 14/-

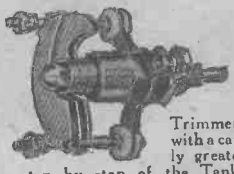


FLEXIBLE COUPLER
Free from back-lash but very flexible, this coupler banishes alignment troubles. DL9. H.F. insulation. For ¼" spindles. No. 1009. Price 1/6.

BANDSPREAD TUNING OUTFIT.
Devised to simplify station selection.



The Tank condenser unit has a capacity range of 10 x 14 m.mfd. Achieved by a patented step by step device. Complete with scale and knob.
Tank Unit: Cat. No. 1042. Price 6/-



In parallel with the Tank capacity is the slow motion Bandspread Trimmer condenser, with a capacity slightly greater than each step by step of the Tank condenser. Complete with dial. **Trimmer Unit:** Cat. No. 1043. Price 6/6

EDDYSTONE SHORT WAVE COMPONENTS

STRATTON & CO., LTD., Bromsgrove St., BIRMINGHAM. LONDON Service Depot: Webb's Radio Stores, 14 Soho St., Oxford St., W.

The GIFT that will be Valued for years!



Here's an idea for Xmas—an AvoMinor! It's the ideal gift for radio enthusiasts. With the aid of this accurate meter you can keep the performance of your set up to concert-pitch. It enables you to go straight to the cause of trouble in all receiving apparatus. Actually the D.C. AvoMinor is thirteen testing meters in one. It gives 13 different ranges of direct readings in milliamps, volts and ohms. You can put your finger quickly on every defect. No other instrument at the price enables you to test with such ease and accuracy.

In its handsome presentation case, complete with instruction booklet, the AvoMinor is the radio man's supreme gift. From all good dealers. But if you have any difficulty in obtaining, send to us.

THE D.C. **AVOMINOR** REGD. TRADE MARK

13 ACCURATE METERS in ONE

Fully descriptive literature on the AvoMinor post free on request.

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Another welcome gift! This book explains radio testing from A to Z in non-technical language. Describes all the faults that sets can develop, and shows how to trace them. Contains numerous diagrams and graphs. Acknowledged to be the most useful book of its kind. Send Postal Order for a copy to-day. **2/6**
Postage 3d.

CLIX

V1 - V2 - V8

Whatever the circuit or type of valve to be chosen, there is always a **CLIX** Valveholder to carry out its important duty to the entire satisfaction of the designer and constructor.

Types V.1. and V.2. are specified for the

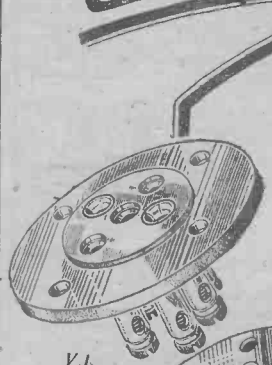
"A.C. RECORD 3"

and type V.8. for the

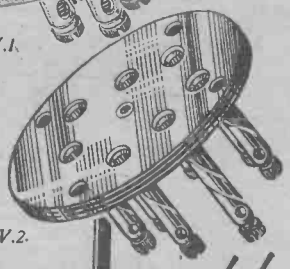
"COLT BATTERY ALL-WAVE 3"

V.1., **9d.** V.2., **1'-** V.8., **1'9.**

3d. less if supplied without terminals.

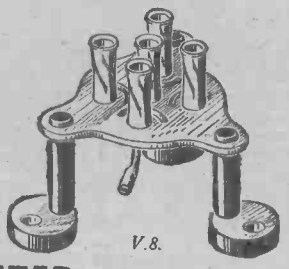


V.1.



V.2.

You can rely upon Clix for long and faithful service.



V.8.

Yours faithfully

LECTRO LINX LIMITED

79A ROCHESTER ROW. LONDON S.W.1



"I told you the set was all right," Cried Dad, "—why it's splendid to-night!" Said his daughter, Doreen, "Course it is, dear old bean, I've fixed all the points with FLUXITE!"

See that FLUXITE is always by you—in the house—garage—workshop—wherever speedy soldering is needed. Used for 30 years in government works and by leading engineers and manufacturers. Of Ironmongers—in tins, 4d., 8d., 1/4 and 2/8.

Ask to see the FLUXITE SMALL-SPACE SOLDERING SET—compact but substantial—complete with full instructions, 7/6.

Write for Free Book on the art of "soft" soldering and ask for Leaflet on CASE-HARDENING STEEL and TEMPERING TOOLS with FLUXITE.

TO CYCLISTS! Your wheels will NOT keep round and true, unless the spokes are tied with the fine wire at the crossings AND SOLDERED. This makes a much stronger wheel. It's simple—with FLUXITE—but IMPORTANT.

THE FLUXITE GUN

is always ready to put Fluxite on the soldering job instantly. A little pressure places the right quantity on the right spot and one charging lasts for ages. Price 1/6.



ALL MECHANICS *WILL* HAVE

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IT SIMPLIFIES *ALL* SOLDERING

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NICORE COIL UNITS





This is a reduced facsimile of one of the Nicore Blueprints.

DID YOU READ—

—The Article on Page 307 in the Nov. 21st issue of this paper? It described our new Nicore coil units and illustrated suitable circuits for these coils. Enthusiasm over these Sets is tremendous, and we are issuing special blueprints for these circuits, which are as follows:

No. 1 (BP.111) Mains superhet for 110 K.C. No. 2 (BP.112) Battery superhet for 465 K.C. No. 3 (BP.113) 3-valve mains receiver with band-pass tuners. No. 4 (BP.114) S.G. Battery 3 with Pentode. You can have one of these blueprints (and they're really worth having) for 6d. (The BP.114 is 3d.) The postage is free.

List No.		Price
BP.111.	3-Gang for Superhet Sets	£1 1 0
BP.112.	2-Gang for Superhet Sets	13 6
BP.113.	3-Gang for Straight Sets	£1 1 0
BP.114.	2-Gang for Straight Sets	13 6

Mr. Camm has advocated the BP.111 for the "Limit All-Wave Four."

Varley

To VARLEY (OLIVER PELL CONTROL, LTD.), BLOOMFIELD RD., WOOLWICH, S.E.18.

Please send me, Post Free, the following blueprint(s). (Put List No. here) .....

I enclose 6d. in stamps for either the BP. 111, BP.112, or the BP.113, or 3d. in stamps for the BP.114.

NAME .....

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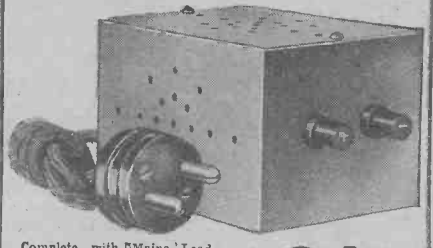
The new "Tom Thumb" Battery Charger incorporates a METAL RECTIFIER and will charge a 2-volt accumulator at ½ amp., for LESS THAN ½d. PER WEEK. Simply connect the output terminals of the charger to the battery, and insert the mains lead into the nearest power point. Home Charging ensures that the accumulator is always "well up" when required.



Complete with Mains Lead and Adaptor.

SEND NOW FOR FULL DETAILS OF THIS REMARKABLE MIDGET BATTERY CHARGER.

12/6

MAINS TRANSFORMER

Designed and Specified for the—

"A. C. RECORD 3."

Model W.31 Price 29/-

Delivery from Stock.

F. C. HEAYBERD & Co. 10, FINSBURY STREET, LONDON E.C.2

SIMPLE SETS FOR TELEVISION SOUND

(*Continued from page 386*)

amplifier. The tuning coils are of the same physical form as those referred to above, and can be similarly placed, although connected differently. Two four-turn coils should be used for tuning, with either a three- or four-turn coil for aerial coupling.

The reaction condenser in this case is of the pre-set kind, having a maximum capacity of about 160 m.mfd. After it has been set initially, reaction control can be carried out by means of the variable resistance in series with the high-tension feed to the detector valve. Details regarding the operation of a set of this nature were given in the issue of PRACTICAL AND AMATEUR WIRELESS dated October 10th, 1936.

The "quench" coils used in the grid and anode circuit of the "quench" valve will not be understood by those unacquainted with super-regeneratives, so it should be explained that they are available from two or three manufacturers as a single unit. It is again preferable that a doublet or dipole type of aerial be used, but this is not essential, and an ordinary short-wave aerial can be used if preferred in conjunction with an earth lead.

Electron-coupled Converter

Those who do not wish to build a complete receiver for the reception of 7-metre transmissions can employ a simple superhet converter in conjunction with the standard H.F.-Det.-L.F. broadcast receiver. A variety of alternative circuits is available, but one of the simplest is that known as an electron-coupled oscillator and shown in Fig. 3. A three-electrode valve of the HL type is used in conjunction with a tapped five-turn 7-metre coil, and a good low-resistance U.S.W. high-frequency choke must be employed in the L.T. + lead. The tuning condenser may be of 25 m.mfd., and should again be used with a slow-motion drive and extension spindle. Aerial coupling, as in the previous circuits, is by means of a separate coil, which may have aerial and earth connections, or be joined to a doublet aerial system.

The lead (through a condenser) from the anode circuit of the valve should be taken to the aerial terminal of the broadcast receiver, whilst the L.T. and H.T. leads can be taken to the appropriate points in the set. Tuning of the broadcast receiver will be fixed while the converter is in use, and the most suitable wavelength can be found by trial. It will generally prove to be the highest wavelength which can be reached on the medium-wave band, but it must be adjusted to avoid interference from other stations.

It should be made clear that the circuits given in this article are intended for use by those constructors with sufficient knowledge and experience to follow them. They are of an experimental nature and wiring diagrams and constructional details cannot be supplied. Those who require more complete particulars of sets suitable for ultra-short-wave use are referred to previous constructional articles which have appeared in these pages.

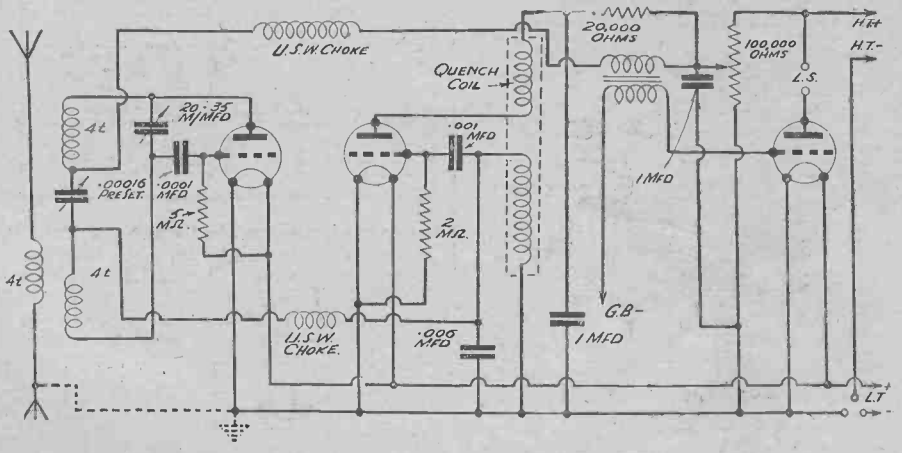


Fig. 4.—A three-valve super-regenerative receiver shown for use with a doublet aerial.

TOPICAL NOTES

From Assembly Lines to Headlines

AN enchanting voice rose above the noise of the assembly line in a famous motor works the other day. A chance visitor happened to hear, and arrangements were promptly made for the mechanic to be properly trained and launched upon a career.

This incident, which suggests an episode from a film, was enacted at Ford Works, Dagenham, the other day, but in case other budding concert stars imagine that a job at Dagenham is a short cut to platform success, it should be explained that it *was* an episode from a film. The owner of the voice was Keith Falkner, the famous concert singer, making his screen debut in a new Warner Bros. First National production. In the film the Ford factory will be the gigantic works of Ludboro Motors, Ltd. ("Ludboro for Luxury").

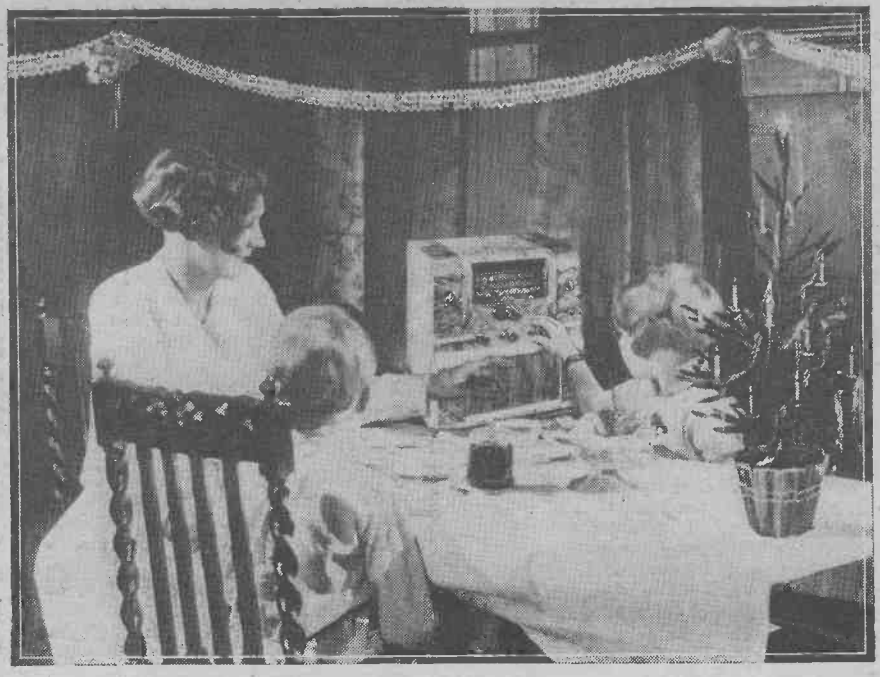
Keith Falkner's part in the picture is that of a motor mechanic. He is heard singing by the millionaire-employer's daughter, who promptly insists on having him properly trained and on launching him into Society. There was no need to call "Quiet, please!" when Falkner, dressed in white overalls, and surrounded by 50 Ford employees similarly attired, began to sing. His voice enchanted artists and the regular factory staff alike. A title for the picture has not yet been chosen.

Progress of Deaf Aids

MR. R. H. DENT, the well-known acoustician, after years of experiment has succeeded in devising the Aurameter which accurately measures deficiency of hearing, and he confesses to being a little proud of this invention as it has proved of great value in enabling him to discover and meet the particular needs of each individual case—an all-important point to those who are hard of hearing.

In the old days many partially-deaf persons seemed ashamed to reveal their infirmity. The results of neglect are often very serious, and he states that those in doubt about their hearing, or actually suffering from deafness are calling in ever increasing numbers for a free Aurameter test which keeps them abreast of their hearing requirements.

AN IDEAL XMAS PRESENT!
EVERYMAN'S WIRELESS BOOK
3/6, by post 3/10 from George Newnes, Ltd., 8-11, Southampton St., Strand, W.C.2



A Happy Christmas meal to the accompaniment of music from a Marconiphone Model 534 six-valve superhet.

A PAGE OF PRACTICAL HINTS

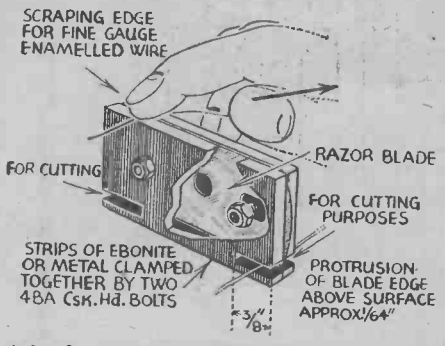
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

A Handy Wire-cutter and Scraper

THE accompanying illustration clearly shows the adaptability of this very useful addition to the test bench. For the device to be most effective the fine-gauge

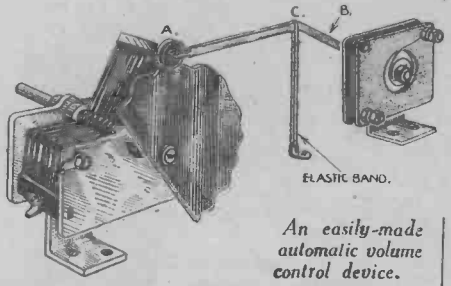


A handy wire-cutter and scraper made with an old razor blade.

wire that is to be scraped should be only gently pressed, as shown, and without removing the first finger the wire should be "drawn" by the thumb and second finger. The slots provided at each end of the blade should be sufficiently wide to allow a clearance between the edge of the blade and ebonite to accommodate about 20 S.W.G. wire. The unit can be screwed to the bench in a handy position by affixing small brackets by means of the 4BA bolts, or it can be simply held by the hand.—H. FREEMAN (London, W.C.2).

A Simple Automatic Volume Control

THIS efficient device, which can be incorporated on most sets for automatic reaction, volume control, or suppression of local stations, was made as follows. A semi-circular card about 3in. diameter



An easily-made automatic volume control device.

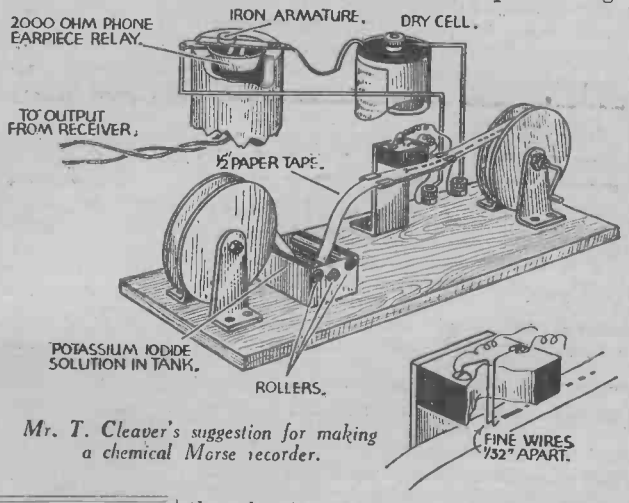
was fixed on the spindle of the tuning condenser, the base being horizontal when the tuning condenser was closed. For setting, a pencil was fixed at A, and the set tuned through the medium wave, volume being adjusted by means of lever A B. The end of the lever at B was fixed on the spindle of the reaction condenser or volume control. When an irregular line on the card had been traced, the card was cut along it (a metal disc cut similarly would be more efficient). A small wheel was fixed at A to run along the edge of the card, and an elastic band stretched from C to the chassis to keep the wheel on the coil. As the set is tuned the volume is varied automatically. Separate condensers may be fitted if desired; one for hand-tuning, and one for automatic operation.—P. H. RIVERS (London, S.W.).

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.

Recording Morse Signals

HERE is a useful way of making a record of Morse signals which will prove of value to those who are anxious to improve their Morse knowledge, as your records may easily be checked. The main parts are a relay (made from a disused phone-earpiece) and an inker. This is a chemical device operating by means of fine wires which press against the paper tape as it is drawn across a contact. Before reaching this point the tape is passed through a solution of potassium iodide retained in a photographic developing dish fitted with a roller.

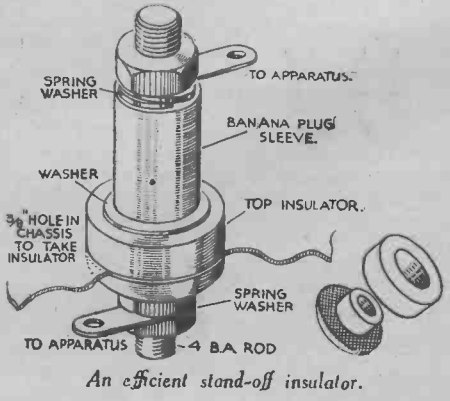


Mr. T. Cleaver's suggestion for making a chemical Morse recorder.

The tape may be wound on to one spool by hand or a small clockwork or electric motor may be used. A slight friction should be on the other reel to prevent the tape flying loose. The diagram clearly shows the connections and the method of arranging the essential parts, and the only difficulty which might occur is in the speed with which the tape is drawn along. If travelling too fast it may lift the roller or tear, whereas if too slow the dots and dashes may not be sufficiently differentiated. A little experiment will soon show the best speed and the apparatus will be found quite efficient to use.—T. CLEAVER (Romford).

A Neat Stand-off Insulator

IN designing an ultra-short-wave receiver on a metal chassis, and searching through my junk box for some suitable sleeving and anchorage for some 18-gauge copper wire, which had to pass through the chassis to the coil and condenser assemblies, I hit upon this simple but efficient dodge. The accompanying sketch shows clearly the method of fixing. The insulators I obtained some time ago for about one penny per pair.—D. G. FRANKS (Ilford).



An efficient stand-off insulator.

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 ENCYCLOPÆDIA. 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.

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

Are you resistance user A or B?

We have found there are two kinds of constructors who use Dubilier Resistances. First there is Group A—who use our resistances because PRACTICAL AND AMATEUR WIRELESS advise them to. We like them.

But better still we like Group B. They are the constructors who always use our resistances anyway—because they have used them for years—because they have found them reliable—because they trust us—and because we've always led the way in new designs and improvements. We feel sure that all the A's will soon be converted into B's. Until then, here are our resistances for F. J. Camm's A.C. Record 3—

Type F.1 watt. 40,000 ohms, 30,000 ohms, 25,000 ohms, 10,000 ohms, 5,000 ohms, 250 ohms, 150 ohms.

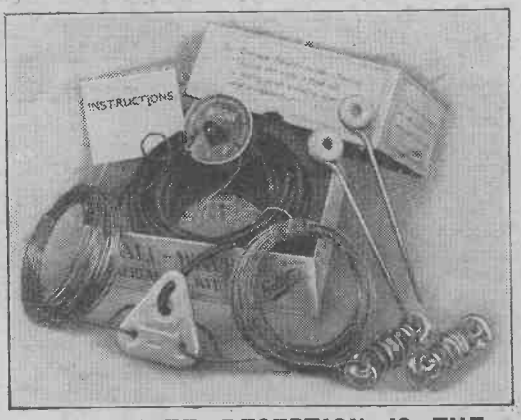
Type F. ½ watt. 500,000 ohms, 250,000 ohms, 100,000 ohms, 2,000 ohms.

DUBILIER

DUBILIER CONDENSER CO., (1925) LTD.,
DUCON WORKS, VICTORIA ROAD, NORTH ACTON, LONDON, W.3.

C. R. Casson S

'GOLTONE' 'OVERSEAS' ALL-WAVE AERIAL KIT



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Scientifically designed to give maximum signal strength on all wave-bands. **15 to 2100 metres.**
Provided with refinements usually unobtainable in other kits.
Price complete - - - - **17/6**

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Our technical department can solve your interference problems. Send P.C. for Interference Elimination Form.

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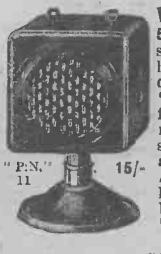
Xmas Fun on your Radio



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VOICES AMPLIFIED FROM RADIO TO LOUD SPEAKER

5/- BUTTON MICROPHONES for all purposes. Usually sold at 3/6. Our price has always been 1/-; Button in 1¼ in. hardwood case with 2 in. mica diaph., 2/6; Ditto, mounted on pedestal, 3/6. **1/-**

"P.N." No. 11 TABLE MIKE. This is a splendid Microphone for speech and music. The bakelite case, containing a 2.in. mike and transformer, is on a bronze pedestal, detachable for sling. Switch and plug fitted. Unrivalled for quality and price **15/-**

A NEW MODEL SOLO MICROPHONE for broadcasting at home. It is a general-purpose, robust mike, with solid bakelite body, back terminals, front metal grille.
No. 11. New design, finely finished **5/6**
No. 11A. Special in solid brass body, unequalled at the price on speech and music, ... **7/6**

Special 100-1 Transformer for use with models 11 and 11A, **4/6** each.

Home recording of your own voice, costs little and is great fun.)

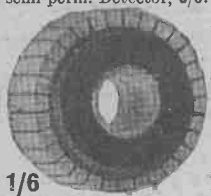
De Luxe "Mivoice" Acoustic Recorder Sets complete. No radio or battery needed. List two guineas. Sale **15/-**.
Ditto **No. 2** Model, one guinea list **10/6**. Junior ditto **5/6**. 6-in. Blank Records **4/-** doz.

PHOTO CELLS. R.C.A. UX867. Talkie model **25/-**, few Osram C.M.G. **35/-** Selenium Raycraft, **21/-**, Photronic self. gen. cells work meter direct **21/6**.

X-RAY TUBES. As illust. previous issues. Brand new W.O. Hospital Surplus. 7 in. dia. bulb, big tungsten electrodes. Full emission. Cost £5. Sale **10/-**

ALL-WAVE CRYSTAL SETS for plug-in-coils, 2 tuning condensers semi-perm. Detector, **5/6**.





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COMMUTATORS: An opportunity for amateurs. Engine built. 24 copper segments, mica insul. Unused and finely finished. Sale, **1/6**.
ELECTRIC GOVERNORS, centrifugal speed control, brushes and slip rings, **7/6**. Auto Cut-outs, **10/-**.
STUD SWITCH PANELS, 4 in. sq. slate, 2 Switch-arms ring, and 20 studs with back stems, **5/-**.
DIMMERS, 12/6 to 42/6. FOOT SWITCHES, 18/-. FLOAT SWITCHES, 30/-.
SHORT WAVE Lead-in insulators, frequentite, brass stem **8d.** Stand-off insulators, porcelain with base, **6d.** each, **5/-** doz. Screened flex, single, **3d.** yard. Screened sleeving **3d.** yard. Tubular condensers various cap., .01, .02 and .1mfd. etc., **6d.** each. Mains Transformers to 3, 5, and 8 volts, **2/6**. Dials Vernier Drum, **2/-**. .0005 varia. condensers, **2/-**.
FRACTIONAL H.P. MOTORS. 6v. to 250 v., prices **12/6** to **30/-**.
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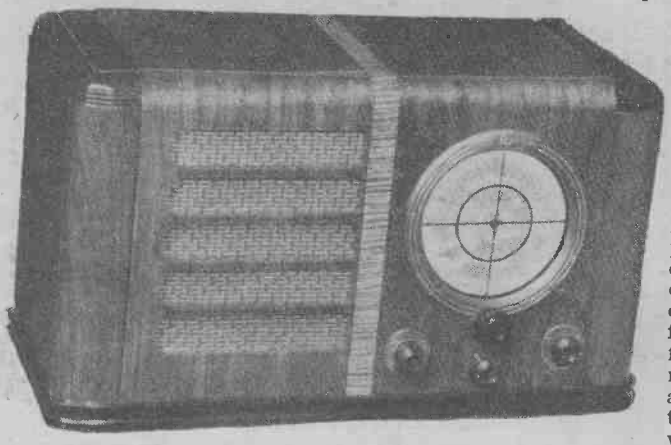
REVIEW OF LATEST RECEIVERS

TESTS OF STANDARD RECEIVERS ON OUR AERIAL

The 'Pilot' 12 Guinea Model U-355 Superhet

The All-wave A.C.

IN this model, Pilot Radio have incorporated the majority of the main features which are to be found in the Model U-650 which was reviewed by us a few weeks ago. The main modification consists of the elimination of one waveband (the 48-150 metre band) and the signal H.F. stage, and the incorporation of the complete apparatus in a horizontal type cabinet, as shown by the accompanying illustration. The chassis follows similar lines to other models, an all-metal method of construction being adopted. The H.F. valves are completely screened, and the coils and I.F. units are in metal screening cans. The same type of full-vision dial is fitted, with



Model U-355. This is a 3-band superhet for A.C. mains use.

double-ended pointer, but the lower section of the dial is in this case occupied only by the short-wave tuning scale, which ranges from 16 to 53 metres. The layout of control knobs is identical, the left-hand control effecting both on/off switching as well as the control of volume, and the right-hand control operating the wave-change switch. The lower central knob is for tone control and the knob above it is for tuning. This has a two-position setting; when pushed in it drives the condenser through a ratio of 12½ to 1, and when pulled out a higher gear is introduced through which a 95 to 1 reduction is effected.

The Circuit

The first valve in the circuit is a frequency-changer of the pentagrid type, with an H.F. aerial transformer operative on all wavebands. This is coupled to the I.F. valve, which is an H.F. pentode of the variable-mu type, through a standard I.F. transformer tuned to 456 kc/s. This in turn is coupled to a double-diode-triode through a similar I.F. transformer, and the two diodes of this valve are strapped and act in the dual capacity of detector and A.V.C. Resistance-capacity coupling is employed to couple the triode section of this valve to a power pentode, and the loudspeaker is included in the anode circuit of this valve. Extension speaker sockets are fed from this part of the circuit through fixed condensers whilst a socket for the accommodation of a gramophone pick-up is included in the grid circuit of the double diode-triode valve. A full-wave valve rectifier supplies the necessary H.T. voltages, and the mains transformer is fitted with a primary suitable for any mains voltage from 100 to 250 volts.

The self-contained speaker is of the energised type, and the output is rated at three watts. The aerial is connected to the receiver by means of a flexible lead which is fitted with a clip, whilst a similar clip is anchored to the chassis for the earth connection.

Test Results

The overall sensitivity is very high, and the performance on all wavebands is very good indeed. On the model which we tested there was only one whistle of any importance, and this fell at a point just above Motala on the long waveband, thus being of very little consequence. With a medium-sized aerial, the selectivity of the medium waveband was adequate for all normal requirements, and Radio-Normandie was quite clear of London. When a large aerial was employed, however, there was some difficulty in separating these two stations, but with even a 15ft. aerial in the centre of London the foreign station was more than sufficient for normal requirements and the volume control had to be set back from its maximum position. On the long waves all of the stations marked on the dial were easily tuned in, and on the short waves the majority of the marked stations were located during the testing period.

The quality is very good and even at maximum volume is free from cabinet resonance or boom. The tone control is most effective and provides a very full range of tone, and this will be found most useful when tuning to a long-distance station, as it enables the background to be reduced in such a case. Speech is very clear-cut and natural, and the judicious combination of the tone and volume controls enables even the weakest long-distance station to be comfortably listened to.

All of the controls act in a smooth and satisfactory manner, and the wave-change switch is very clean in its action, providing a definite setting at each position with freedom from noises due to poor contact. The receiver represents very good value and may be thoroughly recommended.

SPECIFICATION

Receiver: All-wave Superhet.

Circuit: Frequency-changer, H.F. variable-mu pentode I.F. stage, double-diode-triode second detector and A.V.C. stage, and pentode output stage. Resistance-capacity L.F. coupling, energised loudspeaker, and provision for gramophone pick-up and extension loudspeaker.

Tuning covers three wavebands, 16 to 53 metres, 180 to 540 metres, and 800 to 2,000 metres.

Controls: Four— tone, waveband selector, combined on-off switch and volume control, and tuning control. The latter has a two-position setting providing two separate gear ratios—12½ to 1 and 95 to 1.

Price: 12 guineas, for A.C. mains.

Makers: Pilot Radio, Ltd., 87, Park Royal Road, London, N.W.10.

XMAS PRESENTS

THERE is a vast range of articles from which the wireless enthusiast can select his Christmas presents. It will suffice here to mention just a few of the interesting items which you can give to your radio friend, or which you can choose for yourself if you are asked to make a selection by a relative or friend. A loudspeaker is, of course, a very acceptable present, and may be used at an extension listening point. The W.B. Stentorian range offers a wide choice, and these are fitted with a matching switch so that the output stage may be correctly matched.

Gramophone pick-ups are also obtainable in a wide range, prices rising from 5s. to three or four guineas, whilst amongst the component ranges there are many items, such as transformers, coils, valves, etc. These may be added to existing receivers in many cases and will greatly improve the performance of an old set. A good meter, such as the Avominor or the Pifco, is always acceptable.

For converting a battery receiver for mains working there are separate mains components, such as transformers, chokes, metal rectifiers, valves, etc., as well as complete mains units, some of which are very low in price. For the battery user, a trickle charger would no doubt prove a very acceptable gift if mains facilities are available for its use. It is even possible to re-house an old receiver in a modern cabinet, in which case there are many different types of cabinet from which to choose, including those for a radiogram, and an ordinary receiver could be converted to an instrument of the latter type as explained on another page in this issue.

Next week we shall deal more fully with this subject, and illustrations of many favourite items will be included to help in making a selection where it is not possible actually to inspect the components at your local radio store.

MASTER BATTISIN BELFRY IS AT IT AGAIN!



MASTER BATTISIN BELFRY—WHOSE TWISTED BRAIN HAS EVOLVED SO MANY INFAMOUS INVENTIONS—ONCE AGAIN DEFIES SANITY WITH HIS LATEST XMAS NOVELTIES—

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BEAT YOUR NEIGHBOUR! A SUPER SPEAKER ENABLES ONE TO RETALIATE WITH INTEREST—NO MATTER HOW LOUD NEXT-DOOR'S RADIO MAY BE.

MASTER BELFRY'S BRILLIANT WRINKLE FOR MIXING THE CHRISTMAS PUDDING.

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Address.....

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Practical Television

December 5th, 1936. Vol. 3. No. 27.

On the Programme Side

STEADY improvement in the television pictures radiated from Alexandra Palace has been a noticeable feature since the service was inaugurated. The B.B.C. engineers who are being trained to handle the scanning and transmitting equipment are slowly but surely mastering the entirely new technique, and concurrently "technical hitches" are being reduced thereby. On the programme side, however, certain criticisms have been made. First of all, complaint is made of the clock face interval picture which, although useful, is kept on too long and over-emphasises the periods of waiting between programme items. The films are, on the whole, being handled satisfactorily, but care should be exercised to ensure that the film is not too dense, otherwise the degree of modulation in the radiated signal is reduced to such an extent that the received picture is very indistinct. This is very noticeable in the B.B.C. film "Television Comes to London," where some of the shots show up as an almost black picture. Furthermore, this film has been repeated so many times now that viewers are getting rather tired of the story it unfolds. It was revealed in the House of Commons the other day that the cost of the Alexandra Palace station was £110,000. This leaves a balance of £70,000 from the original sum allocated, and is the money now being used for both programmes and maintenance. No doubt this is being husbanded until a further allocation is made, when it is hoped that it will not be necessary to radiate quite so many repeat programmes. To assist the Television Advisory Committee in their deliberations, it is stated that the Radio Manufacturers' Association is to supply them with confidential information from time to time concerning the sales of television receiving sets. With the promise of special Christmas television programmes and the anticipation of television being an active agent in portraying the pageantry of Coronation year, it is confidently expected that the sales will assume unthought-of proportions, and it is certain that anything the manufacturers can do to reduce the cost of the sets will have a profound influence on the popularity and usefulness of the television service.

The Co-axial Cable

THE Postmaster-General made known the fact that the co-axial cable linking London and Birmingham is now completed, and an early start is to be made in laying a new section between Birmingham and Manchester. This cable is proving more efficient than at first thought, and hopes are expressed that it will carry frequencies up to two megacycles. If this materialises, then the relaying of television programmes will be a relatively easy matter, and will hasten the erection of provincial stations. In addition to interchanged programmes, it is certain that each station will have its own scanning equipment installed and so add considerably to the variety of fare which can be portrayed to picture "viewers." The Post Office is also giving careful consideration to the Committee Report on the questions of interference. The troubles found on ordinary sound broadcasting are fairly well known, but television is presenting new problems, and a statement on the Government's policy will no doubt be made within a short time.

A Difficult Case

THE service area of ultra-short-waves when radiated from a transmitting station with high power being still a matter for

(Continued on opposite page)



The Cossor television receiver model 137T in use.

(Continued from previous page)

conjecture, it is only natural that some of the smaller European countries should watch developments in England, France, and Germany before taking steps to inaugurate transmissions in their own country on any large scale. This is particularly the case in Switzerland, where the physical conditions, owing to the mountainous regions, make it difficult to estimate the area over which signals would extend. In an endeavour to secure quantitative data, however, it is learned that an ultra-short-wave station has been erected at Zurich, and field intensity measurements are being made. This will enable the Swiss Post Office to see whether one or two high-powered stations would cover the country adequately or whether the shadow effects in the valleys can only be overcome by a series of low-powered relay stations linked together either by co-axial cables or directional microwave links.

Televising a Football Match

THE other day the Germans were given a foretaste of what they may expect when television has become more highly developed. An association football match took place at the Olympic Stadium between German and Italian teams, and in addition to the 100,000 spectators on the ground itself, an additional number watched the run of play by television. The Witzleben station was responsible for the transmission and in eleven public televiewing rooms in Berlin itself the audiences were able to see the radiated pictures on cathode-ray tube receiving screens. The results were stated to be extremely good when the mobile intermediate-film equipment was in operation on the ground, but as soon as the electron camera came into play the pictures were inferior. This was stated to be due to the poor light, the sensitivity of the photo-electric surfaces in the electron camera then being insufficient to bring the picture signal well above the "mush" level. It is not stated what type of camera was employed, whether iconoscope or image dissector tube, since most of the development work on these electronic devices is being undertaken secretly by the government. Experiments of this nature, however, serve to remind potential viewers that the scope of the programme side will be increased enormously as soon as outdoor televising reaches a higher degree of perfection.

The Electron Camera

A SHORT time ago we drew the attention of readers to experiments which were being conducted at Alexandra Palace with the new Baird electron camera. Those looking-in lately have been rewarded with high-quality pictures using this latest device. The device is instantaneous in action, uses no mechanical methods of scanning and provides a much greater flexibility of operation than the intermediate-film method. Changing focus is a very simple operation and can be undertaken both optically and electrically. The last-named is due to the helical path taken by the electron image in its passage from the photo-electric cathode where it is generated to the target plane aperture at the front of the camera. A single control effects the change instantaneously, while panning and dissolves from one camera to the other in the studio give a wonderful latitude to the producer in his programme arrangements. Those who have seen the results on the very few occasions it has been used have commented most favourably on the pictures radiated.



"COLT" ALL-WAVE BATTERY THREE

DESCRIBED IN THIS ISSUE

It is over a year since we first introduced "all-wave" components to the home constructors' market, and now they are firmly established as highly dependable products. Tried and proven, a number of Bulgin "all-wave" components have been specified in this issue for the "Colt-3." Designers and thousands of amateur constructors know their worth.

FOUR-RANGE COILS

Of all the great achievements in modern radio the Bulgin 4-range coils must rank as one of the most outstanding and the most popular with the home constructor. The most efficient four-band coil unit in the world. Fully screened and with numbered solder tags for connection. For the "Colt-3".

List No. C.56. With reaction. Price 8/9 each. Other types are available for mains or battery-driven superhet. receivers.

MULTI-CONTACT SWITCH

This type of switch was designed specially for use with the above coils and introduced to meet the requirements of multiple switching in modern sets. It has silver-plated self-cleaning contacts with integral soldering tags.

FOR THE "COLT-3"
Drive Locator Units
List No. S.150. 6 x ¼ x ¼ shaft. Price 2/9 each.
5-way double contact Unit.
List No. S.153. With Bracket. Price 2/6 each.

A number of different units are available which may be assembled in various ways to meet any switching requirement.

BULGIN

To obtain a copy of the complete 116-page Catalogue of Bulgin components (No. 156) write your name and address in the white margin below and post with 3d. stamps to A. F. Bulgin & Co., Ltd., Abbey Road, Barking, Essex.

Name.....

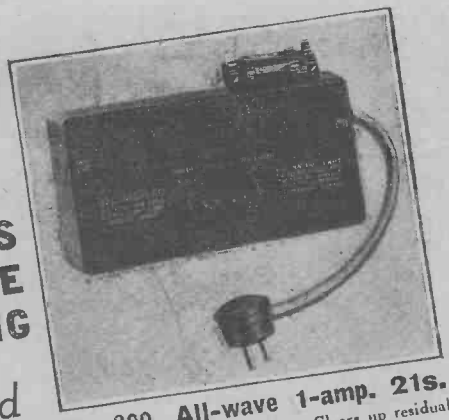
Peace on Earth...

ENJOY CHRISTMAS PROGRAMMES FREE FROM CRACKLING

Get the Set Lead Suppressor that cuts out Mains Interference.

A CHILD CAN PLUG IN.

Belling-Lee Set Lead Suppressors are three-stage choke and condenser filters, making it practicable to effect suppression close to a receiver.



No. 300. All-wave 1-amp. 21s.
Effective down to 10 metres. Clears up residual snowstorm effect on television (7 metres).

No. 1211. Medium and Long Waves. ½-amp. .. .. .. **17s. 6d.**

No. 1256. Medium and Long Waves. 1-amp. .. .. .. **19s. 6d.**

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"Wireless Without Crackling" booklet, FREE.

"Eliminoise" folder, FREE.
"Interference Suppression" book; 1s. 2d. remittance enclosed.

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For the "A.C. RECORD 3"



Q. "Why are Varley components so often specified for constructor sets?"

A. "Because the designers know that for proved high performance they cannot be bettered."

Q. "Are Varley components dear to buy?"

A. "They are not cheap in the sense that you cannot buy a better component at a lower price (or a dearer one for that matter)."

Q. "Can I rely on a Varley component?"

A. "Most certainly. They are made by men who know their job."

VOLUME CONTROL. Wire wound type with tapered resistance element. Suitable for one hole fixing. The element is protected by a removable metal cover. List No. CP 157. 5,000 ohms, 25 milliamps. **Price 5/6.**

L.F. CHOKE. Varley chokes are so well known as to need no introduction. List No. DP 11. Inductance—80 Henries in series, 25 Henries in parallel. Dimensions—3¼×3¼×3¼. **Price 15/-.**

Varley COMPONENTS

Oliver Pell Control, Ltd., Bloomfield Rd., Woolwich, S.E.18. Tel.: Woolwich 2345

LEAVES FROM A SHORT-WAVE LOG

Hong Kong Calling!

IF you have already logged W2XAF, Schenectady, you should have no difficulty in picking up ZBW3, Hong Kong, on 31.49 m. (9,525 kc/s) as the dial readings will be very close to each other. It is one of the channels used by the new short-wave transmitter which has been testing during the past month and is now coming shortly into daily operation. As Hong Kong local time is eight hours ahead of G.M.T., searching must be done between G.M.T. 04.30-06.30 on week-days and between 09.00-15.00 (Mondays and Thursdays); 08.00-15.00 (Tuesdays, Wednesdays, and Fridays) or from 08.00-16.00 on Saturdays. On Sundays Hong Kong is on the air between G.M.T. 02.00-06.30 and again from 08.00-14.30. The studio possesses a male announcer and at G.M.T. 14.00 you should hear a time signal reminiscent of the Big Ben chimes. News in English is broadcast at G.M.T. 13.00 and from 14.00-14.30 you may pick up a broadcast of gramophone records. As a rule the closing announcement reads: *This concludes the day's broadcast from the Hong Kong broadcasting station. We should like to receive reports on our transmission; address them to the Secretary, Broadcasting Committee, ZBW, P.O. Box 200, Hong Kong, China. Good night listeners, good night,*" following which *God Save the King* is played. The other channels to be used, as required, are ZBW5, 16.90 m. (17,755 kc/s); ZBW4, 19.75 m. (15,190 kc/s), and ZBW2, 49.26 m. (6,090 kc/s). From the frequencies you may see that the channels allotted are in close proximity to some already adopted by European and North American short-wave stations.

More Broadcasts from the Far East

The installation of high-power stations by Japan has impelled the Chinese Government to follow the same policy and in the more or less near future we may expect to tune in transmissions from Shanghai, Hangkow and Nanking. The channels allotted to these 20-kilowatt stations are as under: XGSA, Hangkow, 13.99 m. (21,450 kc/s); 16.90 m. (17,755 kc/s); 19.69 m. (15,240 kc/s); 25.56 m. (11,735 kc/s); 31.51 m. (9,520 kc/s); and 49.22 m. (6,095 kc/s). XGSB, Shanghai, will work on 13.95 m. (21,510 kc/s); 16.87 m. (17,785 kc/s); 19.75 m. (15,190 kc/s); 25.26 m. (11,875 kc/s); 31.56 m. (9,505 kc/s); and 49.14 m. (6,105 kc/s). XGOX, Nanking, will use 16.85 m. (17,800 kc/s); 19.69 m. (15,240 kc/s); 25.21 m. (11,900 kc/s); 31.58 m. (9,500 kc/s); and 50 m. (6,000 kc/s). Stand by, therefore, shortly for tests on the wavelengths usually adopted at this period of the year, namely, those in the 16, 19, 25 and 31 metre bands.

Another Mystery Station

On almost the channel used by CT1GO, Parede, Lisbon (Portugal), 48.50 m. (6,185 kc/s) a French call has been heard; it is: *Ici Tunis, Poste privé expérimental* (private experimental station). No lengthy broadcast was made, but merely two or three unconcluded gramophone records of very old vintage, broken off at intervals to insert the call. The time was G.M.T. 18.00, but on another occasion the same signals were heard towards G.M.T. 12.30. As no North African short-wave transmitter is listed to work on or around this channel the puzzle still lacks a solution.

THE BRITISH LONG DISTANCE LISTENERS' CLUB

Interesting Logs

SOME good logs are now coming in, and the following one, from Member 1399 (Tadworth, Surrey), shows how a simple set can be productive of good results:

"The following calls heard here during October on the 20m. 'phone band may be of interest to fellow readers:—

CE3DW, CO2KL, 6OM, 7HF, 8VZ, 8YB, CX1AA, 1CC, 3BL, CN8AA, 8AB, 8AD, 8KC, HI4N, 5X, 6O, 7G, HK3HA. K4DDH, LU1EX, 1HC, 1UA, 2AB, 4AW, 4BH, 6DP, 6KE, 7AG, 7ET, LU8AD, NY2AE, OA1J, PK1MX, 1PU, PY1AY, 2AK, 2AM, 2EJ, 2CK, 8AD, 8AG, TI2AV, 2HG, VE1AR, 1BR, 1CR, 1DC, VE1DR, 2BK, 2DC, 2CA, 2CR, 2FZ, 2HK, 2HY, 3NF, 3WV, VE4GU, 4LH, 4SS, 4WR, 5OT, GA5, VK2AW, 2BA, 2BG, 2MV, 3AM, 3HM, 3HS 3JJ, 5HD, 7JB, VO1I, 1J, 2Z, VP4TH, 6YB, 9R, 9O, W1, 2, 3, 4, 5, 6, 8, 9, W10XDA, XE1G, YV5AK, 7AA.

The receiver used is a two-valve battery set with bandspread tuning. The aerial a 66ft. straight, 30ft. high. May I take this opportunity to thank you for your helpful hints and tips found in your magazine."—Yours faithfully, H. F. HAMILTON, B.L.D.L.C. 1399.

A Transmitter's Point of View

BEFORE bringing to a close the correspondence on QSL cards, we should like to give a transmitting amateur's point of view. Mr. G. T. Ottley (G8BK) writes, "I have been following with some interest letters from readers regarding reports to experimental transmitting stations, and QSL's. Fifty per cent. of the S.W.L. *reports* that I receive are useless, and the wording of the so-called report is as follows: 'Dear Sir, I received you at loudspeaker strength on my all-wave set, using a 40ft. aerial. Please QSL.' I agree with 2ASA when he quotes: 'A good detailed report deserves a card.' If S.W.L.'s will give detailed reports, mentioning the type of set used for reception, direction of aerial, also, if possible, make the report cover several transmissions of various days, it would prove more helpful."

We are afraid that we must now close this particular correspondence. No doubt listeners are by now aware of the type of report they must make if they desire to receive a QSL card.

A Question of Harmonics?

MR. COTTIGNIES raises an interesting point for other B.L.D.L.C. members. He says that "With a friend last night we heard, while the television was on, the self-same vision and sound signals on 13.2 and 14.4 metres respectively, exactly double the wavelengths. The receiver was situated in Herne Hill. Having heard many varied explanations of this phenomenon might I ask if anyone has discovered the real cause? Surely it is not a question of harmonics? for, I think, no harmonics can appear *lower* in frequency than the fundamental. Nor can it be a question of beats; for a signal beating with another produces frequencies equal to sum and difference, and for a beat to appear on 13 metres, signals on 14 and 4 metres would have to beat with the television signals (figures approximate only). This seems hardly possible. (N.B.—The figures convey more if worked out exactly in megacycles). Can anyone oblige?"

Now then, Experts, what solutions can you offer to this interesting letter?

Station COCD

A REQUEST has been received by a reader from the Havana station COCD, in which they say "We would appreciate it very much if you would listen in on our short-wave station COCD, 6.130 kilocycles, 48.92 metres, and send us a special report on the broadcast which we offer every afternoon from 5 to 6 o'clock (E.S.T.) which you should receive in from 10 to 11 o'clock G. M. T.

During this hour we advertise tobacco and offer a very attractive programme of the best orchestras, best Cuban singers and ensembles in Cuba.

The address of this station is COCD "La Voz del Aire, S.A." Box 2294, Havana, Cuba.

Australian Transmissions

THE popular Australian stations VK2ME and VK3ME have sent their new schedule, which is as follows: DECEMBER, 1936,

VK2ME.

	Sydney Time	G.M.T.
Sundays	4 p.m.-6 p.m.,	06.00-08.00
,,	8 p.m.-Mdt.	10.00-14.00
Mondays	Mdt.-2 a.m.	14.00-16.00

VK3ME.

	Melbourne Time.	G.M.T.
Nightly Monday to Saturday (inclusive)	7 p.m.-10 p.m.	09.00-12.00

OVER 50 TYPES

Every Battery and Mains Set can be vastly improved provided you replace all "tired" valves with their modern Hivac equivalents.

Why put up with distortion, lack of volume and sensitivity, when for a small sum you can modernise your receiver.



THE SIGN OF A GOOD VALVE

Have you had particulars of these special types?

HIVAC SHORT-WAVE VALVES
HIVAC HARRIES VALVES
HIVAC MIDGET VALVES

MR. F. J. CAMM USES HIVAC FOR THE "COLT BATTERY ALL-WAVE 3"

Details of all Hivac types sent free for postcard request

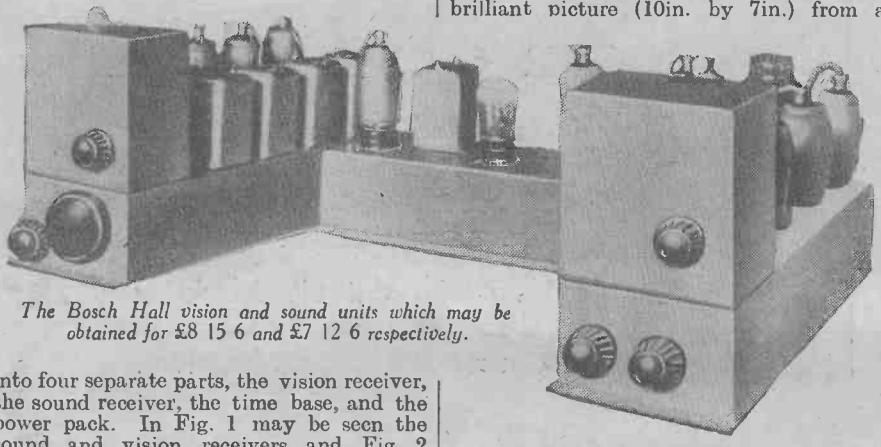
HIGH VACUUM VALVE CO. LTD., 111-117, FARRINGDON ROAD, LONDON, E.C.1

Home-constructor Television Kits

MANY readers will no doubt be interested to learn that a new company has made arrangements to supply complete television receivers (including the sound and vision section as well as the time base) in the form of constructor kits. This new company, Messrs. Bosch Hall, have released full details of the apparatus which has been designed by Mr. C. P. Hall, a Fellow of the Television Society. The kits are guaranteed, and it is stated that providing the units are assembled in accordance with the simple directions the results will give the utmost satisfaction, and the advice of the company's service bureau is available in the event of any difficulty. Furthermore, by arrangement, sets assembled by constructors can be inspected and tested by a qualified engineer on a payment of a small charge.

Details of the First Television Receivers to be Marketed for Home Assembly

The apparatus so far available is divided into four separate parts, the vision receiver, the sound receiver, the time base, and the power pack. In Fig. 1 may be seen the sound and vision receivers and Fig. 2 shows the time base unit with the cathode-ray tube mounted on the special socket in the centre, and it will be noted from this illustration that the vertical method of assembly is arranged for. Therefore the cabinet in which the receiver is housed must be provided with a reflecting mirror in the lid in order that the picture on the end of the cathode-ray tube may be viewed.



The Bosch Hall vision and sound units which may be obtained for £8 15 6 and £7 12 6 respectively.

Vision and Sound Receivers

The vision receiver embodies an amplitude filtering circuit dividing the synchronising signals and providing separate outputs for the time base and the sound unit. Nine valves are employed in this part of the apparatus, and the kit, with drilled chassis but without valves, may be obtained for £8 15s. 6d.

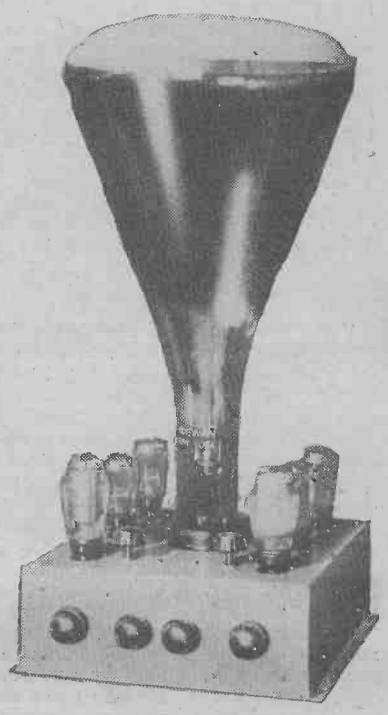
The sound receiver is a five-valve arrangement designed to provide high quality from the television sound signals combined with simplicity of control. It is quite free from interference. The kit for this portion, with drilled chassis and without valves, is £7 12s. 6d.

The Time Base

The time base is designed to provide a brilliant picture (10in. by 7in.) from a standard tube in black and white. The scanning circuit is very efficient and a brilliancy control is fitted. A special holder for the cathode-ray tube is mounted in the centre of the chassis so that the tube may be plugged in and this leaves it in a vertical position, with the result that it takes up less space and enables the remaining part of the equipment to be arranged round it. The kit with drilled chassis is £9 15s., valves and cathode-ray tube being extras.

The Power Pack

To supply the necessary voltages for all parts of the complete equipment a mains unit or power pack is designed to fit in with the entire assembly, and a potential divider is fitted for supplying the H.T. to the anodes of the cathode-ray tube at 400, 1,250 and 4,000 volts, with negative bias up to 150 volts. Again, an all-metal chassis is employed and a special safety switch is fitted. It is designed for mains inputs from 100 to 240 volts, and the kit with chassis ready drilled costs £6 6s. 0d.



The time base unit with cathode-ray tube in position.

Complete Equipment

The complete receiver (sound and vision) utilises 20 valves, and if desired it may be obtained ready assembled with 12in. cathode-ray tube for £85. Where it is not desired to carry out the assembly of the kits at home, they may be obtained ready assembled, in which case the vision receiver costs £18 18s. with valves, and the sound receiver £14 14s. with valves. The time base may be obtained with valves for £17 17s. and the power pack for £10 10s.

"THE WIRELESS TRADER" YEAR BOOK, 1937

THE 1937 edition of "The Wireless Trader" Year Book is now available. Further improvements have been made this year—notably the provision of index tabs to the five most-used sections of the book.

These sections are: Receiver Specifications—condensed technical details, with valve types of nearly 500 current receivers and radiograms by 48 different makers; Valve Data—characteristics of all valves in common use, with diagrams of base connections; Trade Addresses—printed on green-tinted paper; Buyers' Guide and Proprietary Names Directory—both on salmon-tinted paper.

The 28-page Trade Addresses section is invaluable to all engaged in the radio industry. It contains names, addresses (postal and telegraphic), and telephone numbers of radio manufacturers, and both radio and electrical wholesalers, the lists being separated under individual headings for ease of reference.

The Buyers' Guide to goods supplied is arranged under some 200 different headings, and there are nearly 1,200 names listed in the Proprietary Names section.

Other features include a full-sized diary, ruled with cash columns, for the whole of 1937, a directory of mains voltages for some 1,000 districts, and sectionalised legal, technical, and general information which is constantly needed by the radio dealer and, in fact, by everyone engaged in the radio trade.

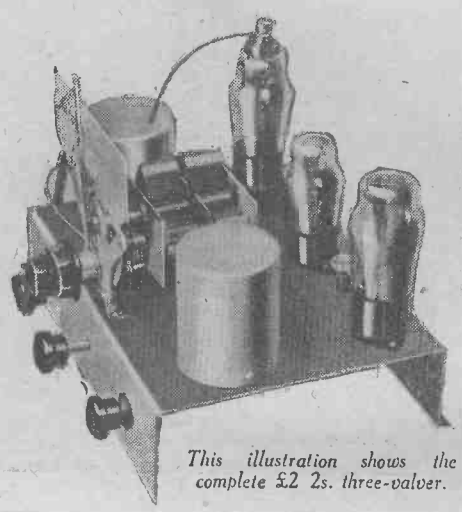
"The Wireless Trader" Year Book costs 5s. 6d. post free (overseas 7s. 6d.), or 3s. 6d. post free to "Trader" subscribers. It is obtainable from The Trader Publishing Co., Ltd., Subscription Department, Dorset House, Stamford Street, London, S.E.1.

THE WIRELESS CONSTRUCTOR'S
ENCYCLOPÆDIA
By F. J. CAMM
(Editor of "Practical and Amateur Wireless")
4th Edition 5/- net
Wireless Construction. Terms and Definitions explained and illustrated in concise, clear language.
From all Booksellers, or by post 5/6 from George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

THE N.T.S. S.G.3

A Low-priced Three-valve Receiver for the Battery User.

THE New Times Sales Co. are now offering a very low-priced receiver for battery operation, designed to provide the maximum performance with the minimum of expense. The illustration below shows the general appearance of this interesting receiver, and it will be seen that a neat and practical layout has been incorporated to combine modern screened coils with an all-metal chassis assembly. The standard H.F., detector and pentode output circuit is employed, and the valves which are fitted are of Tungsram manufacture. Two tuned circuits are employed, and the coupling between H.F. and detector stages is carried out by means of an H.F. transformer, designed with a primary to offer a suitable load for the H.F. pentode. This is not a variable-mu valve, but the aerial is fed to the first tuned circuit through a series-aerial condenser mounted on the control panel and thus a fair measure of control over volume may be obtained by reducing the aerial input. With the types of coil employed, this will not seriously affect tuning, although any slight modification which is brought about may be compensated for



This illustration shows the complete £2 2s. three-valver.

by means of the concentric trimming knob. This is fitted to a small trimming condenser which forms part of the slow-motion dial and it is thus possible to get both circuits dead in tune at all parts of the tuning scale.

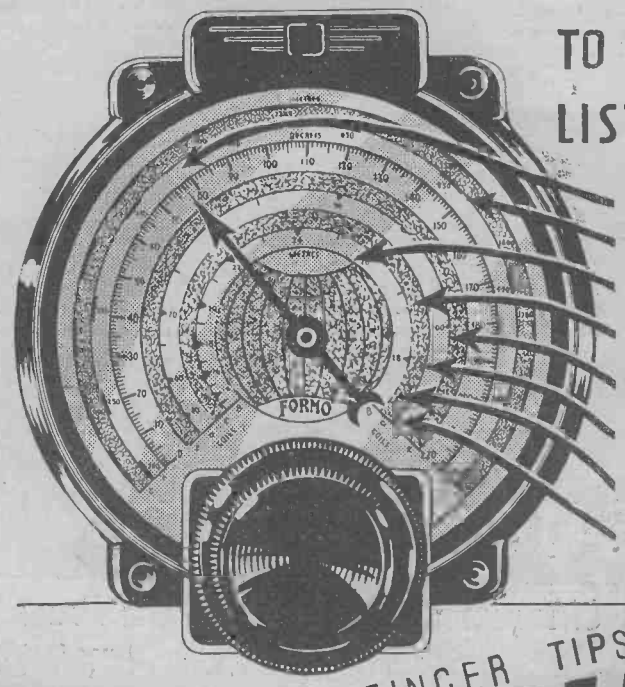
Working Details

The two-gang condenser is not of the screened type, but the separation of the two sections and the general rigid assembly enables the receiver to operate in a stable manner, and the two coils, as will be seen, are split on either side of the condenser. The trimmers fitted to the condenser are adjusted at the factory and sealed so that the panel trimmer will afford a correct degree of balance at all points.

Automatic Grid Bias

A refinement, not often found in a low-priced battery receiver, is the inclusion of an automatic grid bias circuit for the output valve and this naturally enables the receiver to be put into commission without the necessity of a grid-bias battery. The price of this interesting receiver is only £2 2s. complete with three valves.

ASTONISHING NEW BROADCASTS NOW AVAILABLE TO *Every* LISTENER

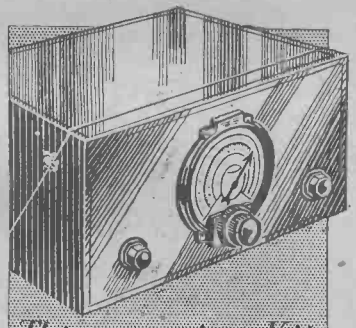


MEDIUM WAVE
LONG WAVE
SHORT WAVE
TRAWLER
AIRCRAFT
SHIPPING
POLICE
AMATEUR

ALL AT YOUR FINGER TIPS ON THE..

MULTIWAVE 3

The amazing ALL-WAVE KIT RECEIVER WITH CONTINUOUS TUNING FROM 12-2,000 METRES



Why be content with a receiver which is only designed to receive an infinitesimal number of the multitude of stations on the air ? Imagine the interest you will find in listening not merely to broadcasts, but to vital communications between shipping, trawlers, aircraft, police and the like, to far distant amateur transmitters, and to the vast number of broadcast short-wave stations in all parts of the globe. These are the stations which the Multiwave receiver can give you, programmes of 100 per cent. interest for 24 hours of every day. Why not investigate this amazing and revolutionary design ? It is not an expensive set—you can build it for less than 1s. 4d. a week. Its extremely simple construction can be undertaken by the veriest novice. It is, in short, a set which gives more stations than any yet produced, and yet at a price which defies comparison.

Now published: **RADIO CONTACT No 4. 4 STAR CIRCUITS**

This amazing Kit can be yours for less than

1/4d PER WEEK OR 57/6 CASH

FILL IN AND POST COUPON BELOW

Graham-Farish Ltd., Dept. M.8, Bromley, Kent.

Dear Sirs,—Please send me :
Contact Star circuits, describing your best circuits, including the Multiwave, price Post Free 1/-.

☐ I am interested in Hire Purchase.
☐ I am not interested in Hire Purchase.

Name .....

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.

H. G. N. (N.1). Although it is not essential to use a tapped control, we do not like to recommend alternatives in the case of a receiver which is not of our design. There is, unfortunately, no alternative component now on the market, and thus it will be necessary to use an ordinary type of control. The wattage rating and other factors must be ascertained.

A. L. W. (Peru). We suggest that you get into touch with Messrs. Stratton and Co., the makers of the well-known Eddystone components.

C. F. Q. (Folkestone). It would not be practicable to add the winding, and the best suggestion we can make is to replace all of the tuning coils. In such a case, however, the correct inductance values must be chosen in order that the ganged tuning condenser will track correctly, and the intermediate frequency must be known.

W. A. B. (Whitchurch). It would be quite possible to use the coils in the £5 superhet. circuit, but not in the Tutor. As, however, we have not used these particular components, we cannot give you a guarantee of performance.

F. H. B. (Teignmouth). We suggest that your coil is not of a suitable type for your Heptode circuit. Therefore, you will either have to obtain a modern coil designed for the purpose, or otherwise modify the Heptode circuit to enable the coil you are trying to use to give the desired result.

A. J. F. (Birmingham). The two resistors which touched may have resulted in damage to these parts or to some other components, valves or batteries. We suggest that you check each stage with a milli-ammeter, and this will no doubt enable you to verify voltages and components in the simplest manner.

J. B. (Birmingham). We are sorry that none of our blueprints gives details of a receiver which would enable you to use the parts mentioned in your letter.

B. C. (Marlow). The circuit is in order, but perhaps the addition of an H.F. choke between the anode of the valve and the 'phones would help to improve the reaction circuit.

J. H. F. (Maidstone). We are not certain that the coils in question would gang with the condenser, as these are of different make and the former are not of recent design. Unless the condenser is designed for use with coils having an inductance value similar to the coils you mention, they will not track correctly. We do not recommend the incorporation of these components in the Monitor 3.

D. W. (Llandough). The connections given in your letter are incorrect. The leads to the extension speaker should be taken from each anode of the Class B valve, through a 2mfd. fixed condenser. No earth connection is required.

A. H. J. (Yorks.). We have no blueprint of a set of the type outlined. Almost any simple short-wave set could be used in the manner described, but there may be some difficulty with regard to hum when an A.C. mains supply is employed for H.T.

L. G. C. (Camperley). Messrs. Peto-Scott can give you a quotation, and can also supply a complete kit for the apparatus.

A. M. B. E. (Tavistock). We refer you to the advertisements of Messrs. McCarthy Radio and Universal High Voltage Radio, Ltd., which appear in our issue from time to time.

C. E. H. (Stechford). The alterations shown by you are quite in order and the apparatus may be used as a one-valve headphone set. You cannot improve on this in any way.

E. L. P. (W.12). Only very simple A.V.C. can be incorporated as there is little H.F. amplification. We have not found a satisfactory method of including it in this particular set.

G. K. M. (Nottingham). The receiver was described in September, 1935. The illustration was simply used to make clear the points raised in the article referred to. We may reprint the article if further requests are received. The H.F. choke is on a ¾in. former with 150 turns of 38 enamelled wire, and the tuning coil is on a 2in. former. The condensers are .0005 mfd. (tuning) and .0003 mfd. (reaction). The set may be used as an adapter, hence the plug.

A. S. (Enfield, Co. Meath). Whilst it should be quite in order to use different speakers, there may be difficulties due to unmatched impedances, balances, resonances, etc. By using a speaker with a matching device, such as that mentioned, you could obtain better results as you could then match the output to your set.

K. E. F. (Walton-on-Thames). We have three blueprints of crystal receivers (see our blueprint list in this issue), and an article on the subject was published with two or three diagrams in our issue dated Feb. 8th last.

R. C. L. (Walthamstow). Although we have no blueprints of a set using the main parts mentioned, the coils and condenser could be used in a circuit of the Monitor Three type (or Tutor 3). We cannot, of course, give instructions for using alternative parts, but you may be able to incorporate the coils from the coil-makers' data sheet.

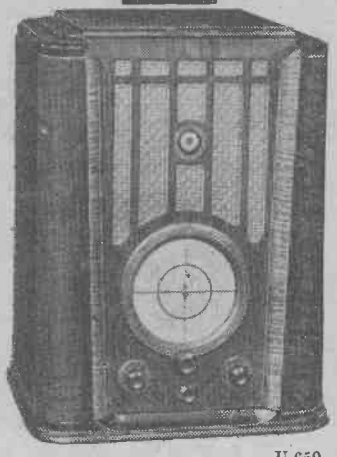
F. E. S. (St. George, Bristol). The Kit A costs £4 10s. 6d. This is, of course, less valves, cabinet, speaker and batteries. With valves, the Kit costs £6 3s. 0d.

I. J. H. McK. (Pitlochry). Generally, the blue glow indicates that the valve is being over-run, due either to excessive H.T. or lack of G.B. Some types of super power mains valve do appear to give a similar effect without damage, but in most cases the valve will be ruined if left operating in this condition, and you should, therefore, try and find the cause of it and obtain working results without the glow.

J. G. W. (Dublin). The trouble is not due to the method of connecting, but to the fact that the hum is already there but is not audible on the speaker owing to its lack of good bass response or to the weakness of the hum. Naturally, it is heard much more clearly in the 'phones.

Pilot Radio
THE SEASONS SENSATION

Unanimous Praise from the Press!



U.650

Daily Herald: Model U.355. "I was frankly astonished at the results, on the short waves my first station was Pittsburg W8XK on the 19 metre band, at full strength. Later on, Caracas, Java, Barranquilla, New York, Tokio and a host of other stations were received."

Daily Mail: Model U.650. "One of the most effective sets I have tried lately . . . Australia on Sunday mornings fills the house."

Wireless World: ". . . two of the qualities which mark this set as a thoroughbred."

Manchester Evening Chronicle: "I had music from all over the world."

Practical Wireless: See test report on page 392 of this issue. For test report on Model U.650 see page 170 issue dated October 24th.

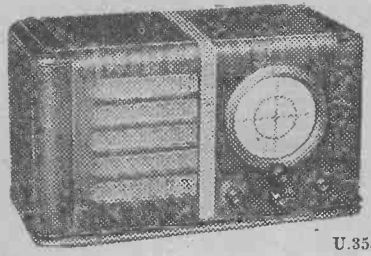
MODEL U.650. 4 Wavebands, 16-52, 43-150, 175-550 and 750-2,100 Metres. Tuning Beacon for silent and accurate tuning. 3 Watts undistorted output. For A.C. Mains 200/250. **16** GNS.
Note: There is also a **D.C.** Model **U.690** at 17 Gns.

THE THRILL OF LISTENING TO THE WORLD'S RADIO IS YOURS WITH A "PILOT."



U.225

MODEL U.225. 3 Wavebands, 16-52, 181-555 and 731-2,140 Metres. 2¼ Watts undistorted output. This is a Universal A.C./D.C. Model for 200/250 v. **14** GNS.



U.355

MODEL U.355. 3 Wavebands, 16-52, 180-540 and 800-2,000 Metres. 3 Watts undistorted output. For A.C. Mains 200/250. **12** GNS.

12 Pilot Models. Prices 12 to 24 gns.
H.P. terms available.
Prices do not apply in I.F.S.

Pilot Pilot Pilot

POST THIS COUPON NOW
Please send me free and without obligation details of all Pilot All-Wave Superhet Receivers; also the special Pilot STANDARD TIME CONVERSION CHART "P.W."

Name.....

Address.....

.....

Place coupon in unsealed envelope; ½d postage.

PILOT RADIO LIMITED
87, Park Royal Rd., London, N.W.10

RADIO CONTACT

A NEW issue of the Graham Farish magazine, *Radio Contact and Television*, is now available, price 1s. This interesting number contains constructional details of a two-valve battery short-wave receiver, a battery all-waver designed to utilise plug-in coils so that every wavelength may be covered, as well as two other constructional receivers. A full-size blueprint is given free for the construction of the all-waver mentioned, which is a three-valve straight set employing the popular detector-2 L.F. arrangement, with resistance-capacity coupling.

The issue also includes an interesting article on the ganging of condensers, as well as operating details for the receivers which are described in the book. All of the receivers are, of course, constructed from Graham Farish or Formo components, and the efficient Graham Farish Ring short-wave detector valve is employed in some of these sets. The book also contains full component lists for the receivers, and these may be obtained on hire purchase terms if desired. The 2-valve S.W. set may be made for 47s. 6d., the 3-valver for 57s. 6d., the S.G. three for 50s., and the all-mains three for 110s.

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.)

Correspondents Wanted

SIR,—I have been a reader of PRACTICAL AND AMATEUR WIRELESS for eight months and have found it a fine paper. I look forward to getting my copy every week, but I have one complaint to make. I have answered three requests for correspondents over a month ago now and I have not had a single reply.

I shall be glad to correspond with any reader interested in 5-metre reception or short-wave reception in general. Also, if there is a reader in my district who is willing to co-operate in learning the Morse Code, will he please drop me a line?—T. MOORE (Junr.), 4, Orange Grove, Lodge Lane, Liverpool, 8.

"The One and Only!"

SIR,—I have been unavoidably detained in writing to you, but I now wish to thank you for the Stentorian Speaker, which you awarded to me in the recent Speaker Competition. Having tested the speaker I find it a splendid addition to my set; the volume and quality are excellent.

As a regular reader of your paper I can remember purchasing not only the first issue of PRACTICAL WIRELESS but also the first number of AMATEUR WIRELESS and would like to say how much I have enjoyed all articles, theoretical and practical, and how helpful they have been to me in my experiments.

I also found PRACTICAL TELEVISION most interesting and hope that it may again appear as a separate journal.

As wireless is my special hobby, I have had many wireless papers on the market, but PRACTICAL AND AMATEUR WIRELESS is "The One and Only." As I have never written you before I take this opportunity of wishing your paper every success.—JAMES MILLER (Dovercourt).

Hydrofluoric Acid: A Warning

SIR,—In reference to the article entitled "A Non-Parallax Tuning Scale" on page 315 of PRACTICAL AND AMATEUR WIRELESS for November 21st, 1936, I do not know if the author is acquainted with the following properties of hydrofluoric acid:

(1) Burns caused by it almost invariably become infected.

(2) Immediate amputation is usually the only cure.

This being so, I would suggest that a rather more urgent warning be given than that conveyed in the article itself.—J. N. HALLETT (Wellingborough).

Component Shortage

DEAR THERMION—There are times when I violently disagree with your remarks, but recently you struck a sympathetic chord in my veins re "Component Shortage." My usual wireless dealers sent *direct* to the manufacturers (of world-wide fame) for two six-pin short-wave coils a fortnight ago and up to the present time nothing has been heard from them. I wonder if they do things like this in America! Already we have American sets and valves on our market, and if British manufacturers keep up this dilatory state of affairs we shall have to look across the "pond" for help. Trusting you will take up the cudgels again on our behalf.—R. HOPPER (March, Cambs.).

W1XAO on 9 Metres

SIR,—It may be of general interest that the Boston (Mass.) Police department, under the call-sign W1XAO, is being well received here. The wavelength is approximately 9 metres (33 megacycles), and the signal is of sufficient strength to give complete quenching of "Super-regen." hiss on a receiver consisting of a self-quench detector and one L.F. stage. Patrol cars can be heard replying on the same frequency. (14.00-17.30 G.M.T.).—E. DE COTTIGNIES (Prittlewell).

Back Number Wanted

SIR—I find that PRACTICAL AND AMATEUR WIRELESS No. 56, dated Oct. 14th, 1933, in which is described the all-wave Unipen (Pentode) is out of print.

I shall be glad if any reader who has this copy to spare would kindly notify me by post card.—F. J. BELL (Merton).

[*Post cards addressed to Mr. Bell, care of this office, will be forwarded.*—Ed.]

Station W1XGT

SIR,—Re experimental station W1XGT on 31.6 mc., 9.5 m., as reported in your issue of November 14th by E. de Cottignies (Prittlewell, Essex). The other transmitter which heterodynes is W9XHW, Minneapolis, Minn, U.S.A. Many U.S.A. 9-metre broadcasters are well received here including U.S. police and the 10-metre band.—L. C. STYLES (Ingatestone, Essex).

CUT THIS OUT EACH WEEK.

Do you know

—THAT special I.F. units are now obtainable for use in vision receivers in order to obtain the requisite band width.

—THAT it is generally accepted that a frequency band of at least 2 megacycles is necessary for good quality in a modern vision receiver.

—THAT a sandy soil makes a very poor earth connection and should not be employed unless no alternative can be provided.

—THAT an earth of the above type should be improved by using one of the proprietary chemical "earths" now on the market.

—THAT the H.T. battery should always be kept in a cool and dry position—not near a fire or radiator.

—THAT the tone of reproduction may be improved, when the bass is unduly accentuated, by removing the speaker to a short distance to the rear of the baffle instead of attaching it direct as usual.

—THAT ordinary flash-lamp bulbs are not always effective as a fuse in a battery receiver, and the special fuse bulbs should always be employed.

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, *George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.*

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

New Lisbon Station, CSW

SIR,—I notice in the November 21st issue of your fine weekly that a correspondent, Mr. S. L. Birchby, mentions reception of the new Lisbon station CSW on 30.21 metres. I have also heard this station on 31.21 m. and also on approx. 25.6 metres when it was making tests some weeks ago. I find that the signal of this station is usually at good QRK, but the quality is not too good.

Our old friend of last year, namely, VP3MR, is heard regularly at night after 22.00 G.M.T., on approx. 49.92 metres. They broadcast sponsored programmes and use the slogan "The voice of the West Indies." Whilst reception of this station is at good strength, quality is poor due to bad QRM.

I would very much like to correspond with other readers, especially any BLDLC members and overseas readers, preferably of my own age, seventeen years. Wishing your paper every success.—F. W. MOORE ("Woolmans," Ide, Nr. Exeter, Devon).

A Good 10-metre Log

SIR,—In a recent issue I saw a reader asking for a 10-metre log. I submit my own log, which is the result of my first attempt on the ultra-shorts. It was compiled during the past month.

W1AA, W1CCZ, W1HQN, W1IAF, W1XH—W2DYP, W2HFS, W2FWJ, W2FWK—W3VGC, W3CWZ—W4EDQ, W4DSY, W4CPG, W4BMR, W4DFU, W4EBQ, W4CYU, W4FT, W4ALD—W5FBE, W5BXA—W6OFR, W6FQY, W6MDN—W8HSP, W8MNJ, W8MWL, W8BBU (portable), W8AJU, W8HFC—W9KFI, W9LUX, W9PPI.

All were heard on the loudspeaker of a 5-valve superhet and converter. My aerial is an indoor one, vertical, and 20ft. high. I have also logged three police transmitters, namely, W2XEM (Newark), W2XEN (Roselle), and W2XFA (Jersey City). These are on 9 or 9.5 metres, but luck has a lot to do with logging these as they're only on for a minute or so at a time.

A log of broadcasting stations might interest some readers, and the following were also heard on the loudspeaker, but the aerial used was an indoor one, 66ft. over all, zig-zagged horizontally north and south.

W1XAL (25 and 49 m.), W1XK, W2XE (13, 19, 25 and 49 m.), W2XAF, W2XAD, W3XAL (16 and 49 m.), W3XAU, W8XK (13, 25 and 49 m.), W8XAL, W9XF, CRCX, VE9DN.

YV1RH, YV2RC, YV3RC, YV4RC, YV5RMO, YV7RMO, YV8RB, YV12RM, and YV6RV.

HJ1ABE—31 m., HJ1ABP—31 m., HJ1ABJ, HJ1ABG, HJ1ABC, HJ3ABX, HJ3ABH, HJ3ABD, HJ4ABB, HJ4ABP, COCO, COCD, COCQ, COCX, and COCH.

HIN (26 and 48 m.), HI1J, HIT, HI4D.

VP3BG—49 m., VP3MR, T1PG, HH2S, CSW, LSX, CT1AA, YDE, PMN, VUB, HS8PJ, HKV—34 m., VK2ME, ZSS, HP5K and CGA4.

These stations were all logged within the last five weeks. Wishing your magazine continued success.—JOHN C. BARROW, B.S.W.L25 (Aberdeen).

Facts and Figures

COMPONENTS TESTED IN OUR NEW LABORATORY

Bulgin Precision Resistors

FOR the purpose of making up various types of meter, it is often necessary to employ series or shunt resistors with a simple meter, and it is often found necessary to use exact values for this purpose. Whilst the standard type of component may often be employed, the tolerance may not prove good enough for the construction of laboratory apparatus, and in such a case some form of precision component has to be employed. Messrs. Bulgin now have a full range of such resistors, wound with special nickel-alloy enamelled wire, non-inductively wound



One of the Bulgin resistors shown with a portion of the casing removed to illustrate the method of winding.

on specially made porcelain formers. These resistors are provided with protective covers and the windings are treated to prevent atmospheric effects. They are guaranteed to have an accuracy, at 15 degs., of better than 2 per cent. The actual value to a figure of approximately half of one per cent. is always stated on the resistance. For example, type R.23, nominally 1,000 ohms accurate to plus or minus 2 per cent., if accurate to 1.5 per cent would be labelled as 1015 ohms. They are rated at 1 watt, at which the values remain constant, but may be used to dissipate 3 watts if a slight change in value can be tolerated.

Resistors accurate to half of one per cent. as the highest degree can always be selected and/or made to any particular exact figure, and there is only a slight increase of price, according to the work involved in such special values. Insulated terminals and soldering tags are fitted and the components are sufficiently light to enable them to be suspended direct in the wiring. The skeleton range covers from .1 ohm to 1 megohm, and values up to 2,000 ohms cost 6s., whilst the ranges from 5,000 ohms up to 1 megohm increase in price up to 24s.

H.M.V. Price Increase

TWO new radiograms, and an increase in price in others, is announced by His Master's Voice. Model 488 is increased to 29½ guineas and model 485A is increased to 38 guineas. The two new models are for mains operation, one an A.C. and one a Universal A.C./D.C. model, both priced at 25 guineas, and both being of the superhet type. The A.C. model embodies a frequency changer, I.F. amplifier, detector and A.V.C., L.F. and pentode output stages, with full-wave rectifier. The Universal model embodies a frequency changer, I.F. amplifier, detector and A.V.C. and pentode output valve with a U.30 rectifier.

Brown Headphones

THE well-known type "A" headphone with adjustable reed is again available to the home-constructor. This headphone is generally recognised to be the finest in the world, and in place of the usual type of flat diaphragm a spun aluminium diaphragm is employed and this is attached to a reed tuned to 900 cycles. The method of construction is novel. To a very powerful magnet made from 35 per cent. cobalt steel are attached two laminated pole pieces holding the coils, which are wound with the finest quality copper wire. The magnets and coils are adjustable in respect of the reed by means of a movable bridge, thus enabling each user to obtain the required degree of sensitivity. The double headband, made of polished aluminium, is universally and completely adjustable. These 'phones are used in the Royal Navy, Air Force, B.B.C. laboratories, etc., and are the most sensitive instruments of their type which are available. The price for the standard model is 50s. per pair, and a single handphone embodying one of the units costs 25s. The standard resistance is 2,000 ohms per earpiece, but special resistances can be wound to order without extra charge.

For those who require a cheaper model, standard featherweight models are available with the flat stalloy diaphragm, and these cost 20s. per pair, or a single handphone for 12s. 6d. The type D is a more sensitive flat-diaphragm model with 35 per cent. cobalt steel magnet, but otherwise similar to the Featherweight model. The double headband as fitted to the "A" type is provided and the cost is 35s. per pair or 18s. 6d. for the single handphone.

New Eddystone Components

AMONG the new Eddystone components introduced by Messrs. Stratton and Co. are a neutralising condenser and a precision 4in. slow-motion dial. The former consists of two large diameter brass plates, one of which is fixed, but the other is attached to a threaded rod passed through a supporting pillar of frequentite. The discs are turned and consequently the variation is proportional as the two discs approach one another and there is no erratic variation such as would be obtained if they had irregular surfaces. Screw adjustment is provided so that the degree of tension on the rod may be adjusted and the instrument rendered completely free from vibration or other variation. The maximum capacity is 5 m.mfd., and the price is 12s. 6d.

The precision dial consists of a 5/16th inch brass scale which is silver-plated and the graduations are machine cut. The slow-motion drive is incorporated in a large-diameter brass barrel mounted on the spindle and reduces the drive 6 to 1. For registration or setting purposes a small plate is supplied with a machine cut on it, and the edge is ground to coincide with the edge of the dial and two short bolts are provided so that it may be attached to a panel. The control knob is of large diameter and affords a comfortable grip which greatly simplifies tuning on an ultra-short-wave receiver. It may be used in transmitting equipment or laboratory apparatus, and can be supplied with ¼in. fitting. The price is 15s.

Loudspeaker Centring Gauges

SERVICE engineers will be interested in the new range of centring gauges produced by Messrs. Holiday and Hemmerdinger. These are designed for use when a moving-coil speaker has to be reassembled or when a speaker has been damaged or is to be tested. They are supplied in a neat wallet in which they are arranged in four sets, each set being a different colour and thickness. The four thicknesses are .015in .010in., .0075in. and .005in. To re-centre a speaker, or rather, speech coil, the locking screw or screws are loosened, and four gauges of the appropriate thickness are inserted symmetrically in the gap, and the screws are then tightened up and the gauges withdrawn. This makes the process very simple and it may be carried out in a very few minutes with the knowledge that the speech coil must be centred truly, unless it has warped or become distorted. The price of the set of gauges is 2s. 6d., complete with wallet. The makers are Messrs. Holiday and Hemmerdinger, Holmer Works, Dolefield, Bridge Street, Manchester, 3.

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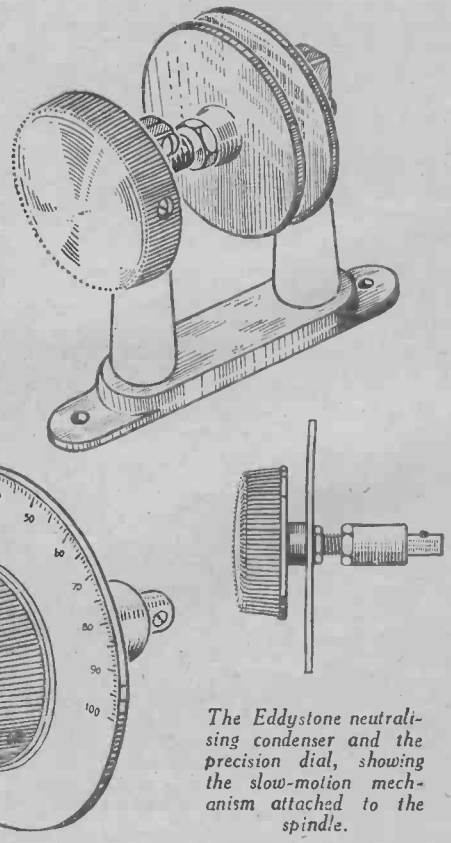

The Eddystone neutralising condenser and the precision dial, showing the slow-motion mechanism attached to the spindle.

RADIO CLUBS AND SOCIETIES

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.

Wellingborough and District Radio and Television Society

THE fortnightly meeting of this Society was held at Wellingborough on Wednesday, November 4th, at which a lecture was given by Mr. Wilkins, of the Automatic Coil Winder and Electrical Equipment Co., makers of the celebrated Avometers, special mention being made of the practical use of such meters in the course of home construction.

Mr. Wilkins illustrated the various points in a receiver in which meters could be inserted when checking for faults, and also described the use of such meters for checking for distortion and correct tuning. The use of output meters was also fully explained and upon the completion of his lecture, a keen and interesting discussion took place.

All PRACTICAL AND AMATEUR WIRELESS readers are cordially invited to attend these meetings and particulars can be obtained from the Hon. Sec., Mr. L. F. Parker, G5LP, 127, Jubilee Crescent, Wellingborough.

The previous Saturday, October 31st, thirty members of the Society paid a visit to the Empire Short-wave Transmitters at Daventry, and were shown around the buildings and transmitting and amplifying gear by an engineer who explained in detail the crystal oscillators, frequency doublers, and push-pull amplifying stages. After the visit, tea was partaken at Daventry, and a discussion followed on the old problem of short-wave aerials. After discussion the party returned to Wellingborough and Rushden after a very enjoyable trip.

Exeter and District Wireless Society

THE usual weekly meeting of this Society was held on Monday, November 9th, and one of the finest lectures ever heard by the members was given by V. Searle, Esq., M.Sc., who is one of the most prominent Physicists of the University College of the South-West. He took for his subject "How and What We Hear," and this was not only dealt with very fully but was illustrated with many excellent lantern slides.

Much apparatus was also brought by the lecturer, and the one outstanding item, which excited considerable interest, was the actual demonstration of the fact that the highest frequencies of sound waves, when altered in their pitch, made very little difference to the human ear. These meetings are held weekly, on Mondays, at 3 and 4, Dix's Field, Exeter.

Further particulars of the Society may be obtained from the Secretary, W. J. Ching, 9, Sivell Place, Heavitree, Exeter.

The Croydon Radio Society

THE Vice-President of this Society Mr. G. S. Vellacott, presided for the lantern lecture on: "Cathode Ray Tubes, Their Construction and Use," on Tuesday, November 10th. It took place in St. Peter's Hall, Ledbury Road, S. Croydon, and the lecturer was Mr. A. F. Hollins, assisted by Mr. H. L. Bowen, technical representatives of the Mullard Wireless Service Co., Ltd. After dwelling on differences between gas-filled and high-vacuum tubes, Mr. Hollins produced some excellent slides which made their inner mysteries very clear. Then there were cathode-ray tubes with three anodes and the meaning of each was carefully discussed.

Radio variety filled the bill for the Society's meeting on Tuesday, November 17th. Various members each gave a ten-minute talk on special subjects. Mr. Sully began with a discourse on iron-core coils, particularly interesting because of the evident study having been given to the topic. Mr. Marshall was thoroughly at home on aspects of earthing A.C. and D.C. mains, and Mr. P. G. Clarke gave a fascinating account of his experiments in searching for high-quality reproduction at reasonable cost. Mention must also be made of Mr. Symonds' speciality, photo-electric cells. There was the use of them in Charing Cross Underground Station in automatically switching on and off the lights on the platform edges. Motion-picture sound reproduction, noctovision, as well as cigarette-packing machines, all came under his survey.

After the interval, the Chairman, Mr. W. J. Bird, asked the seemingly innocent question: "Should the Club set be modernised, and if so what circuit should be employed?" After a heated discussion the Technical Adviser will now proceed with the renovation, if it can be done within the limits of available funds. Even so, the Society would be grateful to hear from any PRACTICAL AND AMATEUR WIRELESS readers. —Hon. Pub. Sec., E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

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BLUEPRINT SERVICE

These blueprints are drawn full size.
Copies of appropriate issues containing descriptions of these sets can in some cases be supplied at the following *prices, which are additional to the cost of the blueprint.* A dash before the Blueprint Number indicates that the issue is out of print.

Issues of Practical Wireless	4d. Post paid
" " Amateur Wireless	4d. " "
" " Practical Mechanics	7½d. " "
" " Wireless Magazine	1/3 " "

The index letters which precede the Blueprint Number indicate the periodical in which the description appears; thus, PW refers to PRACTICAL WIRELESS, AW to *Amateur Wireless*, PM to *Practical Mechanics*, WM to *Wireless Magazine*.

Send (preferably) a postal order to cover the cost of the blueprint and the issue (stamps over 6d. unacceptable), to PRACTICAL AND AMATEUR WIRELESS Blueprint Dept., Geo. Newnes, Ltd., 8-11 Southampton Street, Strand, W.C.2.

PRACTICAL WIRELESS

STRAIGHT SETS. Battery Operated.

	Date of Issue.	No. of Blueprint
One-Valve : Blueprints, 1s.		
All-wave Unipen (Pentode)	—	PW31A
Two-valve : Blueprint, 1s.		
Four-range Super Mag Two (D Pen)	11.8.34	PW36B
Three-valve : Blueprints, 1s. each.		
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty-Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	—	PW35
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	22.9.34	PW39
Hall-Mark Three (SG, D, Pow)	—	PW41
Hall-Mark Cadet (D, LF, Pen.) (RC)	10.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-Wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))	*June* '35	PM2
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen)	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	—	PW64
The Gladiator All-Wave Three	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
Four-valve : Blueprints, 1s. each.		
Fury Four (2 SG, D, Pen)	—	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Pow)	7.10.33	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	10.6.33	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow)	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	18.8.34	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (R.C.))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	—	PW45
Universal Hall-Mark (HF, Pen, D, Push-Pull)	9.2.35	PW47

SUPERHETS.

Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve)	—	PW40
F. J. Camm's 2-valve Superhet (Two-valve)	13.7.35	PW52
F. J. Camm's £4 Superhet	—	PW58
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valve)	—	PW43
D.C. £5 Superhet (Three-valve)	1.12.34	PW42
Universal £5 Superhet (Three valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4	—	PW59
F. J. Camm's Universal £4 Superhet 4	11.1.36	PW60

SHORT-WAVE SETS.

Two-valve : Blueprint, 1s.		
Midget Short-Wave Two (D, Pen)	15.9.34	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2 LF (RC and Trans))	—	PW63
The Bandspread S.W. Three (HF Pen, D (Pen), Pen)	29.8.36	PW68

PORTABLES.

Three-valve : Blueprint, 1s.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	16.5.36	PW65
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl. B)	—	PW12

MISCELLANEOUS.

S.W. Converter-Adapter (1 valve)	—	PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.

Blueprints, 6d. each.		
Four-station Crystal Set	12.12.36	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450

STRAIGHT SETS. Battery Operated.

One-valve : Blueprints, 1s. each.		
B.B.C. Special One-valver	—	AW387
Twenty-station Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG det, Pen)	—	AW392
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	*July* '36	WM400
Three-valve : Blueprints, 1s. each.		
Class-B Three (D, Trans, Class B)	22.4.33	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	—	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	20.1.34	AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Economy-pentode Three (SG, D, Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.* '34	WM354
Iron-Core Band-pass Three (SG, D, QP 21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	*June* '35	WM389
Certainty Three (SG, D, Pen)	*Sept.* '35	WM393
Minitube Three (SG, D, Trans)	*Oct.* '35	WM396
All-wave Winning Three (SG, D, Pen)	*Dec.* '35	WM400
Four-valve : Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2 SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2 HF, D, QP 21)	18.8.34	AW445
(Pentode and Class-B Outputs for above: Blueprints, 6d. each)	25.8.34	AW445A
Self-contained Four (SG, D, LF, Class B)	*Aug.* '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2 LF)	*Feb.* '35	WM381
The H.K. Four (HF Pen, HF Pen, D, Pen)	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*April* '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2 HF, D, RC, Trans)	*May* '33	WM329
Class-B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344

Mains Operated.

Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C./D.C. Two (D, Pen)	*Sept.* '35	WM394
Three-valve : Blueprints, 1s. each.		
Home-Lover's New All-electric Three (SG, D, Trans) A.C.	—	AW383
Three-valve : Blueprints, 1s. each (*contd.*).		
S.G. Three (SG, D, Pen) A.C.	—	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen) A.C.	23.6.34	AW439
Mantovani A.C. Three (HF, Pen, D, Pen) A.C.	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	*Jan.* '36	WM401
Four-valve : Blueprints, 1s. 6d. each.		
All Metal Four (2 SG, D, Pen)	*July* '33	WM326
Harris Jubilee Radiogram (HF Pen, D, LF, P)	*May* '35	WM386

SUPERHETS.

Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
Varsity Four	*Oct.* '35	WM395
The Request All-Waver	*June* '36	WM407
1935 Super Five Battery (Superhet)	—	WM379
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C.	—	AW425
Heptode Super Three A.C.	*May* '34	WM359
"W.M." Radiogram Super A.C.	—	WM366
1935 A.C. Stenode	*Apl.* '34	WM385

PORTABLES.

Four-valve : Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
TWO H.F. Portable (2 SG, D, QP21)	*June* '34	WM363
Tyers Portable (SG, D, 2 Trans)	—	WM367
Five-valve: Blueprint, 1s. 6d.		
New Class-B Five (2 SG, D, LF, Class B)	*Nov.* '33	WM340

SHORT-WAVE SETS—Battery Operated.

One-valve : Blueprints, 1s. each.		
S.W. One-valve converter (Price 6d.)	—	AW329
S.W. One-valve for America	—	AW429
Rome Short-Waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SG det, Pen)	*Feb.* '36	WM402
Home-made Coil Two (D, Pen)	—	AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-wave (SG, D, Pen)	*Jan.* 19, '35	AW463
The Carrier Short-waver (SG, D, P.)	*July* '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-wave World Beater (HF, Pen, D, RC, Trans)	—	AW436
Empire Short-waver (SG, D, RC, Trans)	—	WM313
Standard Four-valver Short-Waver (SG, D, LF, P)	*Mar.* '35	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-wave Super	*Nov.* '35	WM397

Mains Operated.

Two-valve : Blueprints, 1s. each.		
Two-valve Mains short-waver (D, Pen) A.C.	—	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	—	WM368
"W.M." Long-wave Converter	—	WM380
Three-valve : Blueprint, 1s.		
Emigrator (SG, D, Pen) A.C.	—	WM352
Four-valve : Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans)	*Aug.* '35	WM391

MISCELLANEOUS.

Enthusiast's Power Amplifier (1/6)	*June* '35	WM387
Listener's 5-watt A.C. Amplifier (1/6)	*Sept.* '35	WM392
Radio Unit (2v.) for WM392 (1/-)	*Nov.* '35	WM398
Harris Electrogram (battery amplifier) (1/-)	*Dec.* 35	WM399
De-Luxe Concert A.C. Electrogram	*Mar.* '36	WM403
New Style Short-waver Adapter (1/-)	*June* '35	WM388
Trickle Charger (6d.)	*Jan.* 5, '35	AW462
Short-wave Adapter (1/-)	*Dec.* 1, '34	AW456
Superhet Converter (1/-)	*Dec.* 1, '34	AW457
B.L.D.L.C. Short-Wave Converter (1/-)	*May* '36	WM405
Wilson Tone Master (1/-)	*June* '36	WM406
The W.M. A.C. Short-Wave Converter (1/-)	*July* '36	WM408



QUERIES and ENQUIRIES

Small Tuning Indicator

"I have a set which has been built and in use for eight months or so. This is a superhet with fully-delayed and amplified A.V.C., but has the disadvantage that no tuning indicator is fitted. The cabinet is ready drilled and the panel and so on are part and parcel of the complete installation and I do not want to carry out many structural alterations. I do feel, however, that a tuning indicator would be an immense help and should like to know which is the smallest indicator I could fit, either cathode ray or meter type. I naturally do not want to alter the circuit if possible. Perhaps you could suggest something?"—F. P. (Holsworthy).

A SMALL meter could, of course, be mounted so that only the pointer could be viewed through a small hole, and this could be made in such a position that it gave sufficient visibility to enable the pointer to indicate over the usual range of anode current of the I.F. valve. A small button neon indicator is, however, obtainable from the General Electric Company, and this is only 12½ millimetres in diameter and 27½ millimetres in length. It has a standard S.E.S. cap and could easily be mounted above your present tuning scale, with a hole drilled through the cabinet to enable it to be seen. It should be joined between the anode of the I.F. valve and earth, with a series resistance to develop the necessary voltage. Full details are supplied with the component.

Converter Details

"I have obtained Blueprint P.W.48A for the S.W. Converter, but note that no value is given on it for the aerial tuning condenser. Can you tell me the value, and also what is the best type of valve to use in the converter? Also I have the issue dated August 29th last for the Signet 2, but require the other one dated September 5th. What is the cost of the back number, and where can I get it?"—L. S. (Leicester).

THE aerial tuning condenser is the standard Polar Type E component, which has a maximum capacity of approximately .00016 mfd. The other condenser, which is a series aerial tuning component, is a B.T.S. midget component with a maximum capacity of .0001 mfd. Best results with this type of converter are obtained when a valve of the H.L. type is employed, and this may, of course, be either battery operated or a mains valve. Back numbers of this paper may be obtained from the Back Number Department at this address, price 4d. by post.

Tantalum Strip

"I am interested in the trickle charger which was described in a past issue, but cannot obtain the tantalum strip which was recommended. Can you give me the address of the makers of this?"—E. R.W. (Gateshead).

THE tantalum may be obtained, in a suitable size for the charger, from Messrs. Blackwell's Metallurgical Works, Ltd., Speke Road Works, Garston, Liverpool.

Amateur Addresses

"Can you send me the names and addresses of a few wireless amateurs in my district? I am anxious to start some transmitting, and would like to get into touch with someone to learn the principles."—S. B. (Notting Hill Gate, W.2).

RULES

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 queriers.

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.

If a postal reply is desired, a stamped addressed envelope must be enclosed. Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

The Coupon must be enclosed with every query

THE best course for you to adopt is to join a local radio club or society. In addition to meeting other amateurs, this would also enable you to examine apparatus, and at the regular meetings you could raise points and hear the discussions of other members regarding the various difficulties met with and how they are overcome. Furthermore, most clubs run practice classes at which the Morse Code may be studied and mastered. The new series of articles which we are publishing on the subject will also be of assistance to you. We cannot supply names and addresses of transmitters, but you can obtain a copy of the "Radio Amateur Callbook" from F. L. Posthlethwaite, 41, Kinfauns Road, Goodmayes, Ilford, Essex, price 6s. Your nearest club is the Radio, Physical and Television Society, 72a, North End Road, West Kensington. The secretary is Mr. M. E. Arnold, 12, Nassau Road, Barnes, S.W.13.

Testing a Rectifier

"Could you please tell me what the symptoms are in an A.C. set when the rectifying valve is nearing the end of its useful life? Also, is it possible to determine, by means of voltage or current tests, if the valve is definitely getting old."—E. T. R. (Hull).

THE symptoms generally are gradually reducing volume, and failure to obtain reaction. As these symptoms may, however, also be obtained when a resistance or condenser breaks down, the only reliable test is a current test. Include a milliammeter in the H.T. negative lead and you will then see what the anode current of the complete receiver is. To make an accurate test of the valve, rig up a valveholder and a load resistance as given by the makers. You can then apply the output from the mains transformer and measure the rectified output.

Class B

"I have modified my set and fitted a Class B output stage, but the volume is worse than before. I have been told that Class B is no good, and should like to have your opinion on this. Why do I only get such weak signals with this additional stage, especially considering that my old output valve is now driving the Class B?"—G. R. (Hendon).

THE trouble may be due to two things. Either your H.T. is unable to deliver sufficient current for the complete receiver, or the driver valve is considerably overloaded. You should bear in mind that the Class B valve will require a current supply of 30 mA or more to enable the loudest items to be dealt with, and if you include a milliammeter in the H.T. negative lead, you will see that the needle will kick right over the scale when a drum is beaten or other similar sound is received. If the H.T. battery is too small, or a small mains unit is employed, the large current will result in a decrease in H.T. voltage.

S.W. Receiver Details

"I am interested in the layout shown in your issue dated November 21st, and should like details of the size of the tuning coil former and the H.F. choke former. How many turns are there on this, and what gauge of wire is used. Also, what is the capacity of the tuning and reaction condensers? The gauge of wire is not given for the coil."—S. W. A. (Bedford).

THE receiver was fully described in our issue dated September 13th, 1935, under the title of the Simplest Short-waver. The coil is wound on a 2in. diameter cardboard tube and the grid winding (that in the centre) is of 20 gauge enamelled wire. The windings at each end are of 26 gauge enamelled wire. The H.F. choke is wound on a ¾in. glass test tube and 150 turns of 36 enamelled wire are wound on in five sections. The tuning condenser has a maximum capacity of .0005 mfd, and the reaction condenser .0003 mfd.

The coupon on page 408 must be attached to every query.

THE ONE AERIAL FOR THE MODERN SET
PIX INVISIBLE AERIAL
PIX LONDON, S.E.1
Highly efficient, self adhesive aluminium strip—gives wonderful pick-up clear of interference—fixed in a jiffy without tools—just press it and it sticks.
2/-
Double Length 3/6

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Get our quotation for your Short-Wave and Television Gear

Offer the following Set Manufacturers' Brand New Surplus Goods at a Fraction of the Original Cost; all goods guaranteed perfect; carr. paid over 5/-; under 5/- postage 6d. extra. Orders under 5/- cannot be sent C.O.D.

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CALLERS, AS USUAL, TO 20-22, HIGH ST., CLAPHAM, S.W.4 (Macaulay 2381). 'Phone: Amherst 4723 And 165 & 165a, FLEET ST., E.C.4 (Next door to Anderton's Hotel.) **Central 2833.**

MAINS VALVES

MAINS VALVES, famous Europa 4 v. A.C. types. 4/6 each. HL., L., S.G., Var.-Mu-S.G., H.F.-Pens., Var.-Mu-H.F. Pens. 1, 3 and 4-watt A.C. directly-heated output Pentodes. Full-wave rectifiers, 250 v. 60 m.a. A.C./D.C. types. 20-volt. .18 amp. S.G., Var.-Mu-S.G., H., HL., Power.

Following types all 5/6 each. Full-wave rectifiers, 350 v. 120 m.a. and 500 v. 120 m.a. 2½ watt indirectly-heated Pentodes. Frequency Changers, Octodes and Heptodes.

BATTERY VALVES. 2 volts, H.F., L.F., 2/3. Power, Super-Power, 2/9. S.G., Var.-Mu-S.G., 4- or 5-pin Pentodes, H.F. Pens., V.-Mu-H.F. Pens., 5/-. Class B, 3/6.

AMERICAN VALVES. Genuine American **HYTRON** and **TRIAD** first-grade Valves. 3 months' guarantee. All types in stock, 5/6 each. 210 and 250, 8/6 each. New Metal-Glass Valves, all types, 6/6 each. Genuine American **DUOTRON** Valves, all types, 3/6 each. Valve holders for all above types, 6d. each. Metal bases, 9d. each.

SHORT WAVES

SHORT-WAVE COILS, 4- and 6-pin types, 13-26, 22-47, 41-94, 78-170 metres, 1/9 each, with circuit. Special set of 3 S.W. Coils, 14-150 metres, 4/- set, with circuit. Premier 3-band S.W. Coil, 11-25, 19-43, 38-86 metres. Simplifies S.W. receiver construction, suitable any type circuit, 2/6.

COIL FORMERS, in finest plastic material, 1½in. low-loss ribbed, 4- or 6-pin, 1/- each.

SUPER CERAMIC CONDENSERS, S.L.F. .00016, .0001, 2/9 each; double-spaced, .00005, .000025, .000015, 3/- each. All brass with integral slow motion, .00015 tuning, 3/9; .00015 reaction, 2/9. British Radiophone 2-gang .00016, 5/6.

H.F. CHOKES. S.W. 10-200 metres, 9d.; S.W. screened, 1/6; standard screened 180-2,000 metres, 1/6.

CERAMIC S.W. VALVE HOLDERS, 4-, 5- or 7-pin. Chassis types, 6d.; B.B. type, 8d. **GLASS AERIAL INSULATORS**, 4d. each. **BEEHIVE STAND-OFF**, 6d. each. **SCREENED FLEX.** Single, 3d. yd.; twin, 4d. yd.

PREMIER AMPLIFIER KITS

3-WATT A.C. AMPLIFIER, 2-stage, for mike or pick-up. Complete kit of parts with 3 valves, 40/-.

7-WATT A.C./D.C. AMPLIFIER, 3-stage, high-gain, push-pull output. Complete kit of parts with 5 specially matched valves, £4 4s.

10-WATT 3-stage A.C. Amplifier Kit with 5 valves, £5 5s.

20-WATT 3-stage A.C. Amplifier Kit with 5 valves, £8 8s.

ELECTROLYTICS. U.S.A., 4, 8 or 12 mfd. 530 v. peak, 1/9 each. **Dubilier**, 4 or 8 mfd. 500 v., 3/-; 50 mfd. 50 v., 1/9; 12 mfd. 20 v., 6d.; 25 mfd. 25 v., 1/-. T.C.C. 4 or 8 mfd. 650 v., 4/-; 15 mfd. 50 or 100 v., 1/-; 50 mfd. 12 v., 1/-. **Paper Condensers.** W.E., 250 v. working 4 mf., 2/-; 2 mf. 1/-; 1 mf. 6d.; 350 v. working 4 mf., 2/6; 2 mf., 1/6. Dubilier 500 v. working 4 mf., 4/-; 800 v. 4 mf., 6/-. Wego 450 v. working 1 mf., 1/-, 2 mf. 1/9, 4 mf. 3/-; 700 v. working 2 mf. 2/-, 4 mf. 3/6.

COSMOCORD PICK-UPS, with tonearm and volume control, 10/6 each.

PICK-UP HEADS only, 4/6 each.

MAINS TRANSFORMERS

PREMIER wire-end type with screened primaries, tapped 200-250 v. Centre-tapped Filaments. Guaranteed one year. **H.T. 8 & 9** or **H.T. 10** with 4 v. 4 a. C.T. and 4 v. 1 a. C.T., **8/6**. 250-250 v. 60 m.a., 4 v. 4 a., 4 v. 2 a. and 4 v. 4 a., all C.T., **8/6**. 350-350 v. 120 m.a., 4 v. 1 a., 4 v. 2 a. and 4 v. 4 a., all C.T., **10/6**. Any of these transformers with engraved panel and N.P. terminals, 1/6 extra.

500-500 v., 150 m.a., 4 v. 2-3 a., 4 v. 2-3 a., 4 v. 2-3 a., 4 v. 3-4 a., all C.T., 17/6. **AUTO-TRANSFORMERS**, step up or down, 60 watts, 7/6; 100 watts, 10/-. Super Model, 19/6.

FILAMENT TRANSFORMERS, Tapped Primaries, 200-250 v. All secondaries C.T. 4 v. 3 a., 7/6; 4 v. 5 a., 8/6; 7.5 v. 3 a., 7/6; 6 v. 3 a., 7/6; 2.5 v. 8 a., 7/6; 6.3 v. 3 a., 7/6; 5 v. 3 a., 7/6.

SMOOTHING CHOKES, 25 m.a., 2/9; 40 m.a., 4/-; 60 m.a., 5/6; 150 m.a., 10/6. 2,500 ohms, 60 m.a. Speaker Replacement Chokes, 5/6.

MILLIAMMETERS, moving-iron, flush 2½in., all ranges from 0-10 m.a., 5/9. Visual tuning, 6 or 12 m.a., 5/9. Moving-coil meters, 2½in. 0-1 m.a., 18/6; 3½in. 0-1 m.a., 22/6. Multipliers, 1/- each.

AMPMETERS, all ranges, from 0-1 amp., 5/9.

TRANSFORMERS, latest type Telsen R.G.4 (list 12/6), 2/9. Lissen Hypernik Q.P.P. (list 12/6), 3/6.

OUTPUT TRANSFORMERS for Power, Pentode and Push-Pull, 2/6; Multi-Ratio, 4/6; Push-Pull Input Transformers by prominent manufacturer, 4/6 each.

ELIMINATOR KITS for A.C. mains. 120 v. 20 m.a., or 150 v. 25 m.a., 15/-, tapped S.G., det. and output. Complete Kit with long-life valve rectifier (replacement cost only 2/-).

PREMIER L.T. CHARGER KITS for A.C. mains, including Westinghouse Rectifiers and Tapped Mains Transformers. 6 volts at 1 amp., 14/6; 8 volts 1 a., 17/6; 15 volts 1 a., 19/-; 15+15 volts 1 a., 37/6; 15+15+15 volts 1 a., 50/-; 8 volts 2 a., 29/6.

TELSEN iron-cored screened coils, W.349, 4/- each.

Electric **SOLDERING IRONS**, 200-250 v., A.C./D.C., 2/3.

LOTUS JACKS (and Jack-switches), all types, 1/- each. Lotus Plugs, 1/- each.

PREMIER H.T. KITS, all with Westinghouse rectifiers; tapped transformers and adequate smoothing. All Kits absolutely complete. 120 v. 20 m.a., 20/-; with 4 v. L.T. Charger, 28/-. 150 v. 30 m.a., 25/-; with 4 v. L.T. Charger, 31/6. 250 v. 60 m.a., with 4 v. 3 a. C.T., 30/-.

SHORT WAVE KITS

SHORT-WAVE KIT for 1-valve receiver or adaptor, complete with chassis, 4 coils, 14-150 metres, condensers, circuit and all parts, 12/6. **VALVE GIVEN FREE! DE LUXE MODEL**, 17/6. SUPERHET CONVERTER KIT, 13/6. **S.W. SUPERHET CONVERTER**, for A.C. Mains Receivers, 20/-. A.C. Valve given **FREE!**

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ALL-WAVE "ALL-WORLD RANGE" 3-valve Kit, 12-2,000 metres in 4 wavebands without coil changing, complete kit of parts with 3 valves, S.G., H.F., S.G., det. and pentode (2 volts); 50/-. Q.P.P. Model, 6/6 extra.

BAND-PASS TUNING PACK, comprising set of Telsen 3-gang iron-cored coils with switching, mounted on steel chassis with 3-gang condenser, illuminated disc-drive and 4 valve holders. 25/- the lot. All Mains or Battery circuit. **FREE! LISSEN ALL-WAVE COILS**, 12-2,000 metres, complete with switching and wiring diagram, 12/6.

3-VALVE BAND-PASS KIT, 200-2,000 metres. Complete kit of parts, including chassis, all components, valves, M.C. speaker and wiring diagram. Battery Model, 50/-. A.C. Mains Model, 70/-.

MOVING COIL SPEAKERS

MAGNAVOX. Mains energised. 154, 7in. cone, 2,500 ohms 4 watts, 12/6; '152,' 9in. cone, 2,500 ohms, 17/6; 152 'Magna' 9in. cone, 2,500 ohms, 6 watts, 37/6. **Magnavox** P.M.s—'154' 7in. cone, 16/6; '252,' 9in. cone, 22/6. Reliable P.M.s, 10/6.

ROLA latest type P.M.s, 18/6. **KB** 7in. mains energised, 1,500 or 2,500 ohms, 7/9. **GOODMANS'** 8in. mains energised, 1,000 ohms field, 10/6 each.

DIALS.—Clarion Illuminated S.W. slow-motion Dial with 2in. knob, 2/-. **Premier** All-Wave 2-speed Dial, full vision straight-line, dual ratios 10-1 and 150-1, 6/6, with escutcheon.

Potentiometers by well-known makers. All values up to 1 meg., 2/-; with switch, 2/6.

GRAMOPHONE MOTORS. Collaro Gramophone Unit consisting of A.C. motor, 100-250 v. high quality pick-up and volume control, 45/-; Collaro motor only, 30/-; Collaro Universal Gramophone Motor, 100-250 v. A.C./D.C., with high quality pick-up and volume control, 67/6; Collaro Universal Motor only, 49/6; Edison Bell double-spring motors, including turntable and all fittings, 15/-; Cosmocord Gramo unit, comprising A.C. motor, pick-up and volume control (list 55/), 35/9.

TUBULAR CONDENSERS, non-inductive, all values up to .5 mfd., 6d. each.

Wire-end **RESISTORS**, any value, 1 watt, 6d.; 4 watts, 1/-; 8 watts, 1/6; 15 watts, 2/-; 25 watts, 2/6 each.

Reliable **MORSE KEYS** with Morse Code engraved on bakelite base, 2/- each.

Bakelite case **BUZZERS**, 1/6; Walnut case "Loud-tone," 2/6 each.

Super Quality lightweight **HEADPHONES**, 3/9 pair.

PREMIER (Reisz Pattern) Transverse-current MIKE, High Output, Straight Line Response, 30/-. Transformer, 5/-. Table Stand, 7/6.

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G.E.C. 3-valve Battery Sets, "Battery Compact Three," with 3 Osram valves, moving coil speaker in beautiful bakelite cabinet, brand new, in sealed cartons, fully guaranteed; 50/- each (list £5/10).

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COILS.—Telsen, iron core, W349, Midget size, 4/-; Type W478 (twin), 9/- pair; W477 (triple), 16/- set; Type W476 (triple superhet selector and oscillator), 16/- set, all ganged coils complete on base with switch; Telsen I.F. transformer coils, W482, 5/-; Telsen dual range aerial coils, with aerial series condenser incorporated; W76, 4/-; Telsen aerial series condensers with shorting switch, 2/-; Telsen L.F. transformers, Type R.G.4 (4 to 1), 3/-; all brand new, in sealed cartons.

MICROPHONES.—Ace (P.O.) microphones, complete with transformer, ready for use with any receiver, 4/6 each.

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POTENTIAL Dividers.—Lissen wire wound, 3-section, 60-watt, 4,500 ohms, 3,000 ohms, and 2,000 ohms; 3-section, 5 watts, 20,000, 20,000 and 20,000 ohms; 2-section, 5 watt, 50,000 and 30,000 ohms; 1-section, 5 watt, 8,000 ohms, all at 1/3 each; brand new and guaranteed.

AMERICAN Valves.—A full range of valves for all American receivers; 6/- each.

HEADPHONES.—Lightweight headphones, double pole type, 4,000 ohms, each ear piece; 3/- pair.

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5/- Parcel, containing components to the value of at least 20/-, comprising chokes, resistances, coils, switches, condensers, wire and circuits, 5/- per parcel.

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SOUTHERN RADIO, 323, Euston Rd., London, N.W.1 (near Warren Street Tube). 'Phone: Euston 3775.

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VAUXHALL.—Flat, sheet aluminium, hard rolled, 18 gauge, 12in. x 12in., 3/-; 18 x 18, 5/6; other sizes proportionate.

VAUXHALL.—Polar station named scales, for horizontal dials, latest settings; 1/9 each.

VAUXHALL.—Hivac valves, mains or battery, all types. Usual discounts from new prices.

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VAUXHALL.—T.C.C. condensers, tubular, non-inductive, 0.1, 6d.; 50 mfd., 50v. working, 1/6; 50 mfd., 12v., 1/3; 0.05, 6d.; 0.002, 0.0002, 0.001, 0.0001, 4d. each.

VAUXHALL.—T.C.C. mica 0.002, 2,000 volt test, 1/-; 0.0001, 4d.; 0.0001, 0.01, 1/-; 1 mfd. Mansbridge, 1/3; 2 mfd., 1/8.

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VAUXHALL.—Set manufacturers' surplus, skeleton type Westinghouse rectifiers, H.T.8, 9/6; H.T.9, H.T.10, 10/-; complete with fixing brackets.

VAUXHALL.—Clix valve holders, terminals, 5-pin, 7d.; 9-pin, 9d.; baseboard mounting, 5-pin, 4½d.; 7-pin, 1/-.

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RADIOMART

SHORT-WAVE SPECIALISTS

Announce 1937

SHORT-WAVE MANUAL

Packed with short-wave information and circuits of mains and battery receivers, including straight, superhet and 5-metre transmitters, modulators, etc. Information on transmitting licences, aerials, Class B amplification, neutralization, superhet alignment, etc. The most comprehensive manual published, written by practical engineers, price 6d., post free 7½d., including catalogue.

1937 Catalogue only (3 times enlarged) price 1½d. post free.

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AMERICAN mains transformers 230v. fully shrouded, 350/350. 6.3v., 5v., 6/11. Majestic 250/250. 2.5v., 5v., 4/11.

HEAVY DUTY mains transformer worth 35/-, 350/350. 150 ma.; 4v. 2.5ACT., 4v. 6ACT., 12/6.

465 KC/S., IF transformers, 2/11. Telsen Ace, 1/11. RG4, Radio grands, 2/9. 2mf. 300v., 9d.

UTILITY straight line wavelength dials, 3/11. Telsen H.F. chokes, 1/11.

UTILITY 2-gang uniknob and dial, 3/11; 1,500-volt tubular condensers, all sizes, 6d.

ELECTROLYTICS 500-volt 8mf., 1/6; 4mf., 1/6; 4×4, 1/11; 8 × 8, 3/6; 25 mf. 25v., 1/-, etc.

SMOOTHING chokes, 20 hy. 120 ma., 3/11; 100 ma., 2/11; 40 ma., 1/11.

PUSHBACK wire, 6 yds., 6d.; heavy, 9d.; 2 gross solder tags, 6d.; resin-cored solder, 9ft., 6d.

CENTRALAB pots, all sizes, 1/6; switched, 2/-; tubular glass fuses, 2d.

JENSON PM speakers, 12/6. Varley Iron core coils, 2/6; matched pair, 4/6.

SPECIAL OFFER Class B valve, driver transformer and valveholder, new, lot 5/-.

LISSEN 3-gang bandpass, 3-gang superhet, 2-gang all-wave coils, any set, price 7/6.

TRADERS' monster bargain parcels, value £4/10/-, for 10/-; also 5/- parcels.

FAMOUS Continental A.C. valves, 4/6; American Duotron, etc., all types, 3/6; battery from 2/3.

UTILITY 8/6, microdisc dials, 3/11; Radiophone, 0.00016 short-wave condensers, 3/6; series gap, twin, 3/9.

CERAMIC all brass microvariables, 15 mmfd., 1/4; 40 mmfd., 1/7; 100 mmfd., 1/10; short-wave H.F.C., 9d.

CLEARANCE catalogue 1½d. Goods over 5/- post free. All enquirers must send stamp.

Branches: 19, John Bright St., 44, Dale End. Mail Orders, 44, Holloway Head, Birmingham. Telephone, MID 3254.

3/- EACH—American valves all popular types. 90-day guarantee. Full range in stock. National Union, Hytron, Triad, Metal, Glass and M.G. Send for lists.

3/- EACH—Mullard, Cossor, Mazda, Marconi, Osram valves for D.C. receivers: all perfect. 90-day guarantee. State type: Send cash or C.O.D.

RADIOGRAPHIC, LTD., 66, Osborne Street, Glasgow, C.1.

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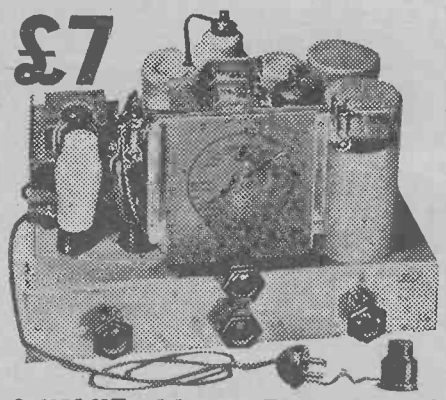

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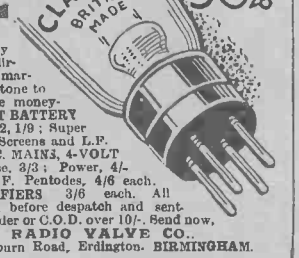

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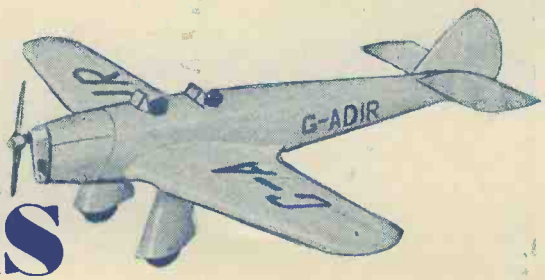

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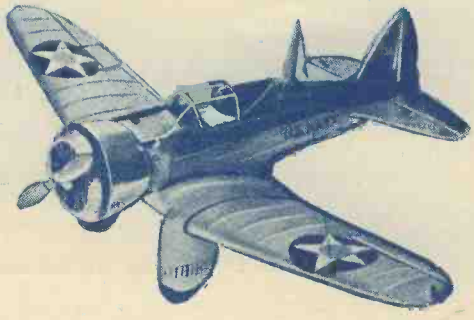



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'Round the World of Wireless

Obituary

THE death has occurred at Upstreet, in Kent, of Mr. William Snowley Entwistle, who, in August, 1901, transmitted the first wireless telegraphy message to be sent across the North Atlantic. As chief engineer and assistant to Marconi he was in charge of the land station at Clifden, Ireland, and it was he who tapped out the momentous message in Morse received at Glace Bay, Newfoundland, by Marconi, and which was the forerunner of world-wide radio communications. He travelled all over the world with the great wireless pioneer, and retired from the service of the Marconi Company three years ago. He was buried at Shirley, Surrey, after cremation at Charing.

Amateur Two-way Air Communication

TWO Cape Town amateurs recently succeeded in achieving two-way telephonic communication on the ultra-short wavelengths at the Cape Town airport. Once again this shows the remarkable success which often attends the experimental work carried out by amateurs, and although full details of the apparatus used are not yet to hand, it was all home-made, and is, therefore, a remarkably successful venture.

A "Movie" Dial

FROM America another new tuning dial is announced, this time on the Airline receivers. It consists of a rectangular "frosted" screen surmounted by an electric-eye tuning device, and as the tuning control is operated it flashes on to the screen (in a similar manner to a cinema projector) the names of the main American stations. The tuning eye also helps to ensure accurate tuning.

Radio for Aerial Police

ALTHOUGH the police in this country often employ the auto-gyro equipped with radio for traffic control and other emergencies, they have not so far adopted the airship for such purposes. In America, however, a demonstration was recently given at Cleveland in which the police employed an airship of the blimp type, equipped with a 50-watt transmitter built by the G.E.C.

Air-raid Televised

TO-DAY (December 12th) an ambitious attempt is to be made to televise a mimic air-raid on London, in which Territorials will take part. This makes yet another remarkable addition to the many novel transmissions which have already taken place in this new art, and it would appear that the modern television transmitter can deal with practically any type of subject. The success of all these transmissions is undoubtedly due to the ingenious electron camera.

The Welsh Region

THE Committee appointed three years ago by the Council of the University of Wales for the consideration of broadcasting questions of Welsh interest, held its last half-yearly Conference recently. Warm appreciation was expressed on behalf of the B.B.C. of the Committee's valuable co-operation since its appointment.

Now that Wales has been formed into a self-contained Region, with a Regional Director of its own, it has been arranged that any future conferences that the Committee and the B.B.C. may agree to be desirable should be held in Wales, and should take the form of meetings between the Committee and the Regional Director, Mr. Hopkin Morris.

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

Aid for S.W. Durham

WE are asked to make an appeal for parcels of clothing, blankets, boots, etc., and also cash donations for the distressed areas of South-West Durham. The unemployment in this part of the country approaches nearly fifty per cent. of the number of insured workers, against an average of 12 per cent. for the country as a whole, and all gifts sent to the following address will be distributed personally to the local organisations and senders may be assured that their help will meet a real need. All gifts, which will be personally acknowledged, should be forwarded to Mr. E. H. Taylor, Managing Director, Messrs. Joseph Lingford and Son, Ltd., The Model Factory, Bishop Auckland.

G.E.C.

IN America the General Electric Company's transmitters use as an identification signal the three musical notes, G. E, and C. In England the G.E.C. have just built an interesting electric sign in which the Osram architectural lamps have been arranged to present an illuminated bar of music, complete with the treble signature, and the three notes are clearly depicted in brilliant outline against a dark background.

Plug-in Wireless

ALTHOUGH stated to be of great interest to users of hotel wireless systems and similar plug-in listening points, the recent action by the G.P.O. against twelve tenants of a block of flats in London has not yet been settled. The Post Office lost the case, but are appealing against the decision. The magistrate found that the loudspeakers were not "wireless apparatus" as defined by the Act, but were "instruments," and, therefore, did not come under the Wireless Telegraphy Act.

"Songs of a Roman Legion"

THE blind English composer, Herbert Ferrers, author of the operas "Penelope" and "The Piper," will conduct in the studio on December 11th (Regional) a performance of his "Songs of a Roman Legion," with poems by Rudyard Kipling, which will be sung by the B.B.C. Men's Chorus accompanied by the B.B.C. Orchestra, Section E. Choral works by another English composer, Leslie Woodgate, will be broadcast in the same concert. These are "Hymn to the Virgin" and "White Island," and they will be sung by Henry Cummings, supported by the B.B.C. Men's Chorus, string orchestra, organ and pianoforte.

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THE PICK of the PROGRAMMES

The "Christmas Cracker"

A ROLLICKING broadcast with a strong Yuletide flavour will be given in the Scottish programme on December 19, when "Christmas Cracker" will be pulled by Jack House and Allan MacKinnon, who confidently expect that it will go with a bang. Seasonable novelties will be distributed by Grace McChlery, Allan MacKinnon, Ian Sadler, James K. Urquhart, and Eric Wightman.

MAKE THESE DATES WITH YOUR RADIO

A DOUBLE ATTRACTION



The charming listener in this picture obviously enjoys the performance of the Cossor All-wave receiver. This 4-channel 6-valve superhet, in the new-style cabinet, costs only fifteen guineas.

Pantomime Variety

THE Christmas season of pantomime approaches again, and on December 16th Victor Smythe hopes to bring to the Northern studios the principals from a number of pantomimes which are to be performed in the North shortly.

Concert from Torquay

JESSIE KING (contralto) will be the soloist in a concert by the Torquay Municipal Orchestra, conducted by Ernest W. Goss, which is to be broadcast from the Pavilion, Torquay, on December 15th.

Fire Brigade Band

BIRMINGHAM has the only provincial Fire Brigade Band in the country. It was formed eight years ago and now has thirty members, with Station Officer R. Ward, an ex-Army musician, as the conductor. It is to broadcast for the first time on December 16th, in the Midland Regional programme. The bandsmen are all regular officers of the Brigade, and apart from concerts at headquarters the public rarely hear them play.

A Popular Quintet

THE Cardiff Ensemble will broadcast from the National Museum of Wales on December 19th. The members of the Ensemble are: Frank Thomas (violin), Nina Rochard (viola), Gwen Griffiths (violin), Ronald Harding (violoncello), and Mabel Draper (pianoforte). The work to be broadcast on December 19th is the "Quintet, Op. 34," by Brahms.

Santley's Songs

JOSEPH FARRINGTON, the well-known bass singer, who comes from Preston, is to broadcast from the Northern Regional on December 17th a programme of the songs which were popularised by Sir Charles Santley (1834-1922), the great Liverpool singer. Santley, whose fame was world wide, is closely associated with songs such as "Simon the Cellarer"; "The Water Man" and "The Erl King."

Christmas Party Broadcast

CHARLES BREWER has, for the last three years, been responsible for the informal Party on Christmas Day, and it is hoped that the old Christmas Gang will again be present for the broadcast on December 25th, which will be given in the National programme.

Tommy Handley, the ace of radio comedians; Clapham and Dwyer and the Two Leslies, will again gravitate to St. George's Hall on Christmas afternoon. Charles Brewer possesses a perpetual challenge cup for musical chairs presented by a listener in Sheffield. This will again be competed for to the running commentary of the Old Christmas Party Gang. Last year it was won by Leslie Sarony.

West Calder Brass Band

ON December 17th the West Calder Brass Band, conducted by Herbert Bennett, will play: March, "Washington Greys," by Grafulla; Overture, "The Arcadians," by Monckton and Talbot; "'Neath Austral Skies," by Percy Code; Selection, "Standard Melodies of Hibernia," arranged Ord Hume; and Excerpts from "The Geisha," by Sidney Jones.

Orchestral and Vocal Concert

THE Midland tea-time concert on December 13th will be given by the Birmingham Hippodrome Orchestra, conducted by Harry Pell, with two well-known Midland singers, Helmar Fernback, tenor, and Gabriel Lavelle, baritone. Each vocalist will sing a group of songs and together they will give two duets.

Pantomime Rehearsals

AS usual just before Christmas there is to be a glimpse of Midland pantomimes under rehearsal. Forty minutes will be given to the programme on December 18th, and it is to be divided between three Midland pantomimes. These are "Dick Whittington," at the Royal, a Tom Arnold pantomime with George Formby, junior, Jack Williams and Helen Breen; "Mother Goose," a Leon Salberg pantomime at the Alexandra, with Barry Lupino and Eric Le Fre; and the Emile Littler pantomime at the Prince of Wales, with June and Gene Gerrard, Bobbie Comber and Helen Gilliland.

Orchestral Concert from Weston-super-Mare

THE Weston Municipal Orchestra, conducted by H. C. Burgess, will broadcast from the Winter Gardens Pavilion, Weston-super-Mare, on December 15th, when Mercia Stotesbury (violin) will be the soloist. This is the third occasion on which Western listeners have heard the Orchestra broadcast under this title, although it has been heard many times before in broadcasts from Weston-super-Mare, under the title of "H. C. Burgess and his Orchestra."

Light Music and Variety

ON December 18th in the Midland Regional programme, Jack Wilson and his Versatile Five are to play light music including Jack Wilson's arrangement of Mabel Wayne's compositions. In an interlude Colinson and Dean, the well-known music-hall and pantomime artists, will entertain.

SOLVE THIS!

Problem No. 221.

Miller decided to connect an extension speaker to his commercial four-valve superhet, and obtained a permanent magnet model with an output transformer attached suitable for matching the pentode output valve in his receiver. Volume from the extension was very low, however, although satisfactory results were obtained when it was used as a principal speaker in another set. What was the trouble? Three books will be awarded for the first three correct solutions opened. Address your solutions to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2. Envelopes must be marked Problem No. 221 in the bottom left-hand corner and must be posted to reach this office not later than the first post on Monday, December 14th, 1936.

Solution to Problem No. 220.

The fixed vanes of the tuning condenser were touching the moving vanes at the London Regional setting thereby short-circuiting the H.T. battery through the tuning coil.

The following three readers successfully solved Problem No. 219, and books are accordingly being forwarded to them: E. J. White, 118, Beech Hill Lane, Wigan, Lancs.; A. E. Moseley, 173, Tretworth Rd., Gloucester; G. T. Storey, 14, Tunsley Close, Newton, W. Kirby.

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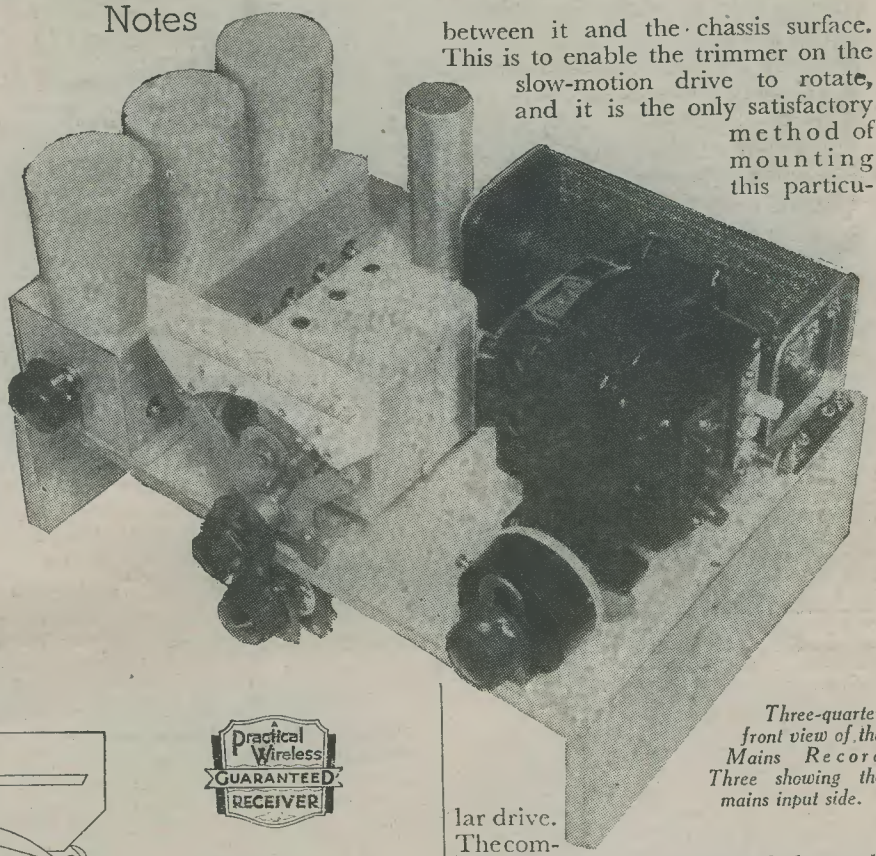
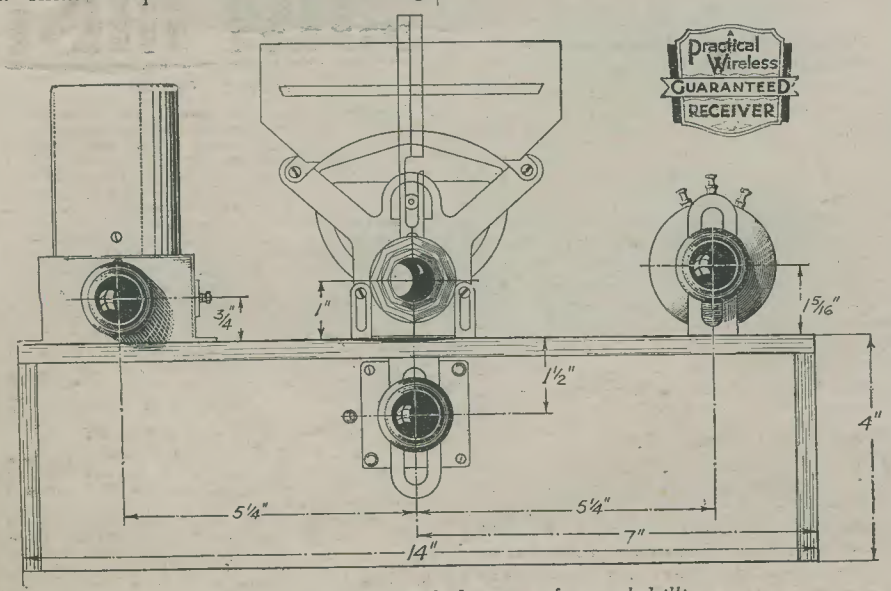
J. J. Camm's "Mains RECORD" All-Wave 3

Constructional Details for the Mains Version of This Year's Most Popular Battery Receiver, and Preliminary Operating Notes

THE main details of the circuit given last week show that this receiver will give to the listener who has the electric mains facilities the same high standard of performance which has been afforded to the battery user of the Record All-Wave Three. But the higher efficiency of the A.C. type of valve will enable this receiver to give an even better performance, and in spite of the simplicity of construction and operating adjustments, the receiver will be found to put up a very good performance. There is only a single control, and this is the main three-gang tuning condenser. The makers supply with this three fixing screws by means of which it is attached to the packing container. In a separate envelope will be found three longer screws and these should be employed in order to mount the condenser with a small strip of wood intervening between it and the chassis surface. This is to enable the trimmer on the slow-motion drive to rotate, and it is the only satisfactory method of mounting this particular drive. The component which is mounted beneath the front edge of the chassis prevents the wood from being cut away to allow the trimmer plates to clear, but by using the mounting plate which accompanies the gang condenser three holes may be drilled in the small piece of wood, which need only be the same size as the bottom of the condenser, and three similar holes may then be drilled in the chassis. The long bolts can then be passed up and screwed into the tapped holes in the condenser.



Three-quarter front view of the Mains Record Three showing the mains input side.



Layout of the controls, with dimensions for panel drilling.

Method of Assembly

The condenser should, therefore,

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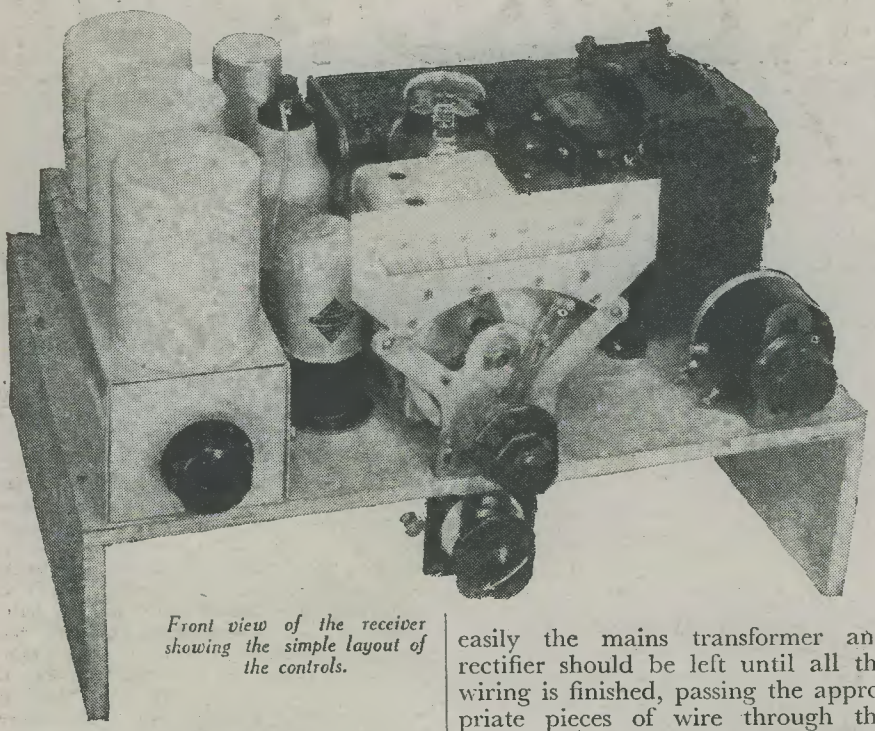
be the first component to place in position, after which the valveholders may be attached. If a ready-drilled chassis is obtained no difficulty will be experienced in placing everything in its right position, but if an unprepared chassis is obtained, three holes must be drilled for the valveholders and a further hole for the electrolytic condenser. This should be $\frac{5}{8}$in. in diameter, and for the valveholders, two $1\frac{1}{4}$in. holes are needed for the seven-pin holders (V1 and V3) and a 1in. hole for V2. For the interconnecting wires between the top and bottom of the chassis $\frac{1}{8}$in. holes should be drilled. For the aerial and L.S. socket strips on the rear edge of the chassis two $\frac{3}{8}$in. holes will be needed for each socket, or a slot may be cut to accommodate both sockets on each strip.

To enable the receiver to be wired easily the mains transformer and rectifier should be left until all the wiring is finished, passing the appropriate pieces of wire through the chassis where required and afterwards cutting these to fit neatly to the transformer and rectifier terminals. The wiring diagram was given last week and is a straightforward task. The only points to be noted concern the earth return leads and the use of the screened sleeving which was specified. It will be noted that a wire runs from the point M.B. on the coil chassis nearest terminal No. 6 beneath the electrolytic condenser C.16 to the M.B. terminal on the H.T.9 rectifier. This should be a length of bare wire, and the ends are anchored beneath the fixing screws for the coil and rectifier, placing the ends between a washer and the holding-down screw. This ensures that the wire makes a good electrical contact with the metal surface of the chassis, and it is passed near to the hole into which the electrolytic condenser is mounted. When the latter is firmly fixed it will be in contact with the wire and this ensures that a good earth return is made—a point which is important, as it has been found that in some cases the constructor uses undue force when tightening the locking-nut for this condenser, and the result is that the metallised surface of the chassis is broken, resulting in poor contact.

The screened sleeving should be slipped over the lead to the anode of V1, and also over the wire end of resistor R11 which is connected to the grid of V4, and also over the lead from terminal No. 4 on the coil unit.



Front view of the receiver showing the simple layout of the controls.

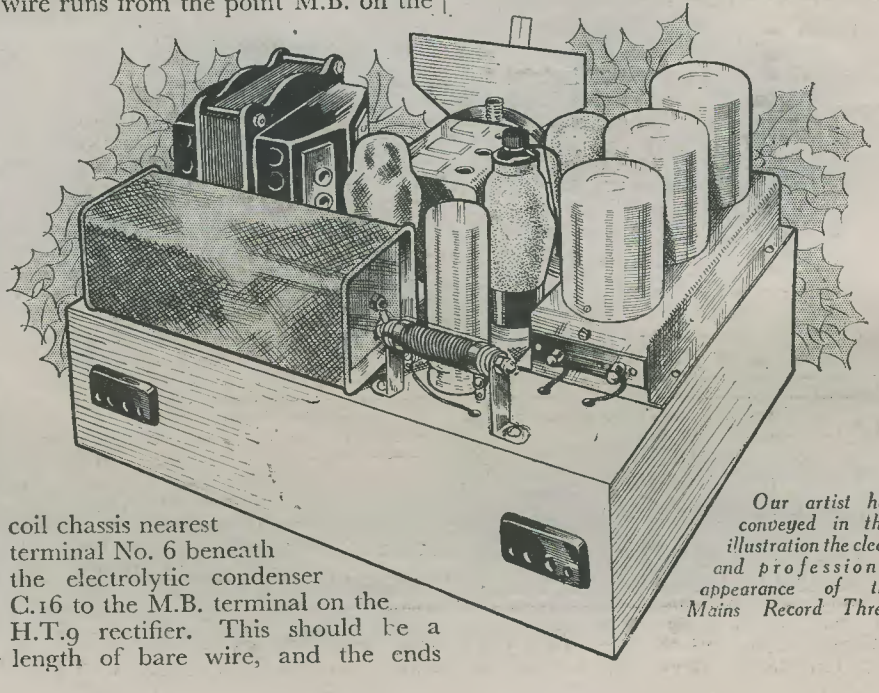
Mains Connections

The mains on-off switch is shown separate, and this may be mounted on the side of the cabinet in any convenient position, and the leads from the mains and the switch should be inserted into the appropriate mains sockets on the transformer. One lead is connected to the terminal marked 0 (or 50), and the other lead into the nearest socket to the mains voltage. If the mains are 240 volts, the 250 socket should be employed, and if 220 volts the 230 socket should be used.

The operation is the same as for the battery Record receiver, the wave ranges being identical.

LIST OF COMPONENTS

One all-wave coil unit (No. 4BTU) (B.T.S.).
One 3-gang (.0005+.00025+.00025) condenser (C2, C8, C9) (J.B.).
One drive with trimmer (SL9) (C3) (J.B.)
Twelve fixed condensers: 8 mfd. (F2920) (C16), 4/4 mfd. block (BE355) (C17, C18), 2 mfd. (BB) (C12), .02 mfd. (C11), .005 mfd. (C15), .0003 mfd. (C7), two .0001 mfd. (4421/E) (C10, C13), three .1 mfd. (4423/S) (C4, C5, C6), 25 mfd. (3016/25v.) (C14) (Dubilier).
Eleven fixed Resistors: 40,000 (R7), 30,000 (R1), 25,000 (R2), 10,000 (R8), 5,000 (R5), 250 (R3), 150 (R12) (F1), 500,000 (R6), 250,000 (R10), 100,000 (R9), 2,000 (R11) (F½) (Dubilier).
One all-wave H.F. choke (HF15) (Bulgin).
One power Resistor, 25,000 ohms (R13) (PR14) (Bulgin).
One Potentiometer, 5,000 ohms (R4) (CP157) (Varley).
One L.F. choke (DP11) (Varley).
One metal rectifier (HT9) (Westinghouse).
One mains transformer (W31) (Heayberd).
One fuseholder with 1 amp. fuse (Microfuse).
One Q.M.B. switch (S80) (Bulgin).
Two terminal sockets L.S. and A.E. (Belling-Lee).
Two component brackets (Peto-Scott).
Three valveholders: Two 7-pin, One 5-pin (Standard) (Clix).
One metallised chassis 14 in. by 10 in. with 3½ in. runners (Peto-Scott).
Two ft. length metal-screened lead (Ward and Goldstone).
Three valves: MVS/Pen 7-pin, 41MHL, 42MP/Pen (Cossor.)
One P.M. speaker (37S) (W.B.).



Our artist has conveyed in this illustration the clean and professional appearance of the Mains Record Three.

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NEW SERIES

Amateur Transmitting

The Various Characteristics of Valves are Dealt With in this Third Article of the Series—By L. O. SPARKS

WHILE the property of inducing currents in other conductors is often turned to good advantage (as in L.F. and "mains" transformers) it can account for serious losses and trouble, if due consideration is not given to the layout of components and screens.

Reactance

Reactance can be likened to resistance in a D.C. circuit; in fact, it is measured in "apparent ohms," but it differs, inasmuch that it does *not dissipate any energy*, although, like resistance in a D.C. circuit, it *does limit* the A.C. current flowing. There is the reactance of a condenser and of an inductance, both of which depend on the frequency of the current for their value of opposition to current flow.

The reactance of a condenser is given by:

$$Xc = \frac{1}{6.28 \times f \times C}$$

where "f" is the frequency and "C" the capacity in *farads*.

For an inductance the reactance $X1 = 6.28 \times f \times L$ where "f" is frequency and L inductance in Henries. The result, in each case, being in "apparent ohms."

If, in a circuit, there is resistance and reactance in series, the total of the two will *not* give the total resistance or opposition, the same as series resistances in a D.C. circuit. It is necessary to use the formula:—

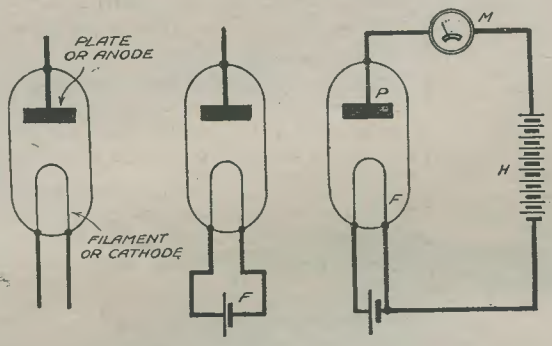
$$Z = \sqrt{(R)^2 + \left(6.28fL - \frac{1}{6.28fC}\right)^2}$$

which is known as the "*impedance*" of the circuit.

If the above formula is examined, it will be seen that the reactance of the condenser is subtracted from that of the inductance; in other words, their oppositions are of different kinds, and the capacity reduces the inductance effect. It is obvious, therefore, that if their values are equal, the resultant reactance will be zero, and the impedance of the circuit becomes the pure resistance. Now, like D.C. circuits, the current in the circuit depends on the impedance, so, if the values of the capacitative and inductive reactances are such that the resultant reactance is zero, the current will be at its maximum. This means that the conditions for maximum current are when $\frac{1}{6.28fC} = 6.28fL$ or, if the values of the capacity and inductance are fixed, the frequency at which maximum current will flow can be written:—

$$f = \frac{1}{6.28\sqrt{LC}}$$

which is the frequency at which the circuit will be at "resonance."



Figs. 1, 2 & 3.—Diagrams showing the diode valve and the method of applying cathode and anode supplies.

Providing the formulæ given above and in the previous article have been studied, so that their applications are, at least, clear, the question of the valve in relation to transmitting can be considered.

It will be appreciated, from future articles, that the valve plays a vital part in the design and construction of transmitting gear; therefore, it is essential to have a reasonable knowledge of its operation.

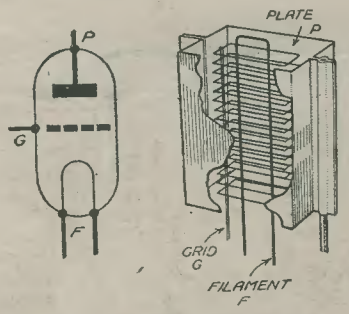
Let us consider the most simple type of valve, namely the "diode," which consists of *two* elements, housed in the familiar glass bulb common to practically all wireless valves.

One element is known as the "plate or anode," and the other is the filament or, if mains operated, the "cathode," and they are shown diagrammatically in Fig. 1.

I have already explained the relation between the movement of electrons and an electric current, so the operation of a "diode" valve should not be difficult to follow.

If the filament is heated by the battery "F," shown in Fig. 2, electrons will be emitted into the space enclosed by the glass bulb, but if another battery is connected in the manner of H, as in Fig. 3, so that the "plate" "P" is *positive* with respect to the filament, then the milliammeter "M" will indicate current flowing, showing that the electrons emitted from the filament are rushing across the space to the "plate," and round through the circuit, back to their starting point, forming a continuous flow or current.

Supposing, instead of a battery, a source of *alternating* current is placed across the filament and plate, thus causing the plate to be alternately positive and negative, it will be found that when the plate is *negative*, no electrons will flow across to it, or, in other words, no current flow will be indicated, but, during every *positive* half-cycle of the alternating current, the electron movement will take place, and a current will flow in the circuit. From this it will be seen that the valve only allows current to flow in one direction, and that it actually "rectifies" the alternating current, leaving, so to speak, a pulsating continuous or direct current. One common application of the "diode" is the rectifying of A.C. supplies in a mains-operated receiver. Fortunately, however, the diode will rectify alternating currents having very high frequencies as well as the usual 50 cycles of electricity supplies; therefore, it can be used as a "detector" or "rectifier" of the radio frequencies in a wireless receiver.



Figs. 4. & 5.—Theoretical and practical assembly of the triode valve.

The Triode

If Fig. 4 is examined, it will be seen that a third element has been added to the diode, converting it to what is known as a "triode," which has different characteristics and greater applications than the diode.

The arrangement of the elements or electrodes is shown in Fig. 5, G being the grid, which is literally a grid formed by a fine wire wound round one or more rigid supports; F the filament, located inside

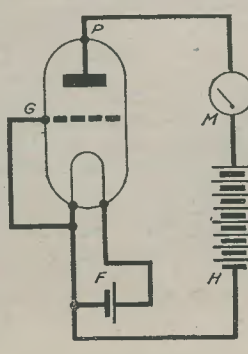


Fig. 6.—The complete circuit of a triode to show the flow of current as mentioned on the next page.

(Continued overleaf)

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WIRELESS TRANSMISSION FOR THE AMATEUR

(Continued from previous page)

the grid; and P the plate surrounding the grid. The "mesh" of the grid, and its position in relation to the other elements play a most important part in valve design and construction, as they directly affect the characteristics of the valve. If the grid is connected to the filament, Fig. 6, and the circuits completed with the batteries F and H, a current will be indicated by the milliammeter, showing that the electrons are passing through the "grid" to the plate.

Now let us take the matter a stage further, and re-draw the circuit as Fig. 7, which will be recognised as a "resistance-capacity coupled" L.F. amplifier.

The battery, G.B., is so arranged that the grid can be made negative with respect to the filament.

It will now be found that, when the grid is made more negative by increasing the value of G.B. (grid bias), the "space" round the grid becomes more negative, and the electron flow is hindered, with the result that less electrons will get across to the plate and, therefore, less current will flow in the plate circuit. Those not familiar with valve operation should carry out these simple experiments, and prove these statements.

Now supposing across the points "g" and "e" (dotted lines, Fig. 7), we apply an "*alternating*" voltage, equivalent to a signal coming from V.1, the effect will be to make the grid more or less negative, in relation to its *normal mean value*, i.e., the bias. This "more or less negative" arrangement may not be too clear. One might say, why negative—what about the positive cycles of the alternating current (signal)? Think of it thus. The grid *is* negative—in this case—because of the applied grid-bias, so the negative half-cycles make it *more* negative, while the *positive* half-cycles make it *less* negative.

The variation of the grid voltage will have its effect on the plate current by causing it to fluctuate about its "mean" value, according to reason given for Fig. 6.

Voltage Drop

Turn now to the plate circuit of V2., where R is a resistance or impedance (coil) forming what is known as the "load." Reverting to the second article, and Ohm's Law, it will be understood that a resistance in a circuit can cause a "voltage drop" according to the current flowing.

In the case in question, the variation in the plate current will cause a variation in the voltage dropped across the resistance R and, now, the next two facts are *very important*, assuming the valve to be operating correctly the voltage variations will be identical to the grid variations, but they will be larger or, in other words, they will be *amplified*, showing that the three-element valve differs from the two-element type inasmuch that it not only acts as a rectifier of alternating current but it also acts as an "amplifier."

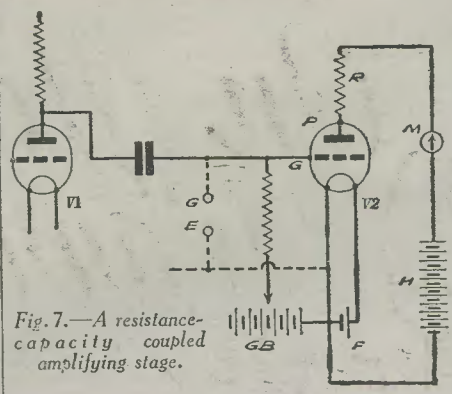

Fig. 7.—A resistance-capacity coupled amplifying stage.

Certain valves are better than others as amplifiers, and as it is necessary to have some term to denote their capabilities in that respect, we speak of the "amplification factor" of a valve, and use the term "Mu" and the sign μ to denote it.

It is possible to calculate the "amplification factor," and it is advisable for all experimenters to be familiar with the procedure, so that they can check their valves from time to time.

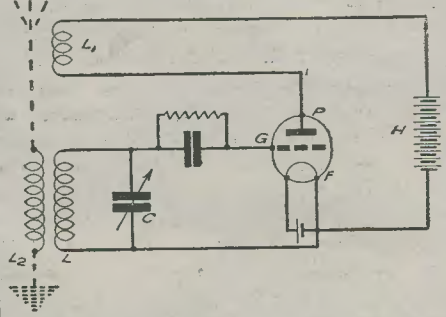

Fig. 8.—The simplest valve oscillator circuit.

As it relates to actual magnification, the factor can be expressed as the ratio between the change in plate voltage necessary to produce a given change in plate current; and the change in *grid* voltage necessary to produce the *same* change in current. The formula can be written:

$$\frac{\text{Change in plate volts}}{\text{Change in grid volts}}$$ The plate current being constant.

There is no unit of measurement, as Mu or μ is simply a number. The Mu of a valve is only one of its characteristics and it is necessary to consider the "Mutual Conductance or Slope" and the "Impedance."

Mutual Conductance

The "Mutual Conductance," denoted by the letter "g," is an indication of the "goodness" of the valve, as it is the ratio between the *change in anode current* and the *change in grid volts*, the plate volts remaining *constant*. It can be written:

$$\frac{\text{Change in plate current}}{\text{Change in grid volts}}$$ the unit of measurement being in milliamps (plate current) per volt (on grid). The "Impedance" or, sometimes quoted as, "A.C. Resistance" of a valve is another ratio, but this time concerned only with the plate circuit, the *grid* being maintained as a *constant voltage*. It is denoted by the letters "Ro," the unit being ohms. and the formula:

$$Ro = \frac{\text{Change in plate volts.}}{\text{Change in plate current.}}$$

The three characteristics quoted are all related, and it is useful to note that:

$$g\ (\text{Mutual Con.}) = \frac{\text{Amplification Factor.}}{\text{Impedance.}}$$

$$\text{or Impedance} = \frac{\text{Amplification Factor}}{\text{Mutual Conductance}}$$

but, it *must be remembered* that for the above formulæ to hold good, g must be expressed in *amperes per volt*, not milliamps.

The Valve as an Oscillator

The first requirement of a wireless transmitter is some source or generator of oscillations, and it is of vital importance that the frequency of the oscillations can be controlled.

The valve is ideal for this purpose, in fact, it may be said that it has superseded all other forms, and is the only method suitable for amateur requirements, bearing in mind regulations. Fig. 8 shows the most simple circuit, and many of the older experimenters will recognise in it the early one-valve receiver. Across the grid filament circuit is connected the inductance L tuned by the variable condenser C. In the plate circuit is another inductance, L.1, in series with the H.T. battery, and it is so placed that it is inductively coupled (article No. 2) to the grid circuit.

If the inductive coupling is sufficient, a certain proportion of the energy in L.1, will be fed back into the grid circuit, and if the transference of energy is great enough, oscillatory currents will be set up in the grid circuit, and a state of oscillation will be reached.

The effect is known to all users of receivers, when oscillation is produced by the excessive use of reaction, the usual name for the method of feeding back energy from the plate circuit. The frequency of the oscillations will be very nearly the resonant frequency of the tuned grid circuit, formed by L and C, and if an aerial is coupled to the circuit by the Coil L.2, then oscillations of the same frequency will be introduced, inductively, into it, the oscillatory current rising to its maximum when L.2 is in resonance, i.e. (article No. 2), when its reactance is at zero.

While the circuit under consideration is capable of producing oscillations, it is hardly suitable for transmitting purposes as will be explained in the next article, which will deal with the requirements of a complete transmitting circuit.

Midland Parliament

ON December 12th, at the third meeting of "Midland Parliament" this winter, the subject to be discussed is Non-Union Labour. Sir Charles Mander, Bt., Mayor of Wolverhampton, will be in the chair. W. M. W. Thomas and Austin Hopkinson, M.P., will speak as employers, and the trade union side will be represented by George Jones, of Midland Miners' Federation, and Arthur Henderson, M.P., for the Kingswinford Division. The discussion will also be heard in the Regional programme.

PROGRAMME NOTES

Concert from Edinburgh

THE Scottish Orchestra, conducted by Georg Szell, will give a concert in the Usher Hall, Edinburgh, on December 14th The broadcast portion of the programme will include "Symphony No. 4 in D Major," by Dvořák, and "Bolèro," by Ravel.

"The Narrow Gauge"

THIS is the title of an interesting programme to celebrate the centenary of the Ffestiniog Toy Railway—the pioneer of narrow-gauge railways—which will be broadcast from Bangor on December 12th. The programme will be produced by Sam Jones.

Alfred Cave Quartet

ON December 17th the Alfred Cave Quartet is to play the Haydn Quartet in E flat and Dvořák's "Nigger" Quartet. This combination consists of Alfred Cave, leader of the B.B.C. Midland Orchestra; Ernest Element (2nd violin); Frank Venton (viola) and Harry Stanier ('cello).

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On Your Wavelength

By THERMION

Long Distance Television

A TELEVISION and sound broadcast from London was picked up in Cape Town on the ultra-short-waves recently, the experimenter in question being Mr. C. G. J. Angilley. He said that on 6 metres he heard a kind of buzzing sound and on 7 metres the musical theme which comes at the end of the Gaumont British News Film. Then followed a voice stating: "This is the London Television Station at Alexandra Palace, North London." Several cases have been reported of successful television reception in Ireland and the North of England which somewhat destroys the optical spectrum theory. Television is very much in the news nowadays. The King has asked for the possibilities of television reception at Belvedere to be investigated. Stores round London are installing sets, and scarcely a day goes by without some interesting item appearing in the daily papers. This carries me back to the early days of wireless, but whereas in those days wireless was very imperfect, television commences its career in a somewhat advanced stage.

Prices at present are high because costs must be covered on a comparatively small output. Things will get cheaper as demands grow, and we can safely look forward to a television receiver at about £15 within five years.

When will our component manufacturers get busy and realise that a valuable market amongst home constructors awaits their wares, in the form of the necessary transformers, resistances, tuning coils, and special condensers which are necessary for television? For, whether manufacturers like to believe it or not, television at the present time is more suited to amateur construction than to commercial exploitation. After you have seen a television demonstration, and you go back to listen to your radio, you sense the missing link. Everything is good until something better comes along with which to make comparisons. A few years ago wireless seemed to have reached the zenith of development, and it seemed impossible to improve it. Since television has been demonstrated there is a feeling of something lacking in radio entertainment. The transmissions are extraordinarily good; my only quarrel being with the composition of the programme. It is being used for education and uplift when its main purpose should be to entertain. I realise that there are difficulties in the way of obtaining artistes, owing to the opposition of the theatrical profession, and that the film companies with perhaps understandable jealousy are refusing to lease their high-class films for television purposes. These difficulties will be overcome, and we must regard the present transmissions as being experimental and as a sort of a gauge of public interest.

Specified Parts

I HAD a crack or two to make the other week about a dealer who objected to specifications on the grounds that he preferred to sell a customer what he had in stock.

A. H., of Yeadon, enters the arena with the following epistolary effort:—

"Dear Thermion,—Whilst I agree that it is almost essential to use specified parts in the home-constructed receiver if results are to be guaranteed, I do not agree with your attack on the radio dealer, who, if he has not the specified part in stock, tries to sell the customer another part, which is 'just as good.' After all, the dealer is in business to sell what he has in stock, and the final choice *does* rest with the customer. Should the set not function correctly, the customer should say to himself: 'Well, it is my own fault for allowing that dealer to persuade me that "so-and-so" is just as good.' And that's all there is about that. Another point; you suggest the customer should ask the dealer to prove that the merits of the component offered are equal to the specified component, and go on to state that the dealer could not do so for lack of knowledge and/or lack of instruments. Supposing, however, the dealer could. Would the customer be able to appreciate the proof? I doubt it. I have met too many home constructors who have not the slightest knowledge of wireless theory, but unfortunately consider themselves to be 'experts' because they have successfully built a receiver with the aid of a blueprint. I say 'unfortunately,' because a radio engineer has, first of all, to dispel their weird notions, before he can instil a little true knowledge. No, 'Thermion,' leave the dealer alone in this respect, for if a customer buys a wrong make of any part he should himself have sufficient knowledge to assure him that the part will be equivalent to that specified. If he has not, well, he must insist on the part specified, and should one dealer not be able to supply, there are other dealers."

Skilled Labour

I DROPPED another bomb recently in drawing attention to the shortage of skilled labour, and this has incited T. R. D., of Ballymoney (horrible sounding name), to indite the following screed:—

"Dear Thermion,—Your discussion on the lack of skilled labour interests me.

"The radio trade happens to be filled with misfits from every calling on earth. At the present moment not 1 per cent. have had any training. May I let you into a secret?

"The technician at a sales counter is a clog rather than a cog in the wheel. It's not his fault. It's the public's. All the amateur constructors for miles around seek out the technician for advice on this and that. Conversa-

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tions often taking anything up to an hour end in the sale of two wander plugs, an egg insulator, or a G.B. battery. Value of technician's time as a commercial proposition, 1d. to 1½d. per hour!

"The ex-fish-hawker can sell an £18 18s. super-plop-o-dyne in that time (possibly at £18, or *even* £15). (That's a secret, too, of course.)

"Then the technician can loan a valve costing him say the best part of 10s., 'in the hopes of future business.' The valve may be returned with the emission off colour or not returned at all.

"The ex-fish-merchant would have the nerve to try to sell the valve and leave hopes where they belong.

"Not until all radio shops are run under Government licence by technicians qualified by rigid examination can your dream of the revival of craftsmanship in radio become a reality.

"To cover the nakedness of a new idea I offer the old mantle wrapped around the gunsmith."

Perhaps the reader can explain what he means by his last sentence; it has got me guessing.

The Component Shortage

AND here is another correspondent who wishes to air a grievance. This time it is A. B., of Neasden :—

"Dear Thermion,—Turning as I do, immediately after I procure my weekly copy of PRACTICAL AND AMATEUR WIRELESS, to your special articles, I note the headline 'The Component Shortage.' This I read with even more than usual interest, for I have a grouse, which, although not on all fours with the case which you cite, is unfortunately a genuine one. I am constructing the 'Add on Superhet Unit' recently described in PRACTICAL AND AMATEUR WIRELESS. The difficulty I have had in obtaining the various components is almost sufficient to outweigh the pleasure of construction. Take, for instance, one small article in particular — a Westector 4. I have tried no less than a dozen stores in the W.C. and E.C. districts to obtain this, but without success. In the end I wrote to the makers telling them the facts and with remittance. The stores referred to include several of the leading suppliers of components. In one of such stores there was another customer endeavouring to procure the necessary kit to construct the all-wave set recently described in your columns, and I do not think it any exaggeration to say that he was unable to procure more than half what he required. Presumably the tendency is to push ready-made sets. It's true a larger profit is made by the dealer, but I think you will agree that if components were more easily procurable, more interest would be taken in home construction, and sales thereby increased.

"I have been a home constructor since pre-war days—when I had both transmitting and receiving licence, and am not writing as a casual constructor.

"However, notwithstanding my somewhat 'dumpy' letter, I have derived many hours'—in fact, years'—pleasure from my experiments, and from your very excellent paper."

Many other readers have written to me in similar strain, so let us agree that it is difficult to purchase components, that dealers will often try to fob you off with anything, and that there is room for considerable improvement in the distribution methods of component manufacturers. Let us also agree that travellers are not always met courteously by the radio dealer, who thinks that home construction is dying, and that he is not going to take financial risks of stocking components. The poor mutts do not realise that by this policy they are killing it. If a man finds it difficult to obtain parts he loses enthusiasm. Many readers have told me that they have visited more than a dozen dealers, not only without purchasing what they wanted, but even without being offered an alternative. Some of the readers tell me that the Mail Order Houses are just as slow, but you must remember that they are very much in the hands of the manufacturer, who prefers to supply his direct orders first. Television will create an enormous demand for components, and my readers might usefully bear in mind, when that happy time arrives, those dealers who have served them faithfully, and ignore those who have not.



Notes from the Test Bench

The Limit Four

SOME readers have experienced difficulty with the Limit Four. Satisfactory results are obtained on the medium and long wavebands, but when the switch is rotated to the short-wave settings the fuse blows. We have investigated this fault and find that it is due to the K and J contacts of the switch being too near each other. There should be a definite break between each contact when wave-changing, but if excessive heat is applied when soldering external leads to the switch tags these are loosened and are liable to move too near each other. When the moving contact is rotated, momentary connection will then occur between the adjacent fixed tags. If this occurs with contacts K and J the fuse blows. The same fault could be due to the fixed and moving vanes of the gang condenser touching each other, but this is not likely to happen with a reliable modern component.

D.C. Mains Receivers

WHEN a receiver is to be supplied from D.C. mains only, a rectifier is not required, and the reservoir condenser can be dispensed with. Very few commercial receivers of this type are available nowadays, as most people want their sets to be suitable for A.C. or D.C. mains operation. When the receiver is home-constructed, however, the rectifier and condenser can easily be omitted, space being left on the chassis for these components so that they can be added should the mains supply be changed to A.C. The omission of the rectifier entails no disadvantages, and the initial cost of the receiver is reduced by approximately £1. The voltage drop of approximately 20 volts which occurs in the rectifier is also avoided and therefore it is possible to apply a higher voltage to the valve anodes. In a receiver incorporating a series rectifier it is only necessary to join the anode and cathode sockets of the rectifier valveholder in order to produce this increase of voltage. The valve can then be removed, but it will be necessary to connect a wire across the heater terminals in order to produce heater circuit continuity. It will also be advisable to increase the value of the heater dropping resistance so that the total heater circuit resistance is not affected by the removal of the rectifying valve.

LATHE WORK FOR AMATEURS
By F. J. CAMM.
1/- or 1/2 by post from
GEORGE NEWNES, LTD., 8/11, Southampton St. Strand, W.C.2.

The Crystal Palace

THE almost total destruction by fire of this historic edifice will fill many with pangs of regret. It has played its part in the development of radio and television, it has seen enormous social gatherings, and that it should come to such an ignominious end is too bad. Whether it will be rebuilt is in the lap of the gods, but there can be no denying the fact that of recent years its claims as an ideal venue for national exhibitions have been sadly overlooked. The new track will, however, be completed, and on it we may hope to see some epic motor races, as well as cycle and motor-cycle races, which will form the subject of interesting broadcasts.

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Practical Television

December 12th, 1936. Vol. 3. No. 28.

Ediswan Television

LAST week we had the pleasure of visiting the television research laboratory of the Edison Swan Electric Company, and in addition to a demonstration of three separate receivers which were used to pick up the B.B.C. programmes from Alexandra Palace, we were shown some of the interesting experimental apparatus and developments which have been made in this laboratory. This was built for the express purpose of carrying out research and experimental investigation into the design and production of cathode-ray tubes. For some years this work was carried out in the special valve department, but progress in television has rendered necessary a separate laboratory devoted entirely to this highly specialised work. It is interesting to note that the laboratory is but a few steps from the original building in which Sir J. A. Fleming produced the first radio valve. The cathode-ray tube has therefore overcome many of its teething troubles in the same nursery as its famous ancestor.

Ediswan Cathode-ray Tubes

The range of Ediswan cathode-ray tubes consists of the types 5H, 7H, 10H, and 12H, having screen diameters of 5, 7, 10, and 12ins. respectively. The 5H and 7H are intended for ordinary cathode-ray oscillograph work, or in monitoring positions in connection with television transmitters or experimental scanning equipments. The 10H and 12H are essentially for use in domestic television receivers. They have been designed to give bright, well-defined black and white pictures, similar in tone to the modern cinema picture. All tubes incorporate two pairs of deflector plates for electrostatic deflection of the electron beam. The latest types of high-vacuum tubes possess high luminosity screens, improved focusing properties, freedom from cathode disintegration due to ionic bombardment, and improved modulation characteristics so necessary for satisfactory television picture reproduction.

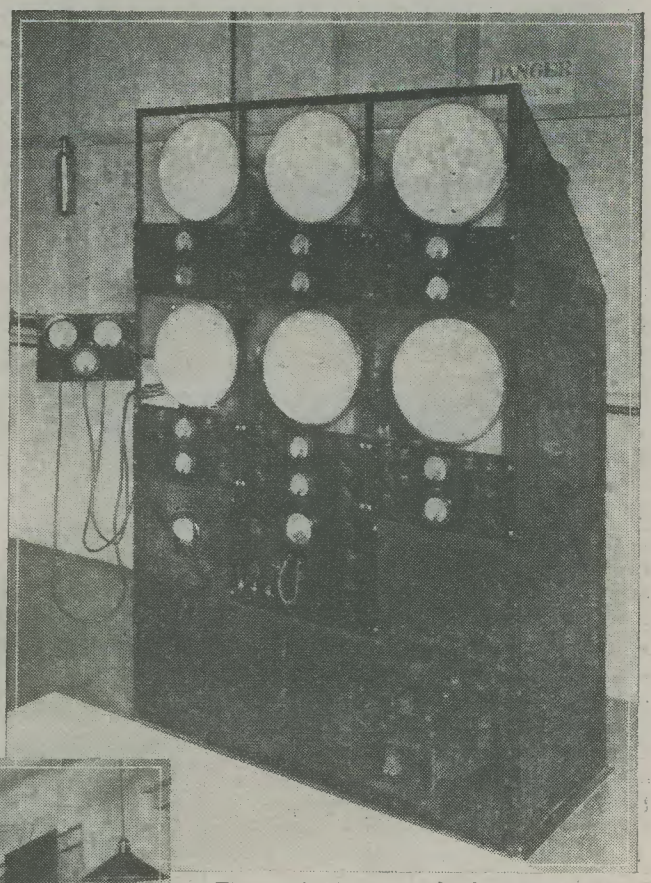
Manufacture

The tubes are manufactured in the special valve factory also situated at Ponder's End. The clear glass bulbs which are blown at the Chesterfield factory are sprayed with the fluorescent compound by a special process, and the nickel cathode is of the indirectly-heated type coated with a barium compound. The coating is at the top end of the cylinder and not along the sides, as in the ordinary radio valve. The complete electrode assembly is mounted on a glass pinch similar to that in the radio valve.

Each tube is subjected to rigorous tests, which include the checking of the cathode emission, screen brightness, shape of raster or scan modulation characteristics, cathode heater voltage and current, and shift of scan with grid control. Care is also taken to see that the variations in anode volts for spot focus are within prescribed limits. All tubes are tested at excessively high voltages to ensure that no breakdown or flash-over can occur when the tube is in normal use. A number of tubes are taken from each batch produced and run under television scanning conditions at full operating voltages and current on the life-test rack, and one of the accompanying illustrations shows six tubes in this rack undergoing the life test.

Television Reception Valves

In use in this laboratory are a number of Mazda valves specially suitable for television work. They include the AC/TH.1, a triode-hexode frequency changer for short- and ultra-short-wave work; the AC/SP3, a high-slope screened pentode for R.F., I.F. and video amplification; the V925, a midget shortpath diode for general diode purposes in television receivers, and the



This is the life-test rack, showing six tubes in position undergoing test.

T31, a gas-filled thyratron, for use in sweep voltage generators.

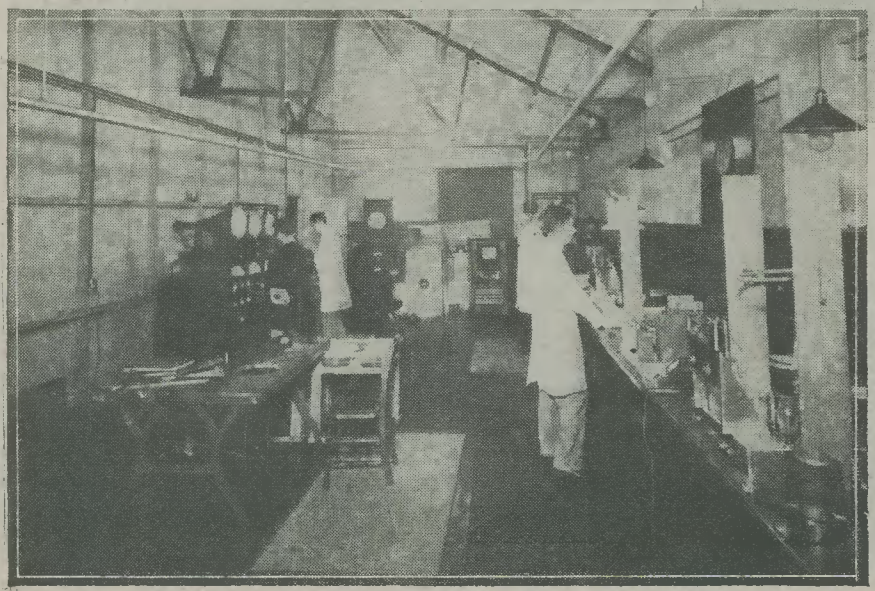
Experimental Receivers

The three receivers used in the laboratory were developed with the sole object of testing, under actual working conditions, television components, i.e., cathode-ray tubes, valves, etc., made by the Edison Swan Company and its associated companies.

These components consist mainly of cathode-ray tubes, receiving valves, rectifiers, thyratrons, transformers and loudspeakers.

One receiver is an experimental model made up on the rack assembly system, and was developed with the aid of a film scanner situated in the laboratory. The second receiver employs the superhet feature in which tuning to the sound

(*Continued overleaf*)



A general view of the Ediswan television laboratory. The life-test rack may be seen on the left, and the three experimental receivers referred to in the above text are at the far end.

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PRACTICAL TELEVISION

(Continued from previous page)

automatically tunes correctly on the vision section, a single frequency-changer being employed. In this model sensitivity was sacrificed to quality in the vision section, in which six band-pass circuits are arranged to provide a 2 mc/s bandspread. The H.F. amplifier is followed by a special diode detector and one D.C. type video amplifier stage, which is connected direct to the control electrode of the cathode-ray tube, thus controlling directly the D.C. bias on which is superimposed the modulating picture frequencies. The sound section utilises a push-pull output stage (two PP.3/250's), and to take full advantage of the high quality of the special ultra-short-wave broadcasts, a dual speaker assembly is employed. The speakers consist of a 12in. and an 8in. model employing the Alnico magnet, giving a useful flux density of over 12,000 lines per square centimetre, and it is claimed that the response is practically flat from 90 to 6,000 c.p.s. The reproduction certainly sounded remarkably good and justified the claims which were made.

A Straight Circuit

In the remaining receiver a straight H.F. circuit is employed, with five special H.F. pentodes preceding the special diode detector, and the H.F. couplings consist of alternate transformers and chokes, the resonant point of the choke coupling being designed to fall in the small trough formed in the bandpass transformer coupling, thus providing a perfectly square form response curve for the full bandwidth required for high-quality pictures.

Other interesting developments which were shown included a special reflector arranged in the lid of one cabinet model which housed the cathode-ray tube in a vertical position. To avoid distortion and reflection difficulties this reflector did not consist of the usual mirror, but was a special component made up by one of the Ediswan company's associated companies, and which consists of a flat glass plate coated on the front with a special chemical, resulting in increased brightness and avoidance of all optical difficulties.

Television Notes

American Television

NOW that Britain has established its high-definition television service, other countries are making an effort to take up the challenge that this country leads the whole world in the quality of its pictures and the engineering soundness of its installation at Alexandra Palace. Details of American work keep filtering through, and if the reports are true efforts are being made to establish stations at New York, Hollywood, and Philadelphia. The R.C.A. have been conducting experiments and demonstrations from the Empire State Building which has an aerial over 1,200 feet above ground level. This great height is essential owing to the very tall buildings in New York. This causes difficulties of shielding and reflections, which latter produce multiple images and mar the picture quality. The R.C.A. still use a standard of 343-line definition with interlaced frame scanning, but so far the largest size cathode-ray tubes shown have a 12in. diameter screen, this producing a picture about 10in. by 8in. On the other hand, Farnsworth claims to be using a 441-line scan. These higher definitions necessitate a very wide sideband, and station range may be reduced if ultra-short wavelengths of from three to four metres become necessary owing to this fact. It is certain, however, that the inauguration of the B.B.C. service has stimulated activities in those countries which are carrying out their own television investigations on a fairly large scale. The smaller countries are holding a watching brief in order to gauge the results obtained and popularity achieved before building or ordering their own television equipment.

A Little Cramped

WITH the prospect of increased hours of television transmission the programme staff at Alexandra Palace are finding themselves rather cramped for studio space in order to carry out rehearsals. Is is stated that the adjoining theatre is to be employed in order to relieve the situation. There are only two large studios at the B.B.C. station, one for each system of television, and rehearsals for either system quite naturally can only be undertaken in the correct studio at the moment. On the programme side it is very noticeable that a direct feminine appeal is being made. Items are being included, especially in the afternoon, which are designed to captivate the taste of women. It is natural that at all the large stores the women outnumber the men in the audience at this time of the day. Many domestic subjects are being illustrated, while beauty experts are scheduled to appear very shortly, and even talks on mothercraft.

Baird's Loss

AS we go to press the news of the destruction of the Crystal Palace is to hand. Apart from its many historic associations the wireless amateur associates this old building with the development of television, as it was here that the Baird company transferred its activities when high-definition systems were tried out. The dipole aerials erected on the South tower may be seen in the illustration below, which was taken when daylight dawned on the remains of this fine old building, and much of the Baird experimental and research apparatus had been, unfortunately, destroyed. Full details of the damage are not yet to hand.



The remains of the historic Crystal Palace on the morning after the great fire. Note the Baird television aerials on the top of the tower nearest the camera, silhouetted against the background of smoke.

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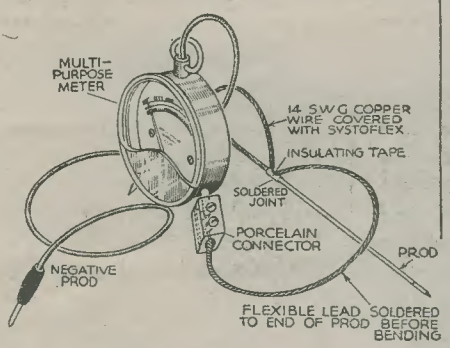
A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — READERS WRINKLES — THE HALF-GUINEA PAGE

A Test-prod Improvement

SOME types of multi-purpose meters are equipped with a flexible common negative lead and two positive prods—one for each voltage scale—which are often too short to reach into the set at the exact point required without some risk of a short, especially if the set is at all compact. The following simple device, illustrated, overcomes these difficulties. A short piece of stout copper wire, about 8in. long, is slipped into a length of Systoflex sleeving, which is cut off to leave about ¼in. bare at each end. On to one end a piece of flex is soldered, and the end of the wire is then bent to form a loop and taped in position,

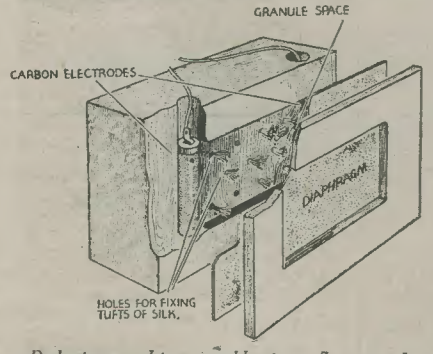


A useful test-prod improvement.

at the same time covering the joint. The other end of the flex is then connected to the meter prod by means of an ordinary porcelain connector. It will be found that the most inaccessible anode terminals "rise to the surface" with this simple gadget.—L. DU PLERGNY (Birmingham).

An Improved Microphone

THE accompanying sketch shows a useful method of reducing packing trouble, and also diaphragm resonance, in a home-made transverse current microphone. The microphone body is made from a piece of hardwood, and the actual details have been explained in these columns before.



Reducing packing trouble in a home-made microphone.

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.

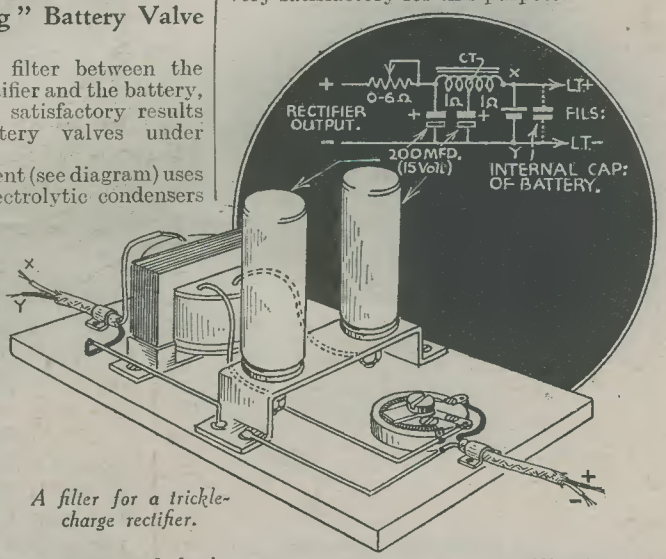
The variation in the design of this model is effected by drilling a series of holes in the surface cut away to form the granule space, and fixing in these holes, with a touch of glue, small tufts of frayed out silk floss. It will be noticed that adjacent rows are staggered vertically, which has the effect of keeping the granules in place when the microphone is in use. Care must be taken that the tufts just touch the diaphragm without bearing heavily against it, otherwise the frequency range of the instrument will suffer.—JOHN HADDON (Glasgow).

Filter for "Floating" Battery Valve Filaments

BY incorporating a filter between the trickle charge rectifier and the battery, I have obtained very satisfactory results whilst operating battery valves under "float" conditions.

The circuit arrangement (see diagram) uses two 200mf 15-volt electrolytic condensers and a centre tapped 1Ω+1Ω choke. The rectifier output is regulated by the rheostat to yield the correct smoothed output for the filament load. The battery, remaining across the filaments, acts as a "buffer" thus ensuring an output of 2 volts, and at the same time allows its large internal capacity to behave as a final smoothing element. The winding data for 1Ω+1Ω choke is as follows:—

Core—36 No. 5 Stalloy stampings, wound with 660 turns of 20 s.w.g. enamelled copper wire centre tapped at 330 turns, giving approx. 1Ω per section at a safe current rating of 1 amp. to cater for a wide range of multi-valve battery sets.—WM. S. HARRISON (Aintree).

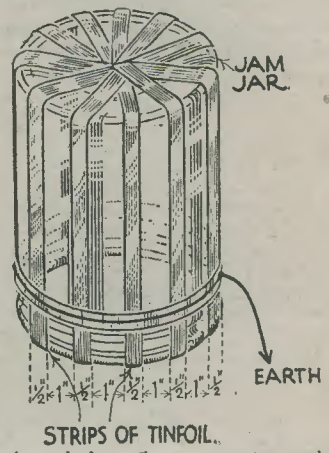


A filter for a trickle-charge rectifier.

LATHE-WORK FOR AMATEURS
by F. J. CAMM
1/- or **1/2** by post from
George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

An Effective Screening Method

IT is often found necessary to screen instruments from external electrical influence, and yet be able to see the apparatus. I have found the following method very satisfactory for this purpose.



A simple but effective screening method.

Take a glass jam jar of the 2lb. size, and round it stick strips of tinfoil ½in. wide, as shown in the sketch, and leave about 1in. between each strip and the next. Glue another piece of foil ½in. wide round the bottom, making sure that this last strip makes good electrical contact with all the others. Take a connection from this strip to earth. This method of screening, although simple and cheap, will be found very efficient, and by using the various small glass jars which are used for various packings, screens for all kinds of components may be made up in a similar manner.—J. BLAKE (Palmers Green).

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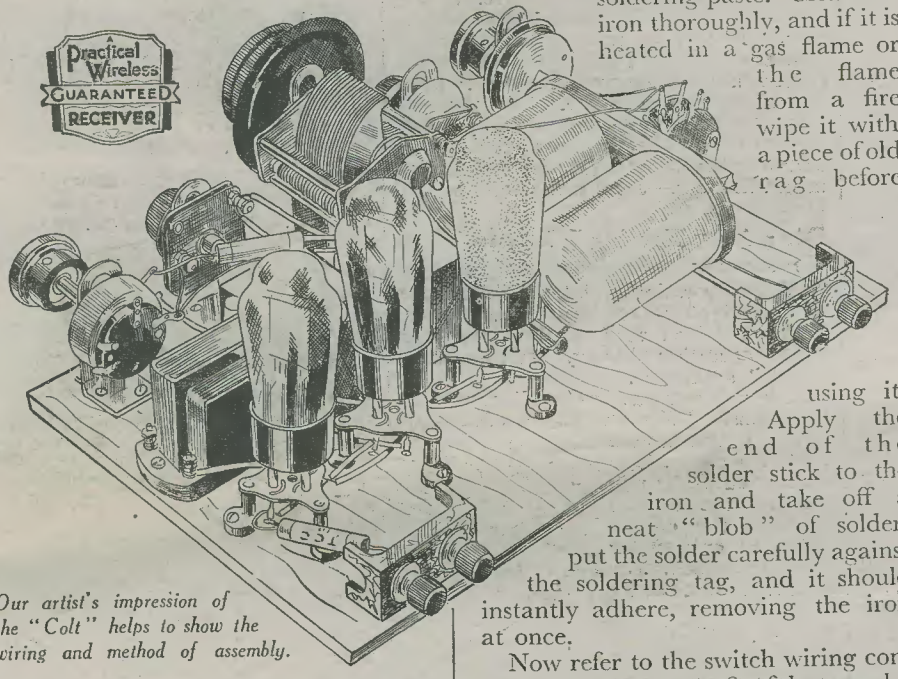
THE experienced constructor may have been able to carry on with the construction of this interesting receiver from the diagrams and brief details given last week, but the following notes will describe fully the actual process of building, and therefore those who have already finished the main part of this work will be able to turn to the end of these notes for the operating details. As mentioned last week, the coil and switch assembly should be carried out before these parts are mounted on the baseboard. When purchased, the switch units and the operating rod will no doubt be separated (unless a complete kit is obtained), and this facilitates the wiring to the coil unit. If they are assembled the operating rod and locator plate may easily be withdrawn, as there is no locking device to keep the switch unit in position on the square rod.



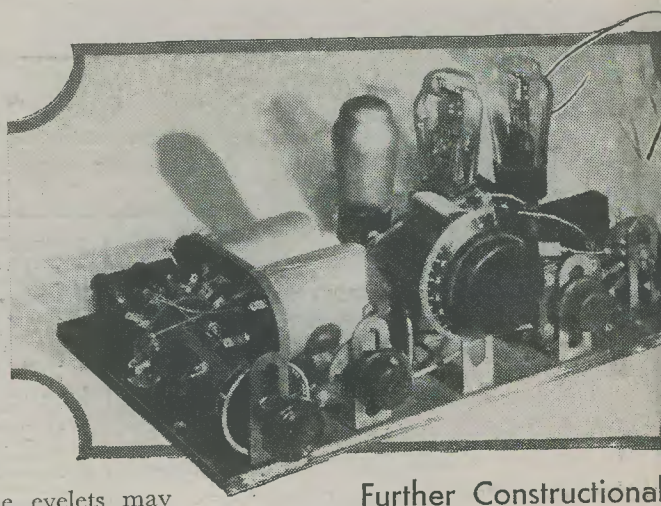
Our artist's impression of the "Colt" helps to show the wiring and method of assembly.

The best way of wiring the coil is to attach to each of the contacts on the base, with the exception of No. 4, and that marked E, a good length of tinned copper wire. To avoid the trouble of measuring each length make these wires about 12ins. long. Insulated sleeving may be passed over some of these wires, although it is not essential for all of them. It will be noted as the contacts on the switch unit are wired up, which of these leads run close together and a length of sleeving may then be cut to avoid the risk of short-circuits.

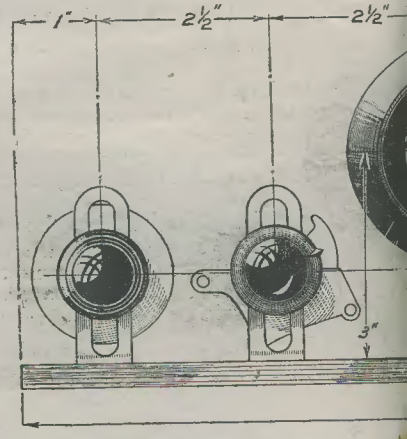
Making Good Connections

The switch plate and the coil unit utilise soldering tag connections, and therefore soldering has to be resorted to in this receiver. Remember, however, that the tags are attached to soft material and make quite certain that a really hot iron is employed and leave it in contact with the tags for the very minimum of time. If this point is not attended to the eyelets may be loosened and the switch will fail to operate satisfactorily. Carefully clean each contact with a piece of well-worn emery cloth and apply the merest trace of Fluxite or similar soldering paste. Clean the iron thoroughly, and if it is heated in a gas flame or the flame from a fire wipe it with a piece of old rag before using it. Apply the end of the solder stick to the iron and take off a neat "blob" of solder, put the solder carefully against the soldering tag, and it should instantly adhere, removing the iron at once.

Now refer to the switch wiring connections on page 376 of last week's issue. It will be noted that there are two plates, marked A and B, and on the switch unit, plate B is the one attached direct to the mounting bracket, and when screwed down this is the one farthest from the control panel. The contact points are not lettered on the actual component, and the letters on the wiring diagram are, therefore, reference points to the remainder of the wiring. Connect together the three lower contacts on each plate leaving about one inch of wire projecting from the front plate (plate A), and four inches of wire from plate B. To one of the fixing nuts a soldering tag must now be attached, and the most convenient nut is that on the left, viewing the switch from the front. A two inch length of wire is then attached to this tag. The switch unit may now be wired to the coil tags, and it will be noted that in four cases there are two wires attached to the coil contacts. Terminal 4 and terminal E nearest to it are now joined together and the coil unit is ready to attach to the baseboard. An ordinary component-mounting bracket is employed for this purpose, with a bolt passed through one of the two fixing holes in



Further Constructional Details of this Interesting



Use this diagram when mounting th

LIST OF COMPONENTS FO

One four-range coil, No. C56 (Bulgin).
One driver-locator unit, No. S150 (Bulgin).
One five-way contact unit, No. S153 (Bulgin).
One .0005 mfd. condenser, No. 2SM (C2) (Pol
One .0003 mfd. diff. reaction condenser (Polar).
One .0001 mfd. Compax condenser (C1) (Pola
Four fixed condensers: .0001 mfd. (type M) (
.005 mfd. (C7), .01 mfd. (C6) (type 300 tubu
2 mfd. (type 65) (C5) (T.C.C.).
Three fixed resistors: 2 meg. (R1), 40,000 (
10,000 (R3) (1 watt type) (Erie).
One potentiometer, 1 meg. with two-point sw
(R4) (Erie).
One L.F. transformer, 3/1, No. LT135 (B.T.S

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The "COLT" All-Wave 3

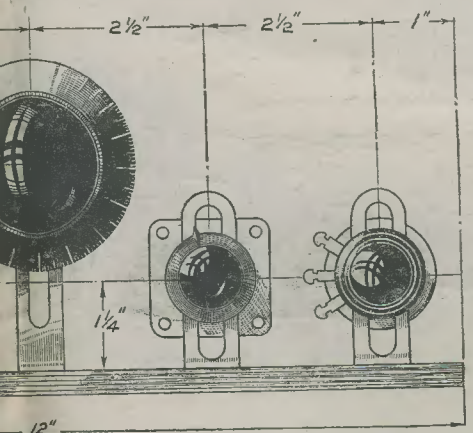
Notes and Preliminary Operating Simple-to-build All-wave Set

the foot of the bracket and through the fixing hole in the coil unit. A screw and large washer may then be used to hold down the bracket through the long slot in the arm and this enables the coil to be accurately positioned when mounting the bracket.

Finishing the Wiring

The one-hole fixing bush attached to the driver-locator unit should now be attached to a component-mounting bracket, and locked into position with the single nut and indicating plate left off. This may afterwards be attached to the front of the panel by means of the second nut which is provided with the unit. The square driving rod is now pushed through the switch unit, and when the front of the bracket is level with the front edge of the baseboard, the bracket should be screwed down. When the indicating plate is to be attached to the panel the switch should be turned to the extreme left, and then an indicating pointer may be attached to the front so as to give a clear indication of the actual setting of the switch.

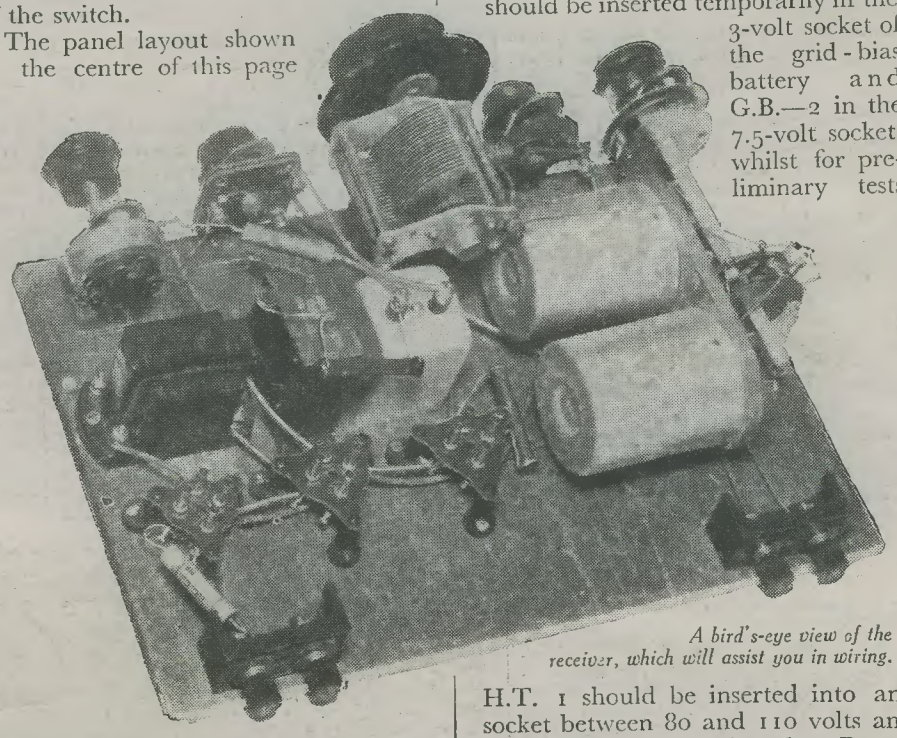
The panel layout shown in the centre of this page gives the mounting positions for the various controls and the four remaining component-mounting brackets should be placed in the appropriate positions. To avoid cutting the spindle of the volume control, and to enable the control knobs all to remain at an equal distance from the panel, the bracket for this component should be mounted slightly back from the front edge of the baseboard. Mount the valve-holders first and carry out the wiring to the legs, as these may prove inaccessible when the transformer and remaining components have been fitted. A single length of wire is employed for each filament run, and lengths of sleeving are cut off to slip over between the valve-holders, passing the wire through the centre holder and finishing off at the other end. Attach the grid leak to the first valve-holder, and lengths of wire to the remaining legs, after which the remaining components may be attached in the positions shown in the wiring diagram, and in the illustrations on this page.



brackets and for drilling the panel or cabinet.

Testing Out

Complete the wiring and attach the battery leads, making quite certain that the correct indicating plugs are attached to these. When the receiver is checked and ready for test, the L.T. leads should be attached to the accumulator, and the H.T.—and G.B.+ should be inserted into the appropriate sockets on these batteries. G.B.—1 should be inserted temporarily in the 3-volt socket of the grid-bias battery and G.B.—2 in the 7.5-volt socket, whilst for preliminary tests H.T. 1 should be inserted into any socket between 80 and 110 volts and H.T.2 into the 120-volt socket. Rotate the right-hand control in a clockwise direction and the switch will be heard to snap over after a short movement, in which condition the set is on, but the L.F. volume control is in the position of minimum volume. As this control is turned further the volume will be gradually increased. The reaction control should be set to minimum for preliminary tests, and the wave-change switch set to the medium-wave position. The local should be heard and there are no trimming adjustments to be carried out. The voltage at H.T.1 should be adjusted until smooth reaction effects are obtainable over all wavebands.



A bird's-eye view of the receiver, which will assist you in wiring.

R THE "COLT" ALL-WAVE THREE

One all-wave choke, No. A.W.C1 (B.T.S.).
Three four-pin S.W. type baseboard mounting valveholders (Clix).
Two terminal blocks with A.E. and L.S. terminals (Belling-Lee).
Six plugs: H.T.—, H.T.1, H.T.2, G.B.+, G.B.—1, G.B.—2 (Belling-Lee).
Two spades: L.T.—, L.T.+ (Belling-Lee).
One baseboard, 12in. by 8in. (Peto-Scott).
Six component brackets (Peto-Scott).
Three valves: D210, L210, P215 (Hivac).
One speaker, type 37J (W.B.).
H.T. Battery, 120 volts (Drydex).
G.B. battery, 9 volts (Drydex).
L.T. accumulator (Exide).
One tin Filt (Graham Farish).
One slot aerial filter (Graham Farish).

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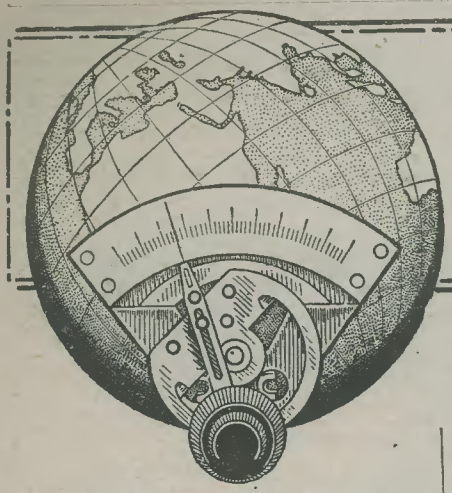

SHORT WAVE SECTION

THE SIMPLEST SHORT-WAVER

In Response to Many Requests We Give in This Article the Constructional Features of One of Our Most Popular One-valve Short-wave Receivers

IT has already been stated that many amateurs appear to obtain the best results on the short waves with the simplest type of receiver. Some of the extensive short-wave logs which have been published bear witness to the fact that a good one-valve set can give a remarkable performance when correctly designed and built, and in 1935 we described a receiver

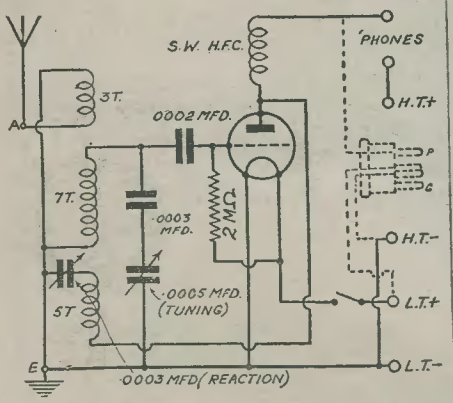

Fig. 1. Theoretical circuit of the simple one-valve set

of the "home-made" type in which the coil and H.F. choke were constructed by the amateur. This particular receiver appears to have given phenomenal results, and we have repeatedly received requests for details of construction. Unfortunately, the issue in which this receiver was described is now entirely out of print, and no further copies are obtainable. We have decided, therefore, to reprint the main part of the article in question so that those readers who were unable to take advantage of the earlier issue, or who have since decided to make up this receiver, can now do so.

The Circuit

The circuit is shown in Fig. 1 and the practical wiring diagram in Fig. 2. It will be seen that quite a straightforward arrangement is employed. A standard .0005 mfd. tuning condenser is employed instead of a special low-capacity, short-wave condenser, but to make tuning simpler a fixed condenser is joined in series with it. Of course, if desired, the fixed condenser may be omitted and a special low-capacity condenser used for tuning. The value of this should be .00016 mfd. or .0002 mfd.

Making the Coil

The coil, it will be seen, consists of 15 turns of wire—in three sections of 3, 7, and 5 turns each—wound on a length of 2in. diameter cardboard tube. Ordinary postal tube is quite suitable for use as the former, and this should, for preference, be given a liberal coating of shellac varnish before use. The 3-turn winding is for aerial coupling, the 7-turn winding is for tuning the grid circuit, and the 5-turn winding is for reaction. The grid coil is wound with 20-gauge enamelled wire, the turns being equally spaced by the diameter of the wire used, but the other two windings have side-by-side turns of about 26-gauge enamelled wire. Actually, it is not essential that these exact gauges be employed, but they are probably the most suitable. All the turns are wound in the same direction, and the ends of the windings are anchored by passing the wire through pairs of small holes made in the tube with a drill or a pricker. As to the connections, these are as shown, and care is needed only to see that the coil leads are connected in the order shown; that is, the leads from any winding must not be reversed.

The coil can be attached to the small baseboard either by fitting a small angle bracket to the former, or by making the latter a push fit over a wooden disc or large cork screwed to the baseboard. The reaction condenser may be any ordinary component having a capacity of .0003 mfd., but it is better to use one of the air-spaced variety if this is to hand. The grid condenser and leak are standard components which nearly every constructor will have in the junk box, but even if they are to be bought new they will not cost more than two shillings. A valve-holder of normal baseboard-mounting type is shown, but, if desired, one of the special short-wave valveholders, such as the Clix, Eddystone, or B.T.S., may be employed. Any on-off switch will serve perfectly well.

The H.F. Choke

The next item is the H.F. choke, and this can be made very easily by winding 150 turns of 36-gauge enamelled wire on a ¾in. diameter test tube (obtainable from a chemist's for a penny or so). The turns are continuous (electrically), but are wound in five sections of 30 turns each. No special care is called for here, for you simply wind 30 turns in a pile about ¼in. wide, leave a gap of ¼in., wind 30 more turns, and so on. As will be seen, the two ends of the winding are held in position by winding a strip of adhesive tape or insulating tape round the tube. On completion, this simple choke can be fixed to the baseboard by means of a cork which fits the open end. When desired, an Eddystone type 948 choke can be bought to replace the simple home-made one.

(Continued on facing page)

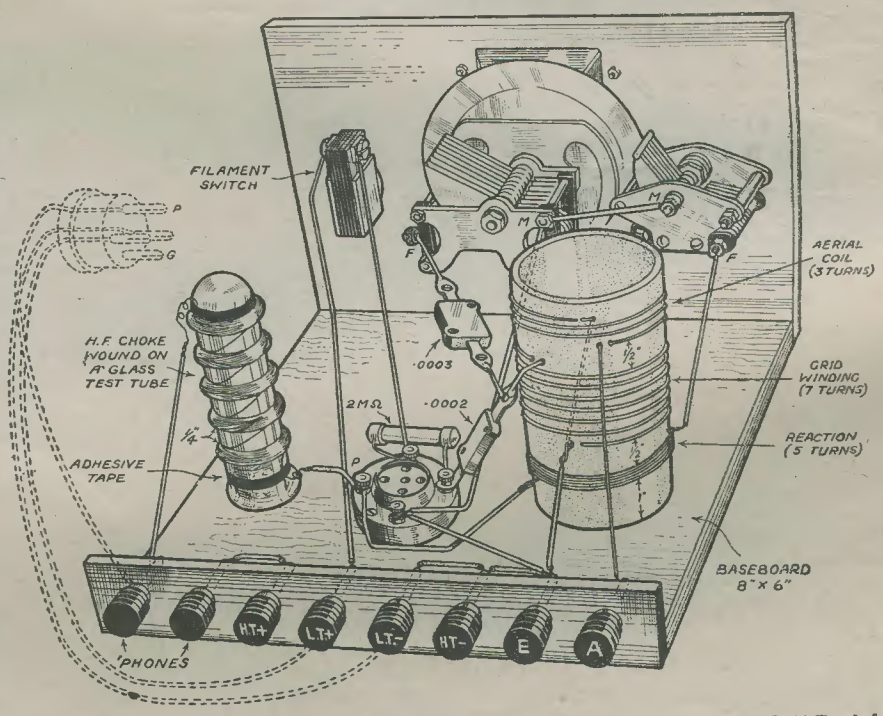

Fig. 2.—Practical wiring diagram showing the constructional details of the coil and H.F. choke.

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SHORT-WAVE SECTION

(Continued from facing page)

Eight terminals are fitted to the rear edge of the baseboard, and are mounted on a strip of ebonite 1½ins. wide. In connecting up, see that all the leads are as short as possible, and cut those from the coil and choke so that they are just long enough to reach to the appropriate terminals.

Wavelength Covered

The finished receiver will tune from about 20 to 40 metres, and will, therefore, cover the wavelengths used by many amateurs (working on about 40 metres) as well as by a number of short-wave broadcasting stations working on wavelengths in the region of 31 metres. Probably the transmissions which will be received most easily are those of Rome, on 25.4 metres, Zeesen (Germany), on 25.57 metres, and Radio Nations (Switzerland), on 31.26 metres, but there are many American stations which are well within range when conditions are favourable.

The method of operation is the same as that in the case of a det.-L.F. receiver designed for medium- and long-wave reception, except that greater delicacy of operation is necessary. This means that the tuning condenser—which must have a reasonably good slow-motion drive—must be controlled slowly, and that the reaction condenser must be employed more frequently, so as to keep the set just on the verge of oscillation; this is indicated by a faint "breathing" sound in the 'phones.

For Loudspeaker Reception

Should it be desired to operate a loudspeaker the set can be used as an adapter by fitting an old valve base or an adapter plug to the two L.T. terminals and to one of the 'phone terminals, as shown in broken lines in Figs. 1 and 2; a convenient length of four-strand cable is suitable for connection. The detector valve of the broadcast receiver is then removed and the plug inserted in its place. It might be added that the most suitable valve for use in the short-wave set is a type H.L. or L., but, in any case, the detector valve from the broadcast receiver can be used satisfactorily.

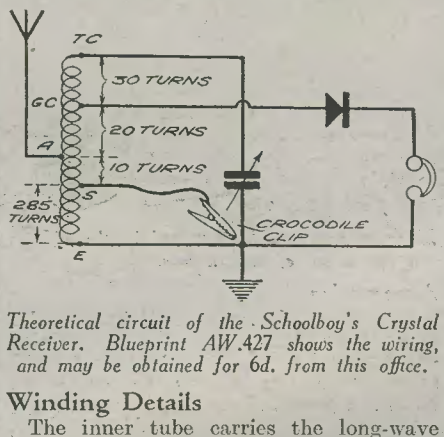
DIFFICULT IDENTIFICATION

If recognition of a station is to be assured and the signal is weak it is essential that the listener should make every effort to pick up the exact call. Unfortunately, many of the South Americans possess almost identical call-letters, differing only in the number following the international prefix. A case in point is that of HJ4ABP, Medellin (Col.), on 48.90 m. (6,135 kc/s), and HJ1ABP, Cartagena (Col.) on 31.25 m. (9,600 kc/s). In this instance no mistake should occur if at the time the difference in frequency is taken into consideration, as the position of the respective stations in the waveband will abolish all uncertainty. But, if the signal is faint it is easy to mistake a P for a D or a B and this is where accuracy is necessary. Personally, when in doubt, if loudspeaker strength is poor, I switch over to headphones. Bear in mind, however, that when a mains-fed set is used adequate protective precautions must be adopted both to reduce signals to suit your eardrums, and also to ensure that no high tension current is allowed to filter through to the headphones.—G. A.

THE SCHOOLBOY'S CRYSTAL RECEIVER

How to make the coil for the receiver which is shown in Blueprint AW.427

As the copy of Amateur Wireless in which details for building this crystal receiver is now out of print, we are reprinting here the constructional details of the coil, as many readers are desirous of making up this interesting and simple receiver. The coil is a very efficient unit, covering both medium and long wavebands, and is made up on two separate formers. These are of paxolin, and are 4ins. in length. The larger of the formers is 2½ins. in diameter, and the other 1¾ins. in diameter, the latter being held in position in the centre of the large former. For this purpose small spacers of ebonite are employed, and are held in position with short screws. Alternatively a disc of wood may be cut and screwed to the baseboard to which the inner tube may be attached, and the outer tube may be held in position with small metal angle brackets.



Theoretical circuit of the Schoolboy's Crystal Receiver. Blueprint AW.427 shows the wiring, and may be obtained for 6d. from this office.

Winding Details

The inner tube carries the long-wave winding, consisting of 285 turns of 36 gauge enamelled wire, arranged in the centre of the tube. On the large tube are wound sixty turns of 26 gauge enamelled wire, also exactly in the centre of the tube. When placing this winding on, however, you must make a tapping at the tenth and twentieth turns from the lower end. Anchor the ends of the windings by passing the wire through two small holes pierced about ¼in. apart. To the top of the larger tube a single terminal is fitted, and this should be immediately above the holes where the end of the winding comes. At the bottom of the larger tube four terminals are mounted, and the connections to these are as follows: The top of the inner winding is joined to the bottom of the inner winding, and the two wires are joined to the terminal on the bottom marked S in the blueprint (one side of the wave-change switch). The bottom of the inner winding is connected to the next terminal marked "E" (Earth). The top of the outer winding is joined to the top terminal marked "TC" (fixed plates of the tuning condenser), and the tapping points on this winding are joined to the remaining terminals in the following order. The lowest tapping, that is, the one which is ten turns from the bottom of the coil, is joined to the A terminal, and the centre tap is joined to the GC terminal, which in this set is connected to the crystal detector.

The theoretical diagram of this receiver is given here for those who wish to make up the circuit, and who are interested in the theoretical connections.

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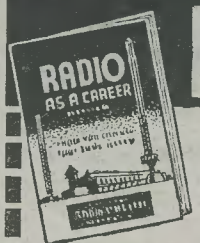

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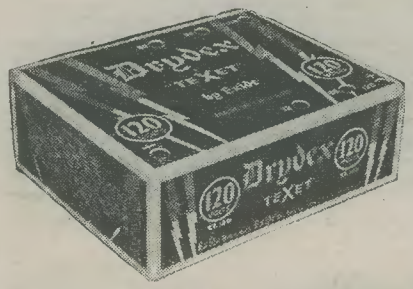
Radio Gifts for Christmas

Some Brief Suggestions for Presents Suitable for the Wireless Amateur. There is an Unlimited Range of Gifts, and the Following Hints Will Enable You to Make Your Selection

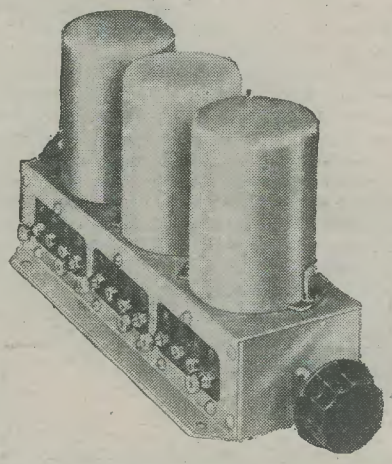
IF you are giving presents to radio friends this year, or are asked to choose a suitable gift for yourself, you will find that the range of accessories which is now available will cater for practically every possible taste. It is possible to obtain components for a few pence, many of which may be included in a ready-made receiver, perhaps to improve its efficiency, or at least to improve its ease of handling or control, and at the other end of the scale there are complete units costing as much as £6, which may be used as the nucleus of a new receiver. Of course, in addition to these separate components, there are extension speakers, cabinets and similar items.

Where a component is required for addition to a ready-made receiver, there are such items as transformers, the addition



A new H.T. battery is a very acceptable gift.

of a modern component of this nature being ideal for old-fashioned receivers. An improvement in quality is almost certain to be obtained when this change is made, but it may be found that the replacement of the tuning coils is a more efficient arrangement. There are now dozens of different types of coil, and no doubt many old sets may be considerably improved by the incorporation of a band-pass circuit, or simply by iron-cored coils in place of old air-core types. A modern coil may be obtained for 5s. or so, and ganged units vary in price from 12s. Some good examples may be found in the Bulgin, Varley, Wearite and B.T.S. range.



Many old sets may be improved by the addition of modern coils.

Accessories

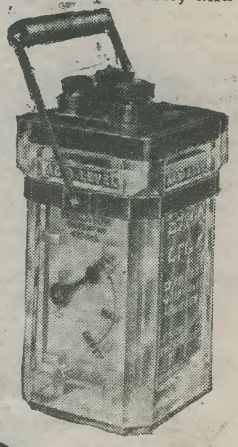
Outside of the receiver there are also many items which will be found acceptable as gifts, and a new H.T. battery or L.T. accumulator can always be employed. Even if a good L.T. battery is now in use, a new one will prove a valuable stand-by, and the latest patterns may be obtained



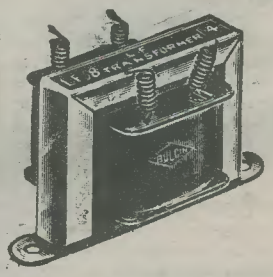
An extension speaker such as this W.B. model can be used with any receiver.

supply. There are also such items as meters and other measuring instruments, without which no experimenter is worthy of the name, and a simple instrument for testing the ordinary battery supplies may be obtained for six or seven shillings, whilst complete testing apparatus is available at prices ranging up to several pounds.

Where a lot of experimenting is carried out, a soldering iron is indispensable, and

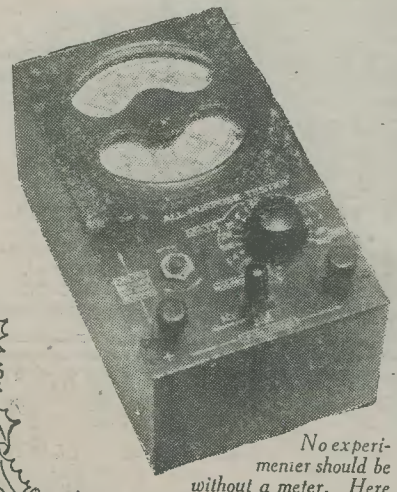


One of the latest L.T. accumulators complete with indicating clock is an ideal gift for the battery user.



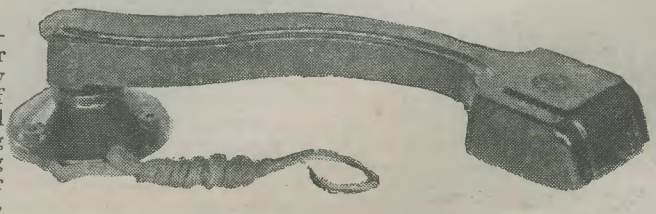
An old set will be improved if a modern transformer is fitted.

the Solon irons need no introduction. For 10s. 6d. one of the latest irons with pencil-bit (which is replaceable) may be obtained. Gramophone pick-ups may be obtained from 5s. upwards, and there are many different makes from which to choose. Amongst these may be mentioned, Cosmocord, Morphy-Richards, B.T.H., etc. Gramophone motors may also be obtained in various forms, from the simplest clockwork models up to the elaborate automatic-changing apparatus costing £10 or so. Suitable models may be found in the Garrard and Collaro range. Accessories for the radiogram may be found in the Bulgin range, and include such items as needle cups, turntable illuminating and signal lamps, and change-over switches.



No experimenter should be without a meter. Here is an all-purpose tester from the Everett-Edgcumbe range.

with a self-indicating pointer showing exactly the condition of the battery and thus avoiding risk of missing a programme or item due to a sudden failure of the L.T.



This is the Morphy-Richards pick-up, which can be obtained for 14s. 6d.

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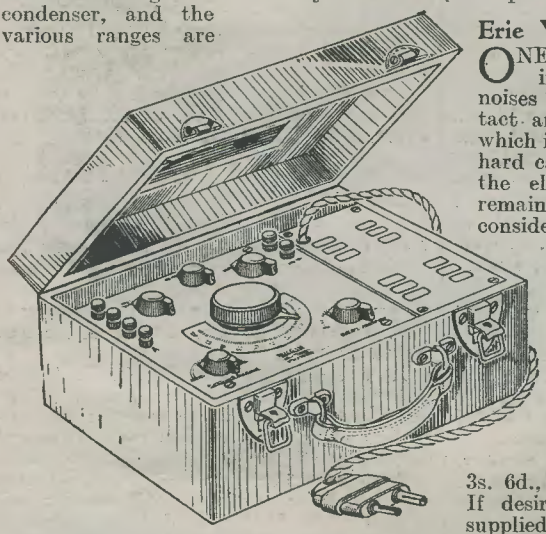
Facts and Figures

COMPONENTS TESTED IN OUR NEW LABORATORY

Bulgin All-mains All-wave Oscillator

THE service-man cannot do without an oscillator, and the keen experimenter will also find that such a piece of apparatus will prove invaluable in calibrating a receiver or aligning various circuits. The output may be measured, and the response curves of speakers, etc., carefully tabulated when a constant signal is applied to a receiver, and for such a purpose a fairly simple piece of apparatus may be employed. The main essential of this type of oscillator is a neon discharge device, and in the oscillator shown below this type of accessory is employed, together with two valves of the mains-voltage filament type. A switch is fitted so that the note provided by the neon oscillator may be employed, or, alternatively, the oscillator may be modulated by a pick-up connected to suitable sockets. Tuning is carried out by a standard condenser, and the various ranges are chosen by means of a multi-contact switch. Separate controls are provided for H.F. and L.F. attenuation, and owing to the use of the special mains valves there is no undue heat dissipation, and the apparatus is instantly ready for use where either A.C. or D.C. mains are available. Fitted in the lid of the oscillator is a complete tuning graph showing the correct dial setting for any desired frequency for calibation purposes, and the range covered embraces both of the normal medium and long-wave broadcast bands in addition to a separate range from 100 to 1,500 kc/s suitable for tuning intermediate-frequency transformers or other similar equipment. The price of the complete oscillator, inclusive of valves, is £10, and a kit of parts for its construction may be obtained (less valves) for £5. The construction of the unit is fully described, with wiring diagrams, in the interesting publication, "Radio Progress," obtainable from Messrs. Bulgin, price 1s.



A useful all-mains oscillator obtainable from Messrs. Bulgin, complete, or as a kit of parts to build yourself.

Mazda High-voltage Rectifier

FOR use in high-voltage apparatus, such as television receivers, the Mazda MU.2 will be found a desirable rectifier. This is of the low-rating filament type, requiring 2 volts for attaining a suitable emission at a current of 2.4 amps., the peak inverse voltage is 11,000, and the maximum anode voltage and current is 4,000 at 300 milliamps. The valve is of the half-wave mercury vapour type, and the anode connection is brought out to a cap on top of the valve, so that a high insulation factor is obtained. A standard four-pin base is fitted, and the price is 20s.

The range of rectifiers is now reduced owing to the substitution of the type UU.3 by the UU.4. This is an indirectly-heated valve with a higher current rating, and it may be substituted for the UU.3 in all circuits in which that valve is now employed. The heater is of the 4-volt 2.2-amp. type, and the rated output is 350 volts at 120 mA. The price is 10s. 6d.

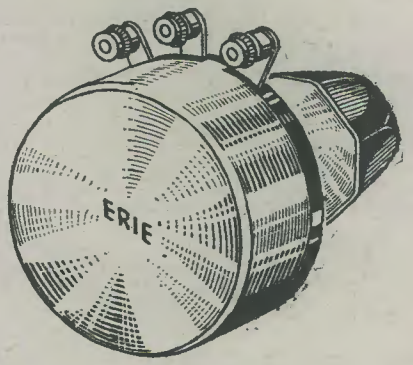
Erie Volume Control

ONE of the main difficulties in designing a volume control is to avoid noises due to wear of the element or contact arm, and in the Erie component which is illustrated on this page a special hard carbon compound is employed for the element, and this is designed to remain noiseless and consistent over considerably more than the normal life of a standard radio receiver. Under a life test in the factory the standard attained is 100,000 revolutions, with a full current load. This particular component is totally enclosed to avoid changes due to climatic conditions, and is available in eight separate ranges, 5,000, 10,000, 25,000, 50,000, 100,000, 250,000, 500,000, and 1,000,000 ohms. The price is 3s. 6d., or 5s. with a single-pole switch. If desired, any of these models may be supplied with a double-pole switch for an extra 2s. 6d. The switches are rated to break 125 volts at 2 amps., or 250 volts at .5 amps.

Marconiphone All-wave Aerial

YET another interference-free all-wave aerial kit has now been produced, this time from the Marconiphone laboratories. This particular equipment is, however, designed to function down to the present television wavelengths and thus covers the extremely wide wave-range from 7 to 2,000 metres. It consists of three lengths of standard 7/22 aerial wire, in 60ft., 39ft., and 5ft. lengths, ready attached to "egg" type insulators and to a special aerial transformer fitted with a spark gap. Attached to the transformer is a 60ft. length of rubber-covered screened cable, to the end of which a receiver transformer is fitted. The output from this consists of two leads in the same rubber and screened covering, provided with two plugs for attachment to the aerial and earth terminals of a receiver. The aerial wire must not be shortened, as the characteristics of the two transformers are designed to operate at maximum efficiency with certain loads, and, therefore, the maker's instructions regarding the use of the assembly must be carefully adhered to. The 5ft. length of wire must be maintained in a vertical direction, but if a "V" type aerial is required, it is permissible to cut the end of the 39ft. length of wire and transfer it to a pair of holes on the other side of the aerial unit.

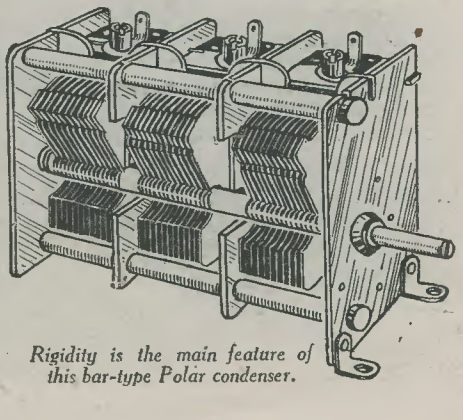
The screened down-lead may be adjusted to suit the requirements of the house, and the book of instructions gives clear details and a diagram showing the method of arranging the connections when the required length has been ascertained. The receiver transformer is fitted with a selector switch, so that the aerial may be matched for use on the desired waveband, and it is stated that although on the broadcast band the switch should be set to the 200-2,000 metre position, it may be found that either of the remaining positions offers best results on the short waves, and, therefore, the switch should be adjusted to provide the best results under actual conditions. The price of this equipment is £1 17s. 6d.



This volume control from the Erie range is noiseless and efficient.

Polar Bar-type Condenser

IN a modern receiver, with sharply-tuned circuits, it is essential to make certain that all components, as well as wiring, shall remain rigid to avoid losses due to mis-alignment of the various circuits. A common source of trouble is the ganged condenser, where this becomes distorted during the mounting process owing to the fixing screws being driven in at an angle, or through bolt-holes being drilled slightly out of place. The Polar condenser shown below is of a massive type, and the main feature is the bar or rod running from end to end at top and bottom, and this ensures that the frame cannot become distorted due to mishandling, and thus the three sections will remain perfectly matched after it leaves the factory. This condenser may be obtained in 2-and 3-gang units, the prices being 12s. and 17s. 6d.



Rigidity is the main feature of this bar-type Polar condenser.

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.....

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.....

RADIO CLUBS AND SOCIETIES

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.

Salisbury and District Short-wave Club

A MEETING of the above club was held on Tuesday, November 17th, at the Bemerton Labour Hall, Wilton Road, Salisbury, when a lecture was given by Mr. C. A. Harley (2ACC) on "Short-wave Superhet Design."

A brief survey of the superhet was given, explaining the reason for, and the advantages of, the superhet principle. An example of modern short-wave superhet design was exhibited, consisting of a five-valve battery receiver with octode frequency changer, two variable-mu H.F. pentodes, double-diode-triode and pentode output. An explanation of the circuit and details of how to gang the receiver with a modulated H.F. oscillator were given, whilst with the aid of a blackboard, diagrams were given to illustrate the various remarks.

The Club regrets that they cannot still listen to the interesting talks which were given by VS3AC on transmission. Unfortunately Mr. Laver is returning this month to Malaya, but it is hoped to arrange tests with CW and 'phone on the 14 mc. band. The Hon. Secretary would be grateful for reports of VS3AC which may be heard at a later date by either members or non-members, and can promise that a QSL card will be forthcoming. All inquiries should be addressed to the Hon. Secretary, C. A. Harley, 85, Fisherton Street, Salisbury, Wilts.

Radio and Television Society (Northwood)

THIS Society had its first meeting on Sunday, November 8th, when the committee was appointed and the activities of the society discussed. It was decided that a review of modern sets would be made at each meeting. On Sunday, November 15th, Mr. Wallace read a paper to the society on "Short-wave Adapters and Converters," in which he pointed out the natural disadvantages of the apparatus due to stray capacities, and concluded his talk with a practical demonstration on a Marconi receiver, utilising an adapter he had constructed. At the next meeting details of a high definition television set will be discussed, with a view to the formation of a vision section.

Details of further activities may be obtained from the Hon. Secretary, R. B. Gardner, 91, Clarence Gate Gardens, London, N.W.1. Membership is confined to the Merchant Taylor's School for the most part, but correspondence on the club's action, with suggestions, will be gratefully accepted.

The Exeter and District Wireless Society

A LARGE and enthusiastic audience at a recent lecture of the Exeter and District Wireless Society heard a very lucid and interesting talk, illustrated with lantern slides, on the maintenance and care of modern batteries, the talk being given by Mr. Stanley Brown, A.M.I.W.T. The lecturer took his audience through the complete manufacture of the battery from the lead in its raw state to the completed plates as they appear in a cell, either of a starter or a radio battery.

A feature which was stressed was the tell-tale gravity clock, which is incorporated in most radio batteries of to-day, the error in this piece of mechanism being demonstrated to be less than one half of 1 per cent.

The Society's meetings are held every Monday at No. 3, Dix's Field, Exeter, and prospective members are asked to contact with the Secretary, W. J. Ching, Sivell Place, Heavitree, Exeter.

Radio, Physical and Television Society

DURING the past year the Radio Physical and Television Society has made considerable progress; since January its membership has increased by nearly 75 per cent. The success of the Society is due, in no small degree, to the excellence of recent lectures.

At a recent meeting Dr. C. G. Lemon lectured on "Cathode-ray Tubes." The use of the oscillograph for investigating distortion in amplifiers was explained and demonstrated by deliberately introducing distortion into an amplifier. Other recent lectures have included "Bacteriological Methods," by Lt.-Col. C. J. Coppinger, and "Short-wave Receivers," by Mr. J. G. Hobbs. Meetings are held every Friday during the winter months at 8 p.m., at 72a, North End Road, when lectures and demonstrations are given on various radio and physical subjects.

Those requiring further details are invited to write to the Hon. Secretary, Mr. V. R. Walker, 49, Fitz-James Avenue, London, W.14.

Bradford Short-wave Club

THE above club recently had a demonstration of Lissen short-wave and all-wave sets.

On Friday, December 11th, Mr. G. A. Briggs, of the Wharfedale Wireless Works, will give a lecture entitled "How to Judge a Loudspeaker." The lecture will be held in the club-room at Bradford Moor Council School, Leeds Road, Bradford, to commence at 8.30 p.m. An application is being made for an A.A. licence, and a very interesting programme is in store for the winter. A cordial invitation is offered to anyone interested in amateur radio, who is desirous of attending any of the club's meetings which are held every Friday in the above school. The Hon. Secretary is Mr. G. Walker, 33, Napier Road, Thornbury, Bradford, Yorks.

(*Continued on opposite page*)

FREE ADVICE BUREAU

COUPON

This coupon is available until December 19th, 1936, and must be attached to all letters containing queries.

PRACTICAL AND AMATEUR WIRELESS, 12/12/36.



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CLUBS AND SOCIETIES

(*Continued from opposite page*)

Swindon and District Short-wave Society

THE above society still continues to progress. Formed just over twelve months ago with a very small membership, it has now grown to be a very active concern. Meetings are held fortnightly, when lectures are given and also discussions and morse practice. The Society are making application for an A.A. transmitting licence, and are also constructing a club short-wave receiver. The President of the Society is W. W. Wakefield, M.P., and Vice-Presidents are G6LM and G2HN, both of Chippenham, whose signals are well-known in various parts of the world.

At the meeting on November 26th, Mr. E. W. Mortimer gave a very interesting lecture on "Condensers, their Manufacture and Uses." This was very much appreciated by the members. F. A. Jefferies, Radio 2AKB, of Oxford, is to give a lecture on 5-metre transmitters and receivers in the near future. The Society welcome new members, and anyone interested is invited to communicate with the Hon. Sec., W. C. Barnes (2BWR), 7, Surrey Road, Swindon.

The Croydon Radio Society

"THE Emotional in Music" was the lecture given on Tuesday, November 24th, in St. Peter's Hall, South Croydon, by "Amphion," music critic of *The Croydon Advertiser*. It required, he said, a good deal of experience to tell the difference between a top flight violinist and the second rank merely by ear. In fact, only a limited number of people could dissociate the music from the performer and listen to it just for its own merits. He went on to emphasise that music spoke a language amply sufficient to convey all it meant, and need not be translated into a story to be intelligible.

Summing up, "Amphion" insisted that expression of profound emotion was peculiarly the province of the great masters. What passed for emotion in so-called "popular" music was really only superficial sentiment, and as exemplified in the output of crooners, was more appropriate to certain forms of mental disease than to emotion of normal humanity. On Tuesday, December 15th, one of the Hon. Secretary's ever-popular musical programmes on gramophone records will be given, to which readers are invited. Hon. Pub. Sec., E. L. Cumbers, Maycourt, Campden Road, South Croydon.

Harco Radio Club

THE above club is progressing favourably, and most of the members are interested in short-wave adapters and learning the Morse Code. All readers of PRACTICAL AND AMATEUR WIRELESS are welcome at any of our meetings, which are held every Tuesday at 8 o'clock. In the near future we are having a television demonstration, to be given by a well-known manufacturer of television material. Sec. C. W. Kemp, Dept. (HRC), 124, River Way, Greenwich, London, S.E.10.

Wirral Amateur Transmitting and Short-wave Club

THE usual monthly meeting was held on November 25th, at King's Square Café, in Birkenhead, at which a junk sale and a raffle were held. Great amusement was caused by Mr. Rogers, who auctioned the junk. The next meeting will be on Wednesday, January 6th, 1937. All details from the Hon. Secretary, B. O'Brien, Caldy, Irby Road, Heswall.

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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.)

"On Your Wavelength": Baseboard versus Chassis

DEAR THERMION,—Having been a reader of PRACTICAL AND AMATEUR WIRELESS for some time I have taken the pleasure of turning to my favourite page, "On your Wavelength," every week. What I want to know is: Why all this bother about Baseboard versus Chassis? I really think that panel mounting holds the record of construction as far as wireless dates back. A chassis was never heard of until some "secret" kind of fellow dropped into this world. My set at present is one taken from the first number of PRACTICAL WIRELESS. It is a one-valver, and I can get anything, within reason, from the Empire stations to Australia, and some American stations. The set is built in a large cigar box which provides both baseboard and chassis. As far as neatness goes I prefer a chassis.

I still think that "On your Wavelength" is still as good as it was years ago. Wishing your page all success and support.—S. G. Lewcock (Fyzabad, India).

An Enthusiastic American Reader

SIR,—I wish to thank you for publishing my letter in the October 10th issue of PRACTICAL AND AMATEUR WIRELESS, and also to express my thanks to those who write me. I have gained about two dozen new friends "across the pond," and still receive a letter from a new one occasionally. My list of QSL's has increased somewhat since my last letter. The latest DX cards received are CO2XF, TI3AV, VE1CR, VE2BE, VE4SS, VE4WR, NY2AE, ON4VK, HI5X, HI7G, XE1BT, XE1FY, XE1G, VP6YB, VPD2, HI1A, and PY2AK. If any SWL has written PY2AK in the past month, don't be impatient; I waited from July 25th to November 14th, but the QSL finally showed up!

The latest American QSL's received are W1FNW, W2BTV, W2CVI, W2DH, W3AKE, W3BOS, W3DMR, W3EWW, W4EBW, W5CRG, W5DWP, W6CQG, W6NUP, W7DNB, W7EKA, W7EUZ, W8JO, W8MMH, W9HBP, W9PWU, W9RBG, W9WSI, W9XBY, and W9WZW. All of these stations were heard on 20 metres, with the exception of one or two. W9PWU, Arvada, Colorado, sends a beautiful card. Anyone hearing him should get his card; it's the most beautiful in my American collection. CO2XF, Havana, also on 20 metres, sends an excellent card.

Regarding that Ambato (Ecuador) station reported last week, the call letters are HCDT, and they verify. JVH has been coming in the past two evenings, but has dropped from QSA5 R7/8 to QSA4 R4/5. VK2ME is slowly fading out as winter approaches, but 3LR and 3ME continue to come in at QSA5 R8/9.

Now that I have heard from several British SWL's, I would appreciate it very much if some of the boys in India, Africa, Fiji, New Zealand, and Australia would drop me a line! Also, I hope some G ham will get in touch with T. E. Lowe, 28, Allenby Road, Cadishead, M/C., so that we can arrange a sked for a QSO *via* a W9 station here in Wauwatosa.—WARREN H. STARK (2117, North 62nd Street, Wauwatosa, Wis., U.S.A.).

QSL Cards and Reports

SIR,—Having keenly followed the QSL controversy carried on in your columns, I feel perhaps a few words from an "Old Timer" might be acceptable. Mr. E. de Cottignies, I think, gives the clue to the position. He says: "My aim in collecting . . . is the verified All Continents Certificate." Quite a legitimate course to follow I will admit. But pity the amateur transmitter who is expected to supply all these veri's. Is it surprising that he feels the QSL card craze is approaching the cigarette coupon collecting stage? To him, the vast majority of reports are of little practical value. There are so many amateur transmitters on the air these days that he can get what reports he needs by direct QSO.

Apart from any expense, think of the work incurred if all reports received are to be conscientiously checked against the station log. The necessity for such a check is evident when I mention that I receive a fairly regular supply of reports, most of them very scrappy, on my 20 metre 'phone, although I never use 'phone and never work in the 20 metre band!

On the other hand a real DX report on a 56 mc. signal would be worth a gold-plated QSL. It is extremely difficult to get regular and reliable observers on the frequency bands where their co-operation is most urgently required. My advice to those transmitters who are nearly buried under an avalanche of listeners reports, is, use CW more, and try the other frequency bands. To the listeners, I would suggest: Learn to read Morse, and try the 56, 28, 3.5 and 1.7 mc. bands.—W. D. Keiller (G6HR, Edmonton).

CUT THIS OUT EACH WEEK

Do you know

—THAT special adapters are obtainable which enable any type of valve to be tested in an instrument fitted only with a standard 9-pin valveholder.

—THAT vibration of the vanes of a tuning condenser can cause "fading" in a superhet or similar sharply-tuned receiver.

—THAT instability can be caused by the radiation from the lead attached to the anode terminal of an S.G. or H.F. pentode valve.

—THAT crystals ready ground to oscillate at fixed frequencies may be obtained for transmitting apparatus.

—THAT these crystals are not of the same type as are used for modern crystal pick-ups and speakers.

—THAT special constant-frequency records are obtainable for testing receivers and L.F. equipment.

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, *George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.*

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

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.

J. M. H. (Penarth). You will find Blueprint numbers in the list of blueprints published on page 404 of issue dated Dec. 5th, 1936.

H. W. (Audenshaw). Although the set could be used as an adaptor a converter would be of greater use in your particular case.

W. L. (Belfast), B. B. (Romford), and Others. We are reprinting in this issue (see page 422) full constructional details of the one-valve short-waver, and you will find all the essential details are given on that page.

H. T. (S.W.16). The construction is very simple, and you can hardly have gone wrong there. Have you adjusted the crystal correctly? A good aerial is also essential.

R. G. (Cheltenham). Messrs. Mullard can recommend alternatives from their latest list. Your method of adjustment simply altered the inductance of the coil (due to the presence of the metal in the torch), and this is similar to tuning. It also, no doubt, acted as a partial screen, and thus reduced the coupling between the aerial and grid coils.

H. L. (Isle of Man). The N.T.S. receiver reviewed in last week's issue, costing £2 2s. is, no doubt, the nearest receiver to the type referred to in your letter.

J. H. (Carragh Camp). You could alter the output, but must be on your guard against overloading of the input valve. The double-diode-triode is generally employed in order that A.V.C. may be obtained, but this feature was not included in our receiver. Hence the use of a simple triode. Q.P.P. could also be used here.

H. W. (Stockport). We cannot recommend any blueprint from the details given in your letter. We only recommend our receivers when the specified parts are used.

W. H. (Clydach). We have several "straight three" circuits in our blueprint list, but cannot send C.O.D. Neither can we recommend one from the few details given in your letter.

V. R. R. (Madras). You would apparently need a wholesaler's catalogue, but we are not clear from your letter whether you require parts for building sets, or replacements for commercial sets received for repair.

H. B. (Houghton). The coils are made by Messrs. Colvern. Write direct to this firm at Romford, Essex.

A. G. (Bulawayo). The Simpson turntable is a synchronous model and thus must be used on a 50-cycle A.C. supply. The other motor referred to is a simple type, and is independent of the frequency of the supply. We do not know the prices in Southern Rhodesia.

S. D. K. (Edinburgh). We refer you to the article on short-wave coils given in our issue dated May 9th, 1936.

T. C. L. (Merthyr). You can use the coils in question in the Universal Superhet.

W. A. C. (Leix). The wiring is not complete. The filament circuit is not joined to the Earth line. When this has been done the G.B. positive lead should be joined to the same point, and the H.T. plus 2 lead should be attached to the other side of the speaker.

D. M. (Liverpool 9). A reversal of the connection at the points A and B on your sketch should not make a great deal of difference. However, you can try it. No damage can arise. The circuit is, in all other respects, quite in order.

S. S. (Shottan). We have no details of the transformers in question, and the makers did not supply the characteristic curves of them.

J. B. J. (Reigate). We have no blueprint which would enable you to use the parts. What type of coils do you refer to? We only guarantee our receivers when the specified parts are used.

F. T. H. (Thornton Heath). Perhaps a transformer is required between the speaker and the output of the set. If one is not fitted, the 15-ohm speech coil would not match the output valve of the amplifier, and you should, therefore, fit an output transformer. If there is already one in position, the hum may be due to pick-up on the speaker leads, or acoustic feed-back from the vibrating diaphragm to the valves in the amplifier.

B. B. (Tiverton). The issue is now out of print.

D. C. (R.F.A., "Elmol"). The only modification, short of rebuilding or re-fitting the receiver, is to parallel feed the L.F. transformer, using a 2-mfd. condenser to obtain a certain amount of bass resonance. Any change in the value of the decoupling condenser referred to will not affect tone. You show no tone control across the pentode output circuit, and should connect a .01 mfd. fixed condenser in series with a 10,000 ohm variable resistor and join these two across the loudspeaker terminals. The variable resistor will enable you to adjust tone with fairly wide limits.

V. M. R. (S.W.8). The combination should certainly function, and we should be glad of more details in order to try and trace your trouble.

W. L. M. (Codnor). We shall publish the details again in the near future. We give in this issue details for the other crystal receiver.

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THE BRITISH LONG DISTANCE LISTENERS' CLUB

Station Reports

AN interesting suggestion has been put forward to Mr. Barrs concerning the station reports which he undertakes each month. In putting forward this suggestion Mr. Barrs writes as follows: "Here is an idea. Mr. C. G. Collett suggests that we get two S.-W.L.'s in six or eight different counties of Great Britain and ask them to keep a regular log of the station we are checking, so that we will be certain of having a very accurate report for the station. What do other S.-W.L.s think of this idea? I think it is the one sure way to success. I suggest that two S.-W.L.s in the following counties listen to the stations chosen for December: Norfolk, Glamorgan, Stafford, Northumberland and Warwick. We have one S.-W.L. reporter in each of the following counties, Lancashire, Yorkshire, Lincoln, Gloucester, Glamorgan, London and Surrey, so if we get one more S.-W.L. in these, that will make it two S.-W.L. reporters in fourteen counties.

"We have two in Hampshire already, so will S.-W.L.s in the above counties please try to help with this idea. Their assistance will be appreciated very much."

A Club for Edinburgh

THE proposal for a short-wave club for Edinburgh and District has met with a fair amount of success since the idea was put forward a few weeks ago. There are now several prospective members, but at the present the membership would not be large enough to permit the inauguration. We should be glad if interested readers would get in touch with Mr. S. D. Keeble, at 118, Craiglea Drive, Edinburgh 10. This club is for short-wave enthusiasts of South-east Scotland, and inquiries are invited from B.L.D.L.C. members and otherwise in this sector. Full details will be sent to all prospective members before the first meeting.

For Middlesbrough Readers

WE have received a request from a new member, Mr. G. Ralston, of 18, Bowley Street, Middlesbrough, concerning the learning of the Morse code. He would like to get into touch with a fellow member in his district with a view to forming a practice class, and perhaps if any local reader is desirous of helping he will get into touch direct with Mr. Ralston.

A Problem Solved?

A MEMBER in India, Mr. A. B. Hulme, sends us some interesting information regarding stations. He says: "I have read the request of Mr. Austin S. Read, Aden, in the issue of PRACTICAL AND AMATEUR WIRELESS dated October 31, and am able to make two suggestions as to the station which this fellow-member has heard on about 6,780 kilocycles.

"The station may be JVT, Nazaki, Japan, on a frequency of 6,750 kc/s. I have no veri from this station, but am able to receive it regularly at R8. In the list of stations I use the power is given as 20 kW. The second suggestion is that the station is XGOX, Nanking, China, on a frequency of 6,820 kc/s. This, of course, assumes that the calibration of Mr. Read's receiver is at fault, but I mean no offence by this, as I have found that my receiver requires fairly frequent adjustment on the frequencies from 6,000 to 8,000 kc/s in this tropical climate. I have a veri from Nanking giving their frequency, the address being The Central Broadcasting Administration, Nanking, China.

"It may be of interest to members to know that as from January 1st, 1937, no verifications of the N.I.R.O.M. stations in Java will be sent. In a recent issue of PRACTICAL AND AMATEUR WIRELESS I noticed a member with a grievance against SM5SX about the time taken for them to send a verification. This is exactly the opposite experience to mine as I had a veri in the form of a very nice letter and a QSL card within a very short time of sending my report. This station asked for further reports when verifying my reception.

"If you can put me in touch with any members of the B.L.D.L.C. who would care to correspond with me on the subject of short-wave radio I shall be very glad indeed. I have a six-valve superhet receiver and am able to listen to countries all over the world on it. This will enable me to compare notes with correspondents in many parts of the world. My address is: P.O., Seorahi, District Gorakhpur, United Provinces, India."

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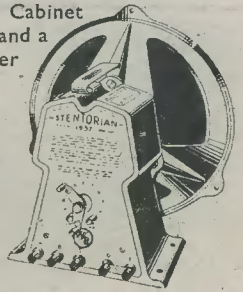

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QUERIES and ENQUIRIES

The "R" Code

"In the Letters from Readers section I have noticed that certain readers say they heard a certain short-wave station at a steady 'R.9.' What is meant by that?"—J. W. (Inverness).

THE "R code" is an arbitrary code of signal strengths which is in use by amateurs and has been adopted in order to give an indication of the strength at which a signal is received. Unfortunately, it is not a measured strength but is based upon audibility, and the table is as follows:

R1—Faint signals—just readable.
R2—Weak signals—barely readable.
R3—Weak signals—can just be copied.
R4—Fair signals—easily readable.
R5—Moderately strong signals.
R6—Good signals.
R7—Good strong signals, readable through interference.
R8—Very strong signals. Audible several feet from 'phones.
R9—Extremely strong signals—good loudspeaker volume.

Screen-grid Voltage

"I notice that in most battery circuits that have been drawn up the auxiliary grid on the S.G. valve has its voltage supplied from a separate tapping on the H.T. battery. Could not this be dropped and decoupled by a resistance in the usual manner? Also, I should like to know if it is possible to calculate the correct value for the anode or extra grid in any valve, only knowing the valve manufacturers' data."—F. G. (Rugby).

THERE are two reasons for using a separate battery tapping for the S.G. voltage, one being that it is cheaper, as the decoupling components are dispensed with, and the second being that it enables the user of the receiver to experiment and find the most suitable working voltage. It is quite permissible to use an automatic supply and this has been done in several of our receivers. The manufacturers' data sheet generally gives the screen and anode current and thus it is quite simple to work out the value of the voltage dropping from Ohms law.

Varley Coil Connections

"I have in my possession two Varley Nicore tuning coils, type B.P.30. These are marked 1 to 8 and I should like to know the connections. Also, what kind of switch is needed for wave-changing and what range would they cover if combined?"—F. C. (Radcliffe).

THE coils are fitted with a wave-change switch in the base, and a switch rod has to be passed through them for wave-change purposes. They are simple tapped aerial coils, with a tapping on the medium- and on the long-wave section. Terminal 1 is joined to the grid, terminal 2 to earth, and the aerial or anode is joined to terminal 3, and this point is automatically transferred to the medium- or long-wave tapping when the switch is operated. The reaction winding is joined to terminals 7 and 8. These two coils were employed in our Three-Star Nicore receiver.

RULES

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 querists.

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.

Requests for Blueprints must not be enclosed with queries as they are dealt with by a different department.

If a postal reply is desired, a stamped addressed envelope must be enclosed. Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

The Coupon must be enclosed with every query.

Double Push-pull

"Would it be possible to have two push-pull stages as an L.F. amplifier, two power valves and then two super power valves? What would be the approximate output of such a hook-up?"—G. D. B. (Bournemouth).

IT would be quite in order to make up a circuit of the type mentioned, and this is, in fact, done in certain power public-address outfits. The only point is that the second push-pull stage must incorporate valves capable of taking the large grid voltage which will be delivered by the first push-pull stage, and very often it is necessary to use two valves in parallel in each "leg" of the second push-pull stage to enable this to be done. The output is, of course, dependent upon the output valve and the fact that a push-pull stage precedes it does not affect the matter. The maximum output of any push-pull stage is approximately 25 per cent. greater than the combined amplification of the two valves employed in that stage. That is, of course, when the valves are fully loaded.

Accumulator H.T. Supply

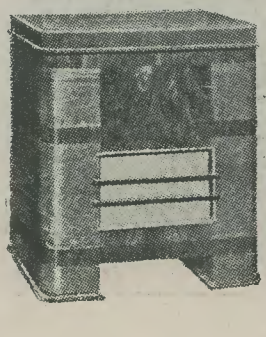
"I have a D.C. supply of 120 volts, and I wish to use this for my H.T. supply. Could you please give me information regarding the building of a D.C. mains unit? The supply is obtained from 60 2-volt accumulators. What dropping resistance would be necessary if the detector valve consumes 1.3 mA at 70 volts, and the power valve 6 mA at 120 volts?"—A. R. (Cheltenham).

AS the supply is obtained from accumulators there should be no necessity for chokes or other smoothing apparatus and the supply should be quite suitable for H.T. No resistor is required for the output valve, which should be connected direct to the supply, but the detector valve should be fed through a resistance of 40,000 ohms in order to provide the necessary 70 volts. This value is obtained by subtracting 70 from 120 and dividing the answer by the number of milliamps. This gives the resistance in thousands of ohms, and 40,000 is the nearest approximate value which may be purchased.

Television Valves

"I am keen to start experimenting with a television receiver, but there seems to be a dearth of data concerning the available equipment. For instance, I believe that inter-electrode capacities can play havoc with certain types of picture receiver, and also that the question of insulation must receive considerable attention in designing a receiver. Is it not possible to give us any data concerning the subject of home-construction for this particular type of apparatus?"—G. S. (Pinner).

UNTIL manufacturers release details of components which they have available we are obviously unable to publish any such data. You will note, however, in this week's issue that details of some of the recently developed Mazda valves are given, and fuller characteristics will be published as soon as they are received. No transformer manufacturer has yet supplied details of a suitable transformer, nor, so far as we can trace, has one been designed for the home-constructor. No doubt one reason for the delay is in the fact that the manufacturer of such a component does not know the circuit the user intends to adopt for his cathode-ray tube, i.e., whether the anode or the cathode will be earthed, and thus the problem of insulation arises. However, the constructor kits referred to last week show that some move is now being made to meet the demands of the home-constructor.



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Potentiometers by well-known makers. All values up to 1 meg., **2/-**; with switch, **2/6.**
GRAMOPHONE MOTORS. Collaro Gramophone Unit consisting of A.C. motor, 100-250 v. high quality pick-up and volume control, **45/-**; Collaro motor only, **30/-**; Collaro Universal Gramophone Motor, 100-250 v. A.C./D.C., with high quality pick-up and volume control, **67/6**; Collaro Universal Motor only, **49/6**; Edison Bell double-spring motors, including turntable and all fittings, **15/-**; Cosmocord Gramo unit, comprising A.C. motor, pick-up and volume control (list 55/), **35/9.**
TUBULAR CONDENSERS, non-inductive, all values up to .5 mfd., **6d.** each.
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Reliable **MORSE KEYS** with Morse Code engraved on bakelite base, **2/-** each.
Bakelite case **BUZZERS, 1/6**; Walnut case "Loud-tone," **2/6** each.
Super Quality lightweight **HEADPHONES, 3/9** pair.

HAVE YOU HAD OUR LATEST GIANT ILLUSTRATED CATALOGUE AND VALVE LIST? IF NOT, SEND 4d. IN STAMPS FOR THIS AMAZING LIST OF BARGAINS!

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TEL. : HOLBORN 4631.

LISSEN 4-VALVE A.C. BAND PASS RECEIVER, a splendid job, fitted in handsome Walnut Cabinet complete with Energised Moving Coil Speaker, Connection for Pick-up; listed **9 guineas**; sent out aerial-tested by our own engineers, **70/-**.

8-VALVE A.C. MAINS SUPERHET RECEIVER, by well-known manufacture incorporating many refinements. Visual Tuning, illuminated colour coded Volume Control, Local Distance Switch, etc. Fitted in Handsome Bird's Eye Maple Cabinet, Size 16" Wide, 12" Deep and 23" High. Comprising the following Valves: AC/VPI, FC4, AC/VP1, AC/VP1, AC/HLDD, V914, AC 2 Pen, IW3. Pre H.F. Stage, 2 I.F. Stages, Full A.V.C., etc. Limited Quantity, **£7 15s.**

EXCLUSIVE BRITISH RIGHTS HELD BY US FOR CONSTRUCTRAD SHORT-WAVE KITS; all Kits supplied, Valves free, 5 Interchangeable Coils, covering a range from 15-600 metres; complete set, not a converter.

ONE-VALVE BATTERY KIT, 29/6.
TWO-VALVE BATTERY KIT, 32/6.
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THREE-VALVE A.C./D.C. KIT, 50/-.

EVER READY 5-VALVE BATTERY SUPERHET; an up-to-the-minute modern receiver fitted 5 Valves (ring), etc., A.V.C., provision for Extension Speaker and Pick-up, latest square type dial calibrated in metres and station names; listed 12 guineas; last few to clear, **£5 10s.** Carriage Paid.

LISSEN BATTERY BAND PASS 3, a Handsome Receiver in Walnut Cabinet of upright design, complete with Valves as follows: Var. mu Screen Grid, Detector, Pentode output; sent out aerial-tested and guaranteed, **57/6.**

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250-0-250, 80 m.a., 2-0-2 volts, 2.5 amp, 2-0-2 volts, 4 amp., **8/6.**
350-0-350, 120 m.a., 2-0-2 volts, 2.5 amp, 2-0-2 volts, 4 amp, **10/6.**
350-0-350, 150 m.a., 2-0-2 volts, 2.5 amp, 2-0-2 volts, 4 amp, 2-0-2 volts, 2 amp, **12/6.**
500-0-500, 150 m.a., 2-0-2 volts, 2.5 amp, 2-0-2 volts, 6 amp, 2-0-2 volts, 2 amp, 2-0-2 volts, 2 amp, **17/6.**
H.T.8 TRANSFORMER, 250 volts, 60 m.a., 2-0-2 volts, 4 amp., **8/6.**
Ditto with H.T.8 Metal Rectifier, **17/6.**
All Transformers are fully shrouded.

BRYCE MAINS CHOKES.
40 m.a. 30 Hys., 500 Ohms, **4/6.**
60 m.a. 40 Hys., 500 Ohms, **6/-.**
150 m.a. 40 Hys., 200 Ohms, **10/6.**
250 m.a. 15 Hys., 200 Ohms, **21/-.**
60 m.a. 80 Hys., 2,500 Ohms for Speaker Replacement, etc., **6/-.**

SPECIAL CLEARANCE CHOKE, 250 m.a., 12 Hys., 100 Ohms, heavy duty type, interleaved windings, etc., cannot be repeated, **11/-.**

TRIAD AMERICAN VALVES, highest quality, all types, **5/6,** as follows:
01A, 24A, 27, 30, 31, 37, 38, 39, 41, 43, 45, 46, 47, 53, 55, 56, 57, 58, 59, 71A, 75, 78, 80, 6A6, 6F7, 2A3, 5Z3, 12A7, 6A7, 6C6, 6D6, 12Z3, 25Z5.
All these Valves carry a 90-day guarantee, and free replacement, provided that the filament or heater is intact, and the glass not broken when returned to us.

AMERICAN 5-6-7 PIN VALVE HOLDER, Chassis Type, **6d.**

LISSEN 126 SUPERHET ASSEMBLY, comprising 3-gang Coil Unit fully screened (2 Band Pass Coils, 1 Oscillator), 2 I.F. Transformers, fully screened, 1 only 3-gang semi-screened condenser with drive, **8/11.**

CENTRALAB VOLUME CONTROL WITH SWITCH, 5,000, 10,000, 25,000, 50,000, **2/6** each.

LISSEN ALL-WAVE COILS, complete with circuit, switching, etc., sent out in matched pairs, covering 2 short bands, 1 medium and 1 long, **8/-.**

DITTO SINGLE COILS, 4/6.

LISSEN 126 K/Cs IRON CORED OSCILLATOR COILS, screened, **1/-.**

ONE DOZEN PEAK METAL CASED CONDENSERS, paper type, all useful sizes, 0001 plus 0001, .1, .2, **2/6** Dozen.

8 mfd. 500 volt working, 550 volt Surge, Heavy Duty Electrolytic CONDENSER by well-known manufacture, **2/11.**

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8 plus 8 Cardboard, Wire Ends, ELECTROLYTICS, 450 volt working, 500 surge. By well-known manufacture, **3/6.**

50 mfd. 12 volt working CONDENSERS. Well-known manufacture, **1/-.**

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50 mfd. 25 volt working CONDENSERS. Well-known manufacture, **1/3.**

25 mfd. 50 volt working CONDENSERS. Well-known manufacture, **1/-.**

8 plus, 8 plus 4 Electrolytic CONDENSERS, Wire Ends, 450 volt working, **3/11.**

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25 volt, 25 mfd. Electrolytic CONDENSERS, Tubular type, by well-known manufacture, **1/-.**

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(Continued at top of column three)

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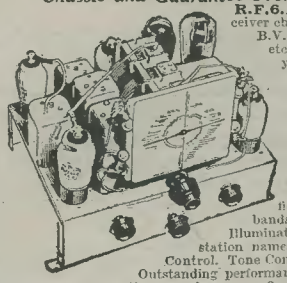
6 VALVE ALL-WAVE RADIO ON EASY TERMS

WE CARRY STOCK of most of the McCarthy Chassis and Guarantee Prompt Delivery.



R.F.6.A.W. Complete receiver chassis supplied with all B.V.A. valves, knobs, leads etc., ready for fitting in your own cabinet (or suitable cabinet and, speaker supplied if required) for only **£8 10** complete; or **27/-** WITH ORDER and 10 monthly payments of 16/-. Specification in brief: 3 wavebands—long, medium, short. Illuminated dial with principal station names. Automatic Volume Control. Tone Control. Switch for gram. Outstanding performance on home and world stations equals average 8-valve receiver. **Write for full 1937 Range of McCarthy All-Wave Chassis from £6.15.0.**

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These splendid speakers are available on Easy Terms:—

37S. Cash or C.O.D. 42/-, or 2/6 with order and 11 monthly payments of 4/-. **2/6** DOWN

PLEASE NOTE OUR EASY PAYMENT TERMS.

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A.C. MAINS SPEAKERS, WITH RECTIFIERS. 100/250 volts, 11in. cone with transformer, **30/-.** Jensen, 220 volt, 7in. cone and transformer, **25/-;** 100 volt, ditto, 7in. cone, **20/-;** 100 volt A.C., 8in. cone with transformer, **21/-.**

7/6

BATTERY ENERGISED SPEAKERS.—Goodman's 6 volt, 8in. cone with transformer, **7/6;** Jensen 6 volt, 7in. cone with transformer, **7/6;** K.B., 6 volt, 8in. cone, **8/6;** Hegra 6 volt, 9in. cone, with transformer, **10/-;** Brown 6/12 volt, 11in. cone, with H.R. speech coil, **17/6;** R. & A. 12-volt, 8in. cone and transformer, **10/-.** New Sonochorde, P.M., "Class B," fitted transformer, **20/-.**

R.M. CABINET SPEAKERS.—Hegra P.M., in oak cabinet, 12in. × 12in. × 12in., **25/-.** H.M.V., P.M., heavy duty, 5 watt with transformer, **50/-;** H.M.V., A.C. energised, 200/250 volts, 5 watts, with transformer, **65/-;** Siemens Magnet table speaker, **4/-.**

PUBLIC ADDRESS HORN UNITS AND SPEAKERS.—M.C. Horn Unit, large type, new, 8 ohms, 8/10 watts, **£7 7s.;** Trix Horn Unit, small size, new, 8 ohms, 5 watts, **£6 10s.;** Trix Horn Unit, large size, new, 8 ohms, 8/10 watts, **£7 10s.;** Brown's Horn Unit, large size, with transformers, for 7,000 ohms load, 5/7 watts, **50/-;** M.C. Vitavox 6 volt Units, 8 ohms, 15 watt size, **30/-;** Brown's Horn Speaker, 36in. horn, heavy duty unit, 120 ohm impedance, **70/-;** Marconi Horn Speakers, P.M., 5 watt size, 8 ohms, 30in. horn, **£4 10s.;** "P" Horn Speaker, P.M., 5½ ohms, 8/10 watts, **£8 8s.;** Short Horn P.M. Speaker, 8 ohms, 2/5 watts, **£3 10s.;** Brown's Cabinet P.A., 5/7 watts, with transformer, **£4.** Siemens Giant Riffell P.A. Speakers, **25/-.**

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SOLENOIDS or model or relay operation, 6v. or 12v. with 2in 1oz. iron travel, **2/6.**

IMMERSION HEATERS.—110 volts, **2/6;** 220 volts, **3/6;** Hotplate, 110 volts, 500 watts, **3/6;** 660 watts, **5/-;** 3-heats, 220 volts hand Motor Blowers, **17/6;** Wax Heaters, 100-250 volts, **15/-;** Bowl Fires, 220 volts, bronze finish, **9/6;** ½ kw. Bar Fire, **7/6;** 1 kw. 220 volts, **17/6;** Elec. Curling Tongs, 220 volts, **5/-.** Elec. Heating Pads, cloth 9" x 7", with flex and adaptor, **12/6.**

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HEADPHONES, Ericsson and others, 2,000 ohms, **4/6.** Single high res. earpieces **2/6.**

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(Continued from foot of column one)

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JENSEN 2,500 OHMS, MOVING COIL SPEAKER, 7/6. each.

MULTI PURPOSE VALVES, suitable for H.F. Pentode, listed 21/-, **3/6.**

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LISSEN CLASS B 1—1 HYPERNIK TRANSFORMERS, boxed, brand new as from makers, **2/6.**

LISSEN H. F. CHOKES, brand New, boxed, disc type, **1/-.**

Enquiries, 1½d. stamp if reply expected.

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SPEAKERS—Celestion Soundex permanent magnet 10/-; Telsen permanent magnet, with 10-ratio transformer to suit any receiver, 12/6; Telsen loud speaker units, 2/6; all brand new and in sealed cartons.

COILS—Telsen, iron core, W349, Midget size, 4/-; Type W478 (twin), 9/- pair; W477 (triple), 16/- set; Type W476 (triple superhet selector and oscillator), 16/- set, all ganged coils complete on base with switch; Telsen I.F. transformer coils, W482, 5/-; Telsen dual range aerial coils, with aerial series condenser incorporated; W76, 4/-; Telsen aerial series condensers with shorting switch, 2/-; Telsen L.F. transformers, Type R.G.4 (4 to 1), 3/-; all brand new, in sealed cartons.

MICROPHONES—Ace (P.O.) microphones, complete with transformer, ready for use with any receiver, 4/6 each.

RESISTANCES.—Tru-ohm 1-watt, colour coded and marked, 36 assorted capacities on card; 6/- per card.

POTENTIAL Dividers.—Lissen wire wound, 3-section, 60-watt, 4,500 ohms, 3,000 ohms, and 2,000 ohms; 3-section, 5 watts, 20,000, 20,000 and 20,000 ohms; 2-section, 5 watt, 50,000 and 30,000 ohms; 1-section, 5 watt, 8,000 ohms, all at 1/3 each; brand new and guaranteed.

AMERICAN Valves.—A full range of valves for all American receivers; 6/- each.

HEADPHONES.—Lightweight headphones, double pole type, 4,000 ohms, each ear piece; 3/- pair.

REPAIRS.—Any type of receivers. American, British, etc., repaired by expert staff.

WE Have Purchased the Complete Component Stock of a Well-known Radio Dealer and Manufacturer, and we are offering the complete stock in parcel lots as under:—

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SHORT WAVE on a crystal set. Full building instruction and crystal, 1/2 post paid.—Radiomail, Tanworth-in-Arden, Warwickshire.

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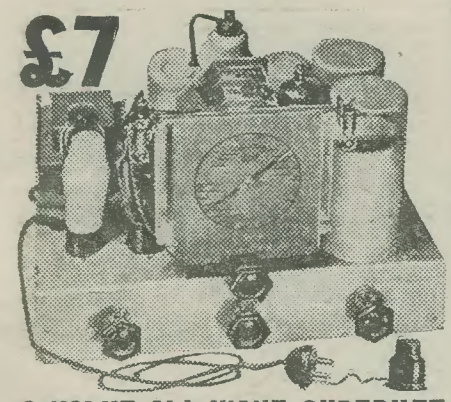

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GRAHAM FARISH SENSITY SUPER

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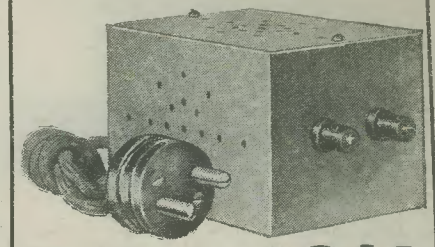

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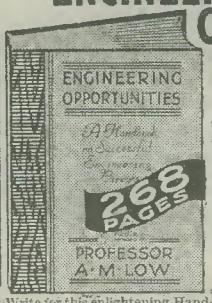

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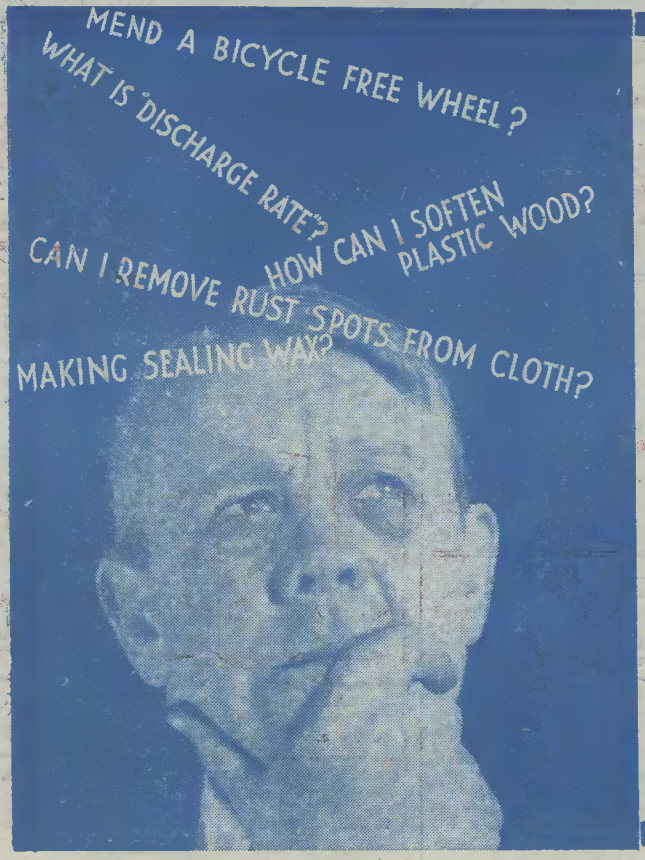

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U-S-W. RECEIVER DESIGN—See Page 451

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

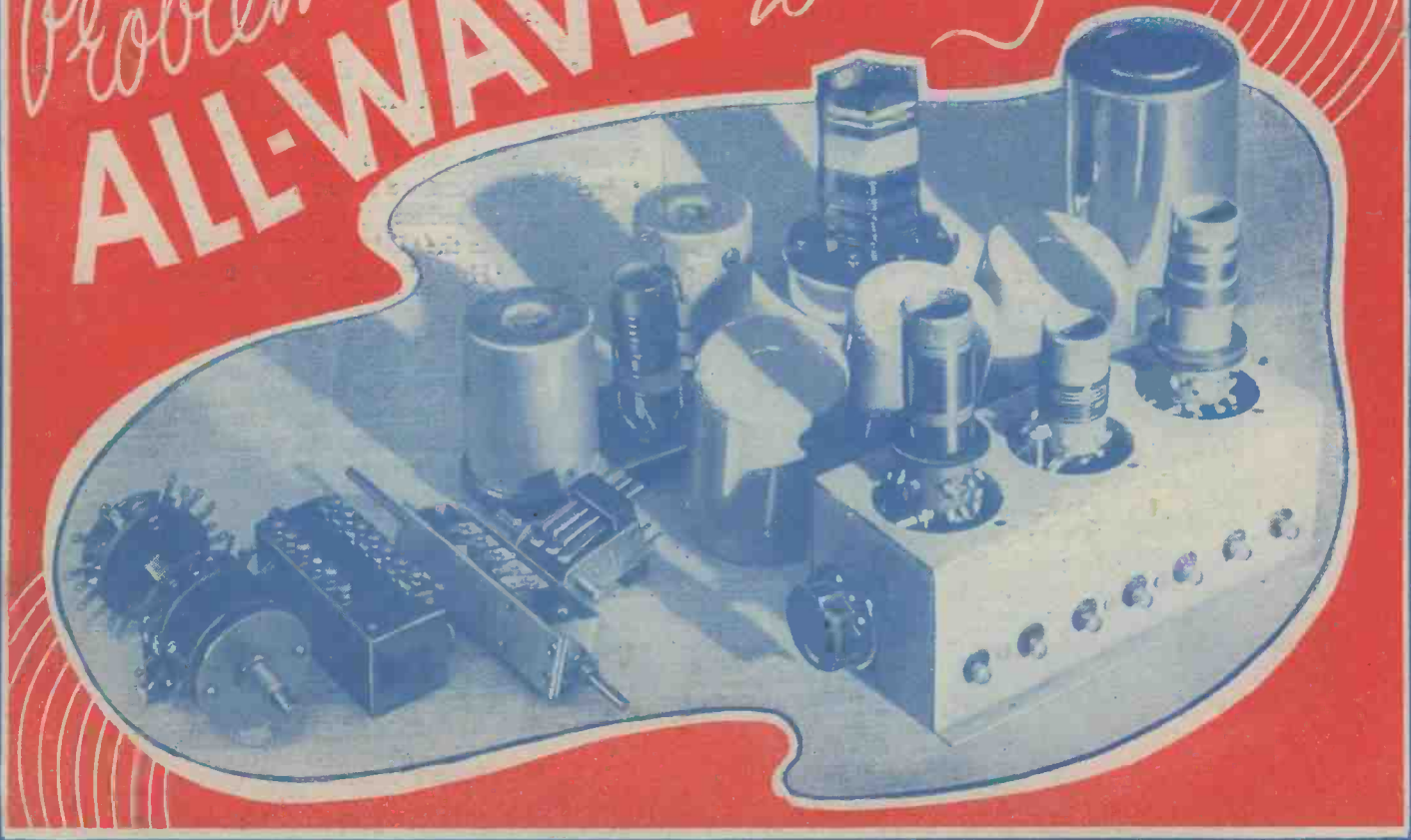
3D EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

Vol. 9. No. 222. December 19th 1936.

Problems of ALL-WAVE Design



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ADVT.

BATTERY LIFE IS AFFECTED BY CHARGE LIFE

A fact not generally known

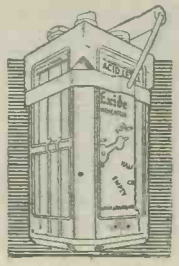
Low tension batteries have undergone the same process of specialisation as most other things and are now produced in various types, each designed to work under certain conditions.

It is, however, not generally known that the life of the battery is adversely affected if it is not used under the conditions for which it is designed. For instance, 'Mass' type batteries containing a few thick plates, such as the popular Exide DTG or DFG, are designed for slow discharge with long periods between recharges. If that type of battery is subjected to cycles of charge and discharge of greater frequency than once a fortnight its life will be shortened. In any case, under those conditions it will not be giving the most economical service, for its full rated capacity will not be obtained.

This type of battery is excellent for small sets with a sufficiently low L.T. current consumption, but lately there has been a marked tendency to increase the size of sets. Over 90% of modern battery sets take 0.4 ampere or more owing to the use of more valves and of illuminated dials.

These loads are too high for the 'D' type of battery and so Exide have produced a new range of multi-plate batteries with characteristics suitable for these new conditions. They are known as Exide 'Hycap' Batteries. The Exide 'Hycap' will give a higher capacity under these heavy discharges, so reducing the frequency of recharging. Listeners gain from 35% to 90% more listening hours per charge. Due not only to the reduced frequency of recharging, but also to the sturdy construction of the multi-plate assembly, 'Hycap' batteries are considerably more durable than thick-plate batteries operated under the same conditions. An additional advantage is that they can be recharged in about half the time required for thick-plate batteries.

With these bigger sets the Exide 'Hycap' will therefore have a longer life and will reduce the cost of listening. Like the 'D' type battery, the Exide 'Hycap' is fitted with the invaluable Exide Indicator, which tells you in time when to recharge.



Sizes and Prices of Exide 'Hycap' Batteries

Type	Voltage	Capacity in ampere hours at the 20 hr. rate	Price (uncharged)
OCG3-C	2	15	8/6
GFG4-C	2	24	10/6
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CZG6-C	2	60	15/6

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R.178

TELEVISION IN THE CINEMA—See Page 448

Practical and Amateur Wireless

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. IX. No. 222. December 19th, 1936.

Round the World of Wireless

Television in Cinemas

IN 1930 an attempt was made to show a large television picture on the stage of the London Coliseum, and the "screen" in this case consisted of over two thousand small electric lamps. In 1932 another large screen was demonstrated at the Metropole Theatre and the finish of the Derby was shown. Now Mr. Baird has gone a stage further, and at a demonstration the other week we saw high-definition pictures on a large screen at the Dominion Cinema Theatre in London. A mechanical system was used, and fuller details will be found on another page. How far distant is the day when we shall be able to see in the cinema a picture in three dimensions and in colour, transmitted by a television system, from some distant point?

Ten Shillings Per Ant

IF you have any white ants to get rid of, Messrs. E. K. Cole will buy them at 10s. per ant. The only restriction is that only fifty are required, and you must supply the purchasers with full instructions for keeping them alive. The reason for this purchase is that Messrs. Ekco are desirious of experimenting with various apparatus to try and solve the problem of making a receiver which is proof against the ravages of these pests. They have tried unsuccessfuly for two years to import them, but in view of the difficulty have now made an appeal here. They will take the ants on one month's appro., and if they pass the doctor's test you get a cheque by return! Apparently listeners abroad have found that these ants will attack a radio receiver and eat every particle except the metal, and a dozen or so can make short work of a cabinet.

Carols

"GOOD King Wenceslas" and "Hark! the Herald Angels," need no introduction, but there are many other carols which are not so well known to many listeners in certain parts of the country. The B.B.C. Mobile Recording Unit has been touring Cornwall, Dorset and Somerset and has recorded some interesting carols from the West Countrie. These will be heard in a programme to be entitled "Sing We Merrily," on December 21st, and should be well worth hearing.

Cinema Variety

THE combination of variety turns and cinema pictures is growing, and many cinemas now make a big feature of their variety "hour." The B.B.C. Variety Director is endeavouring to form a closer link between his department and this section of cinema entertainment, and the first experiment is to be carried out this week.

Sweet, Sympathetic or Swing?

WHAT is the most popular form of modern music? This question is a difficult one to solve, but the Northern station director is endeavouring to find a solution on December 22nd when three popular orchestras will compete for favour. Tommy Matthews and his Concert Orchestra will play symphonic arrangements of jazz (with the accent on "sympathy"), Henry Reed and his Orchestra present swing music, and Richard Valery and his Orchestra, which consists of string instruments only, will play the sweet section.

B.B.C. Talks Director

OVER eight hundred applications were received in reply to the B.B.C. advertisement for a director of talks. The final selection has resulted in the appointment of Sir Richard R. Maconachie, K.B.E., C.I.E. He has had a distinguished career abroad and was for some years in the Indian Civil Service. From 1930 to 1935 he was British Minister at Kabul. Mr. J. M. Rose-Troup, the present temporary Director of Talks, has been appointed Assistant Director of Programme Administration, and Mr. G. R. Barnes, a senior Assistant in the Talks Department, becomes Assistant Director of Talks.

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 ENCYCLOPÆDIA. 4th Edition, 392 pages, 490 illustrations, 5/-, or by post 5/6.

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

Jewish National Station

AN interesting note has been received from Central Europe concerning a proposed broadcasting station for Jewish listeners. It is stated that the proposal has been put forward in an endeavour to counteract the various anti-Semitic broadcasts which are made from certain European stations, and the proposed station is to be erected either in Czechoslovakia or Switzerland.

A Northern Exhibition

IT is stated that next year the North will run its own radio exhibition. At Newcastle the local traders are getting together with a view to making all arrangements well in advance, and it has already been stated that December is to be selected for this show. Will this be the Radiolympia of the North?

New Reproducers

WE have often in these pages commented on the apparent lack of inventive progress so far as the loudspeaker is concerned. Is the present component the best for reproduction? In Japan it appears that a radical departure from convention is being made by a wireless engineer who has evolved an entirely new type of "air-impulser" in which the frequency band covered is vastly wider than that we now take as adequate.

Prague Experimental Broadcasts

PRAGUE is now testing out two new channels for its relay of the medium-wave programmes; they are 25.34 m. (11,840 kc/s) and 49.75 m. (6,030 kc/s). These frequencies were not those originally allotted to the station and, for this reason, may only be used temporarily. Bear in mind that the call mentions *Praha*, and not Prague, even when the woman announcer gives it out in German, French and English in addition to her native language (Czech).

Vienna Also Tries Out New Channel

HAVING increased its power to 1.5 kilowatts the Austrian short-wave station OER3 relays the Vienna programmes daily on 25.42 m. (11,801 kc/s) between G.M.T. 15.00-20.00, with an extended broadcast to midnight on Saturdays. So far I have not picked it up on Sundays. The call is *Radio Veen* (Wien), and the interval signal a fast-ticking metronome as adopted by all other Austrian studios.

ROUND the WORLD of WIRELESS (Continued)

INTERESTING and TOPICAL NEWS and NOTES

"To-morrow will be Christmas"

ACTUAL last-minute Christmas activities will be broadcast in a programme entitled "To-morrow will be Christmas," on December 24th, when Western Regional listeners will hear the last minute auction sale of turkeys at Bristol Meat Market, a description of the day's activities in some wine cellars, and a broadcast from Corsham Court of the ceremony of the welcoming of the waits.

Pantomime Review

A SPECIAL programme appropriate to the festive season will be broadcast on December 23rd, when listeners will be taken behind the scenes at some West Country theatres, where the final rehearsals for pantomime are in progress.



Children delight in identifying stations from all over the world, which can be received on the new "His Master's Voice" Model 482 All-wave Superhet. H.M.V. 482 has six valves and incorporates a new type of fluid light indicator, which gives extreme accuracy of tuning. The price of this receiver is 16 guineas.

Carol Programme

ON Christmas Eve Northern listeners will hear a specially arranged programme of carols by the Newcastle Studio Choir, and the Northumbrian Singers.

Philips Radio Factory Expansion

WE understand that work is to commence immediately on the erection of another big factory block at Mitcham for Philips Radio. The new extension, which has been necessitated by the increased demand for Philips radio receivers, will have a floor area of approximately 60,000 sq. ft., and when completed will give employment to an additional 800 to 1,000 workers. The factory already employs 3,500 people. According to an official of Philips Radio this is the fourth extension the firm has been compelled to make in the past four years, and its undoubtedly a heartening sign to the whole British radio industry.



An aerial view of the extensive works of Philips Radio at Mitcham.

Miss Esther Coleman

WE reproduce on this page a charming study of Miss Esther Coleman, one of the most popular songstresses on the radio, with her new Ekco receiver. Miss Coleman, who has a number of Luxembourg and Radio-Normandie engagements during the Christmas period, is also booked for a B.B.C. show in the first week of the New Year. The receiver shown in the illustration is model AC97, a 9-stage High Fidelity Superhet. In walnut the price is 12½ gns., and in a black and ivory finish, 13 gns.

New B.B.C. Appointment

ACCORDING to a recent B.B.C. announcement, Miss Rose Temple has been appointed Assistant in the London Regional Children's Hour, and will take up her new duties on December 29th, 1936. Miss Temple studied at the Old Vic Dramatic School and has since been engaged as assistant stage manager for productions at Sadler's Wells, the Shaftesbury Theatre and the Old Vic.

Orchestral Concert

ON December 19th Reginald Burston will conduct the B.B.C. Midland Orchestra in a programme which includes Eric Coates' suite "From Meadow to Mayfair," and a selection from "Mercenary Mary."

Young Artists Programme

SIX young artists, most of whom have broadcast once before, will provide the Children's Hour Programme from the Midland Regional on December 17th. Ronald Cook and Donald Aldrick, of Birmingham, will play piano duets; John Taylor, of Hinckley, the piano accordion; Millicent Phillips, of Redditch, is to sing. There will be animal imitations by Olive Huntley, a Derbyshire girl, and impersonations by Ronald Bunker, of Warwick.



Esther Coleman, famous BBC singer frequently heard in Variety, Concert and Children's Hour programmes, at home with her Ekco receiver.

Holly Follies

FROM Aberdeen comes the news that an unusual type of Christmas pudding has been compounded for consumption on December 21st. The ingredients are Arthur Black, Tommy Forbes, John Foster, Catriona Scott, the Miller Brothers, the Singing Sisters, and Jimmy Ross and Bill Thomson at two pianos. Moultrie Kelsall is supplying the sauce. This is a light-hearted revue with sketches by Marris Murray, John Black, and Allan Melville; and music by Ruby Duncan and George McNeil.

Torquay Municipal Orchestra

ELLIS KEELER will be the artist in a concert by the Torquay Municipal Orchestra, conducted by Ernest W. Goss, to be broadcast from the Pavilion, Torquay, on December 22nd.

SOLVE THIS!

PROBLEM No. 222.

Gerrard's A.C. mains receiver stopped functioning, and when voltage tests were made it was found that the anode voltages were all very low. It was also noticed that there was a blue glow in the rectifying valve. What was the probable cause of the trouble? Three books will be awarded for the first three correct solutions opened. Address your solutions 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. 222 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, December 21st, 1936.

Solution to Problem No. 221.

The extension speaker sockets were connected to the speech coil of the set speaker and therefore a low impedance extension speaker should have been used.

The following three readers successfully solved Problem No. 220 and books are accordingly being forwarded to them: A. D. Joues, 1, Meyrick Road, Ely, Cardiff; E. Fisher, 33, Freeth Street, Oldbury, nr. Birmingham; J. Pratt, 4, Knight Street, Ferncliffe, Bingley, Yorks.



NEW SERIES

Amateur Transmitting

In this Fourth Article of the Series, Various Oscillatory Circuits, Suitable for Transmitting Purposes, are Dealt With

By L. O. SPARKS

I MENTIONED in the last article that the first requirement of a transmitter is some form of generator of oscillations, and a brief description was given of a simple valve oscillator which depended on the inductive coupling between the grid and plate (reaction) coils.

The circuit, while capable of producing oscillations, is not suitable for transmitting purposes, so we will examine circuits which are suitable, and which are most widely used for the work in question.

It may be said, in a general sense, that there are two types of oscillators, namely, the "self-controlled," or "self-excited," and the "crystal-controlled." Those which come under the first heading can be split into two distinct classes, depending on the method of obtaining the necessary feed-back between plate and grid. There are those which make use of inductive coupling, and others which rely on capacity to provide the feed-back.

The Hartley Oscillator

This is, without doubt, the best-known form of oscillator using inductive coupling, and two types are shown in Figs. 1 and 2, the first being the general Hartley circuit, and the second what is known as the "series-fed" Hartley.

The latter has certain advantages over the original circuit, inasmuch that the losses associated with the high-frequency choke in Fig. 1, where it is actually in shunt with the part of circuit carrying high or radio frequency currents, are considerably reduced—if not completely eliminated—by the series feed of the arrangement shown in Fig. 2.

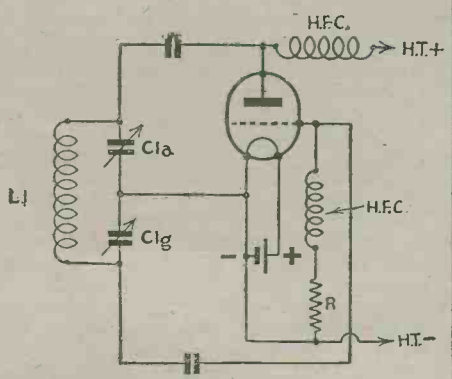


Fig. 3.—The Colpitts circuit.

The first arrangement can be quite satisfactory if the H.F.C. is really efficient and designed to operate at the frequencies under consideration, but the other circuit is the more practical, as the efficiency of the H.F.C. is not of vital importance; in fact, it can be replaced by a resistance H.F. stopper, if so desired.

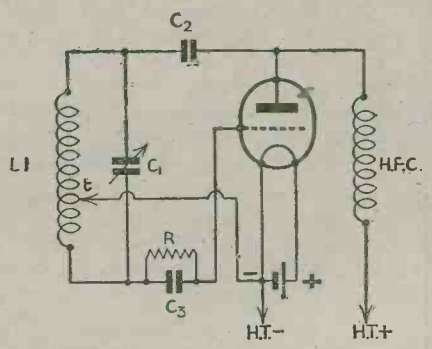


Fig. 1.—The standard Hartley circuit.

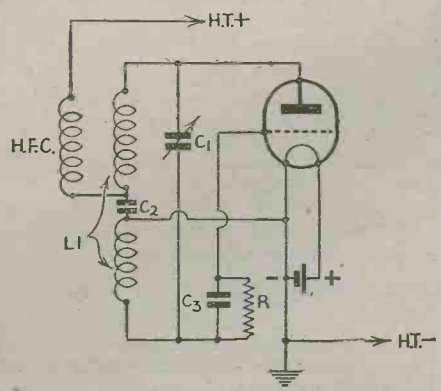


Fig. 2.—A modification of Fig. 1—known as the series-fed Hartley.

It will be appreciated that the condenser C2, which completes the oscillatory circuit, is essential to prevent a shorting of the D.C. plate voltage and the filament supply, and that its value must be such that it provides a low-impedance path for the high-frequencies. Its value is not really critical, a .01 mfd. is a usual capacity, but it should be noted that a mica dielectric type must be used, owing to the characteristics of the ordinary paper condenser not being so suitable or efficient for the work in question.

Inter-electrode Capacity

The variable condenser C1 is placed across the complete coil (or coils) and the frequency of the oscillations depends on the values of L.1 C.1, although the inter-electrode capacities of the valve can, to a certain extent, influence the result (capacity feed-back).

Assuming that a tapped coil, as in Fig. 1, is in use, it will be found that the degree of "grid-excitation" (feed-back) can be controlled by the position of the tap "t" on the coil L.1. The closer the tapping point is moved towards the plate end of L.1, so will the grid-excitation increase. With an average circuit and valve, satisfactory operating conditions can be obtained with, say, .3 to .5 of the total number of turns in the plate-tap circuit.

In each circuit (Figs. 1 and 2) the grid receives its necessary bias by means of the voltage developed across the resistance "R," the condenser C.3 preventing any D.C. voltage from the filament reaching the grid. The value of C.3 is not too critical, but "R" should be selected according to the type of valve and the actual operating conditions. Its value is often best determined by experiment.

Colpitts Circuit

The Colpitts circuit (Fig. 3) is an example of "capacity feed-back" or excitation, and it depends for its control on the capacity ratio of C.1a and C.1g, the two condensers being in series across the inductance L.1. The smaller the capacity of C.1g compared to that of C.1a the greater will be the excitation of the grid circuit, but the total capacity must be kept constant to maintain the desired frequency.

The Ultraudion

Another circuit, very similar to the Colpitts, is the Ultraudion, Fig. 4, but as it is not widely used, except for ultra-short waves, it is not necessary to discuss, in detail, its operation in this article.

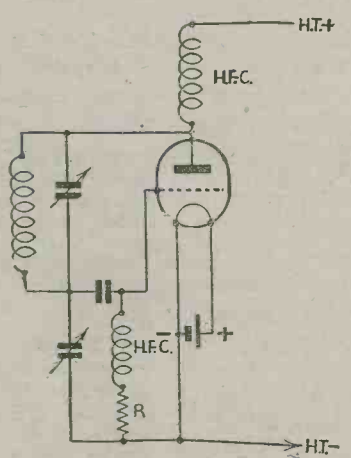


Fig. 4.—This is the Ultraudion circuit.

AMATEUR TRANSMITTING

(*Continued from previous page*)

Tuned-plate Tuned-grid

This circuit, which is quite popular, is shown in Fig, 5, where it will be seen that its name is obtained from tuned circuits of the plate and grid.

It does not depend on inductive coupling between the coils L1 and L2 for the essential feed-back, but on the capacity existing between the grid and plate elements of the valve.

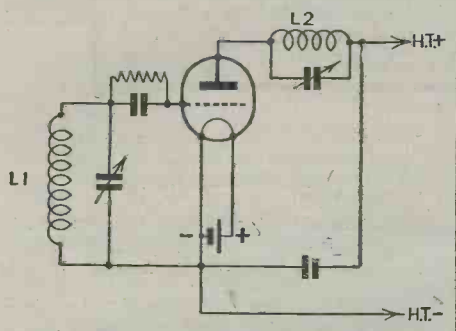


Fig. 5.—The circuit shown here is the tuned-plate tuned-grid arrangement.

A state of oscillation will be reached when both circuits are tuned to a common frequency, although maximum efficiency is only obtained when the two circuits are not "dead" in tune.

The frequency of oscillations is governed—chiefly—by the characteristics of the plate circuit, the grid circuit not being so critical. The degree of excitation is governed—mainly—by the constants of the grid-coil circuit, which is usually tuned to a slightly lower frequency than the plate arrangement.

The tuned-plate tuned-grid, or T.P.T.G. oscillator, is not too easy to adjust but it is quite popular, as far better stability can be obtained than with other circuits of a similar type.

T.N.T. Circuit

A variation of the above is the T.N.T. circuit, which is shown in Fig. 6, and it should be noted that the grid coil is no longer tuned by a variable condenser. The circuit (L1) is brought to an approximate resonant state by its self capacity, and the capacity of the valve and associated wiring. The only snag, if it can be called such, is the coil L1, but once suitable dimensions have been determined, the circuit is quite easy to operate and tune, while it is less costly to construct than, say, the Colpitts.

The Electron-coupled Oscillator

If the circuit Fig. 7 is examined carefully, it will be seen that it is nothing more than an elaboration of the fundamental inductively-coupled circuit; in fact, the Hartley oscillator can be recognised, as shown below.

The normal control grid, G.C., becomes the oscillator grid, while the screening grid, G.S., serves the purpose of the plate in the Hartley circuit, and the plate proper now acts as the output.

It is usual, in a Hartley circuit, to have the filament tap at earth potential, but such an arrangement is not *vital, providing* the plate, grid and filament are the correct *relative* potentials.

In the case in consideration, the circuit is modified so that the oscillator anode is at earth potential, from an *H.F.* point of view, although, as the diagram shows, it is at a

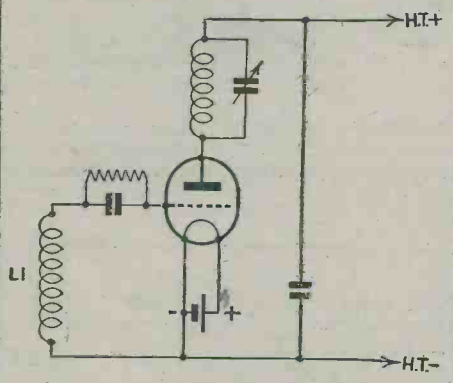


Fig. 6.—This arrangement is known as the T.N.T. circuit.

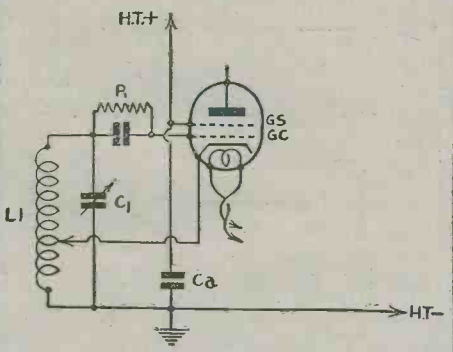


Fig. 7.—The method of coupling here gives rise to the term electron-coupled.

high relative D.C. potential. The condenser C.a. must have a capacity that will present negligible reactance to H.F. currents, thus maintaining the oscillator plate at earth potential.

It will be appreciated that as the plate is not allowed to vary in H.F. potential, the cathodes H.F. potential will vary, while the heater circuit can still be kept at earth potential. With a battery-operated valve, these requirements present certain difficulties, necessitating the use of suitable H.F. chokes, therefore an indirectly-heated mains valve has definite advantages. If the actual anode of the S.G. valve is given a positive potential it will receive the electrons flowing through the screening grid G.S, which forms the oscillator anode. This flow of electrons will actually be modulated by the oscillations generated in the Hartley portion of the circuit, therefore the output plate circuit current will have a high-frequency component, and if a tuned circuit is arranged in the plate circuit (T.C. Fig. 8) and tuned to the oscillator frequency, then the plate will vary in voltage at that frequency, or in other words, the valve will be acting as an oscillator-amplifier.

An oscillator of this type, providing the screening is most complete and no external coupling takes place, is capable of giving a very high degree of stability, a most important item.

Another very good feature is, that the electron-coupled oscillator is very efficient as regards *harmonics* of the oscillator frequency. By this I mean the output circuit (T.C.) can be tuned to two, three and four times the oscillator frequency, thus allowing similar frequencies to be transmitted, but it must be appreciated that the efficiency of the output decreases, rather rapidly, above the second harmonic. Such an operation is known as "doubling," but more about that later on in this series.

Next week "Crystal-controlled" oscillators will be dealt with, which will bring us to the stage of considering the constructional details of the first transmitter to be described, making use of a Class B valve and standard components.

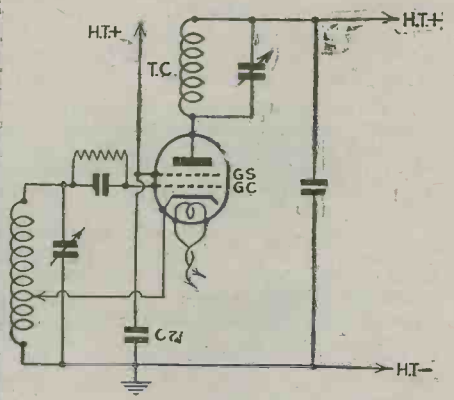


Fig. 8.—A modification of Fig. 7.

ITEMS OF INTEREST

Aerials for Every House

OWING to the large amount of damage done to property by the inexperienced erection of acrials on roofs, the Kirkcaldy Town Council has made a proposal that all houses erected in the future should have an aerial built as part of the structure.

Radio Drama

VAL GIELGUD, B.B.C. Drama Director, has successfully implemented his policy of inviting well-known dramatists to write plays specially for broadcasting. Included in his latest schedule is a new script from Lord Dunsany, who has already demonstrated his mastery of broadcasting technique; another experienced radio dramatist in the person of L. du Garde Peach will also be represented.

Those Spanish War Bulletins

Not content with jamming the 40-metre band the warring parties in Spain for the broadcast of propaganda and war news have now invaded the 20-metre amateur "allotment" and you will find in this section repeated "Atençion" calls which in most instances are so distorted that except for the fact that the Spanish language can just be detected the call-letters of the transmitters are too indistinct to identify. EDZ, Madrid-Vallecas on 31.65 m. (9,480 kc/s) which, for the past fortnight or so, has been transmitting Nationalist bulletins in several languages at more or less regular intervals throughout the day is now badly jammed by EAX, Barcelona, worked by the Government party and which, in its turn, although supposed to work on 31.80 m. (9,434 kc/s) is sending out a flow of morse signals on 31.65 m. for the obvious purpose of jamming its antagonist's transmissions. Reports are also being received of a jamming station which gives no call sign.



On Your Wavelength

By THERMION

A Snob's Club?

IT is not often that I deign to read or even to comment upon the amateurish tripe usually dished up in club journals. I prefer that my adversaries should be worthy of my fire! There are many people, you must remember, who are not worth powder and shot. A few weeks ago (in October 16th issue, to be exact) I wrote a plain paragraph explaining the present position of the wireless clubs and urging that the club movement should be developed; and I also deplored the fact that there are not so many clubs as formerly. I criticised the conduct of some clubs and suggested that the lack of organisation which signalises many of the meetings was a reason for their early demise. I merely comment on this matter now because my attention was drawn to a libel on readers of this paper which appears in a four-page leaflet, that proudly conveys to the world that it is the Bulletin of the Short-Wave Radio and Television Society of Thornton Heath. I do not know who has authorised this small collection of people to use the word "Society" nor do I know whether they have complied with the usual formalities entitling them to its use. The "editor" of this magnificent four-page affair says that he agrees with the comments of his "contributor," so I must take it that the views which I will quote later are the considered views of every member of the Short-Wave Radio and Television Society of Thornton Heath. From the paragraph you will be excused if you come to the conclusion that members of this Society are a collection of snobs who wish to convey their supreme intelligence and knowledge of wireless by discrediting readers of this paper.

Now schoolboy journalism is all very well in its way, and one can excuse the vanity and the aplomb of youngsters who think that in order to become an editor or a journalist, you merely have to know how to dot an *i* and cross a *t*. They are usually inordinately proud of the fact that they have won a prize at school for essay writing and for regular attendance at Sunday school, and think that these are the only qualifications necessary to entitle you to burst forth into the glamorous realms of journalism. Now harken to the vapourings of this youthful member of the Short-Wave Radio and Television Society of Thornton Heath!

(Incidentally, the term B.C.L. is a monstrous abbreviation for Broadcast Listener; the idea being that *broadcast* is two words!)

"'Thermion' (a rival commentator and a mere professional!) of PRACTICAL AND AMATEUR WIRELESS, in a recent article lamented the dearth of radio societies. Perhaps there aren't so many as there were in the early days of broadcasting, when the vast majority of sets were home constructed, but there are still many really active societies. Without profound thought I could recite a list of thirty or so, and Mr. Cholot (Messrs. Lissen) mentioned a couple he has recently addressed which I had not heard of before.

"Perhaps the reason for 'Thermion's' innocence is that his particular journal appears to cater largely for the B.C.L. who builds the 'Pumpkin Three' and then sits tight until the publication of the 'Pumpkin Super,' some three years later. However, the 'Pumpkin' constructor is probably a fan in embryo and a special article inviting him to join us appears in this issue."

Bearing in mind that this journal has regularly published the reports of this local club, with its egregious and high-falutin title, evidently planned to give it an air of importance, and that those reports are sent to us with an idea of recruiting membership from among our readers, I am sure that the latter will resent the supercilious sneer of the local snob who wrote the above paragraph. Our readers will also give any meeting of this local club a wide berth in future, and I publish the paragraph so that they may know the type of individuals with whom they are dealing. I quite expect that most of those who read the paragraph in this club circular still build sets from blueprints, although imagining (such is vanity) that Marconi is on a lesser plane than they. It is just as well for the members of this club to appreciate that they are only a local club and that the world of radio does not gyrate using them as a focus. Our readers could teach them a whale of a lot!

It is rather unfortunate for them that in their self-complacency as "know-alls" they have not taken the trouble to ensure that their four-page rag complies with the rule requiring the printers' imprint thereon. I am sure that they will not welcome the readers of this journal, preferring to remain a mutual-admiration society, lecturing among themselves to demonstrate what really clever fellows they are. Lots of people like to live in similar fools' paradises. Fortunately, most other clubs with which I have come into contact conduct themselves in a vastly different manner, and it is a pleasure to visit them. Incidentally, I would advise my youthful "critic" that there are not thirty wireless clubs in existence, and I challenge him to "recite a list of thirty or so."

I showed this letter to the Editor, who reminded me of a fact which I think you ought to know. This "learned society" recently invited him to deliver a lecture. Apparently the secretary made that invitation in the belief that its members could learn a good deal from the conductor of this paper. I would advise the members of the "Short-Wave . . . etc." to come off their high horse and realise

that they are just amateurs, like the rest of the clubs. It would appear that my readers might usefully form their own club in Thornton Heath.

This is, of course, just *another* friendly tilt!

The Dealers' Side

M. B., of Hinckley, presents me with the dealers' side of the question of component shortage. He says that he has had stocks of spare parts in stock costing between £200 and £300, and that he has had to part with them at junk prices. He says that very few people build sets in his district. That is where I think he should come in. He should *make* people want to build sets. So many dealers merely sit back and wait for the orders to come in. A carefully-planned window display, advertisements in the local papers, and the fostering of interest in the local club would provide him with customers, each of whom would act as a useful ambassador in the cause of home-constructed receivers. This reader has several years' copies of PRACTICAL AND AMATEUR WIRELESS which he will send to any reader forwarding carriage. The first letter with remittance secures them. Mark your envelopes "Hinckley." Unsuccessful applicants will have their money refunded.

Another Moan

F. N., of Birmingham, reports as follows:

"Dear Thermion, I have been interested in your comments on the component shortage. I am trying to get the Colvern coils and I.F. transformers for the 'Add-on Superhet Unit' described in the PRACTICAL AND AMATEUR WIRELESS, October 10th, 1936. I wrote to two very well-known advertisers to see if they had them in stock. The first replied at once (November 11th) saying he would do his best to send them in three or four days. I therefore gave him the order which he acknowledged on the 13th, saying, 'Delivery in approx. four days.' The second, who advertised that he quoted by return of post, took three days to tell me that he had the components in stock. However, I left the order with No. 1, telling him that No. 2 could supply the goods. On the 19th No. 1 then wrote me: 'Makers state that they are definitely despatching them to me to-morrow.'

"On the 25th they wrote me. 'Makers advise me that they are held up for some of the material required. I will approach Messrs. Blank and see if they have any in stock—makers advise me that they will certainly be able to supply by Friday of this week.'—(i.e., 27th). On the 30th No. 1 wrote me: No. 2 now state that they are unable to supply these coils from stock. Furthermore, I have telephoned the makers and they advise me that they are definitely despatching the coils to me to-morrow.'

"So I continue to hope. It is the 'definite' promises that I think are so unbusinesslike. I have the letters from which the above are extracts."

And J. H., of the same district, who writes as follows, provides further evidence that things are not quite as they ought to be in Birmingham:

"Dear Thermion, I read each week with much interest your article in the PRACTICAL AND AMATEUR WIRELESS, and must compliment you on your very sane outlook.

"Returning to set building after a few years of 'hardupishness' I was astonished at the difficulty in buying parts, especially in this district. We have some large alleged 'Wireless dealers' in this district who are nothing better than '*set sellers*'; it is impossible to buy even spare valve-holders, as I found, to my sorrow, a few weeks ago; in fact, they seem to regard the home constructor as slightly mental, or at any rate not all there.

"Things are not a lot better even in town; I find one of your advertisers quite the best people to deal with, they are always helpful and prompt, and invariably polite, even if they do stock 'clearance.' I have always found it reliable.

"Another grouse I have is that quite a number of firms take anything up to *three weeks* to even answer a letter. One firm of coil makers, to whom I wrote and asked a question, sent me a catalogue which told me nothing I wanted to know, and ignored my letter completely. I always enclosed return postage, and I do think a reasonably prompt reply should be expected. If I had treated prospective customers like some of these people do, I should be in the workhouse by now; there are, of course, exceptions.

"Your remarks *re* crooners and dance bands are endorsed. If ever there was over-rated tosh this is it; people seem to have lost all idea of proportion in these times, outside show and bally-hoo mean everything, or so it seems."

These are the final letters which I shall publish on these subjects. Both sides of the various problems have been aired and it now remains for manufacturers to set their houses in order.



Notes from the Test Bench

Preset Condensers

THE ordinary type of bakelite-cased preset condenser is a useful component. Some constructors make too free use of it, however, such as for tuning purposes or as an anode coupling condenser following an S.G. valve. This type of preset cannot be relied upon to provide the exact minimum and maximum values marked on its casing and therefore its use as a tuning device is limited. Some models have a compressed cardboard base, which tends to bulge outwards when the condenser control is tightened. This naturally tends to cause a variation in capacity after the condenser has been in use for a short period, and, therefore, if a preset is used for tuning or padding purposes, its adjustment should be checked periodically. When a preset is used as a reaction or coupling condenser, it is advisable to connect a high-capacity fixed condenser in series with it in order to prevent the possibility of a short-circuit occurring. A .01 mfd. fixed condenser is suitable for use in conjunction with a .0003 mfd. preset for this purpose.

The "Limit" Four

SOME readers have complained that they cannot get satisfactory reception on the lower short-wave band of this receiver. This is due to lack of reaction and can be caused by insufficient voltage on the anode of V2, to a faulty valve in position V2, or to a faulty reaction winding on the short-wave coil. If reversal of valves V2 and V3 does not provide a remedy, resistances R5 and R6 should be tested. When these are of too high a value, insufficient voltage will be applied to V2 anode. If a non-specified detector valve is used, or if the valve used has a slightly low emission, reduction of the values of R5 and R6 will prove beneficial. R5 can be reduced to 25,000 ohms and R6 to 5,000 ohms without seriously affecting volume on the medium and long-wave bands.

U.S.W. Aerial

GOOD reception on the 5 to 8-metre band can be effected without an aerial-earth system, and it has been proved that an unsuitable aerial can completely spoil reception. If an aerial is used it should not be more than about 10ft. in length and should be very loosely coupled to the tuned circuit. Tight coupling will damp the circuit, thereby preventing oscillation. Sufficiently loose coupling can generally be effected by twisting the end of the aerial lead around a short length of insulated wire connected to the aerial terminal.

Practical Television

December 19th, 1936. Vol. 3. No. 29.

Parliament and Television

A FEW days ago the Lord President of the Council, Mr. Ramsay MacDonald, was asked in the House of Commons whether there was a possibility of both filming and televising the Coronation ceremony. He stated that both matters were under consideration, but nothing definite had yet been fixed. In the case of the latter a lot will depend on the progress made in televising outdoor and indoor scenes with a mobile scanning unit coupled with methods for transferring the generated video signal to the Alexandra Palace transmitting station. If permission is granted and the whole scheme is found practicable, then the television service will be given a considerable boost, for hotels alone will be anxious to install sets for the benefit of their visitors who do not desire to mingle with the crowds to watch a section of the whole proceedings. This is quite apart from the many private sales that will be effected on this score alone.

At Westminster Hall

THE interest of M.P.s in television matters has manifested itself to the extent that steps are now being taken to install at least two television receiving sets in the Grand Committee Room at Westminster Hall. The site is by no means an easy one, but such an arrangement was felt to be desirable and of more general interest to members than special visits to the Alexandra Palace station itself. The work is being carried out by the B.B.C. in co-operation with expert service engineers from the supply firms concerned, and there is little doubt that the results will prove satisfactory. In addition, it is also learned that the King himself is anxious to know whether satisfactory television reception can be undertaken at his residence at Fort Belvedere. This is thirty miles from Alexandra Palace, but bearing in mind that sets are working satisfactorily at points nearly fifty miles away there is little doubt that good pictures will be obtained at the King's private home. Installations of this degree of importance will stimulate further sales, and already it has been reported that the number of sets sold is increasing very rapidly each week. Of course, the B.B.C. have helped sales considerably, for apart from the sets housed at Broadcasting House certain officials have them operating in their own private residences so as to obtain first-hand evidence of the consistency of picture quality and the entertainment value of the programmes. This last-named factor is receiving far more criticism at the present moment than the technical standard of the radiated pictures, and it is confidently hoped that the long intervals, too lavish use of films, etc., will be replaced by short and bright variety items. The improvement seen during the last few days in this connection is a welcome sign, and should be maintained.

Picture Size

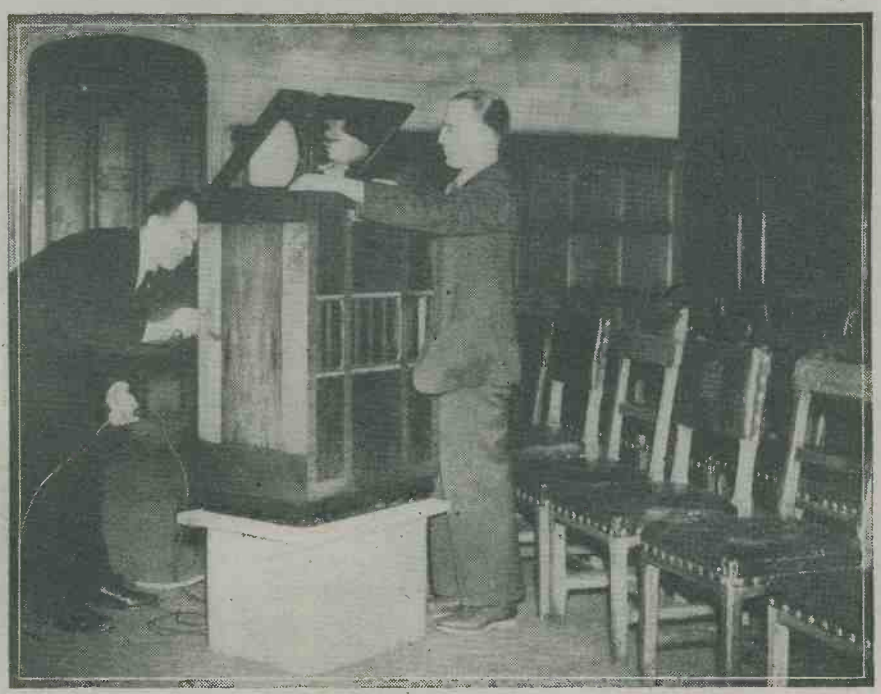
NOW that many television receivers are on the market, and a considerable number of actual demonstrations under good reception conditions have been staged, it is possible to make a preliminary assessment of the reactions of viewers to the pictures which they have witnessed. "Far better than expected" is the general comment, especially when the programme material is of such a character that it shows the technical advances to proper advantage. The steadiness of the pictures is contrasted with the hunting action of the low definition prototypes, while the brightness secured with modern cathode-ray tubes evokes favourable comment. Ease of control is another factor which surprises many, particularly when it is realised that the minimum number of valves employed in the set is twenty. Last but by no means least, is the apparent satisfaction with the present picture sizes. So many writers had said that television would not become popular until screens at least three feet square were possible that it is gratifying to learn that proper *proportions* with reference to cinema screen size are now being considered. To enjoy large television pictures in a room it would require dimensions that are not found in the usual household. In a darkened room a picture about a foot square appears larger than the actual inches infer, and although as the scope of the programmes increase to embrace larger scenes with more performers an increase in picture size will be warranted, this will not be to the extent at first thought desirable. At least a dozen people can watch present-day television pictures in comfort, and it would seem advisable to wait until some form of projection is possible whereby the set and picture screen are separate entities before any attempt is made to enlarge the picture materially from its present standard.

In Philadelphia

THE Federal Communications Commission of America has given permission to Farnsworth to establish an experimental high-definition television station at Philadelphia. This is to operate on a power of 1 kilowatt with two carrier frequencies located between 42 and 56 megacycles and 60 to 86 megacycles. Farnsworth has been working on television for a period of eight years, and his contribution to the art has taken the form of electronic multipliers (cold cathode valves) and an electron camera which uses an image dissector tube. The Federal examiners were of the opinion that Farnsworth's programme of research gave promise of material assistance to television's progress.

The Brocken Transmitter

FOR some time the Germans have been conducting television experiments on the summit of the Brocken in the Hartz mountains. This is to be consolidated, for a complete television station is now in course of erection on the site. Situated nearly 4,000ft. high the range of transmission of the ultra-short-wave high-definition signals for a given power input should be considerable, and every effort is being made to expedite progress so that the installation is capable of starting a regular service by the autumn of next year. Suitable co-axial cable lines will link this radio transmitter with the studios and scanners in Berlin, and in view of the station height it will be interesting to see whether the signals reach this country and, if so, whether they can be resolved into satisfactory pictures.



B.B.C. engineers fixing a television receiver in the Grand Committee Room, Westminster Hall.

Providing a Return Path

WHEN considering the action of a cathode-ray tube for reproducing television pictures, many have wondered what happens to the electrons in the cathode-ray beam after they have struck the screen and been responsible for the degree of fluorescence at the point of impact. To operate modern type C.R. tubes but little electrical power is expended, since it is essentially a voltage-controlled

PRACTICAL TELEVISION

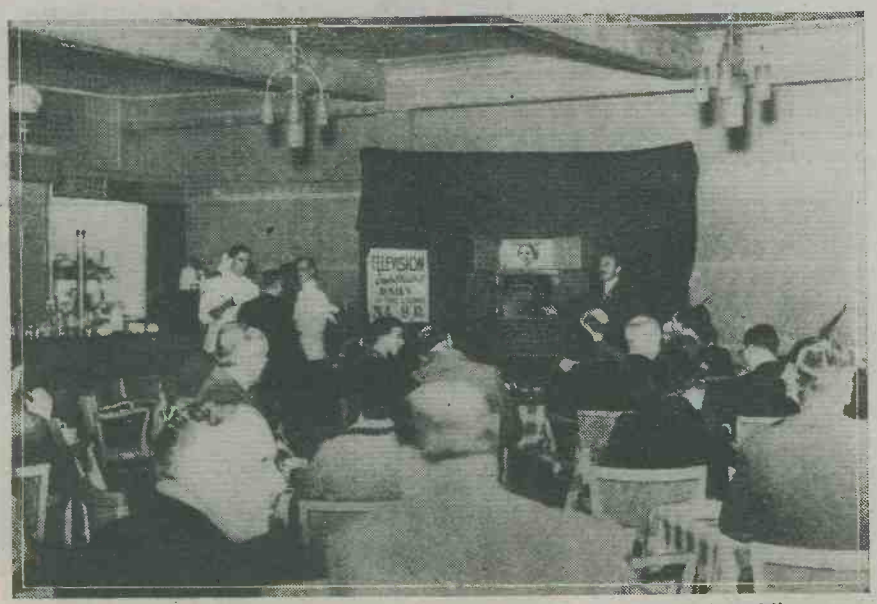
(Continued from previous page)

device, and in the case of the high-tension unit providing the anode volts for accelerating the electrons towards the screen, the current consumption is quite small. After leaving the cathode some of the electrons fail to pass through the anode orifice and, in consequence, return to the cathode via the H.T. unit itself, the low-potential end of which is common with the cathode. In the case of the electrons which proceed to the screen, these then pass on to the inside of the glass envelope on which is sprayed, during manufacture, a thin metallic coating. By joining this coating to an internal terminal on the glass envelope which in turn is joined to the cathode, or joining the far end of the coating to the cathode internally, a metallic or electrical path is provided for these electrons back to the cathode from which they emanated. This screen current, as it is called, is very minute — a matter of microamps in most cases—but unless the return circuit is provided in this way the interior of the glass envelope would acquire a large negative charge and this would increase progressively and so upset the tube's action.

Television Notes

More Television

IT is learned that steps are already being taken to increase the hours of television broadcasting from two per day to three. This would conform to the original suggestion made some months ago and is a direct outcome of the surprisingly large public demand for television sets. Although high priced (the cheapest is 85 guineas), it has been found that the novelty appeal of the new service has exceeded expectations, and the manufacturers concerned are taking immediate steps to put more television sets on to the market at the earliest possible moment. This increased production will reveal itself in a lowering of prices later on. The big factor to consider, however, if the increased programme time materialises, is the additional cost of the television programmes, but no doubt the B.B.C. will find ways and means of meeting this contingency.



A Cossor Television Receiver entertains guests at the Prince's Lounge, Piccadilly

Television and Photography

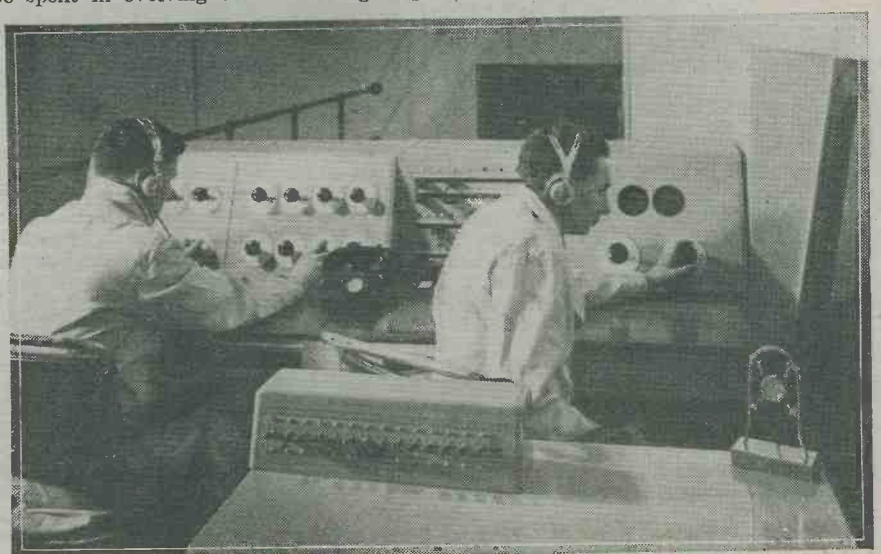
AT the recent annual dinner of the Royal Photographic Society the president, Dr. D. A. Spencer, drew the attention of his audience to the close relationship between photography and television. In his opinion television, for some time to come, would have to depend on the researches made by photographic workers. The truth of this statement is borne out by several factors, for in the case of the transmission of talking films it is becoming increasingly evident that the camera-man will have to bear in mind the dual use of his film (television and the cinema) when taking shots either interior or exterior. A blending of the two requirements will ensure that when used for either purpose the resultant pictures will leave nothing to be desired. Again, photography plays its part in back projection schemes for scenery when it is not desired to include real built scenery in the staging of plays or sketches. Another outstanding example is the intermediate-film process. A considerable amount of research was necessary before the whole equipment was brought to its present stage of efficiency. The rapidity of the intermediate-film processing made it necessary to produce films having a rapid and sensitive emulsified surface. Time had to be spent in evolving the correct lighting technique for the subjects to be televised by this method, while the evolution of the right type of cameras is yet another phase which illustrates the inter-dependence of television and photography at the present stage of its development.

Transatlantic Television

A STATEMENT recently made by Marchese Marconi that television will soon span the Atlantic has aroused considerable international interest among radio engineers. Actually television signals from Germany have been picked up in New York.

"We have maintained communication across the Atlantic on short wavelengths," said a G.E.C. research engineer, "and are exploring the possibility of ultra-short-wave transmission for long-distance broadcast for television. We know that a broadcast on 15 metres can get across the Atlantic, but the objection to using this band for television is largely one of cost. Television takes up too much space in the ether. If television were broadcast from this country to America, the space would have to be obtained at the expense of normal wireless telephony communications. Telephony bands are only 10,000 cycles per second apart, whereas television bands are one million cycles per second apart and as much as three million cycles for very high definition.

"The growing use of wireless telephony will make it practically impossible for enough space on the wavelengths now in use to be sacrificed, except perhaps for 90-line television requiring 100,000 cycles per second, which might give a just satisfactory close-up of one person. From the beginning of television, therefore, we have been experimenting on short wavelengths, and it is quite possible we may be able to broadcast internationally pictures of a full 400-line definition in the future."



The Marconi-E.M.I. System at the Alexandra Palace. A view of the control room, showing the control desk, with a corner of the studio viewing window on the right.

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ABC of the Modern Receiver—11

The Action and Use of Diode, Double-diode, and Double-diode-triode Valves for Second Detection are Explained

By FRANK PRESTON

IN concluding the previous article of this series, it was mentioned that diode valves are to-day most widely used for second detection in superheterodynes. The simple diode is very similar in its operation to the "Westector" which was dealt with before. This can be seen more easily by referring to Fig. 1, which shows the simplest type of diode detector circuit. Unlike other types of valve, the diode does not require any high-tension supply, but has a filament or cathode of the normal type. There are few simple diodes actually on the market, because it is more convenient and more economical to combine the diode electrodes with those of a triode, tetrode or pentode; the multi-electrode portion can then be used for either low- or high-frequency amplification, according to the particular design.

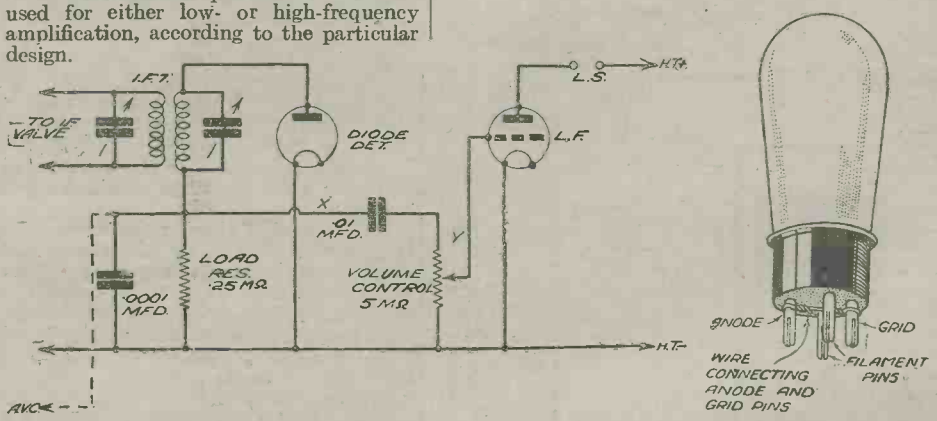

Fig. 1.—The simplest form of diode used as second detector. As shown in the pictorial diagram a triode can be used as a diode by joining together the grid and anode.

Triode Used As a Diode

The diode shown in Fig. 1 might well be a type LF or power triode with the grid and anode pins joined together to form a larger anode, and this arrangement might well be tried by those who would like to experiment. A diode detector is better than one of the leaky-grid type when there is a considerable amount of pre-detector amplification—as there generally is in a modern superhet—for it has a greater "handling capacity." Additionally, a diode can more easily be used to provide distortionless detection. One disadvantage concerning its use in a "straight" circuit is that it is not an easy matter to provide a really satisfactory reaction circuit. Not that this is impossible, but it is not usually to be recommended. This objection does not, of course, apply in a superhet, since reaction is not employed in any normal case.

It may be seen from Fig. 1 that one end of the secondary winding of the intermediate-frequency transformer is connected to the diode anode, whilst the other end is connected through a fixed resistance to the earth line. The fixed resistance provides a load, such as was seen to be necessary when using a "Westector." In other words, the rectified voltage produced by the diode is developed across this resistance, whence it can be applied to the grid and cathode or filament of the following low-frequency valve, as shown. The actual value of the load resistance depends to a certain extent upon the diode used, but .25 megohm, as indicated, is a good average figure. It should be noticed in passing, that the resistance is by-passed by a .0001-mfd. fixed condenser, which serves to allow any residual H.F. currents to "leak" away to earth.

How the Diode Works

The method of operation of the diode is similar to that of a triode which has previously been described: current flows from the negative filament or cathode to the anode. In the present case, since a positive potential is not applied to the anode from the H.T. source, current flows when the anode is made positive by the signal voltages. This means, in effect, that current flows only on each positive half-cycle of the signal. The result is that the fluctuating signal voltage is made uni-directional. Referring again to Fig. 1, it should be explained that the L.F. stage shown is actually of normal type, being resistance-capacity coupled to the detector by means of the load resistance and the .01-mfd. fixed condenser. The .5-megohm potentiometer is simply the normal grid leak, but, being variable, it is used as a volume control.

It is sometimes found better to insert an H.F. choke at the point marked X in Fig. 1 to prevent the passage of stray H.F. currents into the L.F. amplifier, but an alternative and more usual method of achieving the same object is to insert a 100,000-ohm fixed, non-inductive resistance at the point marked Y. This resistance is commonly known as a "stopper" resistance.

Although the simple circuit under consideration is intended only as a detector stage, it *can* be used to provide A.V.C. by taking a lead from the top of the load resistance, as shown in broken lines. This is not generally recommended, for when A.V.C. is required it is better in every way to employ a double diode valve, as shown in Fig. 2. In this case, an indirectly-heated valve is shown, because battery valves are not generally made in this type. There are battery valves available, but even these are indirectly heated.

The Double Diode

In Fig. 2 it will be observed that there are two separate anodes, but again neither of them is supplied with H.T. current. One of these—that shown on the left in the theoretical circuit—is used for second detection, and that on the right is for automatic volume control. If the connections to the two anodes are considered separately, it will be seen that they are of the same form as those in Fig. 1. There is again a .25-megohm load resistance between the lower end of the I.F. transformer secondary and the cathode, whilst a similar coupling condenser and volume-control potentiometer are used to feed the low-frequency valve. The A.V.C. anode is fed with H.F. from the primary winding of the I.F. transformer, through a .0001mfd fixed condenser, and also has a load resistance; this time of .5 megohms (an average value only). A "stopper" resistance is shown in the grid circuit of the L.F. valve, and decoupling condenser and resistance are shown for the A.V.C. feed. Values actually indicated in Fig. 2 are those applying to the Osram D.41 valve,

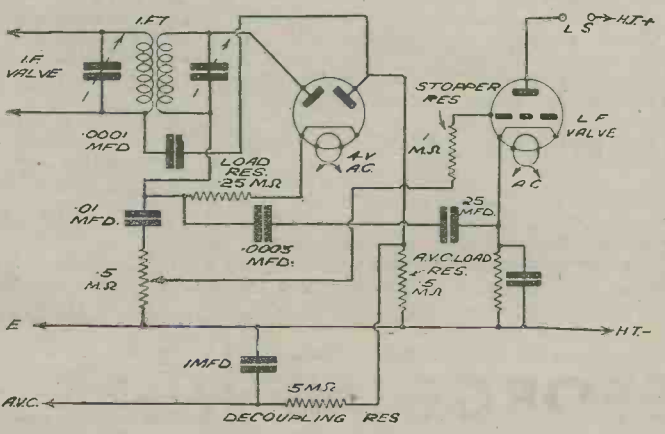

Fig. 2.—Circuit for an indirectly-heated double-diode valve, followed by an L.F. stage.

but similar values are appropriate to other makes of corresponding type.

Double-diode-triodes

It has been pointed out that it is unusual to employ a simple diode or double-diode valve, and that it is generally made as part of a double-diode-triode or double-diode-pentode, which combines the functions of detector, A.V.C., and low-frequency (or in some cases high-frequency) amplifier. A typical circuit is given in Fig. 3 for a double-diode-triode valve, and this should be readily understood after studying the two previous simpler arrangements. Actually, the single valve acts in the same manner as the pair of valves shown in Figs. 1 and 2, and the connections correspond exactly. There is a common filament, which serves for both the double-diode and the triode, in addition to a pair of diode anodes, a triode grid and the triode anode.

Normally, the output from this multi-section which can be used as an H.F. or I.F. amplifier, in which case the diode section is fed into a low-frequency amplifier, as shown in Figs. 1 and 2. This type of valve is not widely used, but is convenient in certain circuit arrangements.

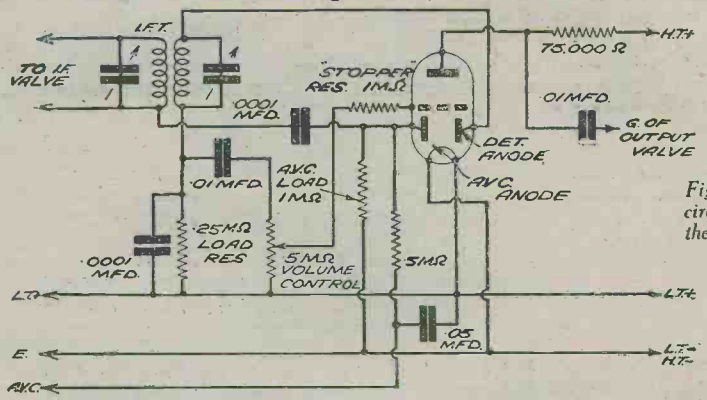

Fig. 4.—Theoretical circuit diagram of the arrangement shown in Fig. 3.

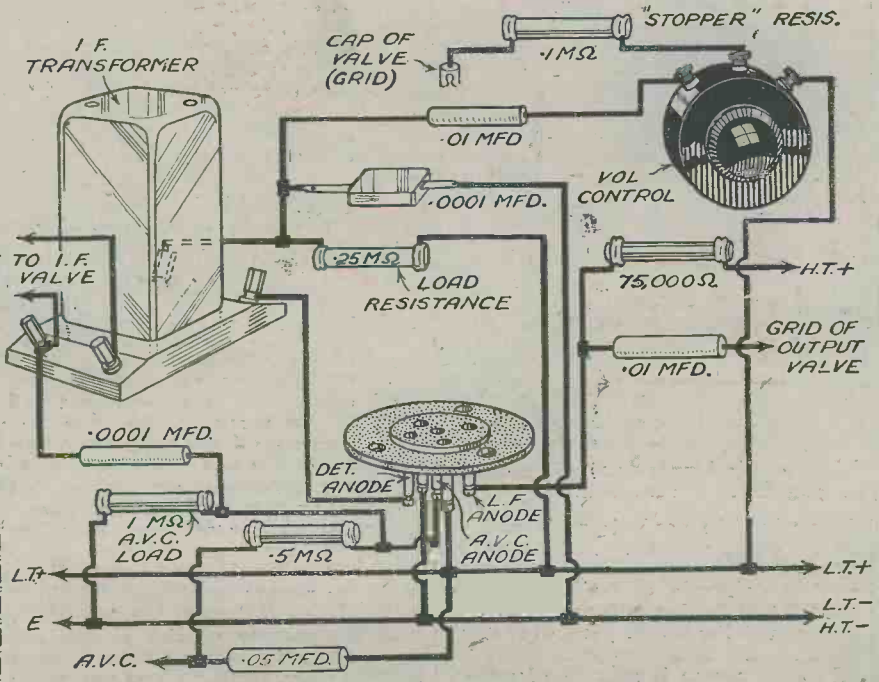

Fig. 3.—Connections for a double-diode-triode used as second detector, A.V.C., and first L.F. amplifier.

electrode valve is insufficient to operate a loudspeaker, and so it must be fed into a power valve by means of the resistance-condenser coupling shown. Again, the component values indicated are average or typical values, and might require to be modified slightly, according to the recommendations of the makers of the particular valve used. A "stopper" resistance is shown, as in Fig. 2, but this might well be replaced by an H.F. choke as explained above.

Double-diode-pentodes

It is now possible to obtain double-diode-output pentodes, in which the triode shown in Figs. 3 and 4 is replaced by pentode electrodes. In that case the valve can be used to feed the loudspeaker direct. This type of valve is, however, made only in mains-operated types. The connections are of the same form as those shown for the double-diode-triode.

Another type of multiple-electrode second detector valve contains a pentode

Diodes in a "Straight" Circuit

The circuits so far dealt with are all intended for use in a superhet receiver after an I.F. amplifier, but it is possible to use a diode in a "straight" receiver, although certain modifications are required to the connections shown. This is because it would not be possible to tune a coil in the diode circuit by means of a gang condenser of which the moving vanes are connected to earth—as they are in all normal patterns. It will be seen that if such a condenser were connected between the "diode-anode" end of the coil and earth the load resistance would be included in the tuning circuit. On the other hand, if the moving vanes were connected to the lower end of the coil the load resistance would be short-circuited; in either case the stage would become inoperative.

The method of altering the connections is indicated in Fig. 5, where a simple single-diode valve is shown for simplicity. As may be seen, the anode is connected to the coil through a .0001-mfd. fixed condenser, whilst the load resistance (.5 megohms is indicated) is joined between the anode and earth. In this way the lower end of the coil, and also the moving vanes of the tuning condenser, are at earth potential. The feed to the low-frequency valve is taken from the anode of the diode, and an H.F. choke and .0001-mfd. by-pass condenser are used to prevent the passage of H.F. into the low-frequency valve. It will be clear that a similar method of connection could be used when employing a double-diode or double-diode-triode valve, except that the A.V.C. anode could not be connected as shown in the other diagrams. One method is to connect it to the other anode through a .0001-mfd. condenser. If A.V.C. is not required, the two anodes of a double-diode can be directly joined together, the valve then being used as if it were a simple diode. Incidentally, the last remark applies also when the valve is used in a superhet, although it is generally considered worth while to make use of the advantages of A.V.C.

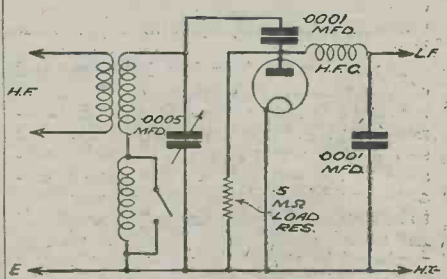

Fig. 5.—Connections for a diode in a "straight" circuit.

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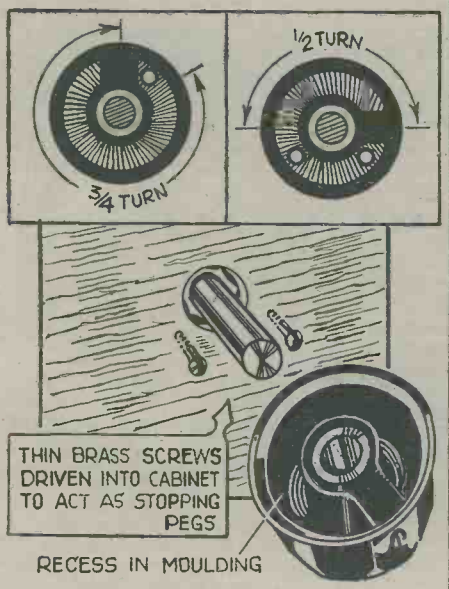
A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — **READERS WRINKLES** — THE HALF-GUINEA PAGE

A Control Knob Dodge

THE minimum and maximum positions for controls nowadays are often indicated by small white spots, the component itself governing the extremities of movement. This has a tendency to turn the component bodily, and so loosen it upon its bracket, thus necessitating the removal of chassis from cabinet to refix.



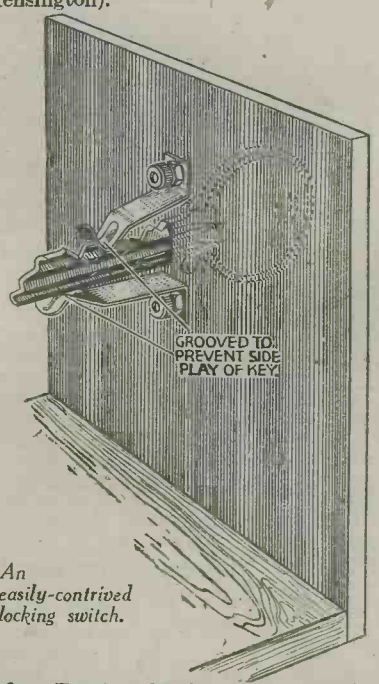
A control knob improvement.

In order to prevent this annoyance, thin brass screws were driven into the front of the cabinet, near the projecting spindle, at such a distance as to allow them to project into the recess of the knob. This allows the knob to be turned, but stops it when the solid section of the moulding (grub screw support) comes up against the projecting screw.

The two screws fitted as described will allow of any movement from a few degrees up to about half a turn, but only one screw should be fitted where a three-quarter turn (approx.) is required, as shown by insets in sketch. Care should be taken to see that the screw (or screws) clear both faces inside the recess so as to allow smooth movement of the control.—R. L. GRAPER (Gillingham).

A Locking-switch Device

HERE is a neat and easily-made switch, which, incidentally, also enables one to "lock up" a wireless set. All that is required is a Yale latchkey and a couple of springy brass brackets. Two holes are bored through the panel next to each other and filed to form a slot to take and hold the key, as shown in the sketch. The brackets are then mounted below and above the key, so that when the key is inserted contact is made and a circuit completed. The device can be improved further by making the key rotatable, and adding two other brackets at right angles to the ones shown.—F. G. ARATHOON (Kensington).



An easily-contrived locking switch.

THAT DODGE OF YOURS!

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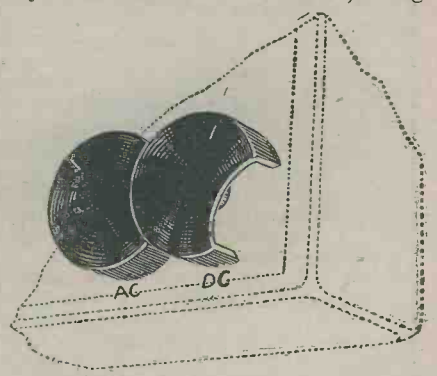
Safety Device for Meter Controls

THE accompanying sketch illustrates an idea which I have found very useful and reliable where there are two selector switches, and it is essential that one shall not be moved till the other is in one particular position, e.g., an A.C., D.C. multi-range meter.

The two ordinary circular knobs have each a sector filed or cut in them with a fret saw, so that they will fit closely, as shown in the sketch. The A.C. knob cannot be moved until the D.C. knob has been turned back to free it, i.e., in the "off" position. When both are in the "off" position, then only one can be turned at a time, though either is free to move. If one desired to have the knobs untouched, then discs fixed to the spindles under the panel (out of sight) would work equally well.—L. KELLY (Thornton Heath).



A safety device for two selector-switch controls.

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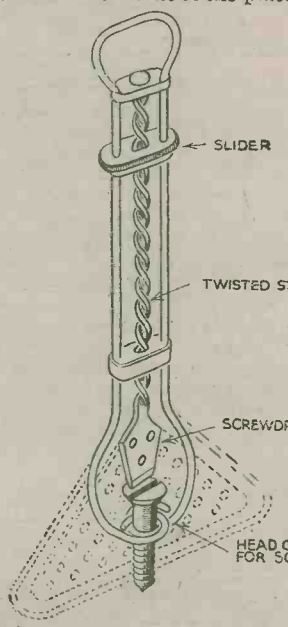
A Handy Screwdriver Tool

HERE is a handy combination tool, which is easily made from an old rotary whisk as shown in the accompanying sketch. With a little wire-twisting the whisk can be converted into a very handy wireless tool. The wire loops at the end grip the screw and the remnant of the plate is filed to act as a screwdriver. For light work the tool is very handy in inaccessible corners. — W. G. GEDDES (Sunderland).



A handy screwdriver tool made from an old rotary whisk.

Problems of A

The Increasing Popularity of the All-wave Receiver Deman Design which are Involved. Some of the Difficulties Enco

PRACTICALLY without exception every manufacturer to-day makes an all-wave receiver. Although one or two firms have concentrated on a single receiver of this type, others have designed two or three different models in which the tuning range embraces the now popular short waves. The receivers described in this journal have also of recent months been of the multi-waveband type, now referred to as all-wave, although this is not strictly a correct term. I believe I am right in saying that at the present moment there is only one all-wave receiver on the market, and this is the Invicta Model AW57, which tunes from 13 to 2,000 metres with only one vacant part in this wide waveband. This is carried out in five steps, namely from 13 to 27, from 25 to 75, from 75 to 200, from 200 to 550, and from 746 to 2,000 metres. The majority of the remaining receivers of the so-called all-wave type generally have another vacant band from 100 metres or just below up to 200 metres or so.

In tracing out the history of this type of receiver we find that what might be termed the first all-wave receiver consisted of a standard broadcast receiver with a short-wave adapter or converter added to it. This combination gives practically all that is required, but has the inconvenience that the adapter or converter has to be disconnected when ordinary broadcast reception is required. A switch may be incorporated to carry out this operation, and thus the receiver is more or less a standard all-wave set with all wave-change switching carried out by switches. But when we come to include all of the coils and valves in a single receiver and arrange for the switching to be carried out by a single control, there are several snags to be overcome.

As mentioned previously, the germ of the idea is the broadcast receiver plus a short-wave converter, and this idea is still retained in practical form in one commercial set. That is to say, on broadcast bands the set is a straight arrangement, but when switched to the short waves it becomes a superhet. This type of circuit can be made very simple, but the switching offers some difficulties. Similarly, when a straight or superhet circuit is to be built to cover all waves, obviously the most important part is the switching, as it is necessary to change the coils for each waveband.

Multi-contact Switches

The introduction of special switches, a group of which may be seen in the illustration on our cover this week, has gone a long way towards solving the problem, and the introduction of special intermediate-frequency transformers has enabled the superhet circuit to be employed in this type of receiver without encountering difficulties from break-through or whistles. In Figs. 1 and 2 extracts are given from two commercial receiver circuits showing the tremendous complication of the tuned circuits, and it will be seen from this that the home-construction of such a circuit is not a very simple matter. The losses introduced on the short waves by the wiring to the switches can assume such proportions that the receiver may be nearly worthless as a short-wave set, but again one manufacturer has stepped into the breach and solved this difficulty for the home-constructor by building the coils on top of the switch assembly and carrying out the wiring as a complete unit. This is, of course, the B.T.S. unit which has proved so successful in our Record All-wave receivers, and the group on our cover shows this unit on the extreme right. It will be noted that the short-wave coil is included in the centre of the unit and is individually screened.

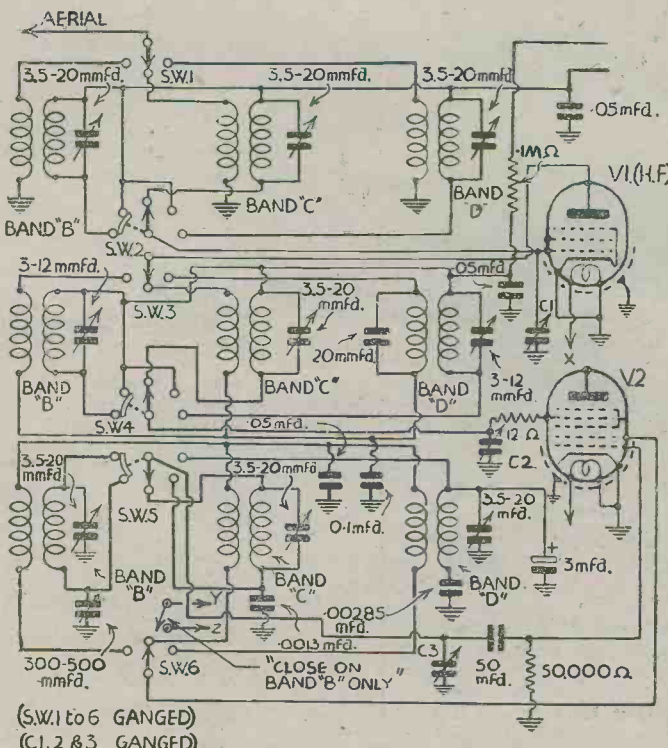


Fig. 1.—This extract from a commercial All-wave circuit shows some of the intricate switching which has to be carried out.

In early all-wave receivers it was customary to wind a single coil (or connect the various coils in series on a single former) and to short-circuit the unwanted portion, one of the earliest coils of this type which proved successful being the Lissen, seen in the background in our cover group. This covered two short-wave ranges in addition

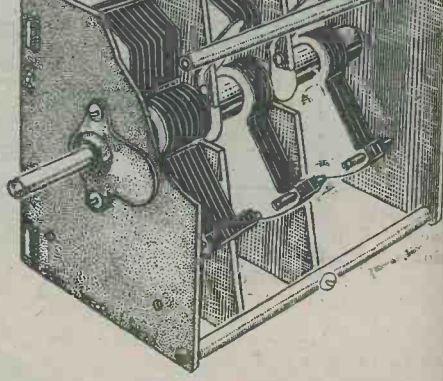


Fig. 3.—This special type of condenser made by Jackson Bros. has been incorporated by us in the Record-Receiver seen below.

to the broadcast medium and long waves and the self-contained switch simply short circuited the coils one after the other. The losses occasioned by the earthed section of coil were not serious, but they did have an effect on the lower of the short-wave ranges, whilst the slight capacity

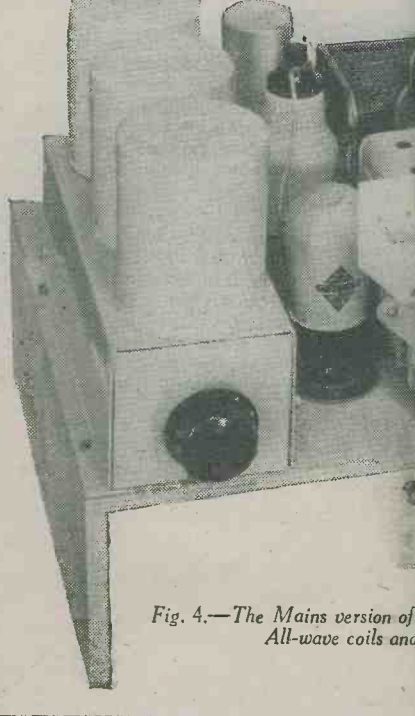


Fig. 4.—The Mains version of All-wave coils and

-Wave Design

at the Constructor Shall Understand the Many Points in d are Given in this Article - - - By W. J. DELANEY

ses introduced by the wave-change itch also took their toll. In the modern emes the short-wave coils are completely arate, and a further instance of this coil he Bulgin C type, which is the remaining it in our cover group, and here again arate screens cover the coils.

rcuit Faults

Another difficulty with the short-wave tion of an all-wave set is the tuning, as is not practicable to incorporate separate ning condensers. It is now well known at for short-wave tuning a low-capacity ndenser is required and even then a good w-motion drive has to be employed. idea which works quite well, and which is orporated in the kits supplied by Ostar hz, for instance, is to include a very low acity condenser in parallel with the linary ganged condenser, so that on ort waves a band-spread device is intro-ced, and the small condenser is used as ind of vernier. A better scheme, and one ich is seen in the Limit and Record eivers designed by us, is the use of a ecial ganged condenser in which two of e sections are of low capacity (actually 025 mfd.), and these are connected to e wave-change switch in such a manner at on short waves they are employed dividually for tuning the short-wave coils, ilst on the broadcast wavebands they e connected in parallel, thus converting em into a single .0005 mfd. condenser oviding standard tuning. This follows e earlier scheme where a special short-ve condenser was mounted on the extended spindle of the ordinary ganged condenser.

So far there is only one receiver which tunes down sufficiently low to enable the television programmes to be heard in addition to the standard broadcast wavelengths up to 2,000 metres, and the stray capacities introduced by the multi-switch units and screens, etc., at the moment preclude the possibility of ever getting down to the real ultra-shorts. Perhaps a new circuit design will be evolved eventually to enable this to be done, although it will be found that the ultra-shorts alone will provide adequate programme material for all ordinary domestic requirements. There is always a feeling that when some wave-band cannot be covered something is being missed, and on this account the real all-wave set will no doubt eventually be the only one worth while, but the constructor will find it difficult to build a set of this nature from standard parts without introducing some new circuit design.

Probably one of the simplest solutions for the amateur who wishes to get the maximum from an all-wave receiver, and who is not therefore prepared to consider expense, is to build the set in two parts. The L.F. section could be built as a single unit at one end of a large baseboard or chassis, but the H.F. and detector portions of the receiver should be duplicated. For the broadcast bands the standard arrangement could be employed, whilst for the short-wave bands a complete H.F. and detector section (or a superhet if the constructor prefers that type of circuit) should be built on standard short-wave lines. To ensure stable operation and complete avoidance of interaction and losses, each of these sections should be separately and entirely screened. That is to say, the two separate portions could be built one behind the other, with a vertical screen running between them and also between both of them and the L.F. section. The components should be mounted on metal or a metallised chassis, and metal lids should be fitted over them. Separate controls would, of course, be needed for such an arrangement, and an experimental model built on these lines some time ago was so arranged that the short-wave section was farthest from the panel, and the operating extension rods passed across the broadcast section and had separate control knobs on the panel. The receiver was naturally very bulky, but it definitely performed as a perfect multi-range set, with the only difficulty that plug-in short-wave coils were used.

Unessential Wavelengths

It might be agreed that certain parts of the frequency range are unnecessary, in view of the fact that there is little to be heard upon them. Thus the ordinary aircraft or ship wavebands will not offer entertainment for normal domestic purposes although the various signals will no doubt be interesting to those who are keen to follow them. For this reason they may, of course, be ignored in designing an all-wave receiver, and this naturally accounts for the gap in the wave-range of the Invicta receiver referred to in the opening paragraphs.



ord All-waver, in which the special B.T.S. 3. condenser have been utilised.

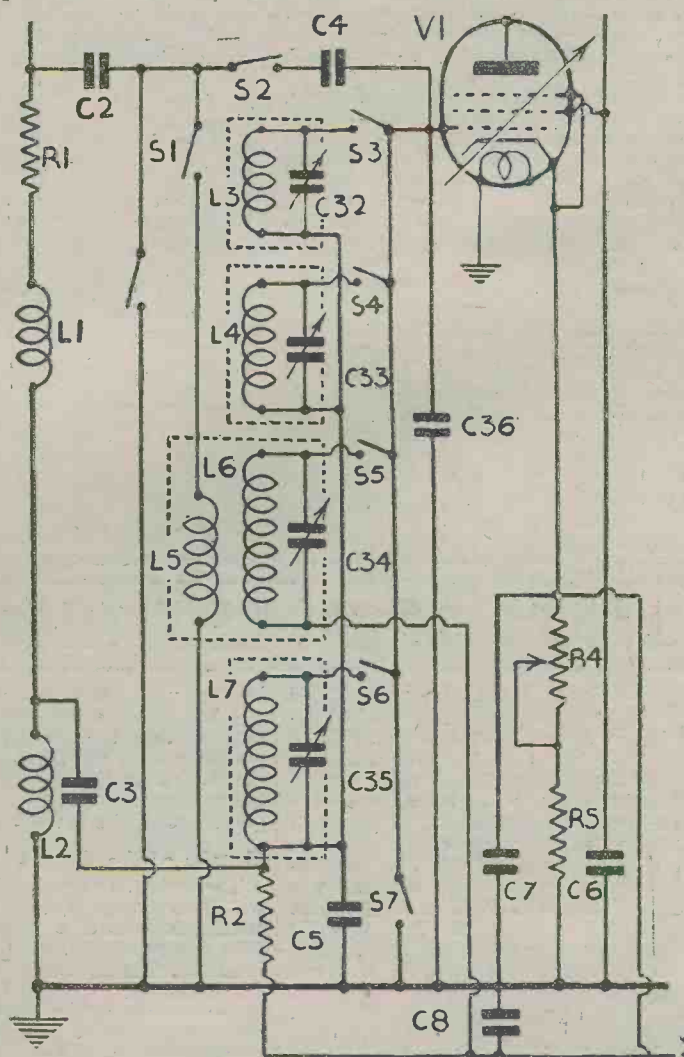
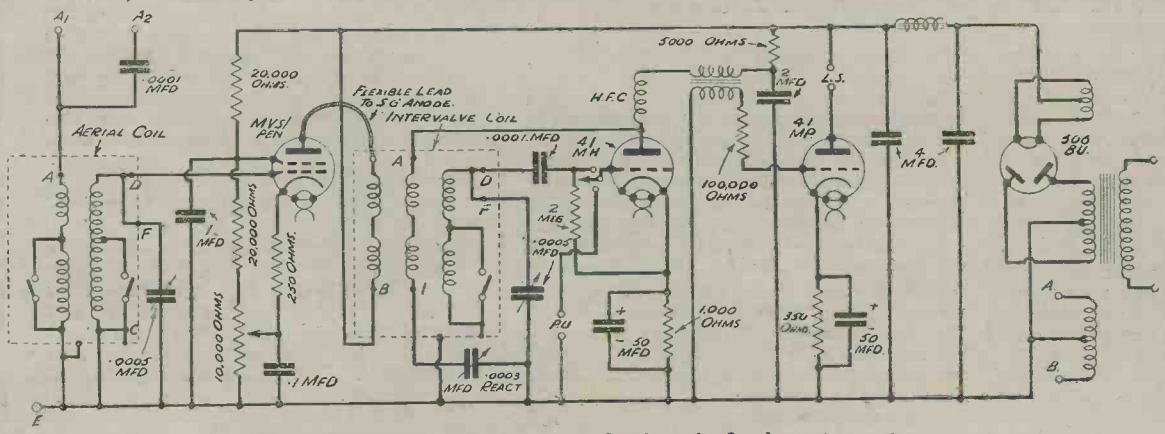


Fig. 2.—Another commercial circuit in which the coil switching has been simplified.

Two Interesting Circuits

Employing the New Varley Coils, These Two Circuits will be Found Very Efficient and Simple to Build

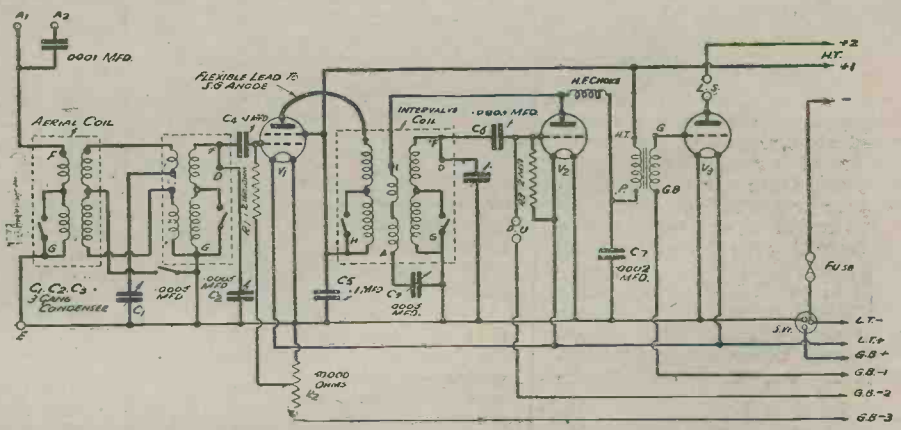
IN response to several requests we give herewith two circuits in which the new Varley coils are embodied. The first is a mains three-valver, in which the BP.114 two-gang coil unit is used, and it will be seen that a straight arrangement is embodied, which may be regarded as fool-proof in action. The coils are, of course, complete with wave-change switch, and the various terminal numbers of the coil base are clearly shown in the circuit diagram. All values are given in the diagram, and all resistors are of the 1 watt type. There are no special components to be recommended, and the only precaution is to see that the condensers are of good type designed to work at the various voltages applied. The mains section can be incorporated on the same chassis, or may be built up as a separate unit, connection between the receiver and mains section being carried out by means of a multi-cable and multi-plug such as can be obtained from Messrs. Bulgin, Ward and Goldstone, etc. As there are only two tuned circuits, no trimming difficulties should arise, and the two-gang condenser should be of the J.B. type, having a separate trimmer operated by a knob concentric with the main knob, thus enabling the two circuits to be balanced at all settings of the dial.



The BP. 114 two-gang coil unit is employed in this 3-valve mains receiver.

A Battery Three

In the second circuit a battery receiver is indicated, and here the BP.113 coil unit is incorporated. This is a three-gang unit, and the first two coils are coupled to form a band-pass tuner, thus providing a high degree of selectivity. The windings are so designed that a square tuning peak is obtained, giving maximum selectivity and high quality. The H.F. valve is of the variable-mu type.



A simple and efficient 3-valve battery set incorporating the Varley BP.113 three-gang unit.

BAIRD'S SUPER-SCREEN TELEVISION

ON Sunday of last week we visited the Dominion Cinema Theatre in Tottenham Court Road and saw Baird's latest contribution to the television art. Here, briefly, we saw the heads of variety artists and of Mr. Baird reproduced on a large screen erected on the stage, and heard them speaking as in an ordinary talkie. The novelties underlying this demonstration were that the system was mechanical (as distinct from the present electrical systems) and that this was the first demonstration of its kind which has been produced in the entire world. Although attempts have been made in the past to show a television picture to a large audience, the results have not been in any way comparable to this latest demonstration. In the earliest "big-screen" television a battery of electric lamps was employed and these were operated by a multi-selector switch, but the system employed was the old low-definition 30-line scheme. A later demonstration also utilised this scheme, but Mr. Baird has been experimenting with a view to embodying high-definition system in this public-address type of apparatus and has at last achieved success. It is not claimed that the present arrangement is perfect, and it was impressed on us at the demonstration that it was an early result, but we must confess that there are obviously great possibilities in the scheme.

Details of the System

The screen, measuring 8ft. by 6ft. 6ins., was erected in place of the standard cinema screen and was of a translucent material, with the receiver erected in a large room behind it. The transmitter in this particular demonstration was erected in another room in the cinema, although when the arrangements were originally made it was proposed to transmit the signals from the Baird laboratories at the Crystal Palace. The fire had, however, destroyed the transmitter and we thus had to be content with a land-line transmission. Only close-ups were shown, but no make-up of any kind was employed and the particular system enables this to be dispensed with. It was stated that extended scenes (or long-shots) can be shown. The system incorporates a combination of a mirror-drum and scanning disc and the definition is 120 lines with 16 pictures per second.

Interlacing

A form of interlacing is employed, and a secondary field is formed of two or more primary interlaced scans. This scanning is then repeated a number of times, being displaced at each repetition. The secondary scan actually consists of two 20-lines intermeshed to form a scan of 40 lines. This 40-line field is then repeated three times and each time it is displaced laterally by means of the scanning disc to interlace with the other fields, and so forms a final field of 120 lines. There is practically no flicker, but in the demonstration picture there was the slight "floating" effect which characterised the earlier 30-line pictures. Furthermore, the picture carried the separate lines running vertically across the picture similar to the older system, but we were assured that this was due entirely to the experimental form of the apparatus being used and that eventually the lines would be obliterated and that the picture would remain perfectly steady. Further technical details of the system will be given in a forthcoming issue.

THE BRITISH LONG DISTANCE LISTENERS' CLUB

More News from India

MR. ADAMS, of the C.I.D. (Bombay), sends us some interesting news and snaps. In his letter he says, "Thanks a lot for that topping little certificate that arrived here safely a couple of weeks ago. It's a fine bit of work, and well worth preserving; more so in view of the fact that it comes from a *British Club*. Honestly, never for a moment did I imagine that such an organisation would take a hold in England. I thought that the States had the monopoly of DX Clubs, and it is really good to find that we are at last to have something that we can call our own.

"From what I read things are going really well with the Club, and it already holds the position of being the largest in Europe. It's just a matter of time ere it becomes one of the largest in the world.

"I have put in for my licence, and expect to be on the air in the not too distant future, but do not think that I'll ever lose my interest in the S.W.L. side of it. It's too darned interesting to throw over as easy as all that.

"I enclose a couple of snaps that you may like to make use of and which are sure to interest readers.

"I am also sending you a photograph of my DX corner as it stood at the end of last year in the hopes that you might be able to squeeze it into some odd corner.



Mr. S. R. Neale, of India, holding a midget transmitter which he has built.

I am sorry I have not a decent snap of the corner as it stands to-day, as the array of cards is now vastly more imposing and the quality more varied."

For Wiltshire Readers

MR. J. OVERTON, of 24, Bridge Street, Taunton, Som. (B.L.D.L.C. No. 2,521), would like to correspond with any one interested in amateur short-wave listening, living in Salisbury or anywhere in the county of Wiltshire. If any local reader is interested perhaps he will get into touch direct with Mr. Overton.

A.E.L. All Empire Listeners

AS an extension of the facilities of the B.L.D.L.C., a new special feature is to be included. Any member who can produce five verifications showing that he has received British Empire Stations in five different continents will receive a letter from the Secretary "conferring" the A.E.L. of the B.L.D.L.C. upon him.

Amateur Report Wanted

MR. CHAPLIN, of Hucknall, has written as follows: "I have before me a QSL and letter from W9MXW in which he thanks me for my report on his fone signals, and adds that although he has worked two G.'s on C.W. he never has had the pleasure of a 2-way fone QSO and would very much appreciate a shout if any G ham should hear him calling on 14 m/cs. He is using 200 watts input and at present is coming over very well. On my report I gave him R7 QSA5 QSB nil on a 1.v.1 battery no A.V.C.

"I am sure W8MXW would, like myself, be very pleased if you would kindly publish this letter in PRACTICAL AND AMATEUR WIRELESS.

"VE4QY, Manitoba on 14 m/cs fone, 35 watts input, is asking for reports, as apparently according to his QSL I am the only one to report his signals on fone, and he would like to know if his signals are being received consistently."



The wireless den of Mr. Adams in Bombay. See his letter above.

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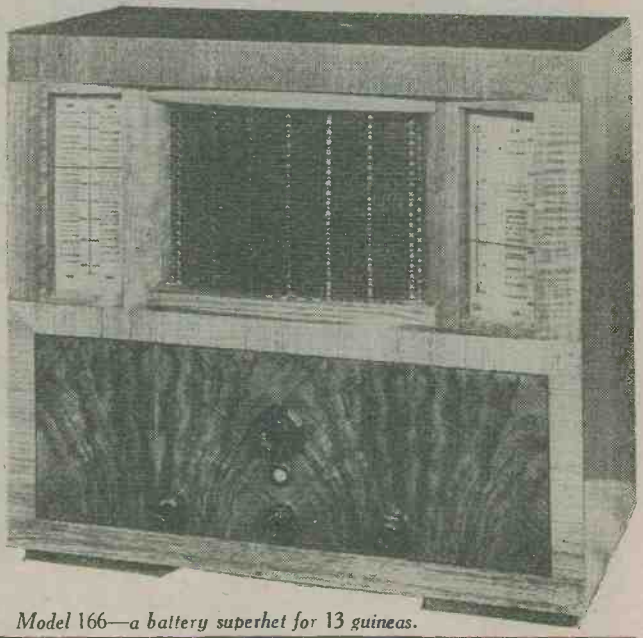
TWO NEW H.M.V. RECEIVERS

THERE are two interesting new models in the H.M.V. range, both of which are here illustrated. The radiogram is an all-wave model, designed for use on any mains, either A.C. or D.C., without alteration. It embodies all the latest circuit refinements and costs only 25 gns. complete. The other model is a battery all-wave superhet, covering three wavebands, namely, 18-50, 195-580, and 840 to 2,000 metres. The two tuning scales are arranged on either side of the loudspeaker opening in a vertical position, and the left-hand scale covers the medium waves, whilst the right-hand one covers short and long wavebands. There are four controls: volume, tuning, waveband switching, and tone. The on/off switch is combined with the volume control, and the waveband switch has a fourth position to effect a change-over for gramophone record reproduction.

A small pilot lamp is mounted behind a red-glass window below the tuning knob to show when the receiver is switched on, and this is a novel refinement. A special nickel-aluminium-cobalt magnet is employed for the loudspeaker, and it is claimed that a flux-density of over 8,500 lines per square cm. is obtained. The output is of the Q.P.P. type, delivering approximately 1¼ watts. To ensure good selectivity the input is of the bandpass type fed direct to the frequency-changer stage, and the intermediate frequency adopted in this particular receiver is 465 kc/s. A double-diode-triode is employed for second detector and A.V.C., and the triode portion feeds the output stage. The L.T. consumption is .8 amps. and the average H.T. consumption 7 mA. The price of the receiver is 13 guineas, and the model number is 166.

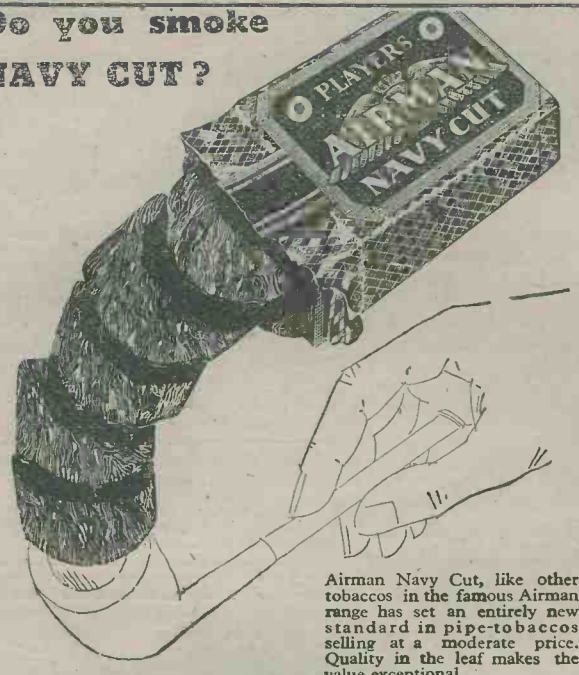


This is the Universal All-World Radiogram.



Model 166—a battery superhet for 13 guineas.

Do you smoke NAVY CUT?



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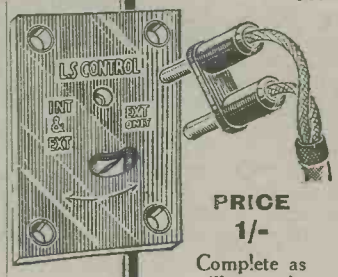

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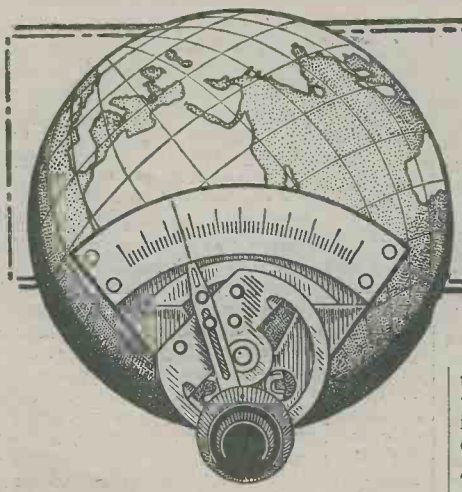

SHORT WAVE SECTION

ULTRA-SHORT-WAVE RECEIVER DESIGN

WHEN the short waves were first "discovered," short-wave receivers were freaks, indeed. They bore little resemblance to the general-purpose receivers of the time, and now that we are all thinking in terms of ultra-short waves, we find that the ordinary short-wave receiver has settled down into a very straightforward affair, devoid of frills and unnecessary gadgets, while the ultra-short-wave receiver is rather out of the ordinary.

This, I suppose, is natural. No one imagines that we know all about these ultra-short waves yet; and even when we do it will be some time before we settle down to a conventionalised technique in our receivers and transmitters.

Let us, therefore, look at some of the types of receiver suitable for use "in the present state of the art," as the Patent Agents so aptly remark. I intend to keep away from the superhet and to deal with two types of set, the "straight" receiver and the super-regenerator.

The amateur's first attempts at getting down to 5 metres with a straight receiver were somewhat discouraging. It got down there all right, and it oscillated, and the reaction control worked nicely, but there simply wasn't anything to listen to. By and by, a few amateur transmitters built some low-power gear and started putting out telephony transmissions on the 5-metre band.

Here was the chance for the owner of the straight receiver; but, unfortunately, the straight receiver just couldn't make anything intelligible of them. The transmitters had not, at that time, succeeded in putting out a crystal-controlled, or frequency-stabilised, signal; and the thing they did put out was so hopelessly wobbly that a reacting receiver simply wouldn't look at it!

All that one could hear of a telephony transmission was a little scratchy parasite that bobbed up and down in the band, and it was pretty weak at that, even at close quarters.

The Super-regenerator

Someone then had the brain-wave of using the old Armstrong super, or a modification of it. You will remember that the principle of the super-regenerator involves keeping the detector in its hyper-sensitive state, right on the threshold of oscillation, by shooting it backwards and forwards across that spot several thousand times per second.

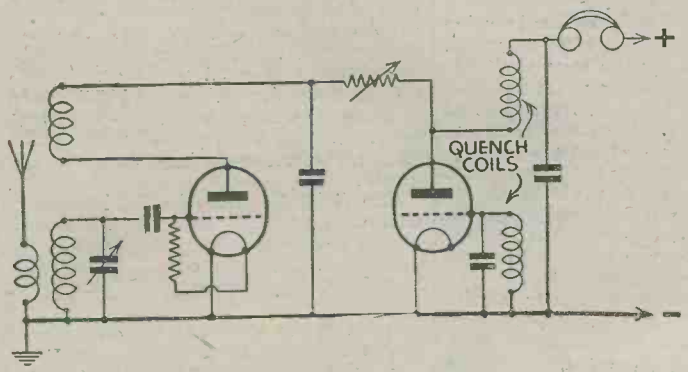

Fig. 1.—The simple super-regenerative receiver with separate quench valve.

In other words, its H.T. supply is modulated by what is really a short-wave oscillator, using a frequency of 15,000 kilocycles or something of that order. One then hears a nice hefty background through which it hardly seems possible that any signal would penetrate, but as soon as a signal arrives that is strong enough to "trigger" the arrangement, the mush disappears and we have a strong, readable signal.

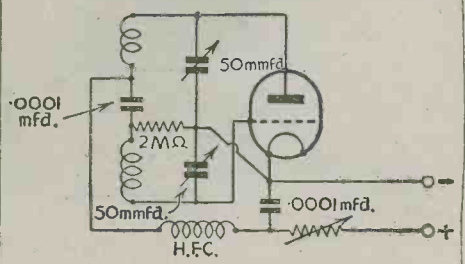

Fig. 2.—The Split Colpitts circuit.

This worked out extremely well for 5-metre work. The super-regenerator was simple to construct and to operate; it was easily made portable, and taken out into the high hills; and it was sufficiently "flat-tuned" to make something of the wobbly transmissions with which it had to cope. Incidentally, its broad-tuning properties were responsible for the ease of operation, and slow-motion dials could be dispensed with in the most amazing way.

It was with gear of this type—unstable transmitters and broad-tuning receivers—that all the early 5-metre records were set up. It is also of interest to note that such gear still proves efficient enough to be used by several public services.

Circuit Details

The need for super-regenerative receivers having been thus explained, we can talk about them for a bit. Fig. 1 shows the original type, consisting of a straightforward detector circuit with a separate valve, arranged as an oscillator, modulating the detector anode supply by a simple series arrangement.

The particular detector circuit used need not concern us at present; anything that worked on 20 metres could be made to work on 5 metres if the layout and components were efficient enough.

A little later someone discovered that our old friend, the Split Colpitts circuit, very popular among transmitters, made a really excellent detector circuit for the ultra-short waves. Not only was it a nice-looking and easily-handled circuit, but it really lent itself to an amazingly simple and compact layout.

Fig. 2 shows the circuit, and Fig. 3 the kind of practical arrangement that is often made of it, from which it will be seen that the layout really *is* good. The next stage in the development of these circuits was to dispense with the separate "quench" valve, and to arrange the two long-wave circuits in the H.T. and grid-return leads of the detector itself, thereby making it do both jobs.

This particular variety of the super-regen. is quite well known, and need not be discussed further, except to remark that general experience shows that it is *not* so sensitive as that in which two valves are used—one for each purpose.

Yet another "self-quench" circuit was evolved, operating on the "grid-blocking" principle. Broadly speaking, the recipe

(*Continued overleaf*)

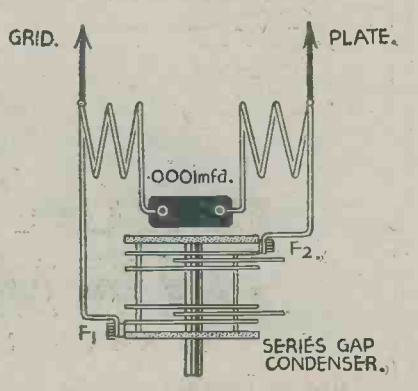

Fig. 3.—Practical arrangement of the Colpitts tuning circuit.

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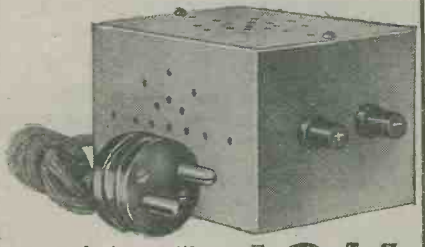

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SHORT-WAVE SECTION

(Continued from previous page)

was on these lines: Take an ordinary reacting detector; increase the size of the reaction condenser until the thing breaks into an audible howl, so fiercely is it oscillating; then gradually reduce the value of the grid-leak until the howl goes up just out of audible frequency. Then you have your detector "supering" nicely, and, if anything, with less background noise than one usually associates with the other methods.

Again, a single-valver operating on this principle is not so efficient as a set using a detector and separate "quench" valve, but, on the other hand, a two-valver using a self-quenching detector and an L.F. stage is undoubtedly more useful than the other type of two-valver.

The set shown in Fig. 4 is a single-valve receiver operating on this "grid-blocking" principle. Here, again, the "Split Colpitts" arrangement is used. The large condenser on the *remote* side of the ultra-short-wave choke is responsible for the fierce oscillation, and the .5-megohm grid-leak shifts the "hoot" out of audibility.

Component Values

In some cases grid-leaks as low in value as 100,000 or even 50,000 ohms are used. It should be noted, by the way, that this circuit works rather better when followed by a resistance-coupled L.F. stage than as a detector only. In that case a resistance of about 30,000 ohms occupies the position in the circuit now filled by the 'phones.

This particular set was made in single-valve guise because it is required to be really portable. A two-valver, however, with another Midget valve and resistance-coupling, would hardly be large!

It is usual to use a condenser of the "series-gap" type for tuning, as the moving plates and control knob are then at earth potential. Such an arrangement would be absolutely essential in a straight circuit, or the frequency-changer of a super-het, to avoid hand-capacity troubles. With the flat tuning of the super-regenerator, however, it does not matter. This little midget set tunes nicely over the 5-metre band with just the plain knob on the variable condenser—no slow-motion or even a large dial.

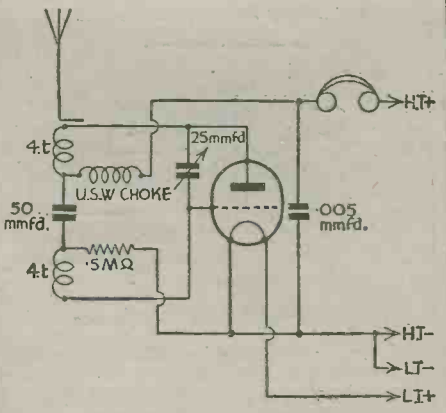

Fig. 4.—A novel single-valve circuit.

Aerial coupling is arranged by clipping the aerial lead-in on to the insulating "spider" of the variable condenser in such a way that the crocodile clip is parallel with the fixed plates. This provides sufficiently loose coupling to allow of the use of a full-length outside aerial. For use with dipoles it is, of course, essential to provide a proper coupling winding, preferably between the grid and anode coils.

The trouble with most super-regenerative receivers is excessive background hiss. This may be caused by a variety of things—unwise choice of quench-frequency, too much H.T. on quenching valve, detector oscillating too fiercely (at the ultra-high frequency), and so on. Where a separate quench valve is used, it is always worth one's while to use some form of oscillation control, whether by means of variable coupling between the two long-wave coils, or by an adjustable condenser.

A variable resistance, as shown in Fig. 1, for controlling the oscillation of the detector (not the quench valve) is also invaluable. It is a fact that a super-regenerator, carefully tuned up and operated, need make very little more noise than an ordinary oscillating detector. The signals it gives, of course, will be vastly stronger, in proportion to the noise, than those that would be obtained with a reacting detector only.

Unfortunately, most of the "supers" that one hears seem to generate a most intolerable racket, through which only the very strongest signals could possibly be heard.

The Straight Sets

And now, a few more words about the "straight" receiver. The same circuit that you normally use for short-wave reception will probably suit you best, because you will have got to know of its little habits. Very small coils will be required, and for the 5-metre band a couple of 4-turn coils of ½in. diameter are generally used. With a tuning condenser of about 25 micro-microfarads, these cover the band nicely.

The Split Colpitts circuit, however, is well worth trying, and may give better results than the others when you become used to it. Reaction cannot be controlled by substituting a variable condenser for the fixed condenser between the two coils, for this varies the tuning as well. A variable resistance in the anode circuit, as shown in Fig. 2, is the best way of doing it. Incidentally, this may have to be shunted by a 1-microfarad condenser to insure quiet operation.

Tuning with this circuit on its own is a very different matter from the handling of a super-regenerator. It is decidedly sharp, and a good slow-motion dial and a large quantity of dexterity are required. Furthermore, the layout must be so planned that hand-capacity is entirely absent, even if this means mounting the condenser well back from the panel and using an extension rod for its control.

Unless you are listening to frequency-stabilised transmissions, you will be disappointed. Speech from unstable transmitters, unless it is very strong, is not often understandable. Until reaction is slackened right off, it is just a confused scrape; with reaction right back it is inaudible.

The obvious solution to these difficulties is to use a suitable type of superheterodyne, and I shall deal with the problems attendant upon the design of such a set in another article.

For the present, if you are really keen on ultra-short-wave work, you will be well advised to build either a straight receiver or a "super-regen," to get the feel of things.

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LEAVES FROM A SHORT-WAVE LOG

Another Question of Interference

UNDOUBTEDLY the daily increasing number of transmitters in the sanctioned broadcasting bands is making matters very difficult for the authorities whose duty—and privilege—it is to allot the channels. During the past week or so, although the reception of programmes from W1XK, Millis (Mass.), on 31.35m. (9,570 kc/s) has been such on most nights that signals were captured at full loudspeaker strength, interference from a South American station has been noticed on several occasions. The culprit would appear to be HJ2ABC, Cuvuta (Col.), which, originally working some kilocycles away, has cut down the separation to barely 2 kilocycles. Careful listening will reveal in addition to an unpleasant hum and "judder," the chimes (c, d, e, f, c) used by the South American as an interval signal. Listen for them in the background of the Boston broadcast.

Havana Broadcasts Heard Nightly

Although Cuba is distant from the British Isles by about 4,700 miles, it is surprising how transmissions from Havana, and other places in the island, are now being heard all over Europe. Almost nightly it is possible to log five or six different broadcasts. Try for COCX, 25.7 m. (11,675 kc/s); COCQ, 30.77 m. (9,750 kc/s); COCH, 31.8 m. (9,430 kc/s); COKG, temporarily on 48.31 m. (6,210 kc/s); and COCO, on 49.92 m. (6,010 kc/s). All are in Havana, with the exception of COKG, situated in Santiago. Their programmes, with a few exceptions, are very similar; they broadcast interminable rumbas interspersed with "puffs" for local or other products, radio sets, automobiles, and so on. Many of these transmissions may be held steadily from G.M.T. 22.00 until the early hours of morning.

A Very Busy Channel

The wavelength of 31.28 m. (9,590 kc/s) is one which should be carefully registered, as it is shared by several important broadcasters. On this channel you should log transmissions in both Dutch and English. Of the former you may tune in PKYDB, Soerabaya (Netherlands East Indies), which is the key station of the N.I.R.O.M. East Java network, or PCJ, Eindhoven (Holland), on the air every Sunday between G.M.T. 19.00-20.00; on Mondays between 00.00-01.00; Tuesdays from 18.30-20.00; and on Thursdays gives a longer broadcast, namely, from 00.00-03.00. Transmissions in English on this channel may be from VK2ME, Sydney (N.S.W.), or from W3XAU, the short-wave outlet of WCAU, Philadelphia, in the Columbia Broadcasting system's hook-up. There can be no hesitation in identifying them, as the American station, in a similar way to that adopted by W2XE, Wayne (N.J.), gives a multilingual call, in this instance in English, French, German, and Spanish. I also learn that the new Perth (Western Australia) 500-watt short-wave transmitter VK6ME, is likely to use the same channel.

Siam Tries Out a New Channel

HS8PJ, Saladeng, Bangkok, has been logged with a broadcast between G.M.T. 13.00-15.00 on Thursdays using a new frequency, 9,350 kc/s (32.09 m.). Announcements in Siamese, English and French. Following a transmission of English or American music a twenty-minutes' news bulletin is given.

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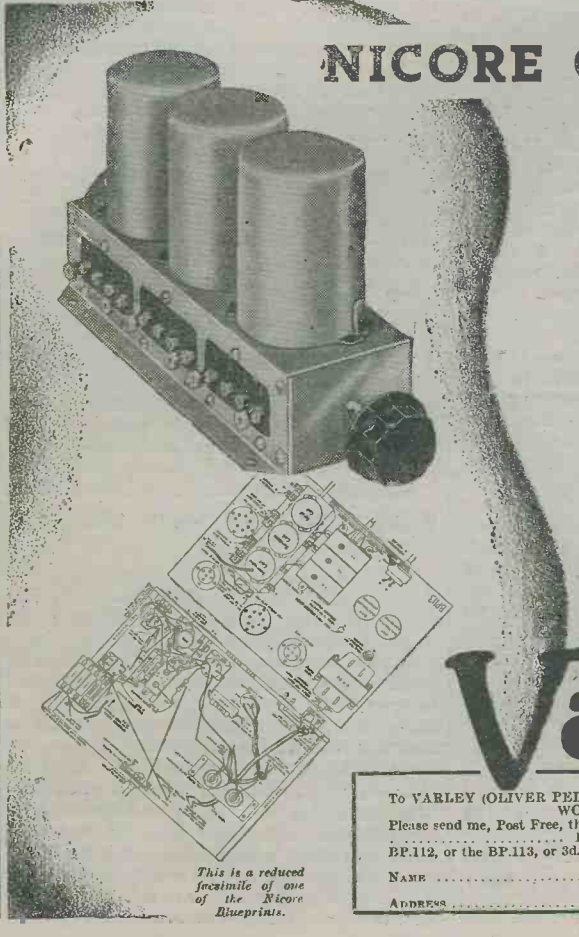
Pr. W. 19.12.36.

NICORE COIL UNITS



This is a reduced facsimile of one of the Nicore Blueprints.

AHEAD of their time—that's how we class these new Coil Units of ours. We sincerely believe that they will make a good deal of difference to any home-constructed set. And to build a set round one of the Nicore Units is to open the door to Radio's best. For your especial benefit we have recently published four brand-new circuit blueprints, which are giving excellent results with these ganged units. No. 1 (BP.111) Mains superhet for 110 K.C. No. 2 (BP.112) Battery superhet. for 465 K.C. No. 3 (BP.113) 3-valve mains receiver with band-pass tuners. No. 4 (BP.114) S.G. Battery 3 with Pentode. You can have one of these blueprints (and they're really worth having) for 6d. (The BP.114 is 3d.) The postage is free.

List No.		Price
BP.111.	3-Gang for Superhet. Sets	£1 1 0
BP.112.	2-Gang for Superhet. Sets	13 6
BP.113.	3-Gang for Straight Sets	£1 1 0
BP.114.	2-Gang for Straight Sets	13 6

Alternatively the BP.113 may be used in a battery-operated circuit and the BP.114 in a mains-operated circuit.

Varley

To VARLEY (OLIVER PELL CONTROL, LTD.), BLOOMFIELD RD., WOOLWICH, S.E.18.

Please send me, Post Free, the following blueprint(s). (Put List No. here) ..... I enclose 6d. in stamps for either the BP.111 BP.112, or the BP.113, or 3d. in stamps for the BP.114.

NAME .....

ADDRESS ..... PRAC. 19/12/36

RADIO CLUBS AND SOCIETIES

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.

Exeter and District Wireless Society

AT the last meeting of this society, held at No. 3, Dix's Field, Exeter, Mr. F. Thorn demonstrated the full range of modern receivers, and also gave a very instructive lecture on the erection and uses of the dipole aerial. The practical use of this aerial system was ably demonstrated, and the members were able to hear for themselves the difference between the dipole and the ordinary broadcast receiving aerial. Secretary, W. J. Ching, 9, Sivell Place, Heavitree, Exeter.

Sutton-in-Ashfield Radio Society

THIS club, which was formed about six months ago, is making considerable progress. At the present time members are busy assembling various types of short-wave receiving apparatus. Two classes are being run teaching morse, one for juniors and the other for senior members. The club has been affiliated to the Radio Society of Great Britain, and an experimental transmitter's licence (artificial aerial) has been granted for the use of the club, the wavelength allotted being of the order of 7,070 kilocycles, and the call-sign is 2AAAT. Interested persons are invited to write to the chairman of the society, Mr. A. R. George, "Lynton," Peveril Drive, Sutton, Notts.

The Croydon Radio Society

FEW members miss the Croydon Radio Society's loudspeaker night, and for that event on Tuesday, December 1st, a large meeting gathered to sit in judgment on the various models brought by members. All this took place in St. Peter's Hall, Ledbury Road, South Croydon. The feature of the evening was the "comeback" of the Vice-President's, Mr. G. S. Vellacott's, home-made loudspeaker. This unique instrument had won many such contests in the past, but lost during last year against up-to-date makes. A guitar recital proved the undoing of Mr. Webster and Mr. Jones, and in the speech test section, Mr. Ménage emerged successfully. The Technical Adviser's special oscillator was a severe test, and all models had to give of their best before being permitted to pass on. Here Mr. Webster scored many points. Five loudspeakers reached the final, including Mr. Clarke's Oval, Mr. M. G. Firmin's home-made, and Mr. Vellacott's. All gave such good results that no one claimant could be given the verdict. Even so, Mr. Vellacott was congratulated on doing so well with his speaker, so old as it was, compared against the modern designs present. The first half of the session has now been concluded, but PRACTICAL AND AMATEUR WIRELESS readers are invited to apply for the fixture card giving programmes from January, 1937, onwards.

Hon. Publicity Secretary, E. L. Cumbers, Maycourt, Campden Road, South Croydon.

Radio Society of Northern Ireland

THE above society, which has been in operation now for over two years, at their monthly meeting, held on November 4th, in the City of Belfast Y.M.C.A. Radio Clubroom, elected their officers for 1937. This very active Northern Ireland society has now over fifty members, and out of this total there are twelve transmitting operators holding GI call-signs. The society hold their monthly meeting on the first Wednesday of each month in the City of Belfast Y.M.C.A. Radio Clubroom (GI6YM), Wellington Place, Belfast. Slow morse practice classes are held weekly for the benefit of all members, and all who have attended these classes have made good progress. At the club station, GI6YM, a powerful new rotary converter has been installed, and within a few weeks the call-sign of the club will be heard on the air. Any reports on these transmissions will be gratefully received and acknowledged. Station visits and lectures have been arranged for the winter months, and further information as to the activities of the society may be obtained by writing direct to the Hon. Secretary, Frank A. Robb (Radio GI6TK), 46, Victoria Avenue, Sydenham, Belfast, N.I.

Wellingborough and District Radio and Television Society

THE fortnightly meeting of the above society was held at The Midland Hotel, Wellingborough, on Wednesday, December 2nd, and a crowded meeting listened to an excellent lecture given by Mr. F. Strafford (G2TD) on problems of electrical interference.

Mr. Strafford commenced his talk by explaining that there were two distinct types of interference, and that both types were often caused at once by the same source of interfering machinery, or whatever it was that caused the interference. He mentioned that one type often travelled from the source via the electric mains wiring, and into the receiver by way of the power supply, the other type being radiated through space in the form of a magnetic wave; this latter component being picked up by the aerial of the receiver. The interference received via the mains could nearly always be suppressed in a simple manner to a degree that rendered it harmless, but the type that was received via the aerial was always more difficult to eradicate.

Mr. A. E. Fletcher was in the chair, and Mr. R. Bradshaw was in charge of the lantern. A lantern slide for this lecture was loaned by PRACTICAL AND AMATEUR WIRELESS.—Hon. Secretary, L. F. Parker, 127, Jubilee Crescent, Wellingborough, Northants.

New Club for Whitstable

A NEW Radio Club is being formed in Whitstable, under the name of the "Tankerton Radio Club." Its chief interest will be short-wave transmitting and receiving. Meetings are to be held every Saturday evening at 7.30 p.m. Further details of this club may be obtained from the Secretary, J. Elvy (Radio G-2AMY), "Shirlmere," Northwood Road, Tankerton.

Radio, Physical and Television Society

AT a meeting of this society, which was held on Friday, December 4th, Mr. J. G. Hobbs, A.M.I.R.E., lectured on "Short-wave Transmitters."

Methods of producing oscillations of radio frequency were dealt with in general and demonstrated by means of apparatus. A low-power C.W. transmitter, built by a member, was also demonstrated.

Meetings of the society are held at 72A, North End Road, West Kensington, London, W.14, on Fridays at 8 p.m. Light refreshments are supplied. Readers requiring further information are invited to write to the Hon. Secretary, Mr. V. R. Walker, 49, Fitz James Avenue, West Kensington, London, W.14.

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.

F. G. (Worthing). The receiver is not one of our designs, and we can therefore give you no details concerning it.

R. C. (Colchester). It would appear that the detector valve needs replacing, or that one of the anode components has become faulty.

G. B. C. (S.E.4). You cannot modify the current or voltage output as you suggest. A better scheme is to fit a load resistor to the switch circuit so that when the amplifier alone is switched on the resist or is automatically brought into circuit. The value should be such that it consumes as much current as the H.F. amplifier. You must calculate the grid swing of the output valve, and then work backwards to find the necessary stages and couplings to give a fully-loaded stage.

V. R. R. (Madras). The apparatus may be used as you suggest, and further details will be given in our pages at a later date.

I. H. H. J. (Sidmouth). You could use a short-wave converter with the set, but it would probably be preferable to dispose of the receiver in view of its age, and build a modern all-wave set. We cannot recommend a blueprint to use up the old parts of the 5-valve set. Again, the parts are now obsolete.

A. H. (Lerwick). So far as we have been able to trace, no English valve manufacturer can supply you with the valves mentioned. The alternative solution is to remove the present valveholders and fit those for English valves, replacing the various stages by standard English valves, but the performance will probably be changed owing to the different characteristics.

A. G. G. (Halifax). Messrs. Electradix Radios can supply you with details of microphones which will no doubt be found suitable for your needs.

M. C. N. (Dromod). The constructional articles which appear in our pages should be adequate for your requirements. No further information is necessary, and when you find a set which suits you, you will find that all necessary constructional details are given.

J. M. (Bournemouth). You do not state what type of set you require. Is the Colt All-Wave three described last week of any use in your case, or do you need a broadcast receiver only—without the short waves?

S. A. B. (W.14). You will find there are seven two-valve battery blueprints in our Blueprint list, and no doubt any one of these would be suitable for you. The type of circuit is given after each name in the list.

G. A. H. (Exeter). The "Wireless Constructors' Encyclopædia" is probably the best book for you, as it explains all the terms, and is profusely illustrated. The Prefect S.W. Three is the nearest of our receivers to the specification outlined by you.

B. R. (Rhuddlan). It would certainly appear that the valve is microphonic, but this may not be the only trouble. As it is a commercial receiver, we advise you to get into touch with the makers or their nearest local service agent.

A. McL. (Glasgow, E.1). The only solution is to modify the degree of aerial coupling. You do not show a tuning condenser in the detector circuit, but presumably you omitted to sketch this, and we assume that one is used in the receiver.

F. G. (Bury St. Edmunds). The wood referred to may be obtained from F. Romany, Ltd., 52, High Street, London, N.W.1. Their catalogue may be obtained for 6d.

A. T. (Liverpool). Unfortunately the issue in question is now out of print, but we hope to describe a similar unit in the near future.

B. M. M. (Repton). The noises may be due to faulty components in the set, or to mains-borne interference. You do not state whether the set is mains-operated, and therefore we cannot advise definitely. If the noises exist in a battery receiver, when aerial and earth are disconnected, a fault is present in the receiver, and a milliammeter in each anode circuit may enable you to trace the faulty part by indicating a fluctuating current in that stage.

J. M. (E.7). The details in our Christmas number will no doubt have enabled you to carry out the desired amplification.

K. W. (Hove). The substituted valve may be the cause of the trouble, and that is why we always advise constructors to adhere to the parts specified.

W. A. C. (Islington). The coil may be obtained direct from Messrs. Peto Scott.

S. C. J. G. (Belfast). You should find one of the latest all-wave interference-free aerial systems most suitable for your locality.

K. H. (S.E.11). See the reply above to F. G., of Bury St. Edmunds.

A. A. T. R. (Dagenham). The microphone may be faulty, as your connections were quite correct.

D. C. (Birmingham, 19). You should not have damaged the eliminator by ordinary use. Perhaps one of the condensers has broken down or a resistor may have failed. Check the output with a meter.

NEWNES' TELEVISION AND SHORT-WAVE HANDBOOK

3/6 or 3/10 by post from
GEORGE NEWNES, Ltd.,
8-11, Southampton St., Strand, W.C.2

Facts and Figures

COMPONENTS TESTED IN OUR NEW LABORATORY

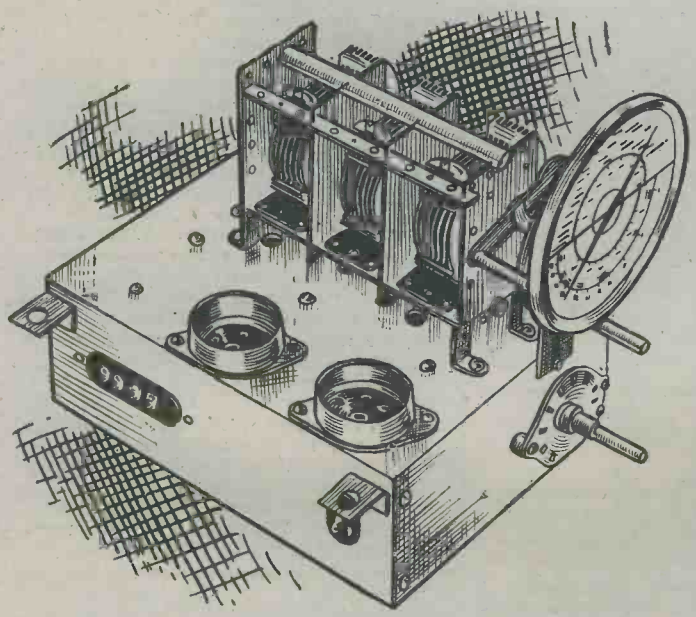
Belling-Lee Low Impedance Feeder

IN the recent articles on dipole aerial systems we have shown how the signals are fed from the centre of the dipole to the receiver, and it has been stated that various methods of feeding the signal may be adopted. A fairly common method of carrying out this part of the system is to use ordinary lighting flex, whilst another popular scheme is to use a single cable of the screened type, employing both the wire and the screen in various combinations. Messrs. Belling-Lee have, however, been investigating the problem and have now evolved a new type of feeder which has been found to provide a very much improved result, which is especially noticeable in television installations. The improvement in this case takes the form of a clearer picture, with freedom from interference which may normally be picked up by the feeder wires.

This new cable consists of two 26 gauge enamelled wires laid parallel but separated from each other in a special insulating material known as "Telconax." The main physical details of this cable are as follow: Spacings between centre of wire .035in.; overall dimensions of the complete cable .1in. by .15in. (elliptical section); weight per 100 ft. .85 lbs.; breaking strain 20 lbs., at which the conductors break before the covering. The surge impedance is 75 ohms, and the loss in decibels per 100 ft. at 45 megacycles is 1.4. The standard method of supplying this cable is on a reel of 65 feet and the price is 6s. 9d., but longer lengths may be obtained to special order. For transmission purposes the feeder may also be employed and it will carry 1.5 amps. H.F. suitable for feeding a transmitting dipole.

The "Radio-Heart"

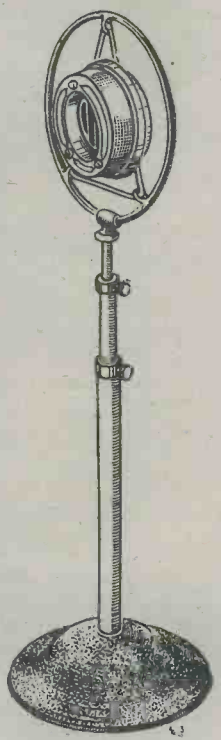
MANY constructors hesitate to build a superhet owing to the apparent difficulty of accurately ganging the various circuits, and it is, of course, well known that unless the circuits are correctly ganged the superhet is no better than any ordinary circuit. Selectivity also depends upon the number of tuned circuits, and unless the tuning condenser is correctly chosen for the particular coils used it is not possible to use a correctly calibrated tuning scale. All of the difficulties may be overcome by employing one of the special built-up radio units which may be obtained from Messrs. R. A. Rothermel. The illustration on this page shows the complete arrangement, from which it will be noted that the valve-holders for the frequency changer and signal H.F. stage are also included, and this particular unit incorporates all of the early components and is completely wired and ganged, thus removing all difficulties associated with correct design and construction. The chassis is of heavy cadmium-plated steel (not aluminium) and is 5⅝in. by 7¼in. by 2½in. with mounting feet fitted to the top edge. The idea underlying this is that the entire unit may be mounted in the centre of a standard wooden or metal chassis and rubber grummets may be interposed between the feet so that the entire unit is "floating" and tuning shifts due to vibration are thereby avoided. The three-gang condenser tunes nine H.F. coils wound with Litz and heavy-gauge copper wire, according to the particular wavelength covered, and the under side is divided by metal partitions into four separate sections thus entirely screening the various coils and associated circuits. Mica dielectric is employed for the trimmers, and the entire unit is ganged and trimmed by the manufacturers and is thus accurately adjusted in such a manner that no modification can take place due to any additional wiring which would normally have to be added by the set builder. A multi-contact wave-change switch is fitted, and there are seven separate sections to this, six of which carry out the change-over on the various coils, whilst the seventh is extended to the rear of the chassis for radiogram switching. Silver-plated contacts are fitted, and the ranges covered are 16.5 to 52.6 metres, 167 to 555 metres and 780 to 2,140 metres. The price of the complete unit with illuminated four-range dial is £5 17s. 6d.



The Radio-Heart tuning unit, consisting of all components ready wired for the H.F. and frequency changing stage of a Superhet.

Bulgin Microphone Stand

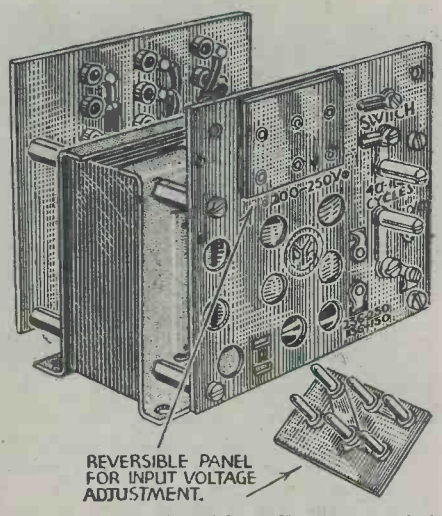
APART from the fact that a stand for a microphone should be efficient in use, providing adjustments for height, stability, and so on, it is also necessary that the general appearance shall be good, as it is usually placed in a very prominent position. The Bulgin stand illustrated embodies all these points, and is finished in a neat chromium plate. The base is heavy enough to provide perfect stability when the stand is extended to its full height of 5 feet and a heavy microphone is carried in the mounting ring. When fully reduced the overall height is only 20in. In the illustration the Bulgin condenser microphone is shown mounted in the ring, but it will carry practically any type of instrument, three fixing rings being provided for this purpose. The price is 60s.



Bulgin Microphone Stand, shown complete with the Bulgin condenser microphone.

Kabi Multi-contact Switches

FOR use in modern all-wave circuits and other similar arrangements where multi-switching is needed, the Kabi components will be found extremely useful. These are of the rotary type with self-cleaning contact studs, and a positive "click" action is provided for each position of the contact or wiper arm. To avoid slipping the arm is keyed to the operating spindle but is insulated from it so that several units may be operated by a common spindle. The switch plates are available with various contact points from 2 up to 19, and with either brass or German silver contacts. The prices vary, from 2s. 6d. to 7s.



This is the new Pye Mains Transformer which was reviewed in our issue dated Nov. 28th last.

ELECTRADIX



A Bargain in Dynamos, Type "C." 140 watt. Enclosed Dynamo, 12-20-v., 12 amps. Ball Bearings, Vee Pulley, 25/-.

Switchboard with Ammeter, max. and-min. Auto Cutout Switch Fuses and Field Reg. 25/-, or 47/6 the pair (as illustrated). 2,000 Dynamos and Motors in stock, all sizes.

47/6

MOTORS for A.C. MAINS. Repulsion, self-starting. 1/60 H.P., with pulley, Type 50, 1,500 revs., 18/6. Ditto, Type 36, 1/25 H.P. G.E.C., 3,500 revs., 27/6. Enclo. Induction 1/10 H.P. Motors, 2,500 revs., 35/-. Self-starting, ¼ H.P., 1,425 revs., 49/-, etc., etc. D.C. Mains Motors, 1/40 H.P., 110 or 220-v. series, Type K.B., 1,750 revs., 15/-. Ditto, G.E.C., 230-v., 2,000 revs., 16/-. Croydon 1/12 H.P., 110 and 220-v. shunt, 1,700 revs., 30/-. Motor Gen. for A.C., 220 volts to D.C. 100 volts, 1 amp., 60/-. Small motors, 6 volts, 12/6; 50 volts 14/-; 100 volts, 15/-. All fully guaranteed.

LARGE RECTIFIERS for D.C. Models or Charging. Westinghouse R. Type, 100 volts., ½ amp., £5. No. 2, 40 volts, 3 amps., £7/10/-. No. 3, 15 volts, 6 amps., £7. Trickle Chargers for H.T. and L.T., 37/6.

TELEPHONES.—House, office and garage, wall and table 'phone sets, 27/6 pair. Portable Army Field 'phones, 60/- each. Headphones, 120 ohm Sullivan, 2/9. High Res. best British for short wave, 4/6. Lightweight, 4/9.



XMAS EXPERIMENTS. LIGHT AND RAY CELLS.—Selenium Raycraft, 21/-; Kingston, 15/-. Raycraft outfit with relay and amplifier, 45/-. Photo-Cells, for Sound-on-Film and Ray work, B.T.P., 15/-; R.C.A., 25/-.

X-RAY TUBES. Large 7in. bulb. New, £5. Govt. type, with Tungsten target, 10/- only, packing 2/6.

CRYSTAL SETS.—The best all-wave, no-battery, Radio Receiver. 500 soiled sets cheap, 7/6 each.

HOME RECORDERS.—Acoustic Mi-voice sets, 15/-, 10/6, and 5/6 each, complete, ready for use.

SPEAKER BARGAINS.—Genuine Bargains in high-grade moving coil speakers by famous makers. All new and offered at less than half price. Quality reproduction of speech and music guaranteed.



7/6

MAINS ENERGISED SPEAKERS.—6in. R. & A., 2,500 ohms, with speech transformer, 7/6. 8in. with transformer, 15/-. Magnavox, 6in., type "144," 2,500 ohms., 12/6.

A.C. MAINS SPEAKERS, WITH RECTIFIERS. 100/250 volts, 11in. cone with transformer, 30/-. Jensen, 220 volt, 7in. cone and transformer, 25/-; 100 volt, ditto, 7in. cone, 20/-; 100 volt A.C. 8in. cone with transformer, 21/-.

BATTERY ENERGISED SPEAKERS.—Goodman's 6 volt, 8in. cone with transformer, 7/6; Jensen 6 volt, 7in. cone with transformer, 7/3; K.B. 6 volt, 8in. cone, 8/6; Hegra 6 volt, 9in. cone, with transformer, 10/-; Brown 6/12 volt, 11in. cone, with H.R. speech coil, 17/6; R. & A. 12 volt, 8in. cone and transformer, 10/-. New Sonochorde, P.M., "Class B," fitted transformer, 20/-.

P.M. CABINET SPEAKERS.—Hegra P.M., in oak cabinet, 12in. x 12in. x 12in., 25/-. P.M., heavy duty, 5 watt with transformer, 50/-; A.C. energised, 200/250 volts, 5 watts, with transformer, 65/-; Siemens Magnet table, 5/-.

SWITCHGEAR, DYNAMOS, MOTORS, ALTERNATORS AND J.I.G.'s, big stock P.A. Sets. Amplifier Microphones and Speakers for outdoor use, 5 watts to 20 watts at tempting prices.

Send for Electrical and Radio Lists "N."

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'Phone: Central 4611.

£7



6 VALVE ALL-WAVE SUPERHET

(Complete with B.V.A. Valves)

All-wave improved superheterodyne for A.C. or D.C. mains. High sensitivity on all three wave-bands (16.5-50 metres, 200-550 metres, 800-2,000 metres). Many interesting features, including:—Illuminated "Airplane" dial with station names. Special "squelch" valve for inter-station noise suppression, with manual muting control. Octode frequency changer. 8 stages, 7 tuned circuits. Iron-Cored I.F. Coils. Delayed A.V.C. 3.5 watts output. Extra heavy Cadmium-plated steel chassis.

£7 cash complete with valves, knobs, pilot lamps, mains cable and plug, etc. Deferred terms from London Radio Supply Co., 11, Oat Lane, E.C.2. 12 months' guarantee. Suitable loudspeakers, cabinets, etc., in stock.

McCarthy Chassis from £4 5s. to £12. Write for illustrated catalogue.

McCARTHY RADIO LTD.

44a, Westbourne Grove, London, W.2.

Telephone: Bayswater 3201.

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.)

Our All-wave Battery Sets: Mains Version

SIR,—There has been much correspondence in your paper recently about a good mains set, and what I would suggest is as follows:—

A superhet for A.C. mains covering all waves, with A.V.C. and visual tuning designed on the lines of the "£4 A.C. Superhet 4." It could have an output of 3-4 watts and an energised M/C. speaker; furthermore, it should be reasonable in price.—J. D. MORRIS (Stockport).

SIR,—I also agree with Mr. R. Stagg's request for an all-wave mains receiver, and would suggest a triple tuned bandpass receiver, as this gives that extra measure of selectivity over the two-circuit receiver so appreciated by the critical constructor.

May I add my appreciation of your efforts with regard to the production of cheaper components for the battery user. I only wish you could do the same with those components used in mains receivers.—W. ATIYEO (Birmingham).

Radio in China

SIR,—Having been a reader of *Amateur Wireless* to the extent of a dozen copies or so, I naturally switched over to PRACTICAL AND AMATEUR WIRELESS when the two papers were merged. Before becoming a regular reader of your paper I relied on American Radio Mags. for information on the best hobby yet! And, of course, I used American tubes, components, etc.

However, a friend of mine, Mr. G. Kemp, of Shanghai, told me all about English valves and their complete reliability. So I rebuilt my short-wave set, using Marconi and Osram valves, and I was amazed at the improved performance, and the small drain on the H.T. battery.

Since then I have built two superhet receivers (battery operation) for use on the broadcast (medium wave) band, and all the information has come from PRACTICAL AND AMATEUR WIRELESS.

I am now in Shantung, the tobacco-growing province of China. The distance from Shanghai "as the crow flies" is approximately 400 miles, and the maximum power of one of the five foreign stations in Shanghai is 1 kW! The other four stations are all under .75 kW. So I am using a 5-valve superhet, which has a tuned H.F. stage before the octode freq. changer. The circuit is a modification of your £4 Superhet. The coils and I.F. transformers are of Chinese make (American style!) the 3-gang tuning condenser Japanese, also all the small components, such as fixed condensers and resistances. The total cost was $75, or just under £5 at the present rate of exchange. These figures include everything, components, valves, loudspeaker and cabinet, the last mentioned being made by the local carpenter here at the cost of 3s. 6d.! How this set would compare with your £4 superhet I cannot say, but I receive two of the foreign stations fairly regularly each evening, using a good outside aerial 100ft. in length. The Chinese Government station at Nanking, XGOA, can be received during daylight, though this station is only putting out one-seventh of its rated power of 75 kW.

I notice now in Shanghai that PRACTICAL AND AMATEUR WIRELESS is selling much better, and it is the only English paper on wireless on the bookstands. Competition is very severe; I have counted seven American radio monthlies side by side with your paper, which in my mind is the "gem of the collection!"

So here's to a long life for PRACTICAL AND AMATEUR WIRELESS, and more power to your pen.—Yours sincerely, J. R. HARLING (Shantung, China).

CUT THIS OUT EACH WEEK.

Do you know

—THAT it is possible to work out mathematically whether an S.G. stage will be stable with certain types of coupling.

—THAT automatic grid bias may be employed with ordinary battery valves.

—THAT the absorption of moisture by the covering of the wire on a tuning coil can affect its tuning range.

—THAT certain high-power output valves must be mounted in a special position in order to assist in heat dissipation and to protect the filament.

—THAT an H.T. battery recuperates slightly when the set is switched off and thus its life curve is of an "undulating" nature.

—THAT nickel and aluminium are employed in the latest types of loudspeaker magnets.

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, *George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.*

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

Baseboards: GBTT

SIR,—With reference to the letter from L. Spalton, and headed "Baseboards: A DX Log," in your issue of November 21st, an argument for baseboards which I have not seen in print is the scope provided by this method of construction for moving components about to different positions in the event of any additions or improvements to the circuit. A metal chassis would somewhat resemble a colander after two or three experiments.

Regarding call signs, is not Mr. Spalton mistaken about GBTT? This should be *Queen Mary*, not *Normandie*.—L. Walton (Upton).

[*GBTT is, of course, the "Queen Mary's" call sign.*—ED.]



IMPRESSIONS ON THE WAX

By T. Onearm

Serious Music

IT is well known that record manufacturers keep many of their brightest offerings for their Christmas list to tempt people who are looking for records not only as gifts for their friends, but as special treats for themselves.

First let us consider the records of serious music for the permanent collection. Pride of place must be claimed for the recording of Beethoven's Symphony No. 7 in E minor, played by the Philharmonic Symphony Orchestra of New York, conducted by Toscanini. There are five records—*H.M.V. DB* 2986/90—sold complete in an album.

Berlioz is now an established favourite in the concert hall, and although most people know the Hungarian March from the "Damnation of Faust," the equally attractive music of the Sprites and Demons is not played so often. It demands a large orchestra, and Koussevitsky, conducting the Boston Symphony Orchestra, gives a fine performance of the March, the Minuet of the Will o' the Wisps and the Presto and Waltz (three sides) with the Larghetto from Handel's Concerto Grosso No. 12 in B minor on the fourth side. The numbers are *H.M.V. DB* 3009/10.

An Important Issue

A VERY important issue concerns the sets of Suites (or Overtures) of Bach played by Adolf Busch Chamber Players, who recently performed them in London. The first two of the suites are now issued in an album, *H.M.V. DB* 3012/7, and I understand that the remaining two will follow shortly.

Four Tenors

THE vocal records afford some interesting comparisons, for there are four tenors of international fame. Gigli gives a brief lesson in "bel canto," singing "Norte e Venezia" (Night in Venice) and "Tu sei la Vita Mia," the title song from his new film, "You Are My Life," on *H.M.V. DA* 1535. This can be contrasted with the latest re-created record of Caruso. By this interesting process, a new and full orchestral accompaniment is grafted on to Caruso's original record of "The Flower Song," from "Carmen," and "Turiddu's Farewell to his Mother," from "Cavalleria Rusticana," in such a way as to give the older recording the advantages of modern electrical methods. The number of the record is *H.M.V. DB* 3023. Richard Crooks as a singer of ballads has an enormous following in America, and has chosen two favourites in "Bird Songs at Eventide" and "The Green Hills of Ireland"—*H.M.V. DA* 1536; and John McCormack has taken two tuneful songs and invests them with his particular charm on *H.M.V. DA* 1533.

Light Music

THERE is a big choice of light music in the December list of new *H.M.V.* records, which are heavily sprinkled with melody and fun. Jeanette MacDonald and Nelson Eddy are heard together in songs from two of their most famous films, "Indian Love Call," from the film "Rose Marie," coupled with "Ah! Sweet Mystery of Life," from "Naughty Marietta," on *H.M.V. DA* 1537. Essie Ackland has made a potpourri of serenades called "At Mother's Knee" on *H.M.V. C* 2873, and Peter Dawson is as robust as ever in "Song of the Grateful Heart" (a Coronation song) and "There's a Bridle Hanging on the Wall," on *H.M.V. B* 8508. Connie Russell, a newcomer to H.M.V., puts plenty of "pep" into "Organ Grinder's Swing" and "Sing me a Swing Song"—*H.M.V. BD* 383, and Denny Dennis makes his début with "Until the Real Thing Comes Along" and "I'll Sing You a Thousand Love Songs"—*H.M.V. BD* 390.

There are plenty of humorous records by favourite stars. Cicely Courtneidge and Jack Hulbert make a medley of their "Greatest Successes" on *H.M.V. C* 2868, as well as a clever piece of foolery in "The Cure,"—*H.M.V. B* 8506.

Leslie Henson and Fred Emney are very funny in scenes from two of their recent shows. The "Riddle Scene" from "Swing Along," and the "German Commissionaire Scene" from "Seeing Stars" is recorded on *H.M.V. C* 2888.

Max Miller will appeal to nimble wits with "The Woman Improver" and "Mary from the Dairy," both very characteristic of his style on *H.M.V. BD* 385, and Nellie Wallace thoroughly enjoys "Bang! Bang! Bang!"—*H.M.V. B* 8502.

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PRACTICAL WIRELESS

STRAIGHT SETS. Battery Operated.

	Date of Issue	No. of Blueprint
One-Valve : Blueprints, 1s.		
All-wave Unipen (Pentode) ..	—	PW31A
Two-valve : Blueprint, 1s.		
Four-range Super Mag Two (D Pen)	11.8.34	PW36B
Three-valve : Blueprints, 1s. each.		
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow) ..	—	PW35
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	22.9.34	PW39
Hall-Mark Three (SG, D, Pow) ..	—	PW41
Hall-Mark Cadet (D, LF, Peu (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Peu), Pen) (All-Wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))	*June* '35	PM2
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen) ..	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P) ..	—	PW64
The Gladiator All-Wave Three ..	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Peu, D, Pen) ..	31.10.36	PW69
Four-valve : Blueprints, 1s. each.		
Fury Four (2 SG, D, Pen) ..	—	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P) ..	26.9.36	PW67
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen) ..	—	PW18
A.C.-D.C. Two (SG, Pow) ..	7.10.33	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	10.6.33	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow) ..	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen) ..	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen) ..	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	18.8.34	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (R.C.))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen) ..	—	PW56
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	—	PW45
Universal Hall-Mark (HF, Pen, D, Push-Pull)	9.2.35	PW47

SUPERHETS.

Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve) ..	—	PW40
F. J. Camm's 2-valve Superhet (Two-valve)	13.7.35	PW52
F. J. Camm's £4 Superhet .	—	PW58
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valve) ..	—	PW43
D.C. £5 Superhet (Three-valve) ..	1.12.34	PW42
Universal £5 Superhet (Three-valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4	—	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60

SHORT-WAVE SETS.

Two-valve : Blueprint, 1s.		
Midget Short-Wave Two (D, Pen)	15.9.34	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2 LF (RC and Trans))	—	PW63
The Bandspread S.W. Three (HF Peu, D (Pen), Pen) . ..	29.8.36	PW68

PORTABLES.

Three-valve : Blueprint, 1s.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen) ..	16.5.36	PW65
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl. B)	—	PW12

MISCELLANEOUS.

S.W. Converter-Adapter (1 valve)	—	PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE

CRYSTAL SETS.

Blueprints, 6d. each.		
Four-station Crystal Set	12.12.36	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450

STRAIGHT SETS. Battery Operated.

One-valve : Blueprints, 1s. each.		
B.B.C. Special One-valver ..	—	AW387
Twenty-station Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans) ..	—	AW388
Full-volume Two (SG det, Pen) ..	—	AW392
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans) ..	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	*July* '36	WM409
Three-valve : Blueprints, 1s. each.		
Class-B Three (D, Trans, Class B)	22.4.33	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	—	AW404
Fau and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans) ..	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	—	AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans) ..	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple-tune Three (SG, D, Pen)..	*June* '33	WM327
Economy-pentode Three (SG, D, Pen)	*Oct* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans) ..	*Mar.* '34	WM354
Iron-Core Band-pass Three (SG, D, QP 21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen) ..	*June* '35	WM389
Certainty Three (SG, D, Pen) ..	*Sept.* '35	WM393
Minitube Three (SG, D, Trans) ..	*Oct.* '35	WM396
All-wave Winning Three (SG, D, Pen)	*Dec.* '35	WM400
Four-valve : Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans) ..	—	AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2 SG, D, Pen) ..	—	AW421
Crusaders' A.V.C. 4 (2 HF, D, QP 21)	18.8.34	AW445
(Pentode and Class-B Outputs for above: Blueprints, 6d. each) ..	25.8.34	AW445A
Self-contained Four (SG, D, LF, Class B)	*Aug.* '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2 LF)	*Feb.* '35	WM381
The H.K. Four (HF Pen, HF Pen, D, Pen)	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*April* '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2 HF, D, RC, Trans)	*May* '33	WM329
Class-B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C./D.C. Two (D, Pen)	*Sept.* '35	WM394
Three-valve : Blueprints, 1s. each.		
Home-Lover's New All-electric Three (SG, D, Trans) A.C.	—	AW383
Three-valve : Blueprints, 1s. each (*contd.*)		
S.G. Three (SG, D, Pen) A.C. ..	—	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A. C. Pentaquester (HF Pen, D, Pen) A.C.	23.6.34	AW439
Mantovani A.C. Three (HF. Pen, D, Pen) A.C.	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	*Jan.* '36	WM401
Four-valve : Blueprints, 1s. 6d. each.		
All Metal Four (2 SG, D, Pen) ..	*July* '33	WM326
Harris Jubilee Radiogram (HF Pen, D, LF, P)	*May* '35	WM386

SUPERHETS.

Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
Varsity Four	*Oct.* '35	WM395
The Request All-Waver	*June* '36	WM407
1935 Super Five Battery (Superhet)	—	WM379
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C. ..	—	AW425
Heptode Super Three A.C. ..	*May* '34	WM359
"W.M." Radiogram Super A.C.	—	WM366
1935 A.C. Stenode	*Apl.* '34	WM385

PORTABLES.

Four-valve : Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
TWO H.F. Portable (2 SG, D, QP21)	*June* '34	WM363
Tyers Portable (SG, D, 2 Trans) ..	—	WM367
Five-valve : Blueprint, 1s. 6d.		
New Class-B Five (2 SG, D, LF, Class B)	*Nov.* '33	WM340

SHORT-WAVE SETS.—Battery Operated.

One-valve : Blueprints, 1s. each.		
S.W. One-valve converter (Price 6d.)	—	AW329
S.W. One-valve for America ..	—	AW429
Rome Short-Waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SG det., Pen)	*Feb.* '36	WM402
Home-made Coil Two (D, Pen) ..	—	AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-waver (SG, D, Pen)	*Jan.* 19, '35	AW463
The Carrier Short-waver (SG, D, P.)	*July* '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A. W. Short-wave World Beater (HF, Pen, D, RC, Trans) ..	—	AW436
Empire Short-waver (SG, D, RC, Trans)	—	WM313
Standard Four-valver Short-Waver (SG, D, LF, P)..	*Mar.* '35	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-wave Super ..	*Nov.* '35	WM397
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Two-valve Mains short-waver (D, Pen) A.C.	—	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	—	WM368
"W.M." Long-wave Converter	—	WM380
Three-valve : Blueprint, 1s.		
Emigrator (SG. D, Pen) A.C. ..	—	WM352
Four-valve : Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans) ..	*Aug.* '35	WM391

MISCELLANEOUS.

Enthusiast's Power Amplifier (1/6)	*June* '35	WM387
Listener's 5-watt A.C. Amplifier (1/6)	*Sept.* '35	WM392
Radio Unit (2v.) for WM392 (1/-)	*Nov.* '35	WM398
Harris Electrogram (battery amplifier) (1/-)	*Dec.* '35	WM399
De-Luxe Concert A.C. Electrogram	*Mar.* '36	WM403
New Style Short-waver Adapter (1/-)	*June* '35	WM388
Trickle Charger (6d.)	*Jan.* 5, '35	AW462
Short-wave Adapter (1/-) ..	*Dec.* 1, '34	AW456
Superhet Converter (1/-).. ..	*Dec.* 1, '34	AW457
B.L.D.L.C. Short-Wave Converter (1/-)	*May* '36	WM405
Wilson Tone Master (1/)	*June* '36	WM406
The W.M. A.C. Short-Wave Converter (1/-)	*July* '36	WM403



QUERIES and ENQUIRIES

Making a Start

"I know nothing of wireless, but having obtained a copy of your book out of interest, I feel I should like to know enough about the subject to build a set. There are various training schools, but this involves tuition over at least six months, and I feel I could not afford the fee. There is 'Everyman's Wireless Book,' edited by you, and I should like to know whether this would meet my requirements, or is it too advanced?"—G. H. W. (Brighton, 7).

THE best book would obviously be the "Constructor's Encyclopædia," as this explains the various terms met with in our pages, as well as providing diagrams to explain different points and all theoretical symbols, etc. This, in conjunction with the various simple constructional and instructional features in these pages, should soon enable you to obtain the necessary knowledge, although you can build a simple set without knowing anything about the subject. Our articles on construction are so worded that even a newcomer can carry out the building of a receiver and operate it to obtain maximum results.

The Transmitting Licence

"In your issue containing No. 1 of the series on Amateur Transmitting, I read that it is compulsory to pass a morse test in order to qualify for a transmitting licence. I intend building a 5-metre instrument in the near future which is intended for use exclusively for telephony (speech). Will it therefore be necessary to learn morse?"—D. S. (Finchley).

THE morse test is one of the conditions of the standard transmitting licence, and no exception is made because you intend to use speech only. You should therefore immediately start learning the code and obtaining the necessary speed if you intend eventually to obtain a transmitting licence.

Unmatched Speakers

"I am using two Rola loudspeakers, and find that one gives much more volume on the same set (Universal Ferguson) than the other. What can be wrong? Is there any adjustment that can be made on the earlier type of speaker?"—J. A. M. (Fort William).

WE presume that you refer to the self-contained speaker and to the extension speaker, and the difference in volume may be due to the fact that the impedances of the two models are different. Furthermore, the speaker in the receiver is of the energised type, and is therefore more sensitive than your external model, which is no doubt of the permanent magnet type. If, however, you refer to two separate P.M. speakers used as extension models, the difference may be due to the fact that the input transformers on them are different and one matches the output circuit whilst the other does not. There are no adjustments for sensitivity on a modern moving-coil loudspeaker.

Multi-purpose Switches

"I am desirous of combining my radiogram, filament, and wave-change switching into one control, but do not wish to obtain modern coils incorporating such switching. Can you tell me where I can get a rotary switch that will accomplish this, if such a thing is made? If it is available, what price is it?"—W. R. F. H. (Bedford).

IT should be quite simple to carry out your idea, and there are several types of switch which my be used. Unfortunately, you do not give any details of the receivers, and thus we cannot make a definite recommendation. A multi-switch unit is obtainable from Messrs. Burne-Jones, having various numbers and combinations of contacts, and if you could supply them with a diagram of the present coil and radiogram switching, they would be able to recommend a suitable type from their range.

RULES

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 querists.

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.

Requests for Blueprints must not be enclosed with queries as they are dealt with by a different department.

If a postal reply is desired, a stamped addressed envelope must be enclosed. Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

The Coupon must be enclosed with every query.

Position of Reaction Condenser

"I have noted in some of your circuits that the reaction condenser is sometimes connected direct to the anode and at other times it is joined between the earth and one side of the reaction coil winding. Is there any advantage in one method, and why is it that sometimes one scheme is adopted and at another you do another thing? Perhaps you could explain this point, as I am building a short-wave set and should like to incorporate the best scheme."—E. T. S. (Canterbury).

IN effect the two methods of connection are the same, as it amounts to the fact that the reaction condenser is connected between the anode and earth. The resistance of the reaction coil winding is usually so low that it may be ignored and the condenser may thus be considered as joined direct to earth. From this point of view, therefore, there is no difference in the two methods of connection. Some commercial coils, however, have the reaction winding already joined internally to the earth side of the grid winding, and thus the condenser has to be joined between the anode and the reaction winding, but in general it may be considered preferable to join the condenser between the reaction winding and earth, as this enables the condenser framework to be directly earthed, and this often simplifies wiring.

Short-wave Components

"I attach a list of the parts I intend to use in the enclosed circuit, designed for use from 5 to 50 metres. Will you criticise this for me and let me have your suggestions?"—F. A. (Barnet).

THE circuit is in order and is quite a standard detector-L.F. scheme, but the components mentioned are in the majority of instances totally unsuitable for use on wavelengths down to 5 metres. At this particular point, the utmost care must be taken to avoid losses, and special ultra-short-wave components are essential. The valve mentioned for the detector is certainly quite in order, and this particular valve is made by Graham Farish, but the top cap is the grid, not the anode. You can find suitable components in the Graham Farish range, and also in the Bulgin, B.T.S., and Eddystone lists. Get a special tuning condenser and ultra-short-wave H.F. choke, and if possible, a low-loss reaction condenser will also be found of assistance.

A Morse Recorder

"I am taking up the television articles, and a friend is working with me. We both wish to learn morse and get speed practice, but often have an argument (as we are both beginners) as to whether the sending or the receiving is wrong. That is, my friend sends a few letters and I write them down, but when we check we sometimes come up against the problem whether my records are right or whether his sending was right. Would a recorder help us, and how could this be used?"—S. A. E. (Weymouth).

YOU will certainly find a recorder of assistance in this case, although there is a difficulty, as you are both beginners, in view of the fact that the sending may be very poor and thus you may get hold of wrong impressions. However, for simply learning the various letters and combinations keep the speed slow until you each have attained a really sound knowledge, and then try to pick up commercial press stations, which send out slow morse signals. Certain weather reports are also given in slow morse. The recorder described in the Readers' Wrinkles page of our issue dated 5th December may be made up quite simply, and attached to the output circuit of your morse practice set. You can then check your signals and all arguments will be avoided.

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PRACTICAL AND AMATEUR WIRELESS, 19/12/36.

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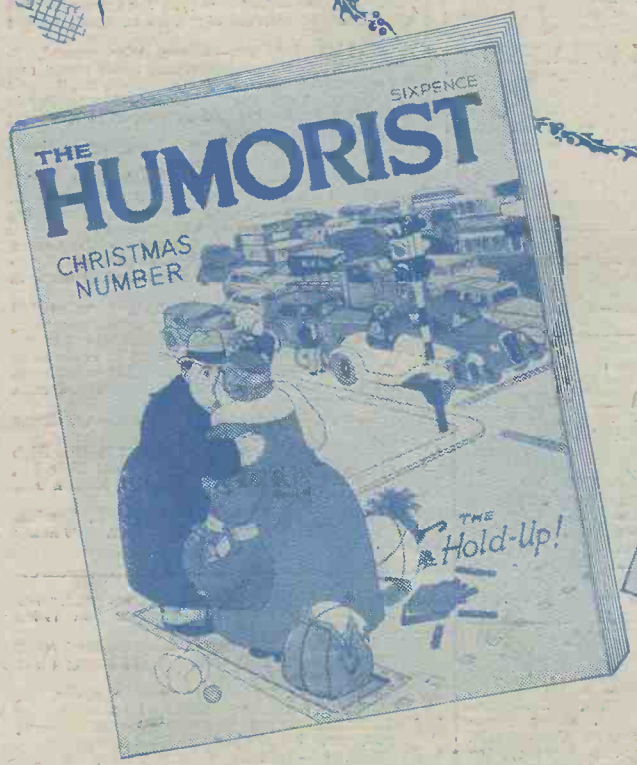



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SEE PAGE 472

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

3D. EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

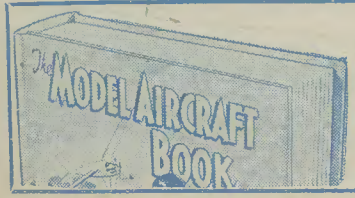
Vol. 9. No. 223. December 26th, 1936.







Building a 2½ watt Transmitter



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THE CHOICE OF INTERMEDIATE FREQUENCY—SEE PAGE 470.

Practical and Amateur Wireless

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. IX. No. 223. December 26th, 1936.

Round the World of Wireless

Our 2½-watt Transmitter

IN this issue will be found the preliminary constructional details of our simple transmitter. We hope we will be forgiven for again reminding readers that this apparatus must not be built until a Post Office licence is obtained. The unauthorised use of such apparatus is not only a disregard of the terms of the licence, but may easily result in a curtailment of the facilities now granted to genuine experimenters, and we therefore trust that readers will respect the terms of the licence. The present transmitter is simple to build but most efficient in action, and it is our intention subsequently to describe the construction of larger transmitters in this special series.

Pulse by Wireless

FURTHER applications of wireless transmission now include the radiation of a patient's pulse-beats and respiration, for examination by a doctor at a distance. Senator Nicola Pende, a noted physician of Rome, has perfected the apparatus, and the first installation is to be on board the liner *Rex*, in order that passengers who are in need of expert advice may be "radio-ed" to the doctor on shore and a suitable treatment prescribed. It is further stated that the apparatus will be of extreme use in experimental aerial flights and altitude records.

Radio in the R.N.

THE advantages of an installation of sound reproduction equipment on ships of the Royal Navy has been demonstrated so satisfactorily that The General Electric Co., Ltd., has been commissioned to supply a complete amplifying system for H.M.S. *Royal Oak*. The system will comprise a 100-watt output channel adapted to be fed by a special all-wave radio input, by a microphone or by a gramophone pick-up. It will relay to twenty-seven loudspeaker points throughout the ship.

For Horogolists

JOHN HARRISON, the well-known clock maker, was responsible for the discovery of longitude. His No. 1 machine, the first accurate marine timekeeper ever made, was tested at sea in 1736 in H.M. ships *Centurion* and *Orford*, and until that time no practical method of finding longitude at sea had been devised. The maximum error permissible in a marine timekeeper suitable for the purpose had not to exceed one second per day. Lt.-Commander R. T. Gould, R.N., who spent twelve years overhauling four of Mr. Harrison's early watches, will give a talk on the subject from the National transmitter on December 24th. As a point of interest it may be mentioned that Mr. Harrison's No. 3 timekeeper took seventeen years to construct and seven years to overhaul!

An Amateur Trophy

THE President of the Columbia Broadcasting system has been so impressed by the activities and successes of amateurs that he has decided to award a trophy for the amateur adjudged to have performed, by means of radio, the most meritorious service during the year. The trophy will be in the permanent custody of the American Radio Relay League, and the winner will have his name engraved upon it and receive a replica for permanent retention. Seven sculptors have been asked to submit designs, and five famous men are to serve on the Board of Award.

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 ENCYCLOPÆDIA. 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.

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

Public Address at the Baths

THE Battersea Borough Council have placed an order with the G.E.C. for the installation of special amplifiers and public address equipment at the Latchmere Road Baths. The equipment, which will be utilised for all public functions, is designed to improve the acoustics of the building.

New Series of Talks

FROM January to March, 1937, a new series of Morning Talks is to be instituted, entitled "Value for Money." This is designed to enlighten women listeners as to the disposal of that portion of their own (or their husbands') incomes which is paid away in the form of "Rates and taxes." Each talk will deal with a particular town or district and will be given by the principal local government authority.

Welsh in the News

FOR the benefit of Welsh listeners a novel programme is to be given from the Welsh transmitter on the last day of the year. In this programme three people who have distinguished themselves during the year will come to the microphone. They are a Golf Champion, a Chief Engineer of one of the world's famous ships, and a Dairy Queen.

Radio Fires a Gun

EXHIBITIONS have been opened by the impulse transmitted from a distance by radio, and similar effects are quite simple to arrange through the medium of relays. It is stated, however, that without the intervention of relays, a high-frequency radiation may be used to detonate a charge at a distance, and the possibility of firing guns without gunners is visualised.

Thirty-five Years Ago

IT is thirty-five years ago this month that the first transatlantic signals were received in Newfoundland from Poldhu in Cornwall. Marconi's belief in the possibility of wireless transmission across the Atlantic had been "pooh-poohed" by everyone, but he persisted in his experiments and laid the foundation of wireless communication as we know it to-day. It was on December 11th that the first experimental transmissions commenced from Poldhu.

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ROUND the WORLD of WIRELESS (Continued)

INTERESTING and TOPICAL NEWS and NOTES

Pantomime Tour

PANTOMIME broadcasts are always welcome at this time of the year, and it is interesting to learn that Victor Smythe, Northern Outside Broadcasts chief, is planning another big "Pantomime Tour," to include excerpts from pantomimes at a number of Northern theatres, to be broadcast on December 23rd.

Concert from Torquay

THE popular Torquay Municipal Orchestra, conducted by Ernest W. Goss, will give a concert from the Pavilion, Torquay, on December 29th. Betty Bannerman will be the artist.

B.B.C.'s New Station

IT is reported that the B.B.C. has chosen a site at Start Point, near Plymouth, for a new 100-kilowatt station to serve the West Country. When it is constructed the present West Regional station at Washford Cross, on the Bristol Channel, will be devoted exclusively to the service of Wales.

Scottish Orchestra

PART of a concert by the Scottish Orchestra, conducted by Georg Szell, will be broadcast from St. Andrew's Hall, Glasgow, on December 26th. The broadcast portion will include the Overture "King Stephen," by Beethoven; the Nile Aria ("Aïda"), by Verdi, with May Blyth (soprano) as soloist; and "Serenade No. 9 in D," by Mozart.



Radiograms will provide a good deal of entertainment during the festive season, and the De Luxe Cossor Radiogram shown in the illustration can be obtained for 22 guineas. Quality of reproduction is one of its most outstanding features.

Address on Radio Broadcasting

AN interesting address on the subject of the "Progress of Radio Broadcasting" was given to a large number of the members of the Electrical Association for Women at the Mikado Café, Plymouth, on Thursday, December 3rd, by Captain H. de A. Donisthorpe, of The General Electric Co., Ltd. The chair was taken by Mrs. Councillor Daymond.

Radio for Bungalow Hospital

A NEW radio receiver, the gift of the "News Chronicle" Wireless for Hospitals Fund, was recently handed over to the Witham, Essex, Nursing Association Maternity Bungalow. The three-valve set is to be installed in the rest room, with an extension speaker for the main ward.

Christmas Party

THE Christmas Eve programme in the Children's Hour takes the form of a Christmas party. Two great favourites of the Corner in its early days—Percy Edgar ("The Skipper") and Harold Casey ("Uncle Pat")—will take part. Songs, a Christmas story and Christmas verse will make a well varied programme. Victor Hely-Hutchinson will be at the piano for the songs by Harold Casey and the B.B.C. Midland Singers, conducted by Edgar Morgan.

The New Year at Blackpool

BLACKPOOL is noted for its big musical shows, and on January 1st, Victor Smythe will present another composite O.B. feature from the Northern Regional. The programme will include music by Reginald Dixon, the Savoy Café Orchestra and Larry Brennan and his Band, a variety act from the Palace Theatre, and an excerpt from "Aladdin" at the Opera House. Those taking part in the pantomime include Betty Huntley Wright, Jimmie Britton, Mark Stone, and Leslie Barker.

Orchestral Concert

LISTENERS to the Western Regional programme on December 27th will hear a concert by the Clifton Light Orchestra. This Orchestra, leader Joan Allen, is conducted by Reginald Redman, and the programme will include five dances from "The Duenna," by Reynolds; the Christmas Scene and Finale, Act I, from "The Miracle," by Humperdinck.



Choir Boys of the King's College Hospital Chapel Choir, Denmark Hill, London, rehearsing in their chapel, carols for Christmas under the microphone. These carols are to be broadcast throughout the hospital to the patients at Christmas.

SOLVE THIS!

PROBLEM No. 223.

Davies made a 4-valve superhet. employing a diode detector and a high-efficiency output pentode (A.C.2/Pen.), with simple A.V.C., the cathode of the diode valve being joined to earth. How could delayed A.V.C. be obtained, preferably without adding extra components? Three books will be awarded for the first three correct solutions opened. Address your solutions to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2. Envelopes must be marked Problem No. 223 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, December 28th, 1936.

Solution to Problem No. 222.

The probable cause of the trouble was a leaking smoothing condenser. This would cause excessive current to be passed by the rectifier, with consequent reduction of voltage.

The following three readers successfully solved Problem No. 221 and books are accordingly being forwarded to them: E. G. Hunt, The Warrens, College Avenue, Freshfield, Nr. Liverpool; W. Paterson, 61, Blenheim St., Springburn, Glasgow, N.; L. Stinton, 106, Lumley Rd., Walsall.

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Cutting the Cost of Construction

Where Economy in the Purchase of Components can Often be Practised Without Sacrificing Efficiency

By FRANK PRESTON

THE question of cost is always an important one with the constructor, and he is always prepared to study means of reducing it. Trouble is the inevitable outcome of thoughtless "economy," but it is frequently possible to prune the component specification without any consequent loss in efficiency of the finished receiver. It should be made perfectly clear that this does not apply to PRACTICAL AND AMATEUR WIRELESS Guaranteed Designs, since these are always prepared with the question of economy well in mind. But when making a receiver to a conventional circuit, it is generally well worth while to study it with care with the idea of eliminating non-essential parts.

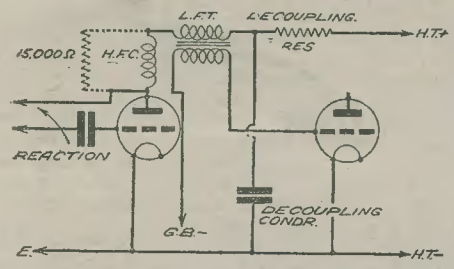

Fig. 1.—The reaction choke in the detector anode circuit can frequently be eliminated or replaced by a fixed resistance, as shown in broken lines.

The Reaction Choke

A good, though very simple and well-known example, is in connection with the H.F. choke used in the anode circuit of the detector valve. This is frequently referred to as a reaction choke, because its main purpose is to prevent high-frequency currents from flowing into the low-frequency circuits, so that they can be usefully employed for feeding-back into the grid circuit. A skeleton circuit diagram to illustrate this point is given in Fig. 1. In this case ordinary L.F.-transformer coupling is used between the detector and L.F. valves, and the primary winding of this frequently has a sufficiently high inductance to provide an effective barrier to H.F. currents. In consequence, it might be found that results are unchanged if the choke is short-circuited or removed from the circuit.

This might not be the case if the transformer is a cheap one having a fairly high self-capacity, or even if it is a good one with a fixed condenser permanently connected in parallel with the primary, and built into the case. In building the set, however, the choke might be omitted unless, and until, it is found that reaction control is very erratic or that oscillation cannot be obtained.

A Resistance "Stopper"

Even then, it is very often sufficient to replace the choke by a non-inductive resistance (which can be a sixpenny ½-watt type). This is shown in broken lines in Fig. 1, where the resistance has a value of 15,000 ohms. The arrangement is nearly always satisfactory because the resistance provides a sufficiently high impedance to H.F. When this idea is employed, it should be remembered that the resistance will reduce the voltage normally applied to the anode of the detector valve; to compensate for this it might be necessary to reduce the value of the decoupling resistance by 15,000 ohms, or to use a higher-voltage tapping for the detector H.T. lead.

When a resistance-fed transformer is used for coupling purposes, as in Fig. 2, the choke is generally unnecessary, and can simply be omitted, because the coupling resistance provides the necessary impedance. In the case of a superhet, where reaction is not employed, it might be found better to connect a .0003 mfd. fixed condenser between the anode and earth, as shown in broken lines. When reaction is employed, a condenser in this position, but with a lower capacity, should be tried.

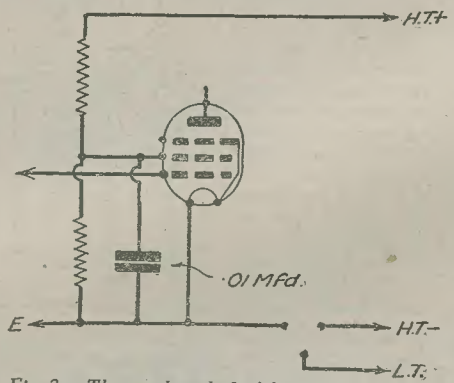

Fig. 3.—The usual method of feeding the screening grid of an H.F. valve, by means of a potentiometer consisting of two fixed resistances.

The S.G. Potentiometer

Another case where a small but not insignificant saving can be effected is in the case of the fixed potentiometer used to feed the screening grid of an S.G. or variable-mu valve. The usual arrangement is as shown in Fig. 3, where two fixed resistances are connected in series between H.T.+ and H.T.—, the feed to the valve being from the junction of the resistances. A fixed condenser is also used between the screening grid and earth, to act as an H.F. by-pass. Yet another practical essential is that a three-point on-off switch is required to cut the potentiometer out of circuit when the set is not in use.

The simplification to which reference is being made is illustrated in Fig. 4. Here it

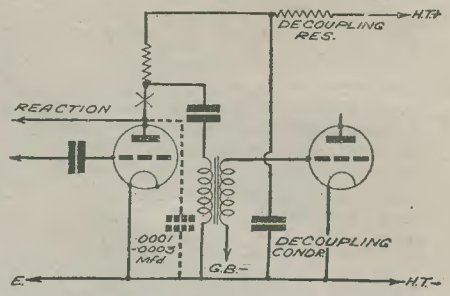

Fig. 2.—When a resistance-fed transformer is used as shown here, an H.F. choke is rarely essential, especially if a small by-pass condenser is connected as shown in broken lines. The H.F. choke, when used, is included at a point marked X.

can be seen that the detector valve and its decoupling resistance are together used as the S.G. potentiometer, whilst the S.G. by-pass condenser also serves to decouple the detector. Furthermore, the three-point switch is replaced by a two-point component, because there can be no passage of current through the "artificial" potentiometer when the L.T. current to the valves is disconnected. In nearly every case this arrangement proves perfectly satisfactory, provided that the detector valve and decoupling resistance can be chosen to provide the correct screening-grid voltage. It is generally satisfactory to apply a voltage of about one-half the anode voltage to the screening grid, which means that if the A.C. resistance of the valve and its decoupling resistance are approximately equal, the correct conditions apply. Actually, the valve should provide rather a greater resistance than the decoupling resistance to allow for the current passed by the screening grid. Consequently, when using a typical detector valve having an A.C. resistance (often referred to as impedance) of 18,000 ohms, it would be correct to use a decoupling resistance of 15,000 ohms, although the difference in performance will rarely be very great if the value is increased up to 20,000 ohms.

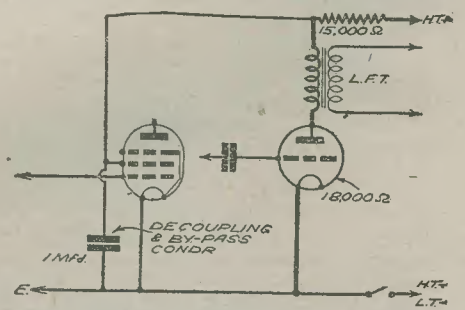

Fig. 4.—How the detector valve and its decoupling resistance can together be used as an S.G. potentiometer. The artificial potentiometer is shown in heavy lines.

(Continued overleaf)

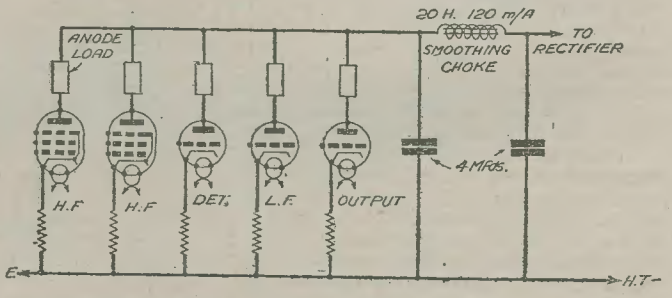

Fig. 5.—A single, expensive smoothing choke used to supply all the valves.

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CUTTING THE COST OF CONSTRUCTION

(*Continued from previous page*)

A practical point which should be noted is that the combined decoupling and by-pass condenser should be placed close to the S.G. terminal of the H.F. valve-holder, and should have a value of not less than 1-mfd. The condenser should, of course, be of the non-inductive type.

By-pass Condenser Capacities

Whilst dealing with H.F. by-passing and decoupling it is worthy of note that condensers of unnecessarily high value are often used, with the result that the cost is made higher than it need be. All by-pass condensers in the H.F. circuits (S.G., variable-mu potentiometer, grid bias and anode circuit) can be of .01 mfd. This might come as a surprise to many of those constructors who habitually use components of about 1 mfd. But when it is remembered that a .01 mfd. condenser offers a resistance of only about 25 ohms at 600 kilocycles (equivalent to 500 metres), or of about 11 ohms at 1,500 kilocycles (200 metres) it is evident that such a capacity is adequate. It is important, however, that the condensers be almost completely non-inductive, for otherwise the effective resistance will be considerably greater.

This explanation should not be considered as applying to the detector decoupling condenser, which has to deal with low-frequencies, because the effective resistance of a condenser increases very rapidly as the frequency is reduced. For example, the resistance offered by a .01-mfd. condenser to a current at an audio frequency of 1,000 cycles is something like 16,000 ohms. A 1-mfd. condenser, on the other hand, shows a resistance of only 160 ohms in the same conditions, and this is low by comparison with the resistance of the decoupling resistance—as it should be if the condenser is to act as an easy by-pass.

High-tension Smoothing

The H.T. supply section of a powerful mains receiver or amplifier is, of necessity, expensive, but a saving can often be effected here without any loss of efficiency. One of the most expensive components is the smoothing choke shown in Fig. 5. If this is to provide adequate smoothing for the H.F. and detector circuits it must have an inductance of not less than about 20 henries. But a choke having this inductance and capable of carrying a current of, say, 120 mA is very costly. In many instances the choke can be replaced by the field winding of an energised moving-coil speaker, when the question under consideration scarcely arises. But when for any reason it is proposed to use a permanent-magnet speaker, or when the resistance of the speaker coil is too high, it is cheaper to use two chokes as shown in Fig. 6. One of these is used simply to supply current for the L.F. stages, whilst the other is for the other valves in the set.

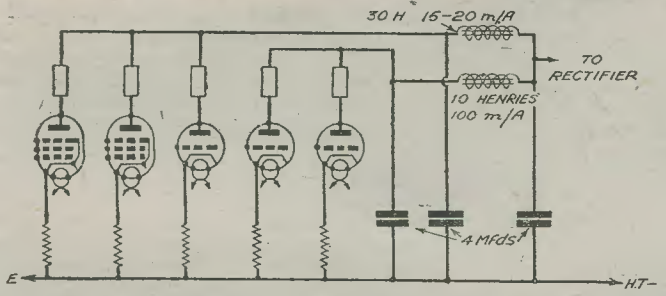


Fig. 6.—It is often cheaper to use two separate smoothing chokes, as shown here, than a larger component as in Fig. 5.

The first-mentioned choke must carry a comparatively heavy current, but need provide only a modest degree of smoothing; thus it can have a low inductance. The second choke, on the other hand, must have a high inductance, but need carry only a light current. Thus it would be possible to employ one choke rated at, say, 10 henries, 100 mA, and another rated at about 30 henries, 15-20 mA. The two components can generally be bought more cheaply than a single one rated at 30 henries, 120 mA.

An alternative system which is often valuable consists of using a single low-inductance, high-current choke for smoothing the whole supply, and using resistances for smoothing the supplies to the individual pre-L.F. valves, as shown in Fig. 7. This arrangement is doubly useful when a considerable voltage drop is required in the supply lines to the earlier valve stages. It will be seen that separate resistances and condensers are used for each of the valves, but these would probably be less expensive than a good choke.

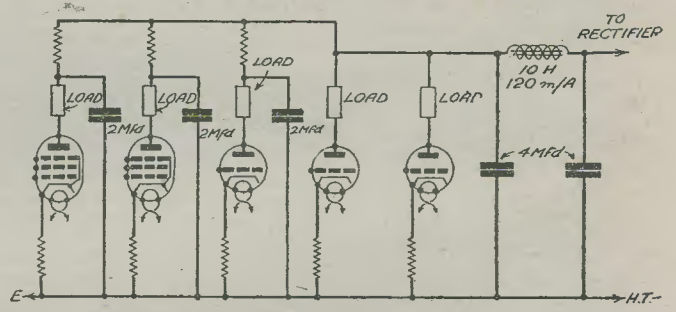


Fig. 7. — Another effective and comparatively inexpensive method of smoothing. The voltage-dropping resistances and smoothing condensers should generally be additional to the normal decoupling condensers, which are included in the rectangles representative of the anode load.

A VARIABLE SELECTIVITY DEVICE

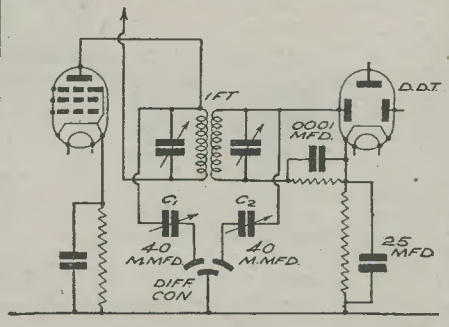
THE reproduction of most sets of the superhet type can be improved by the use of variable selectivity, but if an intermediate-frequency transformer using variable coupling between the primary and secondary circuits is employed, large structural alterations to the set are necessary, and the cost is also fairly high, as a perfectly good I.F.T. has to be scrapped. To overcome the disadvantages of this method, and to render the alteration simple and cheap, the writer evolved the following scheme.

Using a Differential Condenser

Instead of altering the coupling between the primary and secondary windings, the frequency to which they are tuned is altered slightly by the use of a differential condenser in the manner shown in the accompanying diagram, which I think is self explanatory. It will be seen that the frequency to which the primary is tuned is raised, and that of the secondary is lowered on rotating the differential condenser.

There are two methods of using the condenser which are identical as far as the circuit diagram is concerned. The first uses a very small value of differential—of the order of 50 mmfds.—which may be obtained by stripping and suitably modifying a standard condenser which one may have on hand. In this case the method of adjusting the circuit is as follows:

Suppose that when the differential condenser is rotated in an anti-clockwise direction the moving vanes mesh with those fixed vanes which are connected to the primary winding on the transformer. With the vanes in this position, and with the two additional trimmers C1 and C2 both about half in, adjust the trimmers on the I.F.T.'s to get maximum response and selectivity from the set. On rotating the differential in the opposite direction the bandwidth will now increase—too much probably—so that C1 and C2 will have to be reduced until the desired effect is attained.



How a differential condenser can be incorporated in a circuit for variable selectivity purposes.

An Alternative Method

The second method uses an unmodified differential condenser which is set in the mid-way position, with the moving vanes equally meshed with the two sets of fixed vanes while the preliminary adjustments are made. With the condenser in this position, the trimmers C1 and C2 are set at a low value, and the set lined up as before. Rotation of the differential in either direction will result in increased bandwidth, the extent being controlled by C1 and C2 which must be adjusted until the desired results are obtained. For this second method the value of the differential is not critical, although the smallest one available should be used.

If the leads to the condenser are long, it is an advantage to have them screened to avoid interaction with earlier stages of the set, although the leads should, of course, be kept as short as possible to avoid the possibility of the various trimmers being unable to balance out the additional strays introduced.—J. A. B.

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NEW SERIES

Amateur Transmitting

Constructional Details of a Single-valve 'Phone Transmitter are Given in This Fifth Article of the Series By L. ORMOND SPARKS

IN this article, the first transmitter of this series is dealt with, so it will be necessary for me to leave the fundamentals. I shall, however, have to return to them later, as there is still a good bit of ground to be covered.

As previously mentioned, there are two types or classes of oscillators, namely, "self-controlled" and "crystal-controlled." The first of these I dealt with last week, but I did not describe the latter, so, as the first transmitter is of the "crystal-controlled" type, it is essential for a few details to be given about such circuits.

Crystal-controlled Oscillators

Most constructors are familiar with "piezo-electric" crystal pick-ups, loud-speakers and microphones, which make use of certain characteristics of crystals in the piezo-electric group. Quartz is the crystal usually employed, and by virtue of its *electro-mechanical* properties it will oscillate at a frequency which is governed by its dimensions.

The crystal must not be confused with the lumps of crystal associated with receivers. Actually, it is cut and ground into little slabs, an operation which is beyond the scope of the average amateur; therefore, it is usual to buy a crystal having the desired frequency, and mounted in a holder which consists of two metal plates.

Fig. 1 shows the method of denoting a crystal circuit, and also represents its electrical equivalent capacity, inductance and resistance in series, and, as the holding plates on each side of the crystal form a certain capacity, it is necessary to consider a parallel capacity, as C.1.

The property of oscillating, at a frequency which can be determined, makes the quartz crystal ideal for governing the frequency of an oscillator circuit in a transmitter, where constancy of oscillation is of *vital importance.*

With the self-controlled oscillators described last week, such things as valve heating, swinging aerials, variations in H.T. feed, grid and output load all tend to affect the frequency of the circuit, thus making it very difficult to hold the output on a definite frequency or wavelength. (I would mention here that a transmitter must not be allowed to wander all over the place, as regards its wavelength. It is definitely not a sign of good operation, while the licensing authorities most certainly do not favour such transmissions.)

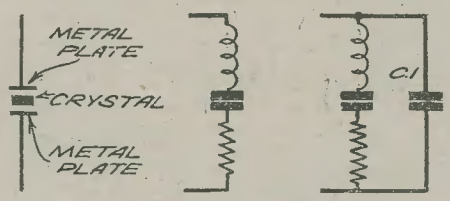

Fig. 1.—Theoretical symbol of the crystal with its electrical circuit equivalents.

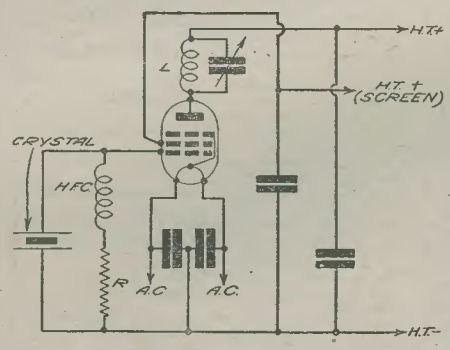

Fig. 5.—Pentode oscillator—crystal controlled.

With a crystal-controlled circuit, these snags are removed, operation simplified, whilst the necessity for accurately calibrated frequency-measuring instruments is removed.

If a crystal circuit is compared to a combination of coil and condenser, i.e., a simple oscillatory circuit, it will be found that the crystal produces a very much sharper resonance. In fact, the state of resonance is so sharply defined that it is impossible to produce similar conditions by the usual coil and condenser arrangements.

Operation

When a crystal is vibrating or oscillating at the very high frequencies usually associated with radio-frequency circuits, a certain amount of heat is generated, due to molecular friction, and the rise in temperature can affect the frequency.

The amount of variation produced depends on the "cut" of the crystal, there being various ways of obtaining or cutting out the little slabs from the natural crystal formation. However, if certain operating points are watched, the temperature/frequency variation can almost be ignored.

The higher the radio-frequency voltages across the crystal, i.e., the greater the amplitude of the vibrations, the greater will be the temperature rise; therefore, certain limiting factors must be introduced if satisfactory operation is to be maintained.

A peculiar part about a quartz crystal is that apart from what may be called the useful vibrations, there are others which tend to produce additional heating and stresses of a mechanical nature in the crystal's structure. If the radio-frequency voltages are great enough, it is possible for the crystal to crack up, due to the excessive stresses thus produced, so it becomes necessary to limit the power to be handled by the circuit. This is one of the points which must be noted about a crystal-controlled oscillator: it will only handle low power, say, 4 to 5 watts. Therefore, it becomes necessary, with the average transmitter, to amplify the output, and the section of a transmitter which attends to that is known as the power amplifier.

It is not always an easy matter to measure the radio-frequency voltages across the crystal, so the more simple procedure of checking the r.-f. current is usually adopted. This can be done with the aid of a suitable meter or lamp in series with the earth potential side of the crystal.

The safe current depends on the type or "cut" of crystal, but for the type concerned with these articles it should not exceed, say, 50 milliamps, the value being also governed by the H.T. applied and the valve in use.

A simple triode crystal-controlled oscillator is shown in Fig. 4, where it will be noted that the usual tuned grid arrange-

(*Continued overleaf*)

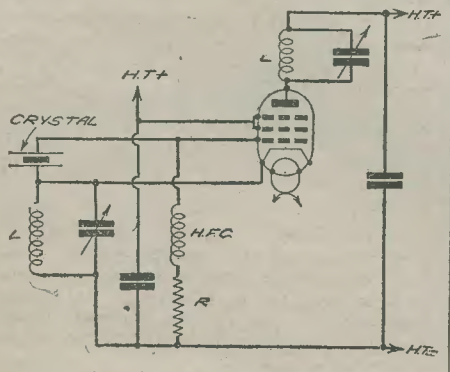

Fig. 6.—The Tritet oscillator.

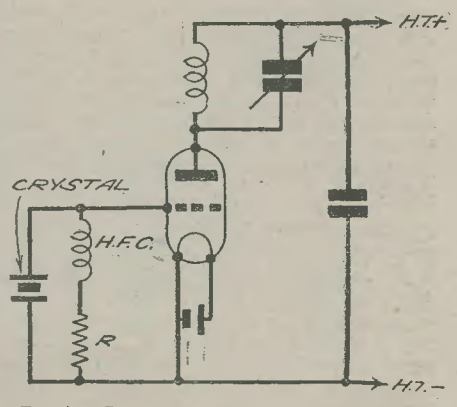

Fig. 4.—Simple triode crystal-controlled circuit.

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AMATEUR TRANSMITTING

(Continued from previous page)

ment, i.e., coil and condenser, has been replaced by the quartz crystal. The circuit is really a form of the T.P.T.G. mentioned last week. Other suitable circuits are shown in Figs. 5 and 6, from which it will be seen that pentodes appear to be more favoured that triodes. There is a very

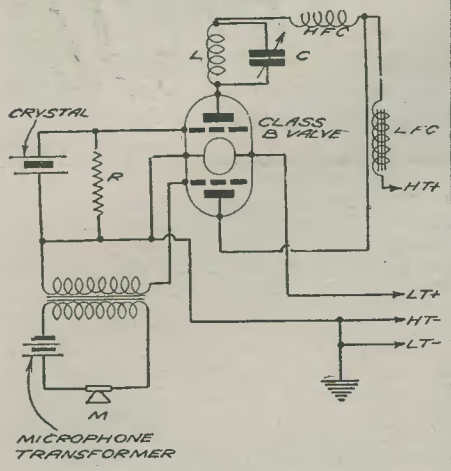

Fig. 7.—Circuit of the 2½-watt transmitter to be fully described next week.

definite reason for this. I have mentioned about the power limitations of a crystal-controlled circuit; well, a pentode helps to overcome that snag, as less heating of the crystal takes place than with a triode for the same power input, and a greater plate voltage can be applied, due to the fact that the feed-back voltage is less owing to the reduction of the plate grid capacity by the presence of the screening grid.

A One-valver 'Phone Transmitter

The first transmitter for home constructors who have not yet explored the more serious and fascinating side of wireless should be as simple as possible, consistent with the purpose it is intended to serve, namely, the progress of the operator's knowledge of wireless.

Bearing this in mind, I do not think that the circuit shown in Fig. 7 can be improved on. It is not a new or original design; in fact, it is one which is already widely used by keen experimenters and experienced transmitters, who require a low-powered "stand by" or "local" outfit.

It also possesses the advantage that if, at a later date, the user wishes to build a more powerful outfit, the components will be usable.

If the circuit is examined, it will be seen that the valve is an ordinary Class B, in this case a Cossor 240B, which consists of two complete triodes, except for the common filament, in the one bulb.

If one triode circuit is traced, it will be seen that it forms a simple crystal-controlled oscillator circuit, which has its plate circuit tuned by the coil L and variable condenser C, its resultant frequency or wavelength being governed by the crystal across the grid circuit.

That section, then, acts as the generator of the oscillations, but that in itself is not sufficient for our purpose. It is necessary to impress on those oscillations speech or music, so some means of "modulating" them has to be employed. Modulation will be described fully in future articles.

If the circuit of the other triode section is followed, it will be seen that it is nothing more than a L.F. amplifier, and it is used to amplify the minute electrical variations from the microphone circuit until they are sufficient to modulate, fully, the oscillator output.

With a circuit of this type, a really efficient microphone having a high output is necessary; therefore, a sensitive transverse-current pattern is advisable.

The coil is perfectly straightforward, the design lending itself to home construction, if so desired, while the construction of the complete transmitter should not present any difficulties to the average enthusiast.

Constructional Details

One is often tempted to sling together test and experimental circuits or "hook-ups" but, with the class of work under consideration, I think every attempt should be made to make the job look neat and compact, so I propose using what is known as "rack" construction, on very similar lines to the large transmitters, as such an arrangement not only looks good, but, what is even more important, it is very reasonable in price, simple to make, and safeguards efficiency.

A general idea of the arrangement can be gathered from Fig. 8. The supports at each corner and the four cross-members are ⅜in. angle aluminium. Their dimensions are given in the diagram, together with those of the two baseboards.

The lower compartment is intended to house the batteries, while the upper one is for the actual transmitter, thus keeping all connecting leads short and constant, and making the whole outfit self-contained.

LIST OF COMPONENTS FOR ONE-VALVE 'PHONE TRANSMITTER

One ebonite panel, 9in. by 7in. by 3/16in.
One valve—Cossor 240B.
One variable condenser—B.T.S..000067 type. Ceramic.
One fixed condenser, .001 mfd.
One H.F.C.—short-wave—Eddystone.
One L.F. choke—Varley.
One microphone transformer—Bulgin, type L.F.35.
One dial—Bulgin, type I.P.8.
One knob, Bulgin, type K. 58.
One terminal block, and two insulated-head terminals.
One Erie resistance, 30,000.
One Quartz Crystal and holder. Frequency 7 M.c. (Quartz Crystal Co.).
Coil to specification (see text).
Two push-pull switches—Bulgin, type S.38 or S.22.
Two panel brackets—Bulgin, type P.B.3.
One valveholder.—B.T.S. U.H.7.
Two brackets.
One strip bakelite.
Four 16in. lengths ⅜in. angle aluminium.
Four 9in. lengths ⅜in. angle aluminium.
Bolts (6B.A.), nuts, 2 spade ends, 2H.T. plugs.

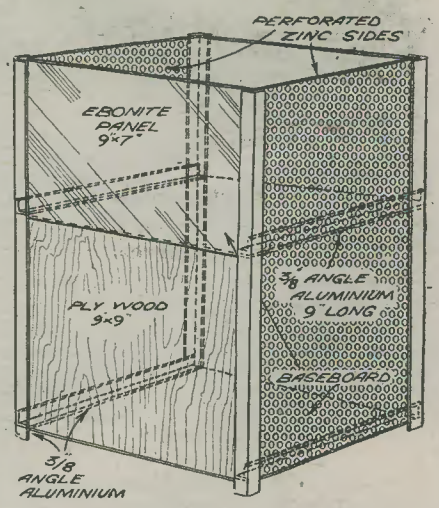

Fig. 8.—Containing case for the transmitter.

The sides of the structure are covered with perforated zinc, which allows ample ventilation for the battery compartment, and forms quite efficient screening for the circuit.

An ebonite panel is used for the transmitter, but the lower part and back can be covered with plywood stained black and left matt or polished, according to taste.

I would suggest that work is commenced on the rack and the fitting of the two baseboards, although the upper one must be removable to allow the assembly of the components, which will be described and illustrated in the next article.

By the way, how are you progressing with the Morse Code? If you haven't settled down to it yet, and made some progress, it's time you did; that is, of course, if you intend becoming an amateur transmitter.

PROGRAMME NOTES

"Aladdin"

A SELECTION from the pantomime produced by Francis Laidler will be broadcast from the stage of the Prince's Theatre, Bristol, on January 2nd, in the Western Regional programme. The cast will include Jean Colin as Aladdin, Leslie Strange, Connie Graham, Monti Ryan, Noyes and Dee, and Norah and Peg St. John.

Christmas Day Music

ON Christmas Day, Midland makes two contributions to the National programme. First, there is an hour's light music by the Coventry Hippodrome Orchestra, conducted by William Pethers, in the early afternoon; and then in the evening there will be something characteristic of the region in the music programme which Felix Felton has been arranging to represent the music of the regions.

Carols from Peterborough

CAROLS by the choristers of Peterborough Cathedral, with Dr. Henry Coleman conducting, have now become a regular Midland broadcast in Christmas week. This year Dr. Coleman, who is in his sixteenth year as Organist and Master of the Music at Peterborough, has chosen a dozen carols, of which one is old Norman, another Breton and the remainder mostly traditional. This broadcast will be given in the Midland Regional programme on December 24th.

City of Bristol Police Band

THIS popular police band, conducted by Captain F. W. Wood, M.V.O., Director of Music, will give a concert from the Western Studio on December 31st. Beryl Chappell (soprano) who first broadcast from the West Regional in "Four Ladies," in April, will sing two groups of songs.

Colliery Band Concert

ON December 24th, the Teversall Colliery Band, from Nottinghamshire, are to give a popular programme, T. Parkes conducting. Arthur Cranmer, the well-known Birmingham baritone, will sing two groups of songs.

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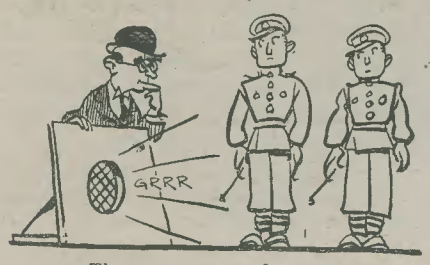
On Your Wavelength

By THERMION

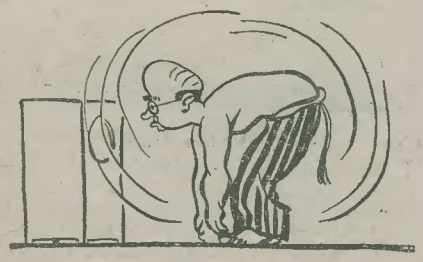
The Short-wave, etc., Society

APROPOS my remarks on this subject last week, a reader points out that, as the critic concerned evidently reads PRACTICAL AND AMATEUR WIRELESS, he therefore must include himself in the castigation he administered to readers of this paper.



The sergeant-major by radio.

As we go to press I have received a large number of letters from readers in the Thornton Heath district expressing indignation and asking me to set the wheels in motion to form a wireless *club* (not a *Society*) in this district. The rule that no member of any other local club will be permitted to join unless he retires from that body, is suggested. I shall be glad to hear



Physical jerks for breakfast?

from other readers in the district, and if necessary will convene a meeting.

The Sergeant-major's Dodge

FIFTY loudspeakers, I learn, are being installed at Llanion Barracks (Pembroke Dock) where the second battalion of the King's Shropshire Light Infantry is quartered. It is quite untrue that the underlying idea is that the sergeant-major can stay in bed and drill his men without getting up. With television in the offing he should be able to do so, however. He will be able to see his men drilling on the square and bawl his expletives through a loudspeaker by means of a P.A. outfit.

Early Morning Exercises

AND speaking of drilling and exercises calls to mind that the B.B.C., anxious to implement the Government's campaign for an A1 nation, proposes to broadcast physical exercises in the early morning. The only obstacle in the way of these slimming exercises at the moment is the fact that the B.B.C. cannot make up its many minds whether to make the broadcast before or after breakfast. So be prepared to bend and touch the toes to the tune of "The Broken Doll."

Fog

DURING the recent thick fog a reader noticed that his short-wave reception vanished. I am not referring to the broadcast fog but to the pea soup variety for which London and Manchester are renowned. We know that the sun and its spots affect radio reception, and so does the moon. This reader says that he has noticed that good reception accompanies a change in the weather. With a little experiment, therefore, it should be possible to forecast the weather from wireless reception. As it is, deep depressions assail me every time I wish to listen to the news.

A Solution

A SENSATION was caused at Broadcasting House the other day when a party of people was discovered sitting round a mike with pegs on their noses. It appears that they were rehearsing a broadcast of Punch and Judy. From my own deductions I should say that this is the solution to the problem of how crooners rattle their larynx, ululate the epiglottis, and make those queer gurgling noises for which they are paid about £1,000 per gurgle. You know the noise—gurgle, gurgle, plonk; plonk, gurgle, gurgle.

A Distressing Scene

I WITNESSED a most distressing scene the other day in a local dealer's shop. A man came in for a set of coils which he had ordered, and as it was being handed to him another man entered the shop and wanted a set of similar coils. His set had not arrived, in spite of the fact



Does the fog affect radio?

that he had had them on order for three weeks. He lost his temper, and tried to collect the other man's coils by force, and a fight resulted in which the coils were damaged. It is really getting very disturbing—the way that manufacturers are getting behindhand with orders. One manufacturer is not giving delivery of one model for at least six weeks, in spite of the fact that his staff is working overtime.



How the crooner gets his 'croon.'

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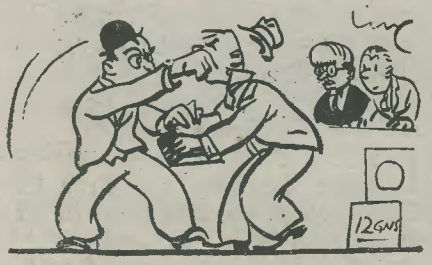
The Overhaul

AS it is getting near the end of the year I must overhaul my set, earth and aerial. I put it off last year until after the Christmas festivities, and having taken the set apart I broke a valve, and thus caused a rift in the lute. Fortunately I have a stock of old sets, so I issue this topical reminder that you should set about the job without delay.

A Curious Phenomenon

I DO so hope that some of my readers will come to the rescue of A. B., of Thornaby-on-Tees, who writes :—

"Dear Thermion,—I wonder if you or other readers have noticed this curious phenomenon. I combed my hair briskly in a dark room whilst holding a mirror opposite my head.



Coils—First come, first served!

Imagine my astonishment as I observed flashes of blueish light being emitted. The faster I combed the bigger the flashes.

"After running the comb through my hair a few times I touched my hand with the comb and a blue light appeared on my hand, but no shock. I'm wondering whether I'll be able to run my wireless off this current, as I could devise a machine to automatically comb my hair whilst sitting down and listening in. It would be an easy thing to transfer the apparatus to someone else's head when my head was tired or I was just about bald.

"What do you think about this idea of mine? Will it be worth taking a patent out for? Wishing you a very Happy Christmas and a Prosperous New Year."

I like really serious letters like this; it is such a change from having my leg pulled! Perhaps the learned members of the Short-wave, etc., *Society* would like to debate this point in solemn conclave—sign and countersign, and all that, you know.

Telegraphic Address, "Boot Repairers."

"Practical and Amateur Wireless" Clubs

A READER makes the suggestion that this journal should form clubs in each district in the same manner as has been done with our companion journal *The Cyclist*. He points to the great success of these clubs—*The Cyclist* Road Clubs—and feels that the PRACTICAL AND AMATEUR WIRELESS Clubs would be just as successful. I am willing to help in their formation and endeavour to set some standard of procedure. If you are interested in the formation of a club in the district, drop me a line.



Notes from the Test Bench

L.W. Tracking in 465 kc/s Supers

IN order to obtain best results on the long-wave band of a superhet, very accurate adjustment of the padding condensers is necessary. If a gang condenser with a specially-shaped oscillator section is employed, a padding condenser is not required on the medium waveband, and no great difficulty should be experienced in correctly adjusting the tuning condenser and I.F. transformer trimmers. But even though a shaped oscillator section is used, a padding condenser is necessary for long-wave matching.

When an intermediate frequency of 465 kc/s is used, as in the £4 Superhet, it is customary to employ two padding condensers. One of these is connected in series with the long-wave winding and the other in parallel with it. It often happens, however, that exact tracking cannot be obtained and, consequently, low sensitivity is experienced at one end of the tuning range. A very easy method of overcoming this difficulty, and one that has proved very successful in the above-mentioned receiver is to use a .0001 mfd. variable condenser, of the solid dielectric type as a parallel padder in place of the normal .0001 mfd. preset. Slight adjustment of this enables the listener to obtain maximum volume from every station receivable on the long-wave band.

Improving Superhet Selectivity

WHILST dealing with the subject of 465 kc/s superhets, another hint will probably prove helpful to constructors. It is generally recognised that the selectivity of this type of superhet is not quite equal to that of the 110 kc/s type, but the degree of selectivity can very often be materially improved by providing a feed-back from the anode to the grid of the I.F. valve. This is done by connecting a short length of flex to the cap terminal of the valve and placing the other end of the flex near the grid terminal of the same valve. The valve can then be brought near its oscillation point and sensitivity and selectivity will be improved. In short-wave superhets the amount of feed-back can be increased sufficiently to produce oscillation so that C.W. morse reception can be effected.

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The Festivities

BY the time you read these notes the Christmas holiday will be in full swing. Can you imagine what Christmas holidays were like before radio? The newspapers do not publish on Christmas Day, and we were all very much victims to the need for entertaining ourselves. The radio still keeps you in touch with the outer world, and it is the one day in the year when electricity consumption is heavier. How many readers will not listen in on Christmas Day?

Recording History

I AM glad that the B.B.C. has seen fit to record King Edward VIII's broadcast speech made on the eve of his abdication. This record is to be preserved for ever, and future generations will not, therefore, be left in doubt as to what he actually did say. Unfortunately, a good deal of history is pure imagination. There is no tittle of evidence to support the Bruce and the Spider story, nor that concerning King Alfred and the burnt cakes. You must remember that anyone can write a book of history, and there is no one to vouch for the accuracy of the information. Historians merely copy previous histories, and if the original source is wrong,



Getting ready for the annual overhaul.

modern history must be wrong. With radio and modern methods of recording speech, accuracy of history is assured for future generations. It is a remarkable thing to reflect that in a thousand years' time people will still be able to hear the voice of King Edward VIII and others who have played a part in our national history. Past history is very much in doubt. I have always felt that the writing of national history books should be a state-controlled affair.

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Practical Television

December 26th, 1936, Vol. 3. No. 30.

Better Synchronising

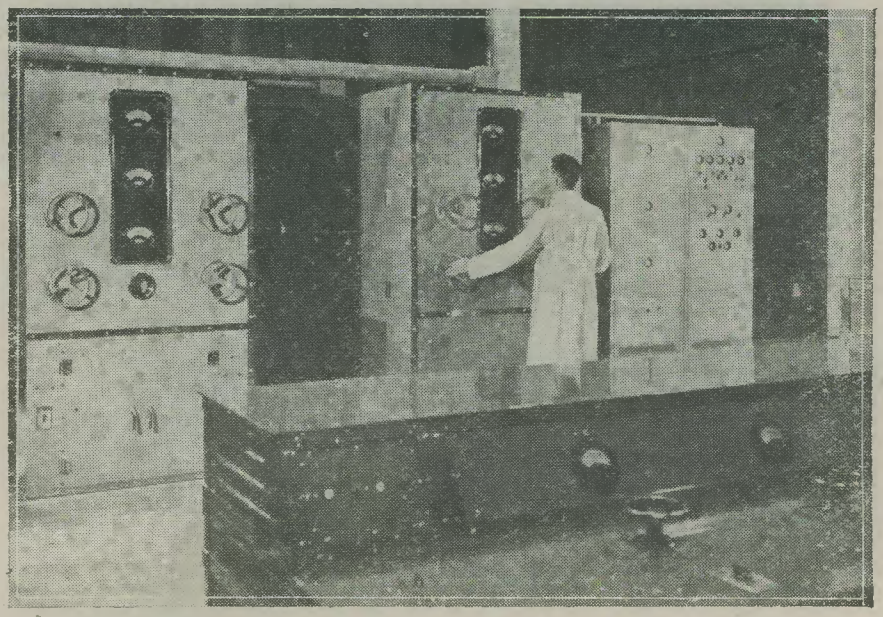
IN watching the results now obtained with high-definition picture reception it is very evident that the question of synchronising does not present a fraction of the difficulty experienced in the days of low-definition transmissions. When using mirror drums and scanning discs for reproducing these thirty-line pictures in conjunction with the source of modulated light, the achievement of good synchronism as represented by a steady, properly phased and framed picture was the prime difficulty of the operator. Ingenious mechanical brakes, electro-magnetic relays, cogged wheels and field coils were incorporated in the equipment and used with varying degrees of success, and many people wondered whether the same difficulty was going to arise with the high-definition television service. In the first place, with low-definition television transmissions only the line repetition synchronising signal was included with the vision signal, this being a pulse having a frequency of 375 per second. The pulse shape was not always definite and no picture repetition pulse was added. The result was that special framing and phasing devices had to be built in the receiver, and even under the best of circumstances hunting effects were present which militated against the measure of success possible with those transmissions.

Two Distinct Signals

WITH the present high-definition television signals, however, quite a different state of affairs exists. At the end of each picture line trace a separately generated and rectangular shaped pulse of known amplitude limits is injected into the modulation, its modulation direction being opposite to that portion of the signal corresponding to picture modulation. Then at the end of each frame a similar type of pulse is injected so that there are two distinct signals of known time duration and shape whose function is to control whatever device is employed at the receiving end for giving the scanning motion. Assuming that a cathode-ray tube picture reproducer is being used, then the time base generators which provide the saw tooth voltage or current variations for imparting movement to the electron beam are so designed that the electrical constants of the dual circuits produce line and picture traces of approximately the correct speed. Filter circuits in the receiving set itself separate these synchronising pulses from the picture modulation signal and apply them to the appropriate control grids of the time base valves. This ensures that the triggering or discharge action of the equipment is timed correctly and the picture takes up its proper position in the available screen area. Picture phasing and framing in the ordinary sense of the terms are functions of the transmitting end, but it is sometimes necessary to "shift" the position of the complete scan on the cathode-ray tube screen so that it is disposed centrally in the cut-out mask representing the picture size. Even in the hands of complete novices, however, the television receivers now in use prove very tractable and after installation by experienced service engineers the user has little cause for complaint on the score of poor synchronising.

Television's Relation to Education

TEACHING in all modern schools has already been supplemented by two mechanical (or more strictly, electrical) aids, namely radio and talking films, and with the establishment of a television service the question is already being raised in certain quarters "Can television help?" The answer is undoubtedly in the affirmative. The young mind needs both sight and sound to impart true knowledge and whereas the radio broadcast to schools has undoubtedly done yeoman work in bringing the specialist's voice to an ever-widening class of scholar, there is a tendency for the mind to become diverted rather easily by anything untoward which may happen in the classroom itself, especially if there are one or two unruly scholars present. The talking film has put a new complexion on this particular angle, but, unfortunately, the expense involved for an installation of this character is very heavy indeed. Again, this last named is localised to the particular school which can afford to pay for the apparatus. With the anticipated rapid development of television, however, especially in the direction of securing larger size pictures which can be seen by a big audience, the whole matter should be reviewed very carefully. Even in the days of low-definition television receiving equipment was built by some schools so that advantage could be taken of certain educational items included in the programmes. It is not suggested, of course, that the personal contact and sympathetic relation between teacher and scholar should be removed.



Part of the Baird transmitter at the Alexandra Palace. In the background (from right to left) are the crystal drive unit, the intermediate radio-frequency amplifier and the power output stage. In the foreground is the control desk.

TELEVISION ON CHRISTMAS DAY

THE chef of a famous Strand restaurant will inaugurate the Christmas afternoon festivities at the London Television Station by carving a prize turkey before the camera. The programme will also present the fourteenth and Christmas edition of "Picture Page," Cecil Madden's topical television magazine, and it is expected that many of those interesting people who come into the limelight only at Christmas time will take part. During the afternoon Edward Shackleton, son of the famous Antarctic explorer, is to give his own account of a lonely Christmas spent on Ellesmere Land. Films actually taken amid the ice and snow will be transmitted during the talk.

A CHRISTMAS party of celebrities enjoying themselves before the television camera will be a high spot in the evening transmission. Cecil Lewis will act as Master of the Ceremonies. The evening programme begins with carols by the Singing Boys from St. Mary-of-the-Angels Song School, the President of which is the Rev. Desmond Morse-Boycott. Then will follow a film programme, "Christmas through the Empire," which is being specially prepared for television. Film sequences have been secured dealing with Christmas in practically all parts of the Empire. There will be glimpses of football in Fiji, a Christmas dance in Basutoland, ski-ing in Canada, the Khyber Pass in winter, and "shots" from Australia, Gibraltar, and the West Indies.

During the evening Commander A. B. Campbell, who is one of television's first "causeurs," or talkers, will describe some unusual Christmases.

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The Choice of Intermediate Frequency

An Explanation of the Reasons for Different Intermediate Frequencies and of the Advantages and Disadvantages of Each

THE constructor of a superhet—especially if he is designing his own receiver—is apt to be in doubt as to the type of intermediate-frequency transformers which would prove most suitable. As most readers are aware, these are of three principal types, tuning to 110, 150, and 465 kilocycles respectively. One might ask: Why three entirely different frequencies, and what are the advantages and disadvantages of each? These are fair questions, although it is by no means an easy matter to answer them simply and conclusively. The fact that all three are still in use, and that different designers have their individual preferences, is sufficient proof that it is impossible to be dogmatic in the matter.

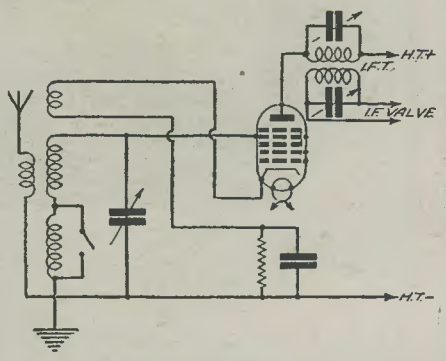
From 110 to 465

Until fairly recent times it was standard practice in this country to use 110 kc/s transformers for broadcast receivers and 110 or 150 kc/s transformers in short-wave sets. To-day, the position is different, partly because all-wave sets are increasing in popularity, and partly because considerable use is being made of the intermediate frequency of 465 kc/s. Why should there be "standard" frequencies, in any case? Why not use any other frequency which seems convenient? In the first place, standardisation is of value because it means that standard superhet gang tuning condensers can be used. But a more important aspect is that the frequency must be chosen so that there is little or no possibility of interference. It is not difficult to imagine that interference would be likely if the I.F. were equivalent to a wavelength which is commonly used for powerful transmissions. If this were the case, such transmissions might be picked up by the oscillator portion of the receiver, even when the first detector were tuned to an entirely different wavelength. The frequencies of 110 and 150 kc/s were originally chosen for this reason more than any other; because these frequencies are equivalent to wavelengths of approximately 2,700 and 2,000 metres, on which there are no regular transmissions.

Second-channel Interference

It was found, however, that interference was still experienced on certain wavelengths, and in certain conditions. The reason is that a beat note occurs which is audible as a whistle at certain settings of the tuning condenser—generally about 450 metres in the region of the London transmitters. This is because the frequency difference between stations operating on about 450 metres (670 kc/s) and the local station on 342.1 metres (887 kc/s) is equal to twice the intermediate frequency, so that a whistle is produced between the 670 kc/s transmission and the oscillator tuned to about 780 kc/s. In other districts, and near to other transmitters, these second-channel whistles are heard, and might be very troublesome. For this reason, some commercial receivers having 110 to 150 kc/s intermediate-frequency transformers are provided with an external adjustment by means of which the exact I.F. can be modified slightly.

Normally, these second-channel whistles are really troublesome only when the receiver is used in fairly close proximity to a powerful transmitter, but the difficulty is always present. On short waves the position might be even worse, and interference might be experienced between two transmissions on wavelengths which are not widely separated. Another reason is that many of the transmissions are picked up at similar strength, and this emphasises the whistles.



One form of image-rejection circuit where the rejector winding (of a few turns) is in series with the cathode of the frequency-change valve.

Non-standard I.F.'s

This was the main reason for the development of an I.F. of 465 kc/s, although it should be mentioned that this and similar intermediate frequencies had been used in America for several years. There was less difficulty in that country, due to the fact that all broadcasting stations operate on medium and short waves. In America, there were, indeed, many alternative intermediate frequencies, according to the whims and fancies of designers. Even in this country there are still many makers of commercial receivers who employ frequencies which do not conform with any of the arbitrary standards mentioned above. In fact, there is still scope for experiment in this direction, although it is difficult for the amateur to take part in it unless he is prepared to employ two separate tuning condensers for the signal and oscillator frequencies, or to go to the immense amount of trouble in making his own gang condensers.

When using the I.F. of 465 kc/s—which is rapidly gaining in popularity—there is little danger of second-channel troubles, since there are no transmissions (on the medium or long-wave bands at any rate) which are on frequencies separated by as much as 465 kc/s. For this reason, there is less need to pay very careful attention to the use of so-called image rejectors (filters for preventing signals at the intermediate frequency from entering the receiver). Several commercial receivers operating on intermediate frequencies of 100 to 200 kc/s are fitted with image-rejection filters of one kind or another. A usual arrangement is to have a special winding on the aerial coil connected in some way to the frequency-changer.

Disadvantages of 465 kc/s

So far, it might appear that the I.F. of 465 kc/s has all the possible advantages with none of the disadvantages. But that is not strictly true. The high I.F. does not normally provide as great a degree of selectivity, whilst rather more care is needed in the tracking and ganging of the tuned stages. Additionally, the amount of amplification per stage is not usually quite as great. It is not possible to deal fully with this point without going into the theory of coil design and allied subjects, but it can be stated that the dynamic resistance (effective resistance in working conditions) of a transformer tuned to, say, 110 kc/s, is greater than that of a similar component tuned to the higher frequency. This means, in effect, that the damping of the tuned circuit is greater when using 465 kc/s.

If it is necessary to sum up the advantages and disadvantages of the various intermediate frequencies, it can be stated that 110 kc/s is to be preferred when *extreme* selectivity and the maximum degree of amplification are required, whilst 465 kc/s is better when a small amount of amplification can be sacrificed, and when the set is connected to a good outside aerial. The I.F. of 150 kc/s is not recommended, since there are very few gang condensers designed for this. Another point is that it is nearly always easier to ensure complete stability with 465 kc/s I.F. transformers; this is due in large measure to the lower amplification and reduced dynamic resistance. Since the sensitivity of modern valves is of a high degree, the very small sacrifice which must be made in the efficiency of the intervalve couplings is not of much importance, and is generally fully offset by the benefits of greater stability.

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An All-purpose Meter

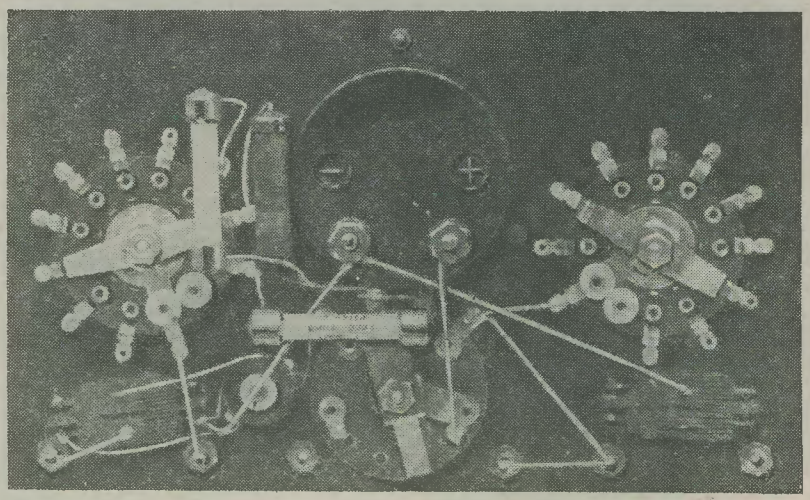
The Main Constructional Features of a Useful Measuring Instrument which has Many Applications. By W. J. DELANEY

TO locate faults in a wireless receiver, or to carry out experimental research, it is absolutely essential to make use of some kind of meter, and practically every keen amateur seems to find the building of a multi-purpose instrument provides a very interesting occupation. We have described various types of instrument of this nature from time to time, and requests are continually being received for meters of various kinds. In this article brief constructional details are given of an all-purpose meter which I recently constructed for a keen amateur, and it will be found that the principles incorporated will be applicable to other instruments of a similar kind. Firstly, it is necessary that such a general-purpose instrument shall be capable of recording voltage, current, and resistance readings, and such a limited range will well fulfil the requirements of the ordinary listener. But the construction will be complicated when it is desired to make the voltage readings cover both A.C. and D.C. ranges, and also when other factors must be measured or calculated.

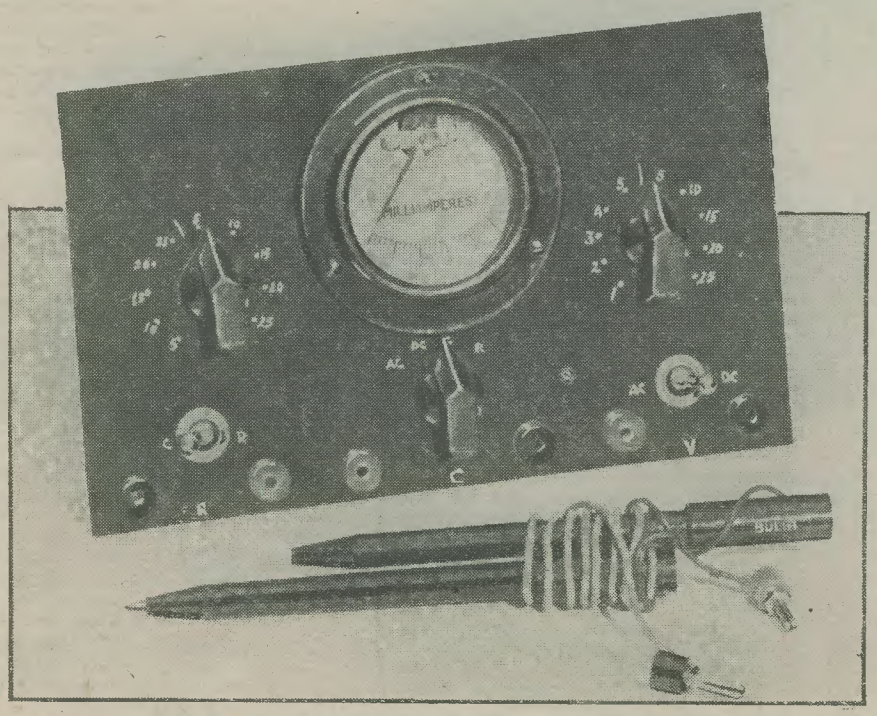
Multi-switching

The general complications of switching need no emphasis, but in the instrument illustrated there are three multi-point selector switches in addition to two double-pole switches of the Q.M.B. type. This particular instrument had to be designed round a milliammeter having a full-scale reading of 5 milliamps, but it should be pointed out that such a high reading is not ideal. However, as the particular amateur had this instrument he wished to avoid further expense, and the limitations were explained and the instrument has to be used with care. The ranges of current are easily arranged for by the use of simple shunts, and the methods have already been explained. The meter is connected to a battery and resistance in series and the current noted, after which a short piece of resistance wire is joined across the meter terminals and adjusted until the reading is half of that previously shown. The multiplication factor with that wire is then 2, and the process is carried out for the various readings which are required.

In the meter illustrated two Bulgin ten-point switches are employed for multiplying the voltage, current, and resistance scales, and a further four-point switch from the Bulgin range is fitted as a safeguarding switch.



This shows the compact arrangement of the switches and other parts. The majority of the resistors have been removed in order to enable the general construction to be seen more clearly.



Panel layout of the All-purpose Meter referred to in this article.

Safety Precautions

It is obvious that when an instrument has to perform several different functions there sometimes arises a risk of damage if it is wrongly connected. For instance, as this particular instrument has to be used for D.C. and A.C. voltage readings care must be taken not to apply A.C. when on the D.C. range, nor connect a voltage source when adjusted for resistance measurements, except within certain limits. Accordingly separate sockets are provided so that the test prods are connected to a different point for voltage, current, and resistance readings. Furthermore, for current and resistance readings a separate change-over switch is inserted, and this is in addition to the four-way switch situated immediately beneath the meter. On the voltage sockets, the change-over switch is arranged to bring into circuit the Westinghouse rectifier for A.C. readings, and thus the user has to exercise a certain amount of thought when using it, which prevents the possibility of damage. It is possible to arrange for all readings with only one input circuit, but this is likely in inexperienced hands to result in the meter being burnt out, as it encourages hasty tests and carelessness.

Output Measurements

In addition to the measurements already given, this instrument was also adapted so that wattage output measurements could be taken, and the usual scheme of connecting it in the output circuit on a high-voltage range is employed, and a complete conversion table was fitted inside the lid of the cabinet. This carried calibration curves and other relative data,

(*Continued on page* 478)

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December 26th, 1936

A HIGH-QUALITY AM

Some Interesting Constructional Details of an L.F. Amplifier Embodying a Novel Circuit. By NOEL BONAVIA-HUNT, M.A.

FIRST of all let us very briefly outline the main characteristic features of a high-quality receiver from the musician's point of view. They are six in number, as follows:—

1. Softness and purity.
2. Spaciousness.
3. Liveliness.
4. Fidelity.
5. Clarity.
6. Proportionality.

These six characteristics all apply to the performance emanating from the loudspeaker and not, of course, to the electrical constituents of the receiver itself. These are the things that we should expect to *hear*, but most of us go on expecting instead of getting them. The first and third hardly require explaining; the second suggests sound radiation, the fourth means character likeness, the fifth clear definition

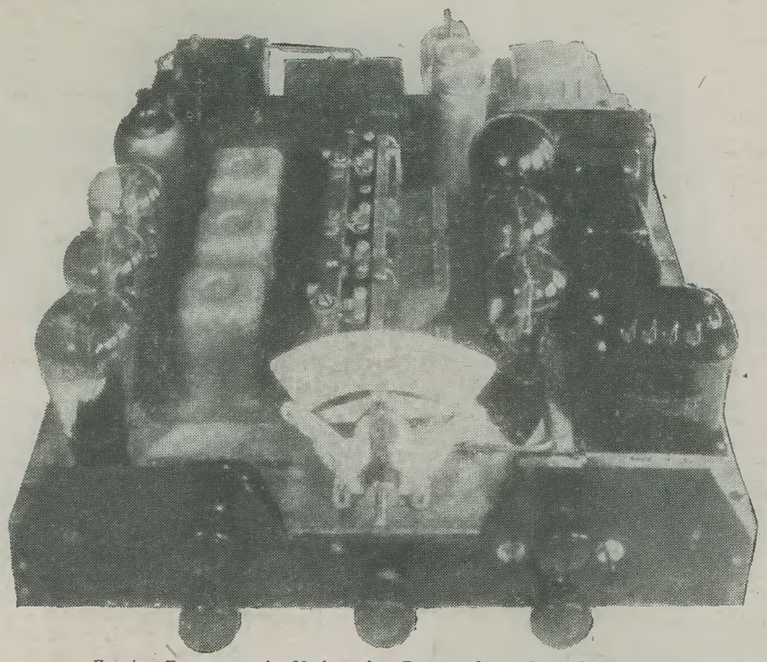

Fig. 4.—Front view of a High-quality Receiver designed on efficient lines.

of all the parts that make up the whole, and the sixth a correct balance between bass, middle and treble registers. It is well known that the third, fourth and fifth characteristics can be obtained reliably from resistance-capacity coupling, while the first and second can, in my opinion, be best secured from the special form of coupling to be described later. The last feature—proportionality or balance—depends on the shape which the frequency response curve is arranged to take. Since the majority of receivers are used in private houses and the volume level is normally below that of the original, it is essential to raise the response curve at the lower end of the spectrum, while the middle and upper portions should be as free from peaks and troughs as possible, in view of the fact that the loudspeaker characteristic is not innocent of these blemishes. Broadcasting conditions being what they are, there may be a distinct advantage in a slightly drooping response above 8,000 cycles provided the droop is gradual, while the reproduction of gramophone records usually demands a gradient in the response curve above 6,000 cycles at least.

A Useful Range

The response curve of the amplifier which I am about to describe is straight between 100 and 8,000 cycles. Below 100 cycles the curve begins to rise till it reaches its maximum point at 50 cycles, where the gain is 8 decibels, and below 50 cycles it starts falling very slightly down to 25 cycles, the drop being of the order of 1 decibel, so that at 25 cycles the actual gain is 7 decibels. Above 8,000 cycles the response gradually drops till at 10,000 cycles there is a loss of 3.5 decibels, which is quite inconsiderable. The frequency characteristic, however, gives only a very imperfect idea of the performance of the amplifier, and it is only mentioned in order to satisfy the curiosity of those who are apt to place undue confidence in response curves.

It has already been pointed out that liveliness, fidelity and clarity of reproduction may be satisfactorily obtained from the employment of resistance-capacity coupling. In accordance with this postulate, the first two stages of the amplifier are so treated, and Fig. 1 gives the fundamental circuit, with (in addition) a special form of high-note control incorporated in the grid circuit of the second valve. This treble control is designed to operate in conjunction with the quarter-megohm potentiometer and will be found extremely serviceable in all circumstances. It is well known that as the volume of the receiver is reduced by means of the usual potentiometer control high-note loss is introduced as the resistance between the coupling condenser and the slider is increased, and in order to compensate for this loss a condenser is shunted across these two points. After careful experiment it has been decided to use a capacity of 0.1 microfarad for this condenser and to graduate the control by means of a half-megohm variable resistor. A switch is also incorporated, since even with half-megohm resistance fully in circuit the condenser still affects the quality to a slight degree.

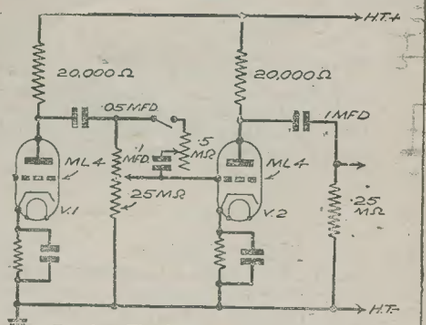

Fig. 1.—The first two stages of the amplifier with the special high-note control.

The complete amplifier consists of four stages, and in order to avoid the overloading of the output valve the stage gain of the two resistance capacity coupled stages is kept down to a low value. Hence the anode resistors are in each case only 20,000 ohms, and the valves employed must be of the power class such as the ML4, AC/P, or 104V. If battery valves are used, the P2 type is recommended.

The Special Coupling

The third stage introduces the special coupling which places this amplifier very high in the scale of design. Readers may experience some difficulty in hailing with adequate enthusiasm the appearance in the diagram of Fig. 2 of three transformers. They will doubtless remark that this is an expensive arrangement for a single-stage coupling; but it must be pointed out that the result amply justifies the extra cost. Besides which, it is hoped that most of my readers already possess at least one of these well-known components. The circuit in Fig. 2 is self-explanatory, all the connections being quite clearly marked. The shorting switch across the secondary winding of the AF3 transformer should be noticed, since with this winding short-circuited the response curve of the amplifier undergoes a change which should be easily

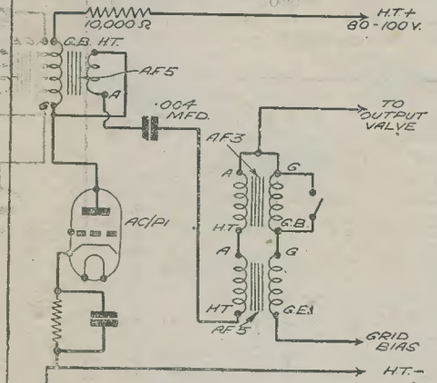

Fig. 2.—The special coupling between the third and last valves.

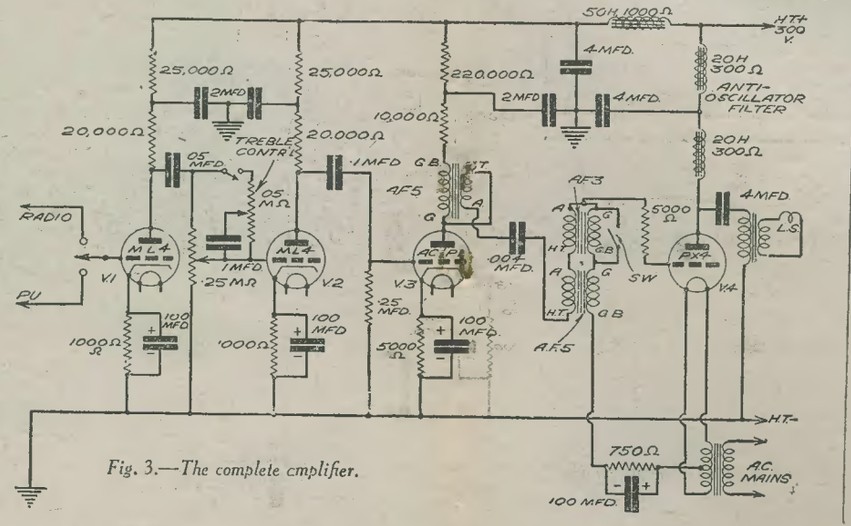

Fig. 3.—The complete amplifier.

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PLIFIER

perceptible even to the average ear. What happens is that the lower frequencies below 500 cycles are gradually increased in strength till at 50 cycles a gain of twelve decibels is attained, while in the upper portion of the curve the response starts falling above 6,000 cycles till at 10,000 the decibel loss reaches the figure of ten. Unless a high-range speaker is employed this attenuation in the upper register may be barely noticeable, though if a peak occurs in the speaker or microphone characteristic (or in the pick-up, as the case may be) the fall in the response curve may effect a gratifying result. It is hardly necessary to stress the advantage of such a curve in cases where the transmission presents high-note distortion or heterodyne whistles interfere with the pleasure of reception. For gramophone work the shorting of the secondary winding of the AF3 will in most cases prove the more satisfactory course, but much depends on the type of loudspeaker in use.

The large winding of the AF5 transformer in the anode circuit of the third valve (also a power valve of the ML4 class) makes it absolutely essential to keep the current dissipation down to a low point. After the most careful study it has been found that the optimum flow of current at 100 volts is 0.75 milliampere, the object being to avoid core magnetisation and consequent amplitude distortion. A series resistance of 10,000 ohms is inserted between the point of high tension and the "G.B." terminal of the transformer, and this resistance forms part of the anode circuit. The valve selected for this stage is the AC/P1 or its equivalent.

The Output Circuit

The output stage follows normal practice, and while it will be observed that only one PX4 valve is employed, there is no reason why two of these should not be used in parallel, or, for that matter, why an output valve of the 400 volt class, such as the DO26 or PX25 should not be substituted, if desired. The voltage-dropping resistances must in this latter case be increased in proportion in accordance with Ohm's law. Attention is drawn to the special arrangement to obviate instability in the output valve by means of the extra decoupling choke and condenser (which duplicates the output filter components) and the 50-henry smoothing choke which is inserted between the main high-tension voltage line and the anode feed supply to the earlier stages including the high-frequency amplifier. The complete circuit diagram of the amplifier is given in Fig. 3. Readers may be interested to know that several examples of this amplifier have been made and the results are phenomenal. The illustration of the radiogram here shown is one supplied by Mr. R. Foden-Petchler, of Manchester, who has constructed the complete receiver to my design, and it will be seen that it is possible to form a very compact lay-out despite the number of stages in use.

It will be seen that a chassis form of construction is adopted, and the resistors are mounted in "banks" to facilitate wiring. The L.F. couplers will be seen on the right-hand side of the chassis, and, in spite of the number of controls, the receiver is extremely simple to operate and represents a splendid musical instrument. The radio portion of a receiver for use with the amplifier described must, of course, be designed on similar high-fidelity lines, and a "straight" receiver with at least one stable H.F. stage, and a diode-detector may be recommened.

I may conclude by stating that I am at present working the amplifier described in this article in conjunction with a Voigt Domestic Loudspeaker, and there can be no question that the result from the musician's point of view sets a new standard in high-quality reproduction.

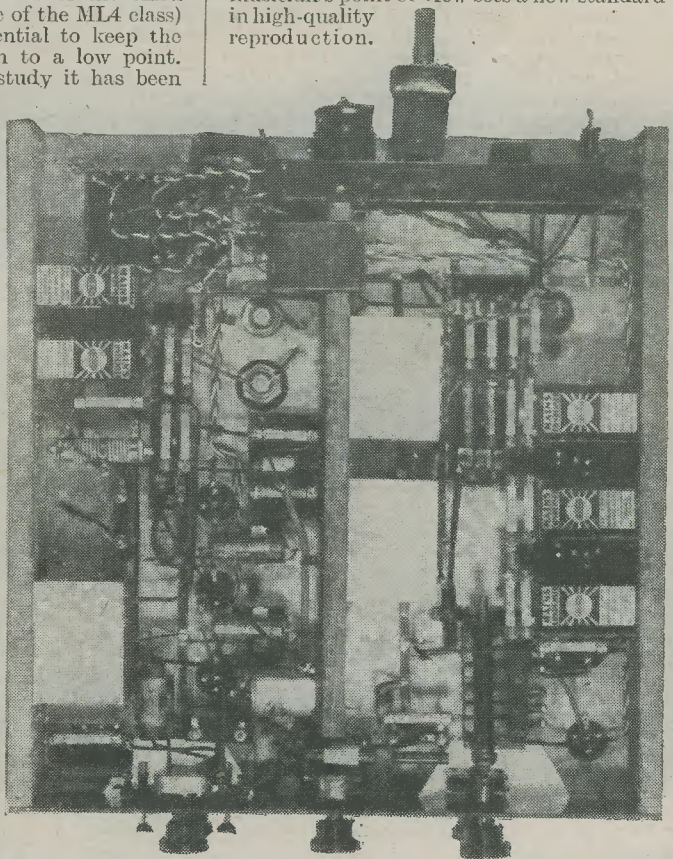

Fig. 5.—Under chassis view of a complete receiver built to Mr. Bonavia-Hunt's design.

TELEVISION AND SHORT-WAVE HANDBOOK
By F. J. CAMM
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Leaves from a Short-wave Log

Switch Over to 50-metre Band

This is a portion of the waveband which comes into its own at this period of the year. Try for HH2S, Port-au-Prince (Haiti), on 50.85 m. (5,900 kc/s), a 100-watt station which is now well heard. Announcements are made in French, Spanish and English. The studio opens its broadcasts towards midnight with the playing of *The Swan* (St. Saëns), and closes down towards G.M.T. 03.00 with the same melody. The interval signal, consisting of four chimes coupled with the call, is put out every fifteen minutes. Reports may be sent to: Société Haitienne de Radiodiffusion, Immeuble Magebgo, Port-au-Prince (Haiti).

And Talking of Harmonics . . . .

On the upper part of the short-wave band you will discover the fourth harmonic of Radio Toulouse (France) on 82.15 m. (3,652 kc/s), and the fourth and fifth harmonics of Poste Parisien (Paris) on 78.2 m. (3,836 kc/s) and 62.56 m. (4,795 kc/s) respectively. On 44.916 m. (6,678 kc/s) the sixth harmonic of Radio Normandie (Fécamp) is often as powerful as the broadcast on the fundamental wave.

Two Puzzling Harmonics

Identification of short-wave stations is sometimes rendered difficult by the fact that in the higher frequency band there will often be encountered harmonics of medium-wave transmitters. It is wise to note that if a French-German broadcast is found on 31.75 m. (9,449 kc/s), it should be entered in the log as the eleventh harmonic of Radio Strasbourg (349.2 m.—859 kc/s). In the same way the writer was puzzled a few nights ago by the presence of a programme apparently emanating from Yugoslavia on 24.59 m. (12,200 kc/s). It was later revealed as the second harmonic of the Belgrade short-wave broadcast on 49.18 m. (6,100 kc/s). Make a note that this transmitter now relays the medium-wave studio entertainments daily from G.M.T. 08.00 until the latter signs off at the end of the day's work.

New S/W Station in French Indo-China

Paris listeners report the reception of good signals from FZR, Saigon, on 31.49 m. (9,530 kc/s), which I am informed is worked by Mons. Michel Robert, Entreprises Electriques, 98, rue d'Espagne, Saigon, French Indo-China, to whom all reports should be addressed. The times at which the transmissions were logged are G.M.T. 12.00-14.00 (daily) and between G.M.T. 04.00-05.00 (Mondays).

Is This a Harmonic?

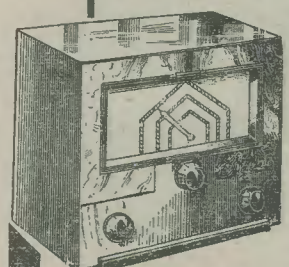
On 25.21 m. (11,900 kc/s) a broadcast was recently picked up from Mexico City; the call heard was XEWI, Radio Mex, with the slogan: *Mi Voz al Mundo desde Mexico* (My Voice to the World from Mexico). Interval signal reminded me of the noise made by a turkey gobbler. The puzzle lies in the fact that XEWI has always been advertised on 50.42 m. (5,950 kc/s). Has the station decided to work on the half-wave, or is this the second harmonic of the original transmission? The address is: Estaçion Radiodifusora Cultural XEWI, Apartado Postal, 2874, Mexico City (D.F.), Mexico. You will hear the name phonetically as *Cee-oo-dad May-hee-ko.*

Have You Logged Ecuador?

Should you hear the call: *Ondas del Pacifico* in a feminine voice on a channel some few degrees of the dial above GBC, Rugby, jot it down as emanating from HC2CW, Guayaquil, on 35.71 m. (8,410 kc/s). Chimes are used as a signature tune, and the station works daily (Mondays excepted) from G.M.T. 01.30-04.30. The call letters may be rendered phonetically as *Ah-chay say dose dooble-vay.* If you want a "veri" the address is: Sr. Manuel Alvaredo Cobas, Apartado Postal, 1166, Guayaquil, Ecuador, South America.

An Ideal Book for the Beginner!
Everyman's Wireless Book
By F. J. CAMM
3/6 or 3/10 by post from George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Aerialite SPECIALITIES
For Better Christmas and New Year Reception



This is the time when the home radio has a special appeal. If you want to get the best out of your set then insist on Aerialite specialities—you'll be amazed at the improvement in the quality of the reception.

★ Use Aerialite H.T. Batteries, Aerial Wires, ALL-WAVE AERIAL, etc., etc.

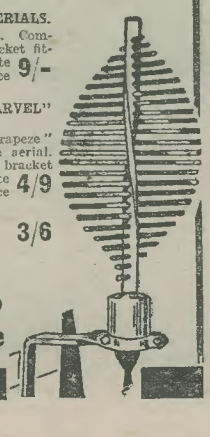
From your dealer—or direct, post free.

SHORT-WAVE ADAPTORS.
Two Types.
1. For coupling to input of S.G. Receiver. Range 16-52 metres.
2. An Autodyne as above with Ultra-Slow-Motion dial covering two ranges—13-27 metres and 27-85 metres.
Price: No. 1, £2.7.6
and with S.M. dial (No. 2). £3.0.0
FITTED IN A MINUTE BY ANYBODY.

AERIALITE TRAPEZE AERIALS.
No danger. Needs no mast. Complete in carton with bracket fittings and 50ft. Aerialite insulated down lead. Price 9/-

AERIALITE "LITTLE MARVEL" AERIAL.
A Junior version of the "Trapeze" An efficient no-pole type aerial. Complete in carton with bracket fittings and 40ft. Aerialite insulated down lead. Price 4/9

The new "RADIAL" AERIAL—No-mast-type 3/6



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REMARKABLE XMAS RADIO OFFER
A FAMOUS SHORT WAVE CONVERTOR UNIT
ENABLING YOU TO CONVERT YOUR OWN
RADIO RECEIVER TO AN ALL-WAVE SET.
Scores of extra programmes from America, Australia, Europe, direct on your Set.



USUAL PRICE
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Complete with 2 plug-in Coils. Adaptor Plugs, etc.

BARGAIN OFFER
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Full instructions and calibration chart. One Plug. One Connection only to set. No alterations.

SEND AT ONCE! LIMITED NUMBER ONLY!
BRING THE WORLD TO YOUR FIRESIDE THIS XMAS.
Sent C.O.D. or Cash with Order. Fully Guaranteed. Write at once for Xmas delivery to Mail Order Dept.,
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With an Introduction by Alexander Korda
A complete survey of the intention and methods of modern cinema art for the amateur film-maker, the serious film-goer or the professional. A worthy successor to the author's standard work, "Filmcraft."
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NEWNES : LONDON

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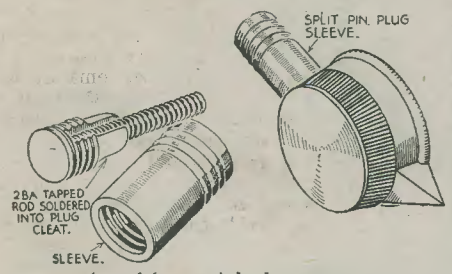
A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — **READERS WRINKLES** — THE HALF-GUINEA PAGE

A Dual-purpose Knob

HERE is a handy dodge for control knobs which have an annoying habit of working loose, with the grub screw



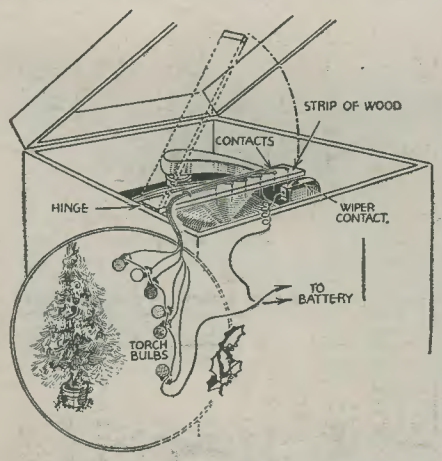
A useful control knob improvement.

awkward to get at, and difficult to tighten.

A piece of 2B.A. tapped brass rod soldered to the cleat of a Clix plug, and then screwed into the sleeve of the plug will serve two purposes, one of tightening the knob at will, and the other of effecting finger control when rapidly scanning the dial.—A. W. WARD (Edgware).

A Novel Automatic Control for Lighting Effects

THE following dodge will probably be found useful at this time of the year in connection with Christmas tree decora-



A novel method of controlling lighting effects for Christmas tree decorations.

tions. With the aid of a few flash-lamp bulbs and a battery, the pick-up arm of the gramophone is used as a circuit breaker, and the lights on the tree changed as the record is played. I use six contacts, each connected to two lamps in series on the tree or used to floodlight the tree in colour.

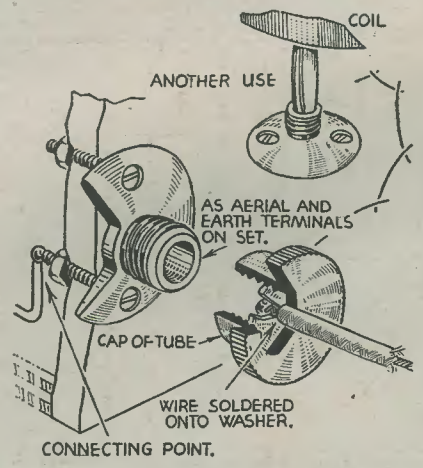
The idea is as follows: The negative contact is a bent piece of tin mounted on the pick-up, whilst the other contacts are mounted on a piece of wood over the top of it, hinged at the end so that it can be lifted out of the way when the record is changed. The wires protrude through the wood just far enough for them to rub the contact on the pick-up and so complete each circuit in turn. As the pick-up only moves slowly to the centre of the record, the slight drag of the connecting wires will not be noticeable.—T. BLAND (Blackpool).

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.

Improvised Terminal Mounts

IN the dodge illustrated in the accompanying sketch the tops of old tooth paste tubes are utilised to make very efficient and cheap terminal mounts. The tops are



Simple but effective improvised terminal mounts.

easily drilled to enable them to be bolted to a piece of bakelite or wood. When completed, it will be found that the aerial and earth or speaker leads are provided with a safe anchorage and cannot be pulled off the set accidentally. Intermittent contact is also eliminated.

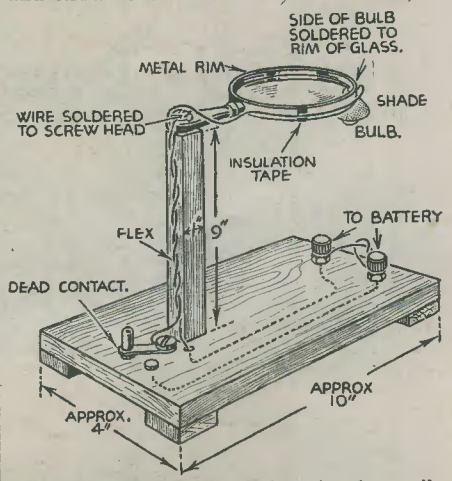
The tops of the tube can also be provided with banana plugs, and used for extension speaker plug points. In fact, there is no end to their usefulness. If mounted flat on the baseboard they make excellent mountings for short-wave four-, five- or six-pin coils.—H. E. HARRIS (Peckham).

LATHE WORK for AMATEURS
1/-, by post 1/2, from
GEORGE NEWNES, LTD.,
8-11, Southampton Street, Strand, London, W.C.2.

A Handy Device for Small Work

THE accompanying sketch shows a piece of apparatus that will be found very useful for very fine wire work, such as winding chokes, transformers, mending broken wires.

The lens can be obtained with handle at any cheap stores, and the rest from odds and ends. The bulb should be shaded, as



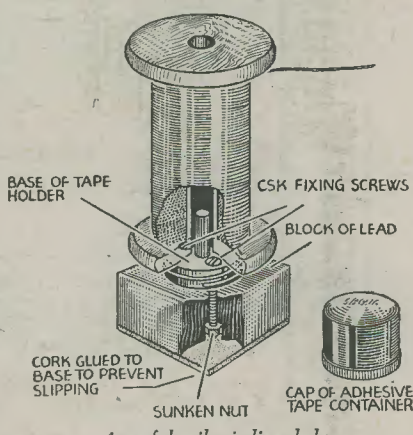
A method of using a magnifying lens for small work.

indicated, to prevent light shining in the eyes.

The work is, of course, held between the baseboard and lens.—E. J. BATES (E. Dulwich).

A Coil-winding Device

THE illustration shows a simple method which I have adopted when engaged in coil winding. The whole assembly takes a matter of a few minutes only to construct, and the additional refinement of cork constitutes a great improvement.



A useful coil-winding dodge.

The adhesive tape holder cost 3d., and its design gives rise to this useful idea.—W. R. HOBBS (Ilford, Essex).

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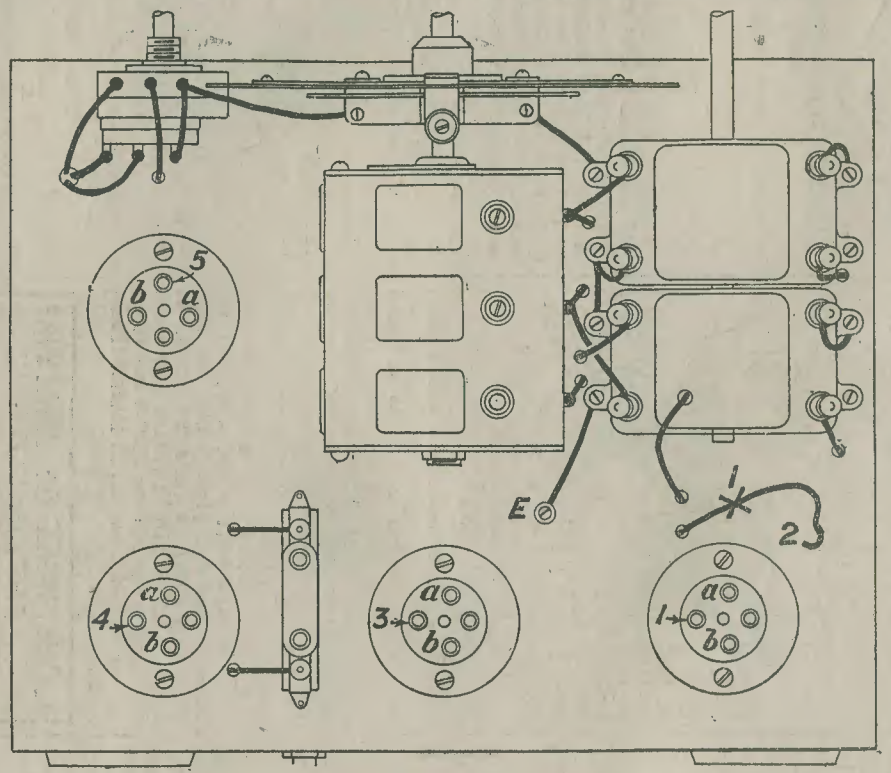
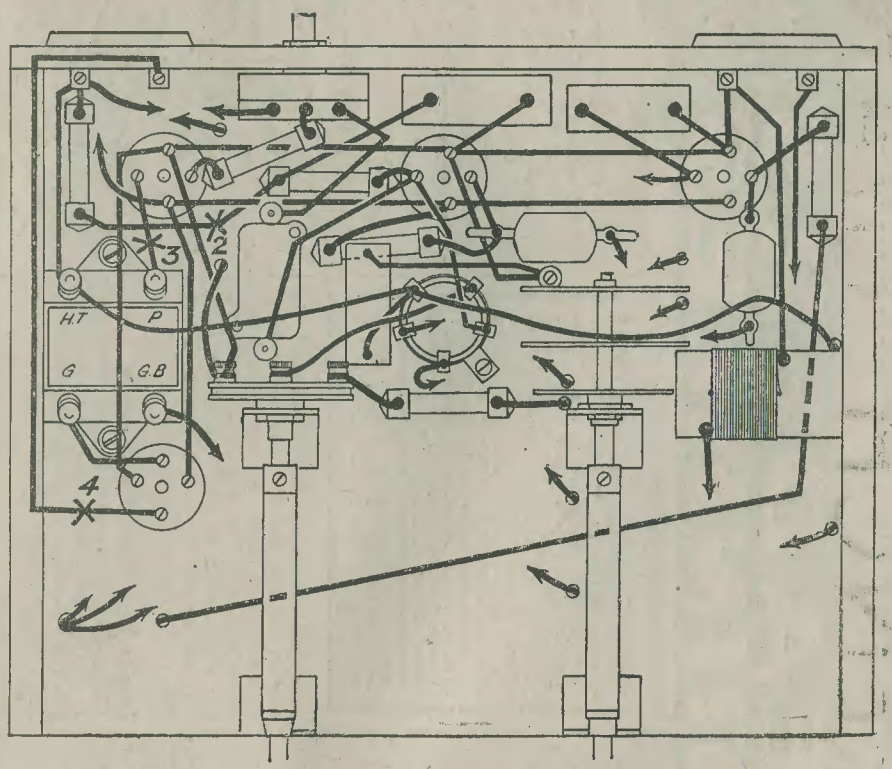
Practical and Amateur Wireless SERVICE DATA SHEET No. 28 FOR THE LIMIT ALL-WAVE FOUR



Top of Chassis View



Underside of Chassis

Approximate Voltage Readings

Voltmeter—to E

„ + to 1=60 volts.
„ + to 2=120 volts.
„ + to 3=40 volts.
„ + to 4=120 volts.
„ + to 5=117 volts.
„ across a and b=2 volts.

Approximate Current Readings

Milliammeter Connected at x1=2½ mA.
„ „ at x2=¾ mA.
„ „ at x3=3 mA.
„ „ at x4=7 mA.

Approximate Resistance Readings

L.F. Transformer
Ohmmeter Connected across P and HT=
750 ohms.
„ „ „ G and GB=
Coil No. 1 4,000 ohms.
A to chassis=1-33 ohms.
D to C=2-13 ohms.
Coil No. 2.
B to top lead=1-5 ohms.
A to 1=2 ohms.
D to chassis=2-13 ohms.

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THE FRENCH GIANTS

An Interesting Account of the French Broadcasting Service

By ARTHUR G. ALLAN

EQUIPPED with a potent letter of recommendation I passed the guard and clambered down the steps leading to the subterranean transmitter hall of the Eiffel Tower station some years ago. This transmitter belongs to the French Army, and the sentinel at the door had seemingly passed on the word because a second man received me at the other end of the passage and led me to the Commander of the station. After some preliminary conversation he took me over to the room where the first French wireless station, dating from 1906, stood disused but brightly polished in a corner. We spoke to Général Ferrié, the famous French wireless enthusiast and the Father of French broadcasting, and then an Adjutant was called to accompany me to the top of the Eiffel Tower to inspect the aerials.

The Eiffel Tower station was the first regular broadcasting station in Europe, but the different interests of private and State initiative, and the enrolment of political parties to uphold them one against the other, and a lot of talk regarding the "Freedom of the Ether," caused France to stand back from the general development of broadcasting for many years.

The introduction of a licence fee, which placed State broadcasting on a secure basis, followed by the liberal policy adopted by the Ministry of Posts toward the private stations, has at last put French broadcasting on a level with that in other countries.

The time had now passed when Post-Office Station Directors devised ways and means of equipping studios and transmitters without causing noticeable charges in the budget, and those days are also passed where telephone-lines were refused to private stations and where they were compelled to maintain their apparatus at the "*status quo*" of many years before.

Immediately on the introduction of the licence fee the Post-Office ordered powerful transmitters, and the first batch of these are now "on the air."

They are as follows:—

The 60 kW transmitter Lille-Camphin,
The 120 kW station Paris-Villebon (P.T.T.),
The 60 kW transmitter Nice-La-Brague,
The 100 kW station Marseilles-Réaltor,
The 90 kW transmitter Lyon-Tramoyes,
The 120 kW station Toulouse-Muret,
And the 120 kW transmitter Rennes-Thourie.

Strasbourg and Normandie

Apart from these new transmitters, the power of the Strasbourg station has been increased to 100 kW. A glance at a good map of France will show that a hole has still been left in the centre of France. A new 100 kW transmitter is to be built here close to the geographical centre of the country, and not very far from it the new high-power long-wave transmitter, which is to take the place of the present Radio-Paris station in 1937, will be erected, together with the short-wave stations. Four of these, each with 100 kW in aerial, are to be in operation by 1938. They will provide programmes on a number of beam aerials to all the French possessions overseas.

Now that the Post-Office has granted permission for the increase of power for the private stations, Radio Lyon-Emissions and Radio-Normandie have availed themselves of this, and the Lyon private station is already "on the air" with a 25 kW transmitter.

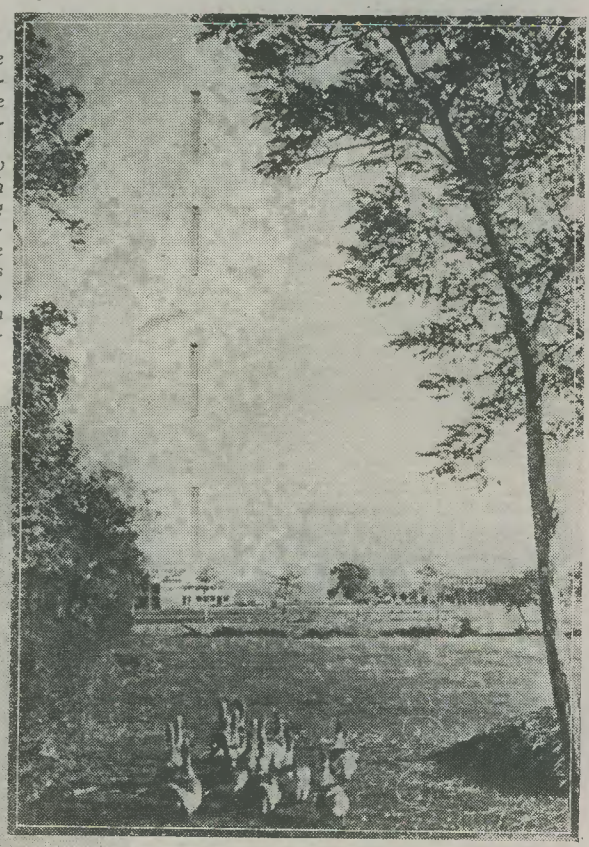
Apart from the Post-Office stations, Paris has three medium-wave private transmitters, so that the fortunate inhabitants of the capital can choose between four local programmes on the medium-waves, and have the long-wave transmitter as stand-by as well.

State Broadcasting and Private Stations

The fact that France operates a system of State broadcasting stations and permits

(Continued on page 478)





(Left) A view of the entrance to the transmitter building of the high-power Lyon-Tramoyes station. (Right) The new 120 kW French State broadcasting station, Toulouse-Muret. The Toulouse district is famous for geese, some of which can be seen in the foreground.



The Eiffel Tower, Paris, from which the first regular European broadcasts were transmitted.

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(*Continued from previous page*)

itself the luxury—I think we will have to call it that in view of the shortage of wavelengths—of a number of private stations which provide alternative programmes in most of the important towns, gives cause for the very natural question: "Where do they get the waves from?" The answer is very simple: Under the Lucerne Plan France has been allotted fourteen wavelengths—more than any other European country—and apart from that, private stations make use of a further three with the tacit understanding, or perhaps the permission, of the rightful owner.

During a recent tour of a number of the French provincial stations, I met many interesting personalities who are prominent in the broadcasting world of the country. All these people are radio enthusiasts. They do not administer or direct or announce broadcasting programmes just because they are paid for it.

AN ALL-PURPOSE METER

(*Continued from page 471*)

and a diagram of the panel, with all indications as to the various settings, was given there. For convenience, at each point of the indicator on the two ten-point switches a single number was given, and this indicated the multiplication factor which had to be applied to the scale on the meter at that particular setting. Thus, on the voltage ranges, when the left-hand pointer is at normal, the meter read 5 volts. When the pointer was set to 5, the scale indicated 25 volts, and thus the simple figures on the scale are simply multiplied by the indicating figure. This is found preferable to rewriting the meter scale, although an alternative idea is to redraw the scale very much enlarged and paste it inside the lid, with the various voltages and so on marked against the engravings on the dial. I prefer the former arrangement.

Simplified Design

The resistors which are required for the A.C. and D.C. voltage ranges are different, as on the former the R.M.S. value has to be taken and this means that a lower value of resistor is required. The alternative is to utilise the same resistor, but to re-engrave the scale, marking the exact points for given voltages as indicated by the pointer when an A.C. voltage is applied to the input terminals. The four-point selector switch may also be dispensed with if the additional safeguard is not thought necessary. No fuse is included in the meter shown, but, of course, such an additional safeguard may be included, although care will have to be taken to allow for the variations in reading which are introduced thereby. The most suitable meter to employ for an instrument of this type, if you are starting to make one, is that having a full-scale deflection of only .5 or 1 mA., but it is necessary to order the correct type of rectifier for the A.C. ranges, as this is made in three different types. To measure high A.C. current ranges an additional transformer is essential, but is quite simple to construct. It is also necessary to incorporate a transformer if very low A.C. voltage readings have to be taken, in view of the error of the scale, but it is not proposed to give constructional details for these in this article. It is hoped that the details given, together with the design and circuit arrangements, will be of assistance to those readers who are desirous of making up for themselves a general multi-purpose instrument of this type.

THE BRITISH LONG DISTANCE LISTENERS' CLUB

Mountain Tests

MEMBER J. W. Leech sends the interesting photo seen below, and says: "The photo includes Mr. C. Ford and myself, both members of the 'B.L.D.L.C.', and it may interest members to know that this photo was taken on the 'Great Orme' Llandudno (well known to all holiday makers), which is 679 feet high.

"We used a 10 to 15 ft. aerial, slung-up to a near-by telegraph pole. The result was amazing, considering the time of the year and our conditions.

"I wish the Club every success and I hope in the near future to make further experiments, this time from Mount Snowdon, some 3,000 ft."

We look forward to hearing some more about these tests, and perhaps we may have some detailed notes and illustrations.

A Harmonic Problem

IN our issue dated 5th December we published a letter from Mr. Cottignies concerning the reception of sound and vision signals on wavelengths of 13.2 and 14.4 metres, and we asked whether any readers could offer a suggestion concerning these signals. Several other members have now written to us stating that they also receive these signals, and Mr. D. Jones of East Sheen actually wrote to the B.B.C. concerning them. We think the problem will be of great interest to other short-wave listeners and accordingly we give below the B.B.C.'s reply to Mr. Jones, together with a letter from Mr. D. R. Bowman, B.Sc., on the point. The letter from the B.B.C. says, ". . . . These transmissions are radiated on frequencies of 45 Mc/s (6.67 metres) for vision and 41.5 Mc/s (7.23 metres) for sound. Reception on approximately 14 metres, therefore, cannot be attributed to harmonics of the transmitter, as these would occur on roughly 3.6 metres, 1.8 metres, etc., and it seems likely that your reception is due to harmonics of the oscillator in your short-wave convertor beating with the incoming signals when the convertor is tuned to 14 or 21 metres."

This seems to be quite a feasible explanation, and Mr. Bowman says, "My solution is that his (Mr. Cottignies) tuning coil is resonating to the higher frequency when tuned to the lower. Thus, in exactly the same way, if middle C on the piano be held down, and its octave struck, one hears both the octave and middle C, i.e., 512 c.p.s. and 256 c.p.s. together. With the tuning coil set to double the wavelength (half the frequency) the harmonic is heard. Clearly, if a coil can radiate a *lower* harmonic (in terms of wavelength) it can also pick one up. It will be interesting to perform experiments of this nature."

Finally, Mr. Cottignies himself has been enquiring more into the problem and he has been offered a solution by G6QB. He concludes his letter with some interesting remarks concerning the handling of a receiver, which goes to show that on the short-waves the method of using the various controls will make or mar a set. Those who own simple short-wavers and only get one or two stations should note what Mr. Cottignies says. Here is his letter: "Just to let you know that the solution to the 'harmonic' question has been solved by our friend G6QB. He says the signal heard on twice the wavelength is due to the *receiver*-harmonic on 6.6 and 7.2 beating with the actual television and producing this signal on double wavelengths. Anyone noticing this phenomenon will probably also notice, as G6QB pointed out to me, that signal strength increases as reaction is increased, but as the receiver comes *out* of reaction, the signal weakens and ultimately disappears at the point where reaction begins. Incidentally G6QB is a wizard. At the controls of my receiver, on 40 metres, within 13 (thirteen) minutes, he sorted out of the terrific local QRM, over twelve stations, amongst them the following—calling CQ—FA8BG, W3GHD, U1BX, U1OE, U3CY, W3FLM, U3AG, W1JPJ. *All on C.W.* Then to finish up he said, 'Let's pack in, old man, these locals are getting on my nerves.' Give me some sal volatile quickly, somebody! This worthy wizard is the proud possessor of over 2,500 cards, all genuine QSO's. When I saw this amazing collection I could not find, off-hand, a country not represented. Now, my dear Mr. Everard, try and beat that!!!"



This illustration shows two members of the B.L.D.L.C. experimenting on the Great Orme, Llandudno (679 feet above sea level).

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RADIO CLUBS AND SOCIETIES

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 Cardiff and District Short-wave Club

AT the last meeting of the above club, the secretary, 2BQB, gave an interesting lecture dealing with "Artificial Aerial Transmitters," and the simple circuits, such as the Hartley, and Armstrong, were described. This lecture was eagerly followed by many of the artificial-aerial transmitters in the club.

The meetings are being held weekly at a clubroom belonging to the Society, and in the near future the following lectures will be given.

R. Clapp, G5XN, "Goyder Lock transmitters."
H. H. Phillips, 2BQB, "Crystal-controlled transmitters."
R. T. Mathews, G8AM, "Morse code practices."

The secretary, Mr. H. H. Phillips (2BQB), of 132, Clare Road, Cardiff, will be pleased to give information regarding the activities of the club to anyone desiring same, and readers of PRACTICAL AND AMATEUR WIRELESS are cordially invited to attend any meetings.

Portsmouth and District Wireless and Television Society (Portsmouth Chapter of B.L.D.L.C.)

A VERY instructive lecture on "Receiver Test Sets," by Mr. Batt, was given at a recent meeting of the above society. The speaker explained the various types of milliammeter, voltmeter, etc., used in practice, and went on to describe the evolution of two useful test sets. These were passed round to the members, who appreciated the ingenuity of the apparatus. Many questions were afterwards answered by Mr. Batt.

The society has now got its own room, which eventually will be open to members any time when fitted up with test apparatus, etc. The Portsmouth representative of the B.L.D.L.C., Mr. H. Leigh (2BBG), 20, King Street, Southsea, will be pleased to hear from any readers interested in short-wave work, and who would like to join the society.

Golders Green and Hendon Radio Scientific Society

THE practical design of a 5-10 metre short-wave receiver suitable for the reception of television sound waves was the subject of a recent lecture, given before the Golders Green and Hendon Radio and Scientific Society, by Mr. D. N. Corfield, D.L.C.

The chief points noted were as follow: anode-bend detection was preferable to a diode as there was a better signal/noise ratio and less damping of the I.F. circuit, particularly when the receiver was used for 56 Mc. and 28 Mc. A triode hexode valve was chosen for the frequency changer, no frequency drift with tuning signal frequency circuits, good oscillator, and good conversion gain. A radio-frequency amplifier stage reduced the strain on the I.F. stage, and so reduced hiss.

A 25,000 ω anode resistance is used instead of a H.F. choke which is taken to a tapping on the next tuning coil. This reduces the damping effect, and is also an aid to selectivity.

The radio and oscillator circuits are more conveniently separately tuned. The dial settings can be arranged to be in step at the top and bottom of the frequency band.

Horizontal aerials should not be used, as the television signal is polarised horizontally, also this type is very sensitive to local disturbances, such as car ignition. Directional aerials can be usefully used to reduce such interference.

At the conclusion, an actual demonstration of the receiver was given with excellent results. H. Ashley Scarlett, 60, Pattison Road, Hampstead, N.W.2.

Exeter and District Wireless Society

AT a recent meeting of the Exeter and District Wireless Society a lecture was given by Mr. Marne, A.M.I.E.E., on Electronics and Cathode Ray Tubes. This lecture was illustrated by over 200 excellent lantern slides, and Mr. Marne took his audience right through the construction of the Cathode Ray Tube from its fundamental elements to the finished article.

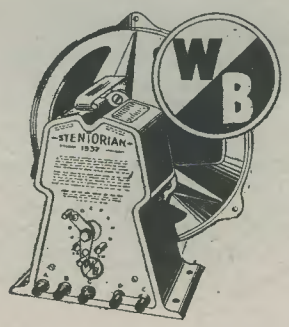
He also gave an excellent demonstration of the causes of distorted pictures in television, and gave many hints as to the cure of this somewhat prevalent and annoying complaint.

The meetings are held at 3, Dix's Field, Exeter, on Monday evenings at 8 p.m. Secretary, Mr. W. J. Ching, 9, Sivell Place, Exeter.

The Croydon Radio Society

A DEMONSTRATION and account of the application of piezo crystals in sound reproduction was given to the Croydon Radio Society in St. Peter's Hall, Ledbury Road, S. Croydon, on Tuesday, December 8th. Mr. P. Clarke presided, and introduced Mr. H. G. Ménage, the lecturer. The Society wishes all PRACTICAL AND AMATEUR WIRELESS readers a very merry Christmas and all the best of listening for the New Year. Hon. Pub. Sec.: E. L. Cumbers, Maycourt, Campden Rd., S. Croydon.

JUST TIME TO GET YOUR NEW STENTORIAN FOR CHRISTMAS—



The 1937 features of this outstanding chassis will give your radio a life—a realism—that will make a big difference to your Christmas programmes.

As principal speakers or extensions, 1937 Stentorians will provide extra pleasure in many homes this Christmas. In yours, too—if you're quick. Chassis from **23s. 6d.**, Cabinet Models from **29s. 6d.** Ask your dealer.

and enjoy your Xmas Radio!

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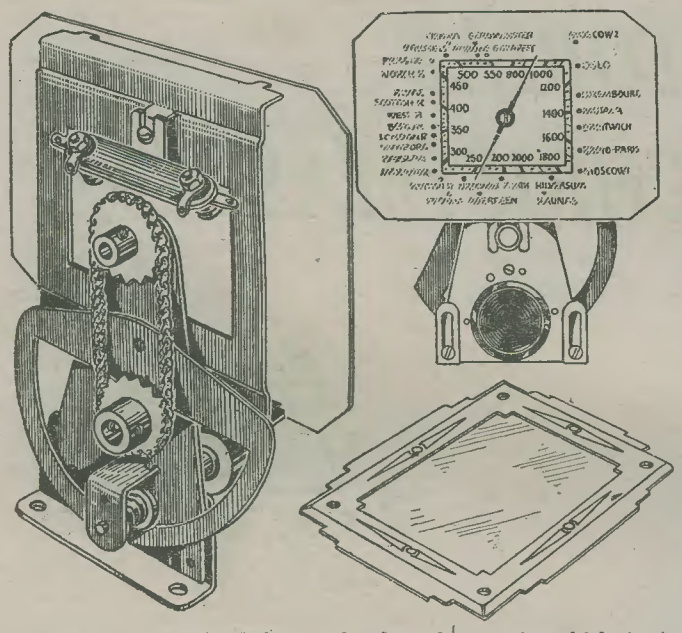
Facts and Figures

COMPONENTS TESTED IN OUR NEW LABORATORY

J. B. Square Plane Drive

IN the Add-on Superhet Unit recently described by us we utilised a square plane dial engraved with station names, and several readers have asked for details of this. The illustration below shows the type of dial, from which it will be seen that the drive from the control knob to the double-ended pointer is carried out by means of a sprocket wheel and chain. The large rectangular dial is engraved in the centre with a square scale carrying the medium-wavelengths on one half and the long-wavelengths on the other half, and, if desired, it may also be obtained with the station names engraved on the outer portion of the dial. A neat metal escutcheon is provided and it is only necessary to cut out a rectangular opening in the panel and attach the escutcheon to the panel front, when the dial may be mounted in the usual manner on the baseboard or chassis. Where a slow-motion drive is required the component may be obtained with a dual-control knob, providing two separate ratios. The price of the single ratio drive is 5s. 9d., and of the dual ratio, 6s. 6d.



A useful J. B. dial which may be obtained with station calibrations.

Calibrated Resistors

IN making experimental apparatus it is often necessary to make use of a resistor which is calibrated so that the final value can be more easily ascertained for subsequent replacement. The old method of doing this was to use a standard rotary element, and draw a circular scale divided into degrees, afterwards working out the approximate value of resistance for each degree and so eventually arriving at the value in circuit. The Radio Resistor Company have now introduced a novel unit known as a Muter Candometer, in which the element is provided with two flexible leads to which crocodile clips of standard pattern are attached. One lead is attached permanently to the end of the resistance wire, whilst the other is attached to a movable contact, and an insulated handle is provided. It is thus very simple to adjust the contact point and ascertain the value of resistance in circuit. Various ranges may be obtained and the degree of accuracy is very high indeed. The price is only 15s.

New Mullard Valve

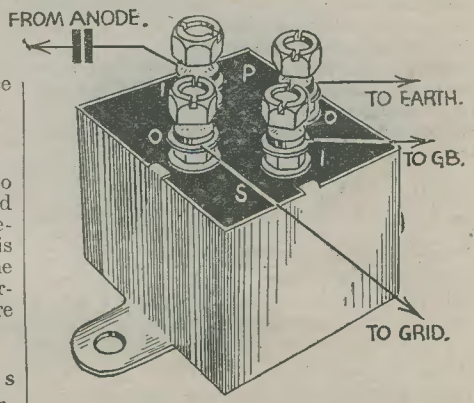
A NEW valve is shortly to be added to the range of Mullard battery valves, and this is to take the form of an octode frequency-changer. The type number is FC2A, and it is an improvement on the present FC2. Further details and characteristics will be given as soon as they are received.

Sound Sales "Filtafeed" Transformer

THE majority of circuits now utilise the parallel-fed L.F. transformer, as this arrangement possesses many advantages. The avoidance of a high direct current through the primary winding enables the component to be made much more compact than the standard instrument, and a typical component of this class is shown on this page. It is of very compact form, measuring only 1¾in. square by 1⅞in. high, and the primary has an inductance of 80 henries. The metal case in which it is mounted enables it to be screened, and so avoid interaction with other inductive components, and terminals are provided for connecting purposes. It may be employed with either resistance or choke coupling and will provide a very efficient L.F. coupling with good frequency characteristics. The price is 4s. 6d., and the makers Sound Sales, Ltd.

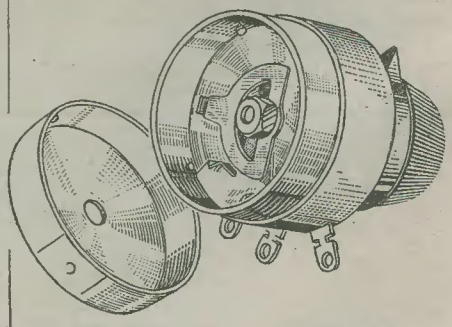
Bulgin Volume Control

THE difficulties underlying the design and construction of a satisfactory volume control have been mentioned before in these pages, and it has been found that a very frequent source of trouble, with well-designed controls, is that they are used in unsuitable positions. A "general purpose" control may well be employed in various parts of a circuit without difficulty, but when various currents are considered it will be found that in some cases the resistance-element will become noisy or break down owing to overloading. In the Bulgin range, however, it will be found that volume controls are classified in various wattage ratings, and thus the difficulty is overcome provided that the constructor first ascertains what current is to be passed through it. Also, to avoid calculation, it will be found in the Bulgin catalogue that each control is given with the maximum current which may be passed. The accompanying illustration shows one of the low-resistance 3-watt controls which are available at 2s. 6d. each in nine different values, from 10 to 50 ohms. The element is wire wound with oxidised nickel-alloy wire, and con-



A neat and efficient filter-fed transformer—the Sound Sales "Filtafeed."

forms to a linear law. Contact with the element is carried out by means of a disc which is "sprung," so that it only comes into contact with the element when the arm attached to the spindle is brought against it. As this rotates, the disc is progressively depressed, and thus there is no rubbing contact on the wire, and all wear and tear is thereby avoided, with the added advantage that there are no noises due to the rubbing contact. The spindle, and, consequently, the mounting bush, are in direct electrical contact with the moving arm, and thus in some cases it will be necessary to mount the component on an insulated panel. The makers supply insulating washers with the component to overcome this difficulty, and an indicating plate and dial are also provided.



This illustration shows the construction of the Bulgin three-watt volume controls.

The component may be thoroughly recommended for all circuits where a low-resistance control is required.

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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 Reader's Radio Den

SIR,—The accompanying snap shows a corner of my radio den. I have been a regular reader of your journal since it first started, and have found the articles very instructive. My field of interest has been for some time centred on short-wave work, and of all the reports I have sent to S.W. stations there has not been a single instance in which a verification has not been returned. I take this opportunity of wishing your journal the continued success it deserves.—MAURICE L. HUNT (Knutsford, Cheshire).

Component Shortage

SIR,—I should like to add my complaint about the component shortage. I ordered the coils for the "Record Three" some weeks ago from a well-known firm, and am still waiting. Their acknowledgment is dated November 12th.—S. POYNER (Shirley, Nr. Birmingham).

Back Issues Available

SIR,—I beg to inform you that I have in my possession the whole of the issues of PRACTICAL AND AMATEUR WIRELESS since it started, and would like to dispose of them. If any of your readers would care to have the lot they are welcome to them for the fetching of same, but I would like to get rid of the lot at once, and not in parts.—K. W. BRANCZIK, 10, Spencer Road, Grove Park, Chiswick, W.4.

Back Numbers Wanted

SIR,—May I ask through your columns if someone would be good enough to loan me a copy of PRACTICAL WIRELESS dated July 15th, 1933, or send me a copy and particulars of wiring, etc., for the "Dancing Man" described therein. I will pay all postage, and if the copy is loaned, I will see that same is treated with every care, and returned immediately to its owner.—JOHN F. GILBERT, 165, St. Benedict's Road, Small Heath, Birmingham.

SIR,—I shall be very grateful if any reader possessing a copy of PRACTICAL AND AMATEUR WIRELESS dated January 26th, 1935 would either lend or sell it to me.—G. HENRY, "Solva," Bache Drive, Upton-by-Chester.

SIR,—I shall be greatly obliged if any of your readers could let me have a copy of your journal dated April 18th, as I want to complete my Vol. 8. I will, of course, refund any expense incurred.—F. W. CURREY, Raybridge, Lacock, Wilts.

SIR,—I am a new reader of PRACTICAL AND AMATEUR WIRELESS, and am very anxious to obtain some back numbers. I shall be glad to get in touch with any reader who has no further use fo the following issues: Nos. 124, 127, 132, 135, 136, and 137, of 1935; April 28th, 1934, and December 23rd, 1933.—A. C. WILLSHERR (28, Brigstocke Road, Stokes Croft, Bristol).

Simple Three-valver!

SIR,—With reference to Mr. W. Spence's letter published in the November 28th issue, suggesting a simple straight three-valve battery model, I also would welcome such a set. I quite understand Mr. Stagg, and other readers, wishing for an A.C. S.W. set; they have, of course, more technical knowledge of the matter than we beginners. It must be understood that a new generation is springing up, and they also have got to start at the bottom, just the same as our pro's have had to do. Wishing the finest wireless paper printed every success.—Frank Hallam (Bestwood, Notts.).

Correspondent Wanted

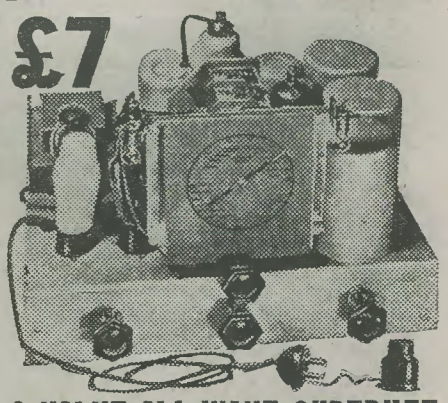
SIR,—I have been reading PRACTICAL AND AMATEUR WIRELESS for over a year, and find the articles on short waves, and Thermion's page, particularly interesting. I shall be very pleased to correspond with any young reader in England with a view to exchanging ideas about short-wave radio.—Albert Ingham, Kirkland, Oneida Co., New York, U.S.A.



A corner of Mr. Maurice L. Hunt's radio den

QSL Cards

SIR,—I have been very interested in the various arguments put forward by readers on this question, and use as my apology for entering the discussion the fact that I claim to have been the first European amateur to issue QSL cards. (See a special article with photograph of the card in the *T. and R. Bulletin* for May, 1931). That card was issued early in 1922, and the step was taken because I thought the idea good, and was receiving, chiefly from the London area, many reports on my signals, the card making it much easier to deal with the numerous reports of that day, and from 1922 to the present day not one single report to this station has passed without acknowledgment. I look upon this acknowledgment not only as a matter of personal honour, but as one of the finest grounds of recruitment the amateur world ever had. Through the medium of QSL card hunting, many of our finest amateurs have been recruited to the movement and a great number of "round the corner" amateurs, to whom the acknowledgment of a QSL card has meant further correspondence, a meeting at the shack, introduction to a club and the final stages to a full-blown transmitter, are too numerous to mention. I have in my file the first QSL card, very often ruled out in ink on a plain postcard, and the present highly coloured work of art of a particular amateur who wrote me many years before and went through the process mentioned. Now, new generations arise very rapidly in the radio world, and if amateurs are going to adopt that obnoxious DX habit and shut their neighbours out of the circle because they are within touching distance, then the time will come when all the amateur spirit will be concentrated into an occasional meeting at a local club, and the local transmitters will be walking about with their noses in the air, and an untouchable swagger in their walk. For heaven's sake let us have a little common sense in the QSL spirit. It does not cost much to buy a packet or two of plain postcards from the local store, and surely even a thank you would be only courteous even to the man next door if he reports your signals. He hasn't reported them for nothing, I am not by any means one of the financially rich members of the community, but I have always managed to keep a supply of cards by me and have a record of every card despatched since 1922. On the question of returns. There are many who do not reply, but I have recently received some due in 1930 and one in 1928 and at least my own conscience is clear. The DX fetish has much to answer for, but I am as much interested in a chat with a local newcomer to radio as with a fellow "Ham" in Australia, and I have had many such conversations. Obviously, the reason so many stations do not receive their reply cards is due to that card being sent to the "Clearing House" of the society of which he is a member.—W. E. F. CORSHAM, G2UV (Wembley).



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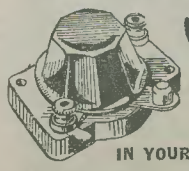

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The index letters which precede the Blueprint Number indicate the periodical in which the description appears: thus, PW refers to PRACTICAL WIRELESS, AW to *Amateur Wireless*, PM to *Practical Mechanics*, WM to *Wireless Magazine*.

Send (preferably) a postal order to cover the cost of the blueprint and the issue (stamps over 6d. unacceptable), to PRACTICAL AND AMATEUR WIRELESS Blueprint Dept., Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

PRACTICAL WIRELESS
STRAIGHT SETS. Battery Operated.

	Date of Issue.	No. of Blueprint
One-Valve : Blueprints, 1s.		
All-wave Unipen (Pentode) ..	—	PW31A
Two-valve : Blueprint, 1s.		
Four-range Super Mag Two (D Pen)	11.8.34	PW36B
Three-valve : Blueprints, 1s. each.		
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow) ..	—	PW35
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	22.9.34	PW39
Hall-Mark Three (SG, D, Pow) ..	—	PW41
Hall-Mark Cadet (D, LF, Pen. (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-Wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))	*June*, '35	PM2
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen) ..	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P) ..	—	PW64
The Gladiator All-Wave Three ..	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen) ..	31.10.36	PW69
Four-valve : Blueprints, 1s. each.		
Fury Four (2 SG, D, Pen) ..	—	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P) ..	26.9.36	PW67

Mains Operated.

Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen) ..	—	PW18
A.C.-D.C. Two (SG, Pow) ..	7.10.33	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	10.6.33	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen) ..	—	PW29
A.C. Leader (HF Pen, D, Pow) ..	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen) ..	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)..	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	18.8.34	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF R.C.))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen) ..	—	PW56
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	—	PW45
Universal Hall-Mark (HF, Pen, D, Push-Pull)	9.2.35	PW47

SUPERHETS.

Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve) ..	—	PW40
F. J. Camm's 2-valve Superhet (Two-valve)	13.7.35	PW52
F. J. Camm's £4 Superhet ..	—	PW58
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valve) ..	—	PW43
D.C. £5 Superhet (Three-valve) ..	1.12.34	PW42
Universal £5 Superhet (Three-valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4	—	PW59
F. J. Camm's Universal £4 Superhet 4	11.1.36	PW60

SHORT-WAVE SETS.

Two-valve : Blueprint, 1s.		
Midget Short-Wave Two (D, Pen)	15.9.34	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2 LF (RC and Trans))	—	PW63
The Bandspread S.W. Three (HF Pen, D (Pen), Pen)	29.8.36	PW68

PORTABLES.

Three-valve : Blueprint, 1s.		
F. J. Camm's E.L.F. Three-valve Portable (HF Pen, D, Pen) ..	16.5.36	PW65
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl. B)	—	PW12

MISCELLANEOUS.

S.W. Converter-Adapter (1 valve)	—	PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.

Blueprints, 6d. each.		
Four-station Crystal Set ..	12.12.36	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450

STRAIGHT SETS. Battery Operated.

One-valve : Blueprints, 1s. each.		
B.B.C. Special One-valver ..	—	AW387
Twenty-station Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans) ..	—	AW388
Full-volume Two (SG det, Pen) ..	—	AW392
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans) ..	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	*July* '36	WM409
Three-valve : Blueprints, 1s. each.		
Class-B Three (D, Trans, Class B)	22.4.33	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	—	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG D, Trans) ..	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	20.1.34	AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans) ..	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Economy-pentode Three (SG, D, Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans) ..	*Mar.* '34	WM354
Iron-Core Band-pass Three (SG, D, QP 21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen) ..	*June* '35	WM389
Certainty Three (SG, D, Pen) ..	*Sept.* '35	WM393
Minitube Three (SG, D, Trans) ..	*Oct.* '35	WM396
All-wave Winning Three (SG, D, Pen)	*Dec.* '35	WM400
Four-valve : Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans) ..	—	AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2 SG, D, Pen) ..	—	AW421
Crusaders' A.V.C. 4 (2 HF, D, QP 21)	18.8.34	AW445
(Pentode and Class-B Outputs for above: Blueprints, 6d. each)..	25.8.34	AW445A
Self-contained Four (SG, D, LF, Class B)	*Aug.* '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2 LF)	*Feb.* '35	WM381
The H. K. Four (HF Pen, HF Pen, D, Pen)	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*April* '36	WM404

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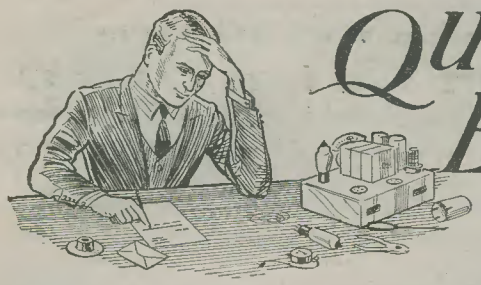

QUERIES and ENQUIRIES

S.W. Converter

"In your issue dated Nov. 14th last, you gave a simple circuit for a converter. I will be using a metal chassis and should like to know whether a metal panel would be sufficient to screen the I.F. Unit from the rest of the circuit, or would a screening can be necessary. Also, is there a complete I.F. Unit on the market which would be suitable for the above-mentioned converter? If so, could you tell me the maker's name and address and the size and price of the component?"—A. C. (Cowdenbeath).

THE unit indicated in the circuit diagram is made by Messrs. Eddystone and is included in a metal can. It is approximately 5in. high by 2½in. in diameter. You could, of course, employ any tuned circuit at this point, provided that the tuning would be adjustable to the desired intermediate frequency, and if the remaining coils in the receiver are themselves screened there is no necessity to use a screened I.F. unit. A standard screened broadcast coil could be employed, with a pre-set type of condenser across it, and the coil should be set to the long-wave band.

Home Recording

"Could you give me the address of a firm from which the aluminium blank records mentioned in your Christmas number could be obtained?"—A. W. B. (Swindon).

PLAIN aluminium blanks (that is, those which carry no recording grooves and which consequently have to be employed with a tracking device) may be obtained from Electradix Radios, price 5s. per dozen. This firm can also supply some of the chemical blanks, which do not require any after-treatment, and these cost 1s. 6d. each.

Winding a Resistor

"I am building a power amplifier, but find that as at present worked out, I shall need a series resistor in the H.T. lead to prevent over-running of the early valves. So far as my calculations go I shall want about 70 to 100 ohms and to carry 80 mA. What type of resistor do you advise me to make for this particular purpose? Is there any commercial component which will do?"—T. E. (Windsor).

A STANDARD 1-watt resistor is suitable, but as you are uncertain of the exact value it would be preferable to use a variable component. In the Bulgin lists some small-power resistors will be found in which metal clips are attached to the ends, and you could adapt one of these by loosening the clip and slipping it along to the desired position. They cost only 1s., the same as the standard fixed 1-watt resistors, and are wound on asbestos. The rating is 10 watts, so that you have an ample margin of safety.

Soldered Contacts

"I have built your Limit set, but as I cannot solder I made the connections with a patent stuff which I got in a tube, and this is called cold solder. Do you think this is the cause of my failure to get any signals at all? There is a sort of rushing in the speaker, but I cannot get any signals on any waveband. I should like to know how to test this set and find what is wrong. It is my first attempt."—B. W. (E.4).

WE do not know the particular substance you have used for soldering, but there is a possibility that this is the cause of your trouble. Was any heat required to harden the solder, or is it simply spread on the joint direct from the tube? We believe there is a solder which is supposed to melt and make a good joint simply with the aid of a match flame, but there may be some chemical arrangement in the material you used which has resulted in a poor electrical connection. The only satisfactory test is to include a milliammeter in each anode circuit in turn and make certain that all correct voltages are applied. If so, and results are not obtained when tuning is carried out, it would indicate that the coils are not correctly wired, or the switching is faulty. There is no simple method of locating the trouble and systematic stage-by-stage tests must be carried out.

RULES

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 querists.

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.

If a postal reply is desired, a stamped addressed envelope must be enclosed. Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

The Coupon must be enclosed with every query.

Quality Amplifiers

"What is the best circuit for a really good amplifier suitable mainly for gramophone reproduction for a music-lover? I have heard numerous claims for push-pull, whilst certain of my friends tell me that harmonic distortion can only be avoided by single output stages. I am anxious to start to build a good amplifier, but am undecided as to the best arrangement for my purpose."—P. R. S. C. (Swindon).

MANY keen listeners claim that the results from a good push-pull stage cannot be beaten, and your references to harmonic distortion apply to both types of output circuit. It is really a matter of personal preference, and we suggest, if you cannot make up your mind otherwise, that you hear good amplifiers of each type and thus judge which suits your ear. We describe in this issue a high-quality amplifier which could no doubt be adapted for your purpose.

The coupon on page iii of cover must be attached to every query.

The Limit All-Wave 4

"I believe the Limit receiver would be ideal for me, but I should like to know what the cost of this set is. I have not seen any advertisements of the complete set, and perhaps you could tell me where I could get all the parts at one time to avoid the delay in awaiting delivery from several firms."—G. R. (Belfast).

THE complete set of parts for this receiver, known as Kit A, costs £4 16s. 6d. To this must be added the cost of the valves, speaker, and batteries. All of the parts may be obtained from Messrs. Peto-Scott or H. W. Holmes.

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.

T. E. B. (Winton). The issue in question is now out of print. You did not enclose a stamp nor a remittance for the issue.

F. R. D. (Bombay). It is unnecessary to know the data referred to. Any standard L.F. transformer will be quite satisfactory in the circuit in question.

F. P. (Gateshead). The article in question appeared in our issue dated May 4th, 1935.

C. B. (Bellshill). We do not think a set of the type mentioned would have a popular appeal. However, we will bear your suggestion in mind.

A. M. D. (Hamilton). The receiver was not designed by us, but by Messrs. Cossor. No details are now available and we cannot supply you with a blueprint.

K. J. H. (Kenton). The change in valves may easily have caused the trouble, as the characteristics are not the same. What load did you apply to the eliminator when you measured it? You should check the current and voltage in order to make a satisfactory test.

G. E. M. (N.19). The only way to use a loudspeaker would be to add an L.F. Amplifier.

A. W. B. (Kettering). P.W.48A should meet your requirements. This can be operated from A.C.

J. A. (Hebden Bridge). It is not practicable to use the half winding as mentioned. You would find it impossible to remove hum troubles, and there would be insufficient voltage to permit of the inclusion of substantial smoothing chokes. You must not exceed the makers' voltage recommendations.

A. N. (Underwood, Notts). The coils required were specified in the list of parts for the receiver. They were two 6-turn and two 4-turn coils, No. 1051 (Eddystone). They are obtainable from Messrs. Stratton & Co., price 1s. 8d. and 1s. 6d. each respectively.

H. E. S. (Ballingarry). As you have used so many mixed parts you have probably had to use alternative wiring, etc., and naturally we cannot advise you concerning the difficulties you have encountered. In a receiver of the superhet type it is especially necessary to adhere to published instructions and components if you have had no previous knowledge.

M. S. (Claverdon). The valves in question would not fit the modern midget valveholders, and special valveholders are required for them. They were used in our Midget Short-Wave Two, blueprint P.W.38A obtainable for 1s. from this office. The issue in which the construction was described was September 15th, 1934.

H. V. (St. Helens). The Cyldon products are manufactured by Messrs. Sydney S. Bird and Sons, Cyldon Works, Cambridge Arterial Road, Enfield.

A. J. L. (Nantwich). The mathematical calculations for working out the desired information are rather difficult, and you will find it much simpler to adopt the rule of thumb method, of bending the paper to achieve the desired size. It is not a critical measurement, and you can easily cut a circle from a piece of newspaper and bend this to form the desired shape, afterwards using this as a template for your thicker paper.

C. E. V. (Birmingham). The consumption is dependent upon the receiver load, and therefore there must be a high leakage in your set or between the primary and earth. There is no way of reducing it if it is the correct load value.

F. N. (E.14). Whilst the various values appear more or less correct, we have not tried the valves and therefore cannot state definitely whether any modification is possible. We do not recommend the omission of the rectifier unless you are certain that no harm can result, and it is particularly important to consider the heater voltages for the other valves.

F. E. G. B. (Womans Wold, Kent). The receiver is not one of our designs, and we believe that the coil was a special type described in another paper. Consequently we cannot recommend any of our blueprints to use with this coil.

W. P. (Liverpool 8). The circuit itself is quite suitable for modern conditions, although better selectivity would be obtained by using a modern band-pass tuning unit. We suggest, if you wish to build a really up-to-date set, that you adopt the circuit in question, but fit a set of three of the new Varley coils, such as were recently described in these pages. Alternatively, Messrs. Varley can supply a blueprint for a three-valver built round the coils.

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Miscellaneous Advertisements

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Announce 1937

SHORT-WAVE MANUAL

Packed with short-wave information and circuits of mains and battery receivers, including straight, superhet and 5-metre transmitters, modulators, etc. Information on transmitting licences, aerials, Class B amplification, neutralization, superhet alignment, etc. The most comprehensive manual published, written by practical engineers, price 6d., post free 7½d., including catalogue.

1937 Catalogue only (3 times enlarged) price 1½d. post free.

TELSEN screened dual range coils, 2/6. Pair, 4/6. Milliammeters, 25 ma. upwards, 5/9. Super, 6/9.
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HEAVY DUTY mains transformer worth 35/-, 350/350, 150 ma.; 4v. 2.5ACT., 4v. 6ACT., 12/6.
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UTILITY 2-gang uniknob and dial, 3/11; 1,500-volt tubular condensers, all sizes, 6d.
ELECTROLYTICS 500-volt 8mf., 1/6; 4 mf., 1/6; 4 × 4, 1/11; 8 × 8, 3/6; 25 mf. 25v., 1/-. etc.
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PUSHBACK wire, 6 yds., 6d.; heavy, 9d.; 2 gross solder tags, 6d.; resin-cored solder, 9ft., 6d.
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SPECIAL OFFER Class B valve, driver transformer and valveholder, new, lot 5/-.
LISSEN 3-gang bandpass, 3-gang superhet, 2-gang all-wave coils, any set, price 7/6.
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UTILITY 8/6, microdisc dials, 3/11; Radiophone, 0.00016 short-wave condensers, 3/6; series gap, twin, 3/9.
CERAMIC all brass microvariables, 15 mmfd., 1/4; 40 mmfd., 1/7; 100 mmfd., 1/10; short-wave H.F.C., 9d.
CLEARANCE catalogue 1½d. Goods over 5/- post free. All enquirers must send stamp.
Branches: 19, John Bright St., 44, Dale End. Mail Orders, 44, Holloway Head, Birmingham. Telephone, MID 3254.

CONVERSION UNITS for operating D.C. Receivers from A.C. Mains, improved type, 120 watts output, at £2/10/0. Send for our comprehensive list of speakers, Resistances and other components.
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SHORT WAVE on a crystal set. Full building instruction and crystal, 1/2 post paid.—Radiomail, Tanworth-in-Arden. Warwickshire.

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MAINS VALVES, famous Europa 4 v. A.C. types, 4/6 each. HL., L., S.G., Var.-Mu-S.G., H.F.-Pens., Var.-Mu-H.F. Pens. 1, 3 and 4-watt A.C. directly-heated output Pentodes. Full-wave rectifiers, 250 v. 60 m.a. **A.C./D.C.** types. 20-volt. .18 amp. S.G., Var.-Mu-S.G., H., HL., Power.
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AMERICAN VALVES. Genuine American **HYTRON** and **TRIAD** first-grade Valves. 3 months' guarantee. All types in stock, 5/6 each. 210 and 250, 8/6 each. New Metal-Glass Valves, all types, 6/6 each. Genuine American **DUOTRON** Valves, all types, 3/6 each. Valve holders for all above types, 6d. each. Metal bases, 9d. each.

SHORT WAVES

SHORT-WAVE COILS, 4- and 6-pin types, 13-26, 22-47, 41-94, 78-170 metres, 1/9 each, with circuit. Special set of 3 S.W. Coils, 14-150 metres, 4/- set, with circuit. Premier 3-band S.W. Coil, 11-25, 19-43, 38-86 metres. Simplifies S.W. receiver construction, suitable any type circuit, 2/6.
COIL FORMERS, in finest plastic material, 1½in. low-loss ribbed, 4- or 6-pin, 1/- each.
SUPER CERAMIC CONDENSERS, S.L.F. .00016, .0001, 2/9 each; double-spaced, .00005, .000025, .000015, 3/- each. All brass with integral slow motion, .00015 tuning, 3/9; .00015 reaction, 2/9. British Radiophone 2-gang .00016, 5/6.
H.F. CHOKES. S.W. 10-200 metres, 9d.; S.W. screened, 1/6; standard screened 180-2,000 metres, 1/6.
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10-WATT 3-stage A.C. Amplifier Kit with 5 valves, £5 5s.
20-WATT 3-stage A.C. Amplifier Kit with 5 valves, £8 8s.
ELECTROLYTICS. U.S.A., 4, 8 or 12 mfd. 530 v. peak, 1/9 each. **Dubilier**, 4 or 8 mfd. 500 v., 3/-; 50 mfd. 50 v., 1/9; 12 mfd. 20 v., 6d.; 25 mfd. 25 v., 1/-. T.C.C. 4 or 8 mfd. 650 v., 4/-; 15 mfd. 50 or 100 v., 1/-; 50 mfd. 12 v., 1/-. **Paper Condensers.** W.E., 250 v. working 4 mf., 2/-; 2 mf. 1/-; 1 mf. 6d.; 350 v. working 4 mf., 2/6; 2 mf., 1/6.
Dubilier 500 v. working 4 mf., 4/-; 800 v. 4 mf., 6/-.
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500-0-500, 150 m.a., 2-0-2 volts, 2.5 amp, 2-0-2 volts, 6 amp, 2-0-2 volts, 2 amp, 2-0-2 volts, 2 amp, **17/6.**

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LISSEN 126 K/C SUPERHET ASSEMBLY, comprising 3-Gang Coil Unit, fully screened (2 Band Pass Coils, 1 Oscillator), 2 I.F. Transformers, fully screened, 1 only 3-Gang semi-screened condenser with drive. **8/11.**

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(Continued at top of column two)

(Continued from foot of column one)

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