A SIMPLE SINGLE-VALVE SET—See Page 267.

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

3D EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

Vol. 10. No. 246. June 5th, 1937.

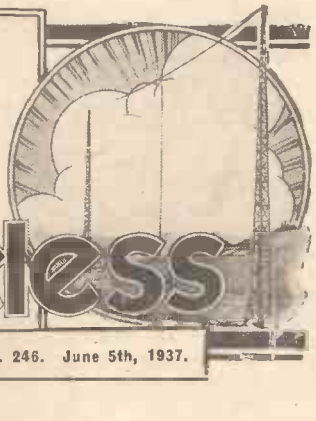
EXPERIMENTAL SUPER-REGENERATIVE CIRCUITS.—*See Page 278*

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. X. No. 246. June 5th, 1937.



ROUND *the* WORLD *of* WIRELESS

Summer Radio

DURING the fine weather it is the aim of everyone to be out of doors as much as possible, and hiking, camping and similar pastimes become popular. The enjoyment of a picnic or a camping holiday is increased tremendously if music of some kind is available, and many listeners are keen to make a wireless receiver part of their equipment under these conditions. Usually weight is an important factor and this means that a small receiver or small batteries are carried, with a resultant limitation in the range of reception. This means that the deficiency has to be made up by employing the best possible type of aerial, and a little-used method of obtaining this desirable factor is to employ a kite to elevate the aerial wire. Turn to page 276 and read how this arrangement may be adapted to various conditions, including those met with afloat.

Avoiding Static

WE recently commented on the fact that a car passing over Sydney Harbour Bridge accumulates sufficient static electricity to provide the driver with a severe shock when he touches anything earthed. We now understand that short lengths of flexible wire have been placed on the roadway projecting so that they may come into contact with the body of the car and thus discharge the accumulated charge. Petrol wagons are also fitted with dragging chains contacting with the roadway to avoid the risk of an explosion due to the static collected in the metal body.

Australian Schedules

THE Amalgamated Wireless (A'sia) company announce the following transmission schedules for the month of June. VK2ME, Sydney, will transmit on a wavelength of 31.28 metres (9,590 kc/s) on Sundays from 6 to 8 a.m. and from 11 a.m. to 3 p.m. B.S.T., and on Mondays from 5.30 p.m. to 7.30 p.m. B.S.T. VK3ME, Melbourne, may be heard on 31.5 metres (9,510 kc/s) every day from Monday to Saturday inclusive from 10 a.m. to 1 p.m. VK6ME, Perth, will transmit on 31.28 metres (9,590 kc/s) every day from Monday to Saturday inclusive from mid-day to 2 p.m. B.S.T.

Uruguay Buys Philcos

THE Philco company inform us that Uruguay has recently received 220 of their receivers for use in the public school system of that country. They also announce that Czechoslovakia has just accepted delivery of Philco all-wave receivers for its diplomatic corps in 19 countries, to link its Ministers and Chargés d'Affaires with the home office by radio. These sets have been installed in the offices of its ministers in France, Latvia, Italy, Albania, Greece, Hungary and Belgium, and in the offices of the Chargés d'Affaires in Esthonia, Egypt, Denmark, Portugal, Iran and Finland.

ON OTHER PAGES.

Anglo-South African Telephones

THE Postmaster-General announces that the telephone service to South Africa, which has hitherto been available only until 2 p.m. daily except Sundays, will, in future, remain open until 6 p.m. on Mondays to Fridays, and until 4 p.m. on Saturdays.

How to Make Gold

ARE you interested in making gold from the baser metals, or in studying the technique of flying on broomsticks? These, together with the art of prophecy and other arts of the witch and sorcerer, will be dealt with in a special programme from the West on June 12th. The programme is entitled "Abracadabra," and it will form a trailer to the full programme to be broadcast on June 23rd.

More Stops for the Organ

ON June 10th a novel programme will be broadcast from the National programme by George Melachrino and Reginald Foort. The latter will play the B.B.C. organ and will be accompanied by George Melachrino, who will play clarinet, oboe, cor anglais, violin, viola and three different saxophones—in addition to crooning. He will thus, in effect, be adding several stops to the already famous and mighty organ.

Promenade Concerts, 1937

THE B.B.C. announces that the Summer Season of Promenade Concerts at the Queen's Hall will begin on Saturday, August 7th, and will continue until Saturday, October 2nd. Sir Henry J. Wood will conduct the B.B.C. Symphony Orchestra of ninety players.

North Regional Director Resigns

MR. E. G. D. LIVEING, North Regional Director, has asked to be released from his appointment in the near future. He has stated that he desires to devote himself to literary and journalistic work, but arrangements are being made whereby his experience will continue to be at the disposal of the B.B.C. for certain specified purposes. He has been with the B.B.C. for nearly thirteen years, and his resignation will take effect as from June 30th.

The International Regatta

IN celebration of Coronation Year, an International Regatta is being held under the auspices of a Committee appointed by the Yacht Racing Association. The programme of sailing opens in Torbay on June 19th, and will continue until July 3. Yachts of all the International and National classes will assemble for the biggest yachting event ever organised in the British Isles, and Torbay, too, will be the finishing point of an Ocean Race to Cherbourg and back, competitors for which will sail from Southsea on June 18th. On the opening day (June 19th), C. R. Fairey, Commodore of the Royal London Yacht Club, and Chairman of the Regatta Committee, will come to the microphone to speak from Torquay of the Regatta and its outstanding place in yachting history.

Binding Cases and Indexes

BINDING cases and indexes for volume 9 of PRACTICAL AND AMATEUR WIRELESS are now available. The binding case, complete with title page and index, costs 3s. 6d., and the index alone 7d. by post.

ROUND the WORLD of WIRELESS (Continued)

French Schools Broadcasts

AT the instigation of M. Jean Zay, French Minister of National Education, in co-operation with the Ministry of Posts and Telegraphs, which controls radio, a regular programme of radio broadcasts to schools of primary and secondary grade has been inaugurated. Broadcasts from the Eiffel Tower station take place ordinarily between the hours of 9 to 10.30 a.m. and 2.30 to 3 p.m., talks being ten to fifteen minutes long. Outside of school hours there is also a broadcast between 6 and 6.30 p.m., and another interesting adults talk is given between 10.30 and 11 p.m. Subjects treated cover languages, classics, science, history, and geography.

New Polish High-powered Stations

IT is stated that the two Polish stations at Lwow and Wilno will shortly be radiating on 50 kW. The work of rebuilding these transmitters has been carried out entirely by Polish engineers. At the same time, it is stated that the Czechoslovakian Government has under consideration an extensive programme of station building. Two new 100-kilowatt stations are being planned, one at Neutra and the other near Brno.

INTERESTING and TOPICAL NEWS and NOTES.

Moscow's New Broadcasting House

IT is stated that work has commenced in Moscow on what is claimed will be the finest broadcasting headquarters in the world. The main studio will be approximately 30 feet high and have an area of 600 square yards. It will accommodate an orchestra of 250 performers, together with an audience of 350.

Teddy Foster, the well-known trumpeter and band-leader, conducting his orchestra during the making of his latest gramophone records at the "His Master's Voice" Studios.

B.B.C. Midland Orchestra

ERIC WARR will conduct the B.B.C. Midland Orchestra on June 10th in a programme which will include "Pages Intimes," by Jongen, the Belgian composer, and an unpublished work, "Concert Overture," by Kenneth Pakeman.

Northern Concert Party

EXCERPTS from two Blackpool Concert Party shows will be broadcast to Northern listeners on June 9th. The Arcadian Follies, with Harry Korris, the well-known Manx comedian, at the South Pier, will be followed by an excerpt from "On With the Show" at the North Pier. In the latter are featured Tessie O'Shea, Delyse, Renee Foster, Percy Manchester, Betty and Peter Dighton, Horace Kenney, the Five Sherry Brothers, and others.

B.B.C. Scottish Orchestra

THIS popular orchestra, conducted by Guy Warrack, will broadcast for three-quarters of an hour on June 12th. The programme will include: Overture, "Hamlet," by O'Neill; "Mediterranean," by Bax; "Mock Morris" and "Shepherd's Hey," by Grainger; Suite, "Where the Rainbow Ends," by Quilter; and "Shepherd Fennel's Dance," by Balfour.

London Symphony Orchestra

ON June 6th (Regional) Anthony Bernard, who is Music Director of the Shakespeare Memorial Theatre, Stratford-on-Avon, will conduct the London Symphony Orchestra in a programme containing two unfamiliar works: A Flute Sonata by Grétry (1741-1813), played by René Le Roy, and an Overture to Œdipus at Colonnus, by Sacchini (1734). Three Botticelli Pictures by Respighi, the Italian composer, who died last year, will also be included in the programme. The Three Pictures, which are here described in music, are "Spring," "The Adoration of the Magi," and "The Birth of Venus."

Henry Hall's Resignation

WE understand that the present B.B.C. Dance Orchestra will be disbanded on August 7th next. The last transmission by the orchestra will be on July 17th, and the members will then receive their normal annual holidays. As from August 8th, Mr. Henry Hall will assemble his own band which will be employed by the Corporation in a full-time capacity until September 25th, when Mr. Hall's resignation takes effect.

Variety from Southampton

ON June 9th a variety programme will be broadcast from the stage of the Hippodrome, Southampton.

Concert from Bristol

BRIGHT'S Bristol Quintet, led by Joan Allen, will give a concert from the Western studio on June 10th.

Theatre Variety

IN the Midland Regional programme on June 8th, a variety bill will be broadcast from the Theatre Royal, Worcester, from which there have been several broadcasts. This theatre also figured in the series of histories of Midland Variety theatres, when Lady Carleton, its owner, was the chief speaker.

SOLVE THIS!

PROBLEM No. 246

Brown built an A.C./D.C. receiver and obtained good results when the set was supplied from D.C. When connection was made to A.C. mains, however, satisfactory reception could not be obtained. 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., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 246 in the top left-hand corner, and must be posted to reach this office not later than the first post on Monday, June 7th, 1937.

Solution to Problem No. 245

There was an internal short-circuit in the mains transformer between the primary winding and the heater winding.

The following three readers successfully solved Problem No. 244, and books are accordingly being forwarded to them: D. Robertson, Auckengill, Wick, Caithness; J. D. Morris, 17, Lynton Rd., Heaton Moor, Stockport; J. Dalton, Issallt, Brynteg, Anglesey.

French Radio Pirates

IT is reported that a new system is being introduced in France to endeavour to foil pirate listeners. The postman will collect the monthly tax as is done in Germany, and it is claimed that this prevents much unauthorised listening, and also results in the capture of many pirates.

Three Broadcasts by Jack Hylton

WE are informed that during the summer three one-hour broadcasts will be given by Jack Hylton and his Band. Each of them will take place on a Saturday, viz., July 24th, August 14th, and September 18th.

The title of the broadcasts, "Past, Present and Future," is itself an indication of the type of music that will be played. Mr. Hylton will also bring with him to the studio variety stars of the past and present, together with some newcomers for whom he himself predicts future stardom.

Concert from Leamington

JAN. BERENSKA and his Orchestra, with Alex Penney, the Derby soprano, will give a concert on June 13th in the Jephson Gardens Pavilion, Leamington Spa. The orchestra will open the concert with a fantasy on Schubert's music, arranged by Finck. Miss Penney, with orchestral accompaniment, will sing the waltz song from "Tom Jones" and Bemberg's "Nymphs and Fawns," as well as a group of four songs.

An Easily-made Single-valve Set

Our Old Friends The Experimenters Return with a Series of Informal Articles Intended Especially for New Readers and Less-advanced Constructors

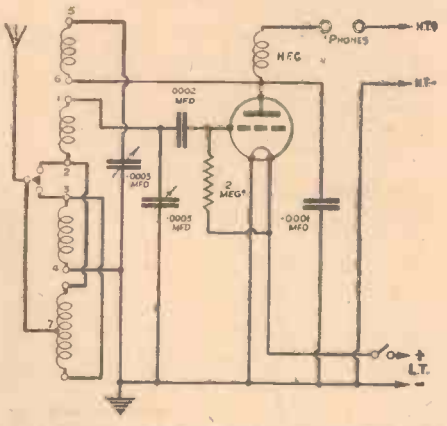


Fig. 1.—Circuit of the single-valve set of which The Experimenters will give full constructional details.

WE have been criticised by a few of the newer readers of PRACTICAL AND AMATEUR WIRELESS who consider that we have become rather too "highbrow." They say that in describing experiments in connection with all-wave receivers, mains working, superhets and so on, we have sadly neglected those who are not experienced constructors.

Well, we are here to serve, and we have never had any intention of neglecting anybody. To those who consider that they have been "left out in the cold" we say "sorry," and attempt to make good our omissions. It is very easy to forget, after spending the best part of a lifetime in experimental work, that there are many really enthusiastic amateurs who are just starting that thrilling and most interesting of all hobbies—home set construction. We have resolved to go about the laboratory in sackcloth and ashes for the next few weeks as atonement for our wrong-doings.

Let us not harp on this unpleasant theme, but pass on to the subject of this and a few more chats on the construction of simple receivers. The difficulty is to know just where to start. If we took a ballot we should probably find that many would like us first of all to describe a crystal set; others would go to the other extreme and ask for details of a "pukka" superhet. If we strike a middle course we should avoid a number of brickbats. Before settling down to the practical aspects, however, perhaps we had better introduce ourselves to those who are new readers of this journal—and the Editor tells us that it is evident that there are many new readers from the tremendous amount of correspondence which he handles every day.

Pleased To Meet You

You might say that we are professional amateurs if you like. That would not be a bad description because, although each of us earns his bread and butter from radio, we are all amateurs at heart. We are four in all, and three of us have been ardent radio "fans" for something like twenty years; the other member of our select society is a comparative newcomer, although he often tells us just where we "get off." He is new from school, and is inclined to let theory blind his eyes to facts which the others have established by experience. This youngster will often break out in dissertations on logarithmic graphs and sun spots, but he will no doubt be suppressed before he is able to tell you how much you don't know.

A Good Circuit

But we are wasting valuable space. Our object this week is to describe the construction of a simple single-valve set that can be made quite cheaply by anyone. It is suitable only for 'phone reception, but we shall later describe how a second valve can be added so that a speaker can be operated. The theoretical circuit is shown in Fig. 1, but if this means nothing to you do not lose heart, for its practical counterpart is given in Fig. 2, which shows the components assembled on a panel and baseboard, all wired up.

The circuit is not new, and we do not claim to have invented it; most of those who do claim to have invented a circuit are simply blowing a large size in trumpets, because nearly every so-called new circuit

by The Experimenters

is a modification of an older one. We have chosen the particular circuit shown because it is simple, without being ineffective. It will give good reception of a large number of stations on 'phones, and is responsive to careful manipulation. In fact, the results obtained depend more upon the use of the set than upon its "design"—if that word can be applied to so simple a piece of apparatus.

Centre-tapped For Selectivity

For the benefit of those who are interested we can say that the coil is centre tapped on both medium and long waves, the aerial being connected to the centre tapping. Due to this, the degree of selectivity is just about as high as can be obtained with so simple an arrangement. Even the type of coil is not new, but it is seldom used—we cannot say why, for in our opinion it cannot be beaten. From the circuit it can be seen that there are four windings in all; two of these together form the medium-wave section, a third is a loading coil for long waves, and the fourth provides reaction, along with a .0003-mfd. variable condenser.

Wave-change switching is carried out by means of a three-point on-off switch. When it is in the off position, all three of the tuning windings are in use, being connected in series, with the long-wave portion between the two medium-wave sections. By turning the switch to the on position,

(Continued overleaf)

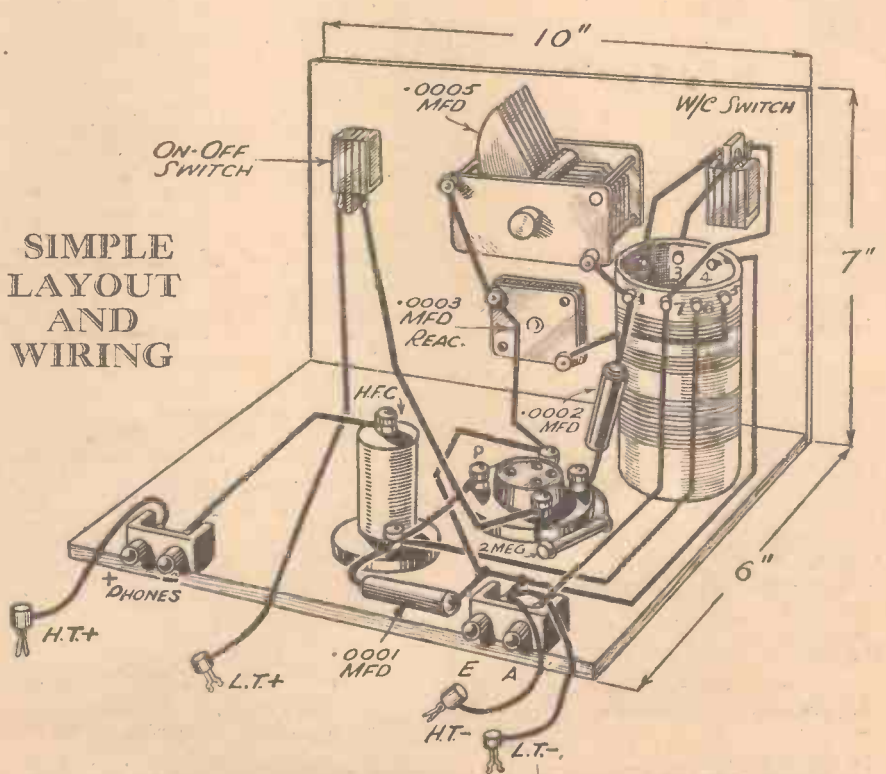


Fig. 2.—Practical wiring plan and layout of the set. Space is left on the baseboard for the addition of a second valve.

AN EASILY-MADE SINGLE-VALVE SET

(*Continued from previous page*)

the long-wave coil (or loading coil) is short-circuited. In either position of the switch the aerial is joined to the centre of the portion of the coil in use.

Coil Requirements

There is no difficulty in making the coil if you follow the details given in Fig. 3. The parts required are: one paxolin or shellacked cardboard tube, 2½in. in diameter and 5in. long; one tube of similar material, 2in. in diameter and about 3in. long; seven small terminals; 4ozs. of 30-gauge enamelled wire; 2ozs. of 36-gauge enamelled wire; a few rubber bands; and just a little patience. The smaller tube, by the way, is for the reaction winding, and this is placed inside a larger one, and is held in place by rubber bands which grip the inside of the larger tube.

If you can obtain paxolin tubes from your radio dealer, so much the better. This material is a form of fibre, is strong and rigid, and is a good insulator. When paxolin cannot be obtained, thin postal tubing will serve if it is first given two or three thin coats of shellac varnish—obtainable from any electrician. The purpose of the varnish is to harden the cardboard and to improve its insulating qualities by making it impervious to moisture. After applying each coat it is best to place the tubes in a warm, not hot, oven or in the heat of a strong sun; this "bakes" the varnish and drives out moisture. It is also a good plan to warm the tubes before varnishing, to make sure that they are quite dry.

Winding

Next, a series of seven holes should be drilled near to one end to receive the terminals, which can then be fitted. Just below the terminals make a pair of very small holes with a stout needle or a fine bradawl. Take the 30-gauge wire, and pass the end through the two holes so that it is gripped. It might also be found helpful to apply a spot of sealing wax to the wire round the holes to prevent its being damaged. Then commence to wind on the wire, keeping it under light and easy tension, until 25 turns have been wound on to the former. The wire should be held in place with the thumb while another pair of small holes is made, when it can be cut off so that there is about 6in. to spare. This end should be threaded through the holes as before, again applying a spot of sealing wax.

Leave about ¼in. and make a third pair of holes. Proceed as before, and wind on another 25 turns, taking care that they are in the same direction as the first lot. It does not matter in the least which direction the turns follow, as long as they all follow the same direction. Anchor the end of the wire as before.

This completes the medium-wave section of the coil. Leave about ¼in. (the exact distance is not critical) and make another

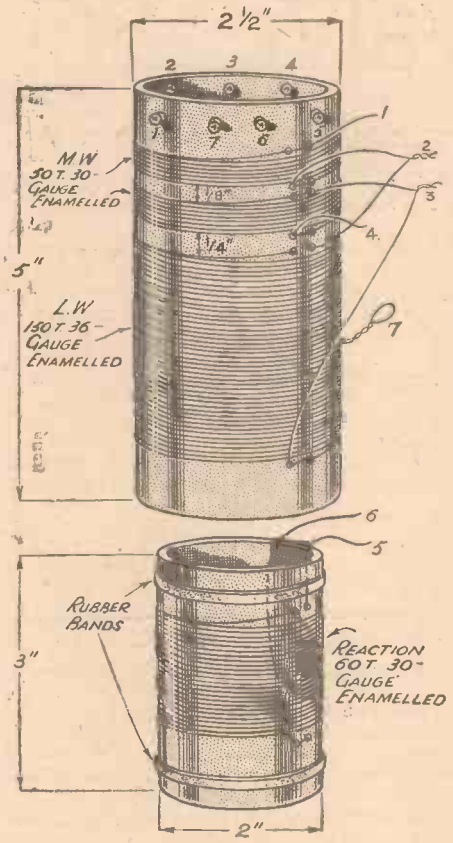


Fig. 3.—Coil details. The smaller former fits inside the larger one.

pair of holes. The thinner wire is used for the long-wave section, in order to keep the whole coil reasonably compact. Anchor the end of this wire as before, and continue to wind it on the former. This wire is rather fragile, so be careful not to pull it too tightly. At the same time keep it sufficiently taut to ensure that the turns will not slip, and keep the turns as close together as possible without allowing them to overlap.

After winding one-half of the total of 150 turns (75 turns) make a twisted loop in the wire about 6in. long. Twist the wire carefully so that it is not fractured, and put another spot of sealing wax near the loop to hold the wire in place. After that, the remaining 75 turns can be wound on, and the end anchored as before. If there seems to be any likelihood of the turns slipping, give the whole coil another light application of shellac varnish.

The procedure for the reaction coil, on the smaller former, is the same, and the thicker wire is used for this. Start winding about ¾in. away from the end of the tube. Again, the turns should be in the same direction as those of the other windings.

Terminal Connections

It remains only to connect the various tappings to the seven terminals. To avoid any mistake in this direction, it is best to number the terminals, starting with any one of them, from 1 to 7; tabs of gummed paper are useful for this purpose. Now take each of the leads from the larger coil in turn to the appropriate terminal, and cut it off so that there is about an inch to spare. Carefully bare the end of the wire by lightly scraping it with the edge of a blunt knife blade and attach it to its terminal. There are two methods of doing this; one is by soldering the wire to the end of the terminal shank, and the other is by gripping the wire between a couple of washers placed under the terminal nuts. The method to be used depends upon the ability of the constructor to make a neat soldered joint.

In the case of the looped tapping, it might be necessary to cut off the end of the loop, but this does not matter as long as both ends are well cleaned and connected to the terminal. It will also be seen that two connections are made to terminals 2 and 3.

This can best be done by twisting the two bared ends together before making connection to the terminals.

The leads from the reaction coil should be passed through holes to the inside of the tube, as shown in Fig. 3, after which rubber bands should be placed over the ends of the tube, so that it will fit fairly tightly into the larger former. Take care when inserting the coil that the anchored ends of the medium and long-wave windings are not fractured. Finally connect the leads from the reaction coil to their terminals, but leave at least an inch of "slack" in them, since the coil might have to be moved upward or downward when the set is first tested.

And now we have exhausted the space at our disposal, so we must leave you until next week. If you make the coil in the meantime, you will be ready to proceed with the construction of the set when we meet again. Good-luck and good fun until then!

(*To be continued.*)

PROGRAMME NOTES

Bournemouth Repertory Company

THE Bournemouth Repertory Company, under the direction of Anthony Bazell, will present "Quartet," a play in four movements by Cedric Wallis, on June 5th, which will be produced by Cyril Wood. The play is about the four members of a string quartet, and, looking into their private lives, skilfully presents four real people in front of the background of their own music. There are some dramatic situations in the "four movements" of the play, and a thrilling climax at the end.

Minor County Cricket

A WELL-KNOWN figure in minor cricket for many years will come to the microphone on June 12th to describe the prospects of the West Country clubs during the current season.

A Potpourri of Revues

FROM radio revues and other musical shows produced during the year, Martyn Webster has devised a potpourri programme entitled "The Tune you Heard," to be broadcast on June 9th. The soloists will be Webster Booth (who began his musical career in Birmingham) and Marjorie Westbury. Reginald Burston will conduct the Midland Revue Chorus and the Revue Orchestra.

Organ Recital

AN organ recital by W. Gordon Brewer will be broadcast from St. Mary Abbotsbury, Newton Abbot, on June 11th in the Western programme. Mr. Brewer, who is organist and choirmaster at the church, is a frequent recitalist at churches throughout Devon, adjudicates at numerous competitive festivals, and is conductor of several South Devon choral organisations. The church is the largest in mid-Devon, and is a centre for Deanery Choral Festivals. Regular organ recitals are given on the three-manual organ, and the church has remarkably good acoustic properties.

Wisbech Male Voice Choir

THE Wisbech Male Voice Choir, conducted by Fred Ingram, will pay a return visit to the Birmingham studio on June 8th, when it will sing six part-songs. It was founded in 1926. Its successes in the contest field include "The Open" at Norwich (thrice) and the South Midland Championship Cup (twice).

Constructional Details of "P.W." Receivers—7

How to Modify the £5 Superhet Three in Order to Make Use of the Latest Type of Coil Unit

IN October, 1934, we produced the novel three-valve circuit shown below, in which the full superhet principle was incorporated with the use of a Westector in place of the second detector valve. This resulted in a powerful three-valve receiver, giving maximum selectivity and good range of reception, and is still in use in many parts of the country. The coils originally specified cannot now be obtained, but as the circuit is such a valuable one for those who are anxious to economise in H.T. and L.T. battery consumption and who desire long range and high selectivity, we give below instructions for fitting modern coils to the receiver, and these instructions will enable the reader to modify the design shown on Blueprint No. 40, which gives the original wiring for this particular set. No other alterations are required, and the design is rendered slightly more simple, by reason of the fact that the coil unit now specified incorporates its own coupling between the two band-pass coils, and thus the original twisted-wire condenser may be omitted. As will be seen from the theoretical diagram, the pentagrid frequency-changer is provided with variable bias, obtained from a manual control, and this feeds also the I.F. stage. The output pentode which is employed ensures that a good volume is fed to the loudspeaker, whilst the H.T. consumption is kept within reasonable bounds.

Circuit Modifications

It will be noted that the Varley Unit, Type BP111, which is now specified, has the majority of its terminals arranged almost in the same positions as the original coil unit, and thus there is very little difficulty in wiring this unit. In one or two cases the leads are slightly altered, but the diagram, Fig. 2, shows these quite clearly. No further holes have to be drilled in the chassis, and beyond the change in coil connections, nothing else has to be modified. The preliminary setting-up of the receiver is rendered slightly easier, due to the fact that the small variable condenser C4 is not now used for band-pass coupling, and thus it it only necessary to adjust the three trimmers on the gang condenser and the trimmers on the I.F. transformers.

The method of adjusting the various trimmers will depend upon the facilities for ganging which the builder possesses. If you have an oscillator, naturally conditions are greatly simplified, and the I.F. transformers may be adjusted to exactly 110 kc/s, after which the oscillator trimmer (C3) may be adjusted for maximum response with the oscillator connected on the input side. Trimmers C1 and C2 are then adjusted to provide maximum volume. Without an oscillator the best method is probably the following: First turn the hexagonal nuts on the I.F. trimmers, so that they are nearly tight, in a clockwise direction. Next, turn the concentric screw inside the hexagonal nuts in an antis clockwise direction, so that they also are nearly tight. This will bring the primary and secondary windings to approximately 110 kc/s. The trimmer C3 should then be turned to approximately half a turn from the full-in position (clockwise rotation), after which C1 and C2 trimmers are turned to provide a maximum volume on the local station. A distant station should then be located, and a final adjustment of the various trimmers made. It should be remembered that unless the correct I.F. is located on the transformers, and the correct frequency-separation is obtained in the oscillator stage, the tuning will not hold throughout the dial, and thus good results will be obtained at one end of the dial, and perhaps no signals at all at another part of the dial. The long-wave

(Continued overleaf)

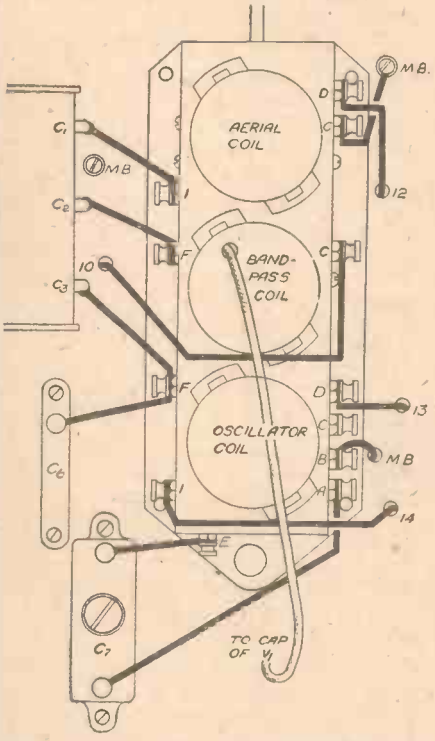


Fig. 2.—How to wire the Varley coil unit into the £5 Superhet Three.

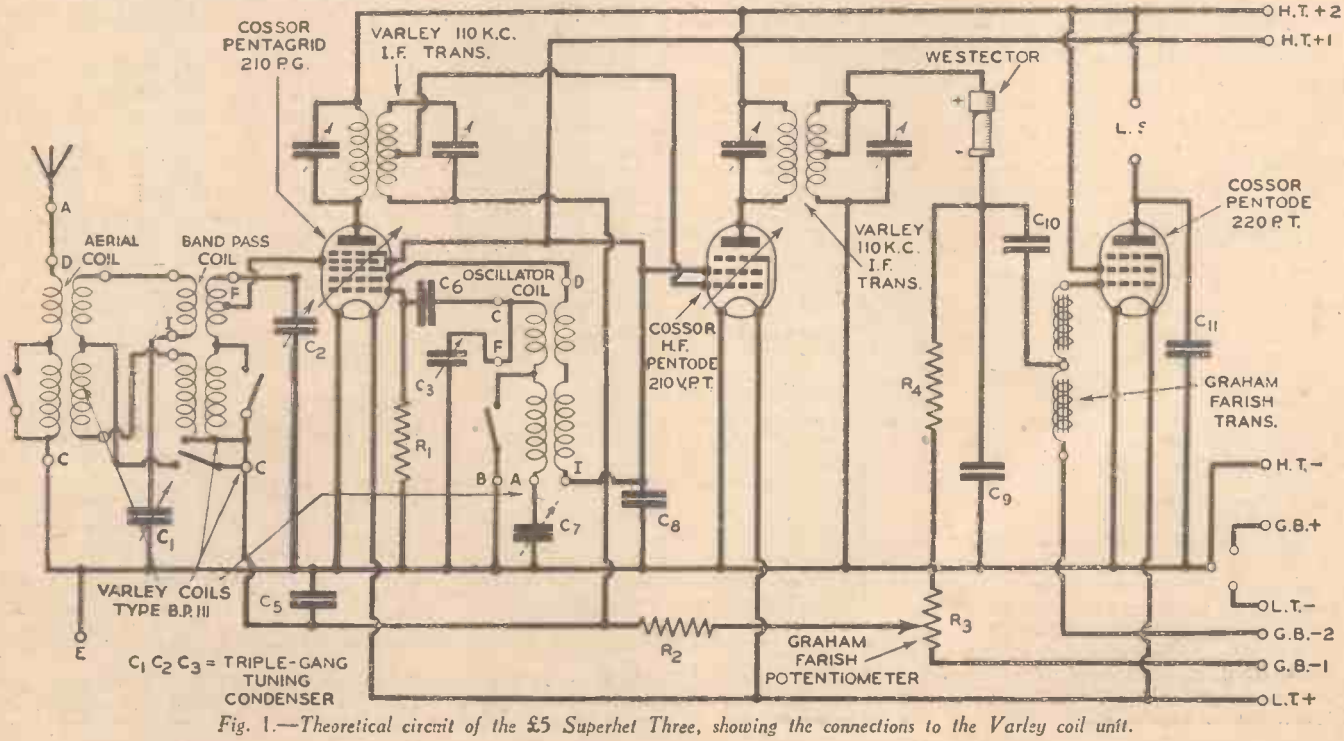


Fig. 1.—Theoretical circuit of the £5 Superhet Three, showing the connections to the Varley coil unit.

CONSTRUCTIONAL DETAILS OF "P.W." RECEIVERS

(*Continued from previous page.*)

padding condenser, C7, is only adjusted on long waves, and no alteration of the trimmers already mentioned should be carried out on long waves.

A list of components is attached, and a Blueprint, No. PW40, may be obtained from this office, price 1s.

COMPONENTS FOR THE £5 SUPERHET THREE

One set 3-gang superhet coils, type BP111 (Varley).
One 3-gang superhet Midget variable condenser, type 2124 B, and disc drive (J. B.).
Two "Practical Wireless" I.F. transformers (110 kc/s) (Varley).
One .002 mfd. Formodenser (Formo).
One 50,000 ohm potentiometer (Graham Farish).
One 1 mfd. fixed condenser (Graham Farish).
Two .5 mfd. fixed condensers (Graham Farish).
One .01 mfd. tubular condenser (Graham Farish).
Two .0001 mfd. fixed condensers, type 34 (T.C.C.).
Three ohmite resistances, 150,000, 100,000, 30,000 (Graham Farish).
One Max. L.F. transformer (Graham Farish).
One potentiometer bracket (Peto-Scott).
One 3-point on-off switch (Graham Farish).
One 7-pin sub-baseboard valveholder, terminal type (Clix).
One 5-pin sub-baseboard valveholder, terminal type (Clix).
One 4-pin sub-baseboard valveholder, terminal type (Clix).
One Westector, type W6 (Westinghouse).
Three wander plugs (H.T.+1, H.T.+2, H.T.—) (Belling Lee).
Two spade terminals (L.T.+, L.T.—) (Belling Lee).
Three G.B. plugs (G.B.+, G.B.—1, G.B.—2) (Belling Lee).
Two terminal strips (A.-E. and L.S) (Clix).
One Metaplex chassis, 11in. by 10in. with 2½in. runners (Peto-Scott).
Three valves, 210PG, 210VPT, 220PT (Cossor).
One Stentorian Standard P.M. loudspeaker (W.B.).
One 120-volt H.T. battery (Drydex).
One G.B. 16½-volt battery (Drydex).
One L.T. 2-volt accumulator (Exide).
Kits or separate parts are supplied by Peto-Scott, Ltd.

Televiews

A Successful Experiment

THE supreme trial of British television as exemplified by the attempt to televise the Coronation procession from Apsley Gate by means of three cameras was voted a huge success. Unfortunately, the weather was not in a co-operative mood, and just before the head of the two-and a-half-mile procession reached the vital spot at Hyde Park Corner, rain fell and the light became very poor. The increased sensitivity of the new cameras was able to cope with this situation, however, and although the advent of sunshine would have improved the picture at least 100 per cent., viewers spread over the 7,500 square miles of service area were rewarded with extremely good pictures. There was a curious cumulative, almost hypnotic, effect in the unified motion of the massed bodies seen in perspective coming down from Stanhope Gate. The impression of pageantry was felt, and when the telephoto lens was brought into operation to give those close-up glimpses of Royalty, viewers' heads unconsciously craned forward to ensure that nothing was missed in the few seconds' glimpse. It is perhaps unfair to criticise at this initiation stage of new O.B. equipment, but the absence of an adequate framing mask was apparent. This was evidenced on the receivers by a tendency for the picture to slip up or down, due to the small frame synchronising pulse, but careful adjustment of the time-base generator controls rectified the trouble, and no doubt the fault will be remedied for future outdoor transmissions. One could not help contrasting the results with the first daylight television experiment conducted by Baird in June, 1928, and repeated again in 1932 with improved equipment when the Derby was televised. The improvements made over that short space of years are enormous, for in addition to the picture definition increasing more than twelvefold, the actual scanning equipment has altered beyond recognition.

Line Pairing

THE problems associated with the production of an interlaced scan on a cathode-ray tube screen are of greater magnitude than the more straight forward sequential building up of the picture lines. The dual time-base generator must produce an odd number of pulses (405) for the picture lines, and an even number (50) for the frame frequency. Furthermore, the odd and even lines must interleave exactly if the best-detailed picture is to be seen. If the tube screen is watched carefully the action of interlacing can be observed, but if the set is not operating correctly then line-pairing will occur. That is to say, instead of the odd and even lines occurring above and below each other, they will coalesce, giving a total definition of 202½ lines. Not only that, the picture will lose its sharp, clear features, for the superimposed lines represent scans over neighbouring sections of the picture and the result is a blurring of detail. This point must be studied closely, and if pairing does occur, then the time-base generator controls must be adjusted slightly to restore the correct conditions. The exact control to operate cannot be stated definitely as it is generally a combination of circumstances which brings about the effect. Line lock, frame lock, line speed and frame speed are the four concerned, and a little manipulation will ensure that the interlaced scan is made to take place.

Important Broadcasts of the Week

NATIONAL

Wednesday, June 2nd.—London Music Festival, 1937 (organised by the British Broadcasting Corporation); Third Concert, from the Queen's Hall, London.
Thursday, June 3rd.—Commentaries on the start, progress and finish of the R.A.C. Light Car Race, from the Isle of Man.
Friday, June 4.—Derby Day, a comic opera.
Saturday, June 5th.—Music Hall programme.

REGIONAL

Wednesday, June 2nd.—Derby Day, a comic opera.
Thursday, June 3rd.—Figaro (Mozart), Act 3, from Glyndebourne.
Friday, June 4th.—London Music Festival, 1937 (organised by the British Broadcasting Corporation); Fourth Concert, from the Queen's Hall, London.
Saturday, June 5th.—Chamber Music.

MIDLAND

Wednesday, June 2nd.—English Song Writers, Vaughan Williams: vocal programme.
Thursday, June 3rd.—Canals: Children's Hour feature programme.
Friday, June 4th.—The Roving Reporter, a feature column in sound.
Saturday, June 5th.—Shelsley Walsh: A recording of the commentary broadcast in the National programme this afternoon.

WESTERN AND WELSH

Wednesday, June 2nd.—Down from London: Looking for Design, a talk by Anthony Bertram.
Thursday, June 3rd.—A Variety programme from the stage of the Palace Theatre, Plymouth.
Friday, June 4th.—School Pipe Band programme.
Saturday, June 5th.—Bournemouth Repertory Company presents Quartet, a play by Cedric Wallis.

NORTHERN

Wednesday, June 2nd.—Concert Party programme, from Douglas, Isle of Man.
Thursday, June 3rd.—Commentaries on the start, progress and finish of the R.A.C. International Light Car Race, from the Isle of Man.
Friday, June 4th.—The Trumpet Blowers, a radio comedy, by R. Roberts and S. H. Marsden.
Saturday, June 5th.—Replanning Burbleton: The history in dramatic form of an entirely imaginary town-planning scheme.

SCOTTISH

Wednesday, June 2nd.—Cute McCheyne, a play by Joseph Laing Waugh and Andrew P. Wilson.
Thursday, June 3rd.—Concert Party programme, from Rothesay.
Friday, June 4th.—Men and Matters, a talk.
Saturday, June 5th.—Punch counts Ten, a fantasy by Robert Bain.

NORTHERN IRELAND

Wednesday, June 2nd.—Variety programme from the Empire Theatre, Belfast.
Thursday, June 3rd.—An organ recital from the Cathedral Church of St. Columb, Londonderry.
Friday, June 4th.—An eye-witness account of the final of the Northern Ireland Professional Golf Championship at Belvoir Park.
Saturday, June 5th.—Students' Songs: choral programme.

Practical Television

June 5th, 1937. Vol. 3. No. 53.

OBTAINING BEST RESULTS

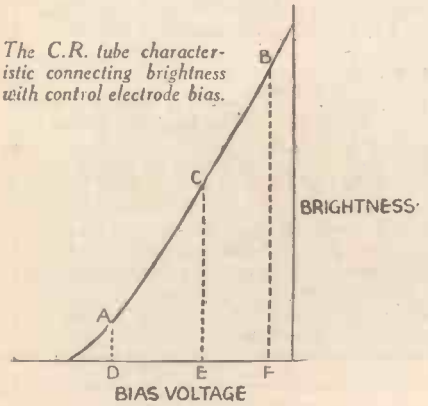
ON many occasions when visiting a friend's house or when walking past a radio shop, one has felt constrained to pass comment on the quality of the sound heard from the loudspeaker. Instead of being a rich, mellow tone with the words clear and distinct, or musical passages rendered with a high degree of faithfulness to the original, overloading has occurred and the reproduction has suffered to a very high degree. It is not quantity but quality that should be aimed at, and very often the fault has laid not with the type of speaker employed but arises from a failure on the part of the user to handle his set controls with intelligence and understanding.

With the advent of television and the installation of sets in many homes, whether of the commercial or home-constructed type, the same sort of thing can be noticed, only in this case it is not the sound side of the receiver which is at fault, but the results as seen on the cathode-ray tube picture reproducer. Here, again, the set itself is in nearly every case blameless, but the proud possessor of the instrument has not appreciated the true function of the main controls.

The two picture controls are situated immediately below the cathode-ray tube in this Cossor receiver.

A Matter of Opinion

Opinions differ as to the degree of importance attached to each knob available to the user for manipulation, but the consensus of opinion seems to associate the greatest degree with those called "brightness," "contrast" and "gain." These, in their own particular manner, are all associated with the intensity modulation of the stream of electrons which as a result of their high velocity of impact produce the correct degree of fluorescence on the screen of the tube, and so build up the picture in terms of light and shade.



The C.R. tube characteristic connecting brightness with control electrode bias.

Many of the other controls are linked up with the time-base generator, but under normal viewing conditions, when once they have been adjusted to give correct interlacing, picture ratio, together with line and frame locks, they need little, if any, attention, provided one is not on the fringe of the service area, where there may be a tendency for the picture to slip either horizontally or vertically. Then there is tuning over a limited range of frequency and focus, both of which can be set once and for all, and apart from a slight degree of shift in the case of the latter, due to the set warming up, these can also be forgotten. The same remark applies to sound volume, which is set to be compatible with picture size while taking into account the acoustics of the room and the number of people looking-in at any one time.

Inter-related

The three controls mentioned earlier, however, are, as a rule, all inter-related, and no doubt this accounts for the degree of mishandling which is so often noticed. When this happens there is the overloading effect mentioned, or over-contrast, as it is generally termed, with the result that the right picture balance is lost and the true pictorial value of the picture quality fails to be appreciated. Taking first of all the case of the brightness control, this is one which governs the general brilliance of the picture and invariably takes the form of an alteration to the static bias condition applied to the control electrode of the cathode-ray tube. It is all too frequently overlooked by readers that the functioning of a C.R. tube resembles in some respects that of the familiar thermionic valve. The interposition of a control electrode between the tube's cathode and anode enables the number of electrons in the beam passing to the front screen to be altered at will. Assuming the anode or electron accelerating voltage remains constant (neglecting the presence of auxiliary focusing anodes when they are present, since they do not enter into this part of our discussion), the characteristic curve relating control electrode bias with tube brightness is similar to a valve curve under static conditions. This is shown in the accompanying diagram, where brightness (beam current or number of electrons in the cathode-ray stream) is plotted against the bias voltage applied to the electrode just mentioned.

Brightness Changes

Starting with a fairly sharp bend at a bias value which may vary from 50 to 80 volts, according to the make or type of tube, the beam current rises from zero to values which show a proportional rise for change of bias voltage, since the characteristic is a straight line. Between the points A and B the tube can pass from black (minimum beam current) to white (maximum normal brightness). If it is known that the modulation volts from the incoming signal will cover the range D to F, then the tube should be biased to the point E which is midway between these extremes. With a signal voltage range greater than DF the modulator will be made positive, while correct balance will be lost at the bottom end of the characteristic. Distortion takes place and the quality of the picture is ruined.

(*Continued overleaf*)

"100% BROADWAY"

An all-Broadway presentation with films, and music from many productions appropriate to Broadway, will be televised in the afternoon programme on June 11th. The Albertina Rasch Girls from the Dorchester Hotel will appear, and the compère will be David Burns, who made his first appearance at the Alexandra Palace as Stooge to the comedian, Lou Holtz.

Joan Miller, who is known for her work in "Picture Page," and who also presented her own original sketches as Mrs. Homer Cummerbund, in "Coffee Stall" and "Grand Hotel, Good Morning," and a new sketch as an American chorus girl in Empire Variety on May 15th, will, in this programme, appear in an entirely new dramatic episode, in which she will be a gangster's "moll."

PRACTICAL TELEVISION

(Continued from previous page)

Picture Contrast

When the tube is run too bright to start with, the blacks merely become a light grey, and the whites are almost lost. The result is something like a ghost or partially-assembled picture, and naturally this condition should be avoided altogether. It is better not to run the tube too bright, but rather set it so that with the signal strength available the blacks come out really well in the picture. This, of course, brings into account the control labelled contrast. It adjusts the magnitude of the vision signal volts which are passed from the output circuit of the vision chassis to the modulator electrode, and does not in any way affect the strength of the synchronising pulses. Strictly speaking, it is a volume control, but the normal position under most conditions is for the contrast knob to be fully advanced. Brightness may then be set to balance with this condition. Too much contrast for certain settings of the other controls will give a picture which has a soot and white-wash effect. This must be watched very carefully if a pleasant pictorial effect is desired, although it must be admitted that some set users show a partiality towards the over-contrasted picture just the same as in photography many show a desire for prints which are over-contrasted.

Overall Gain

On the other hand it may be that the whites and blacks are present, but there is a considerable amount of mush covering the picture, and detail is rather poor. The latter may be due to an incorrect tuning position which is bringing about a severe cutting of the sidebands and can readily be put right. The mush, however, is probably the result of having the gain control advanced too far. This increases the degree of amplification at an early stage in the vision chassis and not only magnifies the picture signal but also the strength of the synchronising pulses. Generally speaking, this control should be set towards minimum, compatible with adequacy of picture hold and vision signal strength, for any inherent mush effect will then be reduced, and not mar the picture quality. Every care and attention should be directed towards becoming quite familiar with the effects of these three main controls so that a proper balance can be struck, according to the type of picture being radiated. Advancing one control may necessitate retarding either or both the others, but, once mastered, the full value of the radiated picture can be reproduced on the screen without any effort. Do not imagine that one must be continually manipulating the controls during the course of a transmission. An average balance can be struck which will meet most conditions, although when the B.B.C. fade over to films it is found quite frequently that an increase in brightness improves matters.

Lighting

While dealing with this important problem of picture balance, readers must pay attention to the type of room lighting that is present. Any direct lighting which is made to fall on the screen end of the cathode-ray tube will reduce very considerably the range of contrast which can be observed. This should always be avoided, as well as viewing the picture with bright daylight or sunlight streaming through the window before which the set stands. Always screen off this outside light by drawing the curtains, and the observed picture contrast will show a marked improvement. Research into the illumination side of television pictures has revealed a number of interesting facts, showing quite clearly that the correct "presentation" of a cathode-ray tube television picture can make a very material difference.

As is well known, the colour of the picture depends on the chemical composition of the powder used to make the fluorescent screen. In some cases these give a picture of a greenish hue; indeed, in America this shade held favour for a very long time. If this tube screen is surrounded by a bluey-green diffused light, then the picture itself to all intents and purposes has all the attributes of a black-and-white picture, the colour most popular in this country. Another point that can be noted with a television set is that if the picture is running rather bright, then the picture focus is not so important a factor as when running darker. Those readers with facilities at their disposal may like to try out the effects of diffused coloured surrounds for their television pictures. It really amounts to framing the picture, but in any case only soft shading should be aimed at or the main object of the experiment will be defeated.

On Your Wavelength

By THERMION

Banal Nonsense

ALTHOUGH it irritates me I have been listening recently to some of the outside broadcasts, and I now give my considered judgment on them. I think they are childish and ridiculous, and lower the high standard of the B.B.C. These commentators stutter and yammer their way through their descriptive rubbish, interlarded with a wealth of tautological verbosity in an effort to give verisimilitude to the broadcast and to enable the listener to build his mental picture. I do not wish to be told that the "fleet is all lit up," "it is very warm here, very warm indeed," "it's a splendid day," "the crowd is cheering," and similar inanities. Such commentary should be confined to a cold-blooded report unvarnished by bathos and free from meiosis and tmesis. The trifling details should be omitted; no one wants to know that the goalkeeper is rubbing his hands, or that they are bringing out tea to the referee. The "square five" idea is a similar washout, particularly when you have to buy a copy of a periodical in order to follow it out. A copy may not always be handy.

Another Fidgety Critic

ON page 226 of our May 22nd issue I gave some statistics concerning the number of blueprints used by Philco each year, and I referred to "that enormous volume, 1,000,000 square feet a year," which is produced in keeping Philco Radio up to date. A fidgety critic, T. R., of The Schoolhouse, Sedbergh, Yorks, thinks I have made a blunder in using the word "volume" as applicable to area. Apparently, according to him, I should be wrong in calling a book a volume, for he evidently does not understand that words have different meanings and shades of meaning. Area applies theoretically to a surface having no thickness, and as by no stretch of the imagination can you call a blueprint a surface without thickness, I am justified in the solecism of referring to the area which the volume of blueprints occupies, and certainly I have ample authority for doing so. It was used as indicative of *dimensions* as long ago as 1794. This reader thought he had caught me out, but he is bowled!

Calling Mr. Jones

ONE of the traditional duties of the page-boy—calling out for Mr. Brown or Mr. Jones—is being taken over by modern apparatus.

A new "verbal call system" which is being installed by the General Electric Company at the Great Western Railway Royal Hotel, Paddington Station, consists of a series of loudspeakers so arranged that either a call or a message for any guest can be put through to any public room in the building at a moment's notice.

An official of the G.E.C. said:—"The installation will be the largest of its kind, and, while the idea is not entirely new, it has not been applied anything like so extensively before.

"The loudspeakers will be so arranged that any one of them, or several of them at a time, can be used. Thus, if a visitor were wanted really urgently, his name could be announced in all the public rooms simultaneously.

"Apart from the saving of much time and the relieving of page-boys for other useful service, special care has been taken to see that all the speakers are unobtrusive both to the eye and to the ear, so that there will be no disturbance or inconvenience caused to any guest."

Chimes Without Bells

"NEVER noticed you could hear Big Ben right up the Strand." A Covent Garden porter looked up in amazement as first the quarters in the familiar Westminster Chime and then the hour strokes filled the air.

"Sounds as plain as if it was just up there," said his mate, pointing across the road.

Many other people in the vicinity of the Aldwych end of the Strand paused in bewilderment and looked around for the source of the chimes.

These listeners would have been more surprised still had they known not only that the chimes did not come from bells in the Westminster tower but that they did not proceed from bells at all—neither from original bells, records, nor relays of bells.

The source is to be found in a little patented electrical device not more than 8in. high, and weighing under 10lb., in a Strand showroom. The notes are as true and the chimes as musical as they would be if they came from an expensive peal of bells. The sound at its source is only slightly audible, but suitable amplification sends it forth outside the building in full tone, with an almost unlimited volume that can be varied at will.

The accurate timing of the chimes and their undistorted amplification necessitate special Philco-International Equipment that has to be precise in its operation, and the musical unit that produces the sound is the result of years of patient experiment. The notes have been tested by means of oscillographs — that would show graphically any variation in tone—and by other means, yet musical experts have failed to detect any errors, say the International Time Recording Co., Ltd., from whose showrooms the chimes issue forth. The chimes can be automatically cut off during the night, which is a pleasant feature, and another great advantage is the low cost as compared with ordinary bell installations.

Our Guarantee

THE Editor tells me that a reader the other day sent him a set which was built over four years ago

and asked him to "see what was wrong with it under your guarantee." Now, it is inconceivable that the reader has been four years trying to make it work, and the assumption is that he has bought it second-hand, perhaps third or fourth-hand. A guarantee does not last for ever. A car manufacturer guarantees his product for not more than six months. With our receivers we do not consider it fair to have to service free of charge a set which has passed through several hands and is four years old. This is a friendly hint to quite a lot of readers. Dealers are the worst offenders; they will undertake to build a set, fail to make it work owing to their ignorance, tell the customer that the set is wrongly designed, but that they will put it right. The "putting right" consists of sending the receiver to us so that we can put the dealer right. All the dealer does is to pass along a charge to the customer. If you build one of our sets deal direct with us, and cut out the dealer.

Making For Friends

THEN there is the reader who likes to "make a bit" in his spare time. He probably knows nothing about wireless, but because he can solder a wire to a terminal tag, his friends think him a wizard and place an order with him to construct one of our designs.

If he switches on the set and it fails to work at once he is all at sea; he has not the faintest idea how to test a set. He calls in our aid. Here, again, we are compelled to decline to perform the work free of charge. Do not place orders with your friends, build the set yourself, and if you fail we will come to the rescue.

Coupons Not Enclosed

ANOTHER source of irritation is the reader who sends his queries on a postcard, asking several questions and swearing by all the gods that he has been a "regular reader from No. 1." Quite often the subject of his query was very fully dealt with in the current week's issue! These "regular readers" should remember that we insist upon the query coupon and a stamped and addressed envelope when a postal reply is desired, otherwise the queries go into the W.P.B. And just another crack: we shall not answer questions over the telephone. We have no means of ascertaining whether the person at the other end of the wire is a genuine reader, and the only person who has a claim upon us under our Free Advice Bureau is the man who actually purchases the paper and provides us with evidence of such purchase in the form of the query coupon. Dealers, again, have been offenders in this respect. They ring us up at all hours of the day, and evening, asking questions and claiming to be "regular" readers. In some cases we have been able to check the 'phone call and have traced it to, say, Blank and Co., Wireless Experts, High Street, Blanktown.

Notes from the Test Bench

Mains Hum

A RECENT query concerned hum experienced in a receiver when used with an induction type gramophone motor. There are, of course, no brushes in a motor of this type to give rise to interference, and the motor had been adequately screened. Everything had apparently been tried to cure the hum without effect. It must not be overlooked, however, that a motor of this type can cause hum due to the fact that harmonics are induced into the mains leads, and these are fed back into the mains section of the receiver. The trouble in this particular case was removed when mains suppressors were fitted into the mains leads feeding the receiver, and the gramophone motor was fed through a separate pair of leads taken from the mains plug—that is, on the mains side of the suppressor just referred to.

Speaker Distortion

A COMPLAINT was recently received concerning a form of distortion arising in the speaker, and this called to mind a peculiarity which is often met in speakers of old vintage. The cone is made of paper, which is often subjected to some form of treatment during manufacture. This should render it more or less impervious to atmospheric changes, but where the process has not been correctly carried out, or where the diaphragm has not been treated, it is possible for distortion to arise and in some cases for a rattle to be set up. This is due to the fact that the diaphragm becomes slack, owing to the absorption of moisture from the air, which may occur on a very wet day or when a room becomes damp. The trouble may be remedied by placing the speaker in a current of warm air (a hair-drier, for instance) or before a fire. Care must be taken, of course, to avoid undue heat, which might damage the speech coil or some other part.

Systematic Testing

ALTHOUGH a complete series of articles is now being published in these pages on testing, it is important to remember that some system must be adopted when trying to locate a fault in a receiver. We recently heard of an amateur who had spent many hours trying to locate a fault which caused a complete stoppage of signals. He tested practically everything in the receiver without avail. Finally, a service engineer was called in and after a very short time located the trouble. The aerial lead was broken inside the insulated covering through which it passed.

Television Exhibition

THAT home of scientific interest, The Science Museum, South Kensington, is, so I am told by my friend Mr. G. R. M. Garratt, M.A., opening a Television Exhibition which will extend to September, 1937. Admission is free, and the Exhibition is open from 10 a.m. to 6 p.m. on Mondays, Tuesdays and Wednesdays; from 10 a.m. to 8 p.m. on Thursdays, Fridays and Saturdays; from 2.30 p.m. to 6 p.m. on Sundays; and from 10 a.m. to 8 p.m. on August Bank Holiday.

To the general public the development of modern television has seemed to have taken place suddenly. It has made its debut in an advanced state of perfection, unheralded, it has seemed, by the more usual process of steady development over a period of many years. This is actually far from the truth because the development of high-definition television actually commenced about ten years ago.

The technique of television, though related in some respects to that of sound broadcasting, is far more complex, and it would have been both useless and impossible to commence the public broadcasting of high-definition television until its development was properly completed. Research and development, therefore, have been in progress over a number of years, but the final completion and inauguration of a television service has, to the general public, come almost as a surprise.

Partly with a view to demonstrating that television has now emerged from the experimental stage, partly to illustrate the general principles which underlie the modern technique, and partly to foster the widest possible appreciation of television as a home entertainment, a special Exhibition has been organised by the Science Museum in co-operation with the British Broadcasting Corporation and the leading manufacturers.

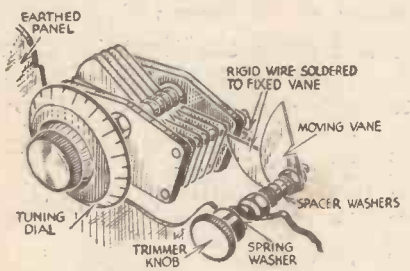
The exhibition incorporates an historic section dealing briefly with early proposals for television, and a number of exhibits describe the developments of the past ten years. There is a working demonstration.

A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — READERS WRINKLES — THE HALF-GUINEA PAGE

Easily-made Trimmers

THE accompanying sketch shows a trimmer which can be fitted together easily from parts of old components. I have two of these on my S.W. set, one with the tuning condenser, and with this one it only needs a simple adjustment to get right



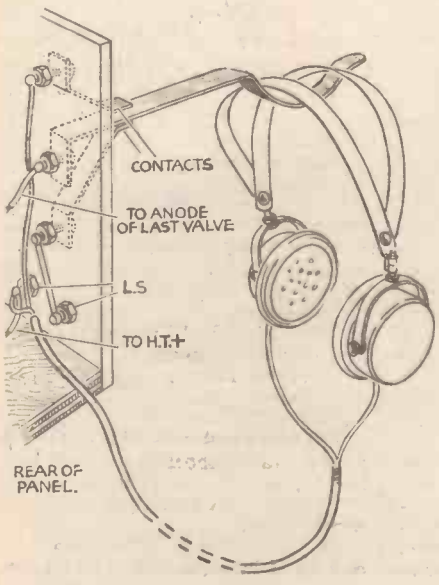
A trimmer, made from odd parts.

on the signal after using the main tuning dial. I find it invaluable on the crowded amateur bands. The other trimmer is on the reaction condenser, and with this one it is possible to add that little extra capacity that brings the signals to maximum. The latter trimmer can only be fitted in circuits where the reaction moving vanes are being earthed through the panel.—PETER STIRLAND (Heanor).

Change-over Switch for L.S. and 'Phones

IT is sometimes necessary to change over quickly from the loudspeaker to earphones. With this in mind I devised the following method of quick change-over. I procured a 6in. strip of thin, springy metal for the hook, and bent it into the required shape. For the two contacts I used pieces of brass, the distance between the hook and the contacts being ¼in.

It will be seen from the illustration that with the 'phones on the hook the loud-speaker is in circuit, but with the 'phones in use and the hook raised the output goes to the 'phones. It is best to bind some tape round the hook to save a possible short.—DAVID J. COMBER (Wembley).



A quick change-over switch for L.S. and 'phones.

An Improvised Stand-off Insulator

A NEAT stand-off insulator can be easily made as follows:—

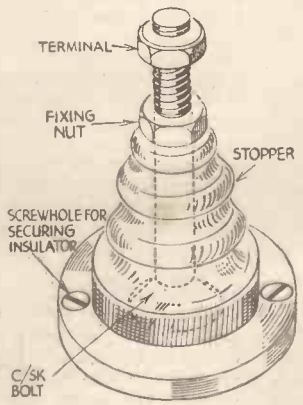
Obtain the stopper from an old lemonade or beer bottle, of the black, screw-on type, and drill a hole down the centre, as shown in the sketch.

A twist drill should be used for doing this, and the stopper should be placed in a vice while drilling, to prevent it from shifting.

Into the hole insert a bolt of suitable length, so that about ⅜in. projects from the other end.

A nut is then screwed on to hold the bolt in place, and a terminal also added.

The head of the bolt should be countersunk about ¼in. so that the stopper will stand firm, and also to prevent a short, should it be mounted on a metal chassis. Finally, a hole should be drilled, as shown, on either side of the stopper top to take the fixing screws. The sketch should make everything clear.—D. BAKER (Pitsea).



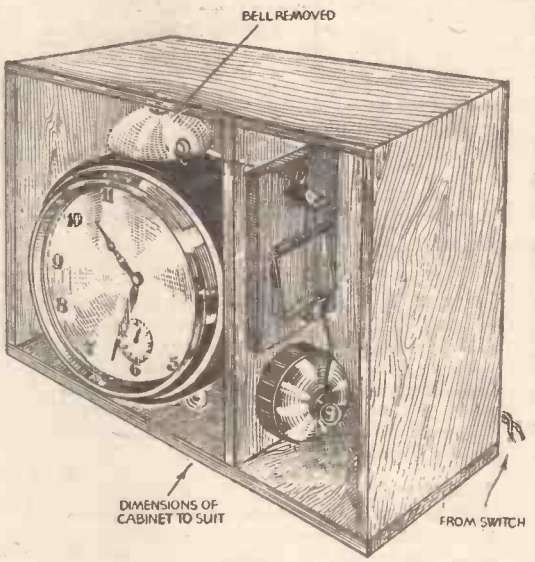
A stand-off insulator made from a bottle stopper.

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., Tower House, 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 wrinkles.

A Simple Time Switch

THE simple time switch, shown in the accompanying sketch, may be used in conjunction with a mains or battery-operated set, and can, if desired, be used with a remote control device. The main essentials consist of an alarm clock (the bell of which is removed), a penny "break-back" mouse trap, and a small tumbler switch. In the case of a mains switch, a brass-capped one is preferable to bakelite, as it is stronger, and the lever is surmounted by a knob, which enables a good connection to be made by means of a small length of brass chain, or wire, which can be soldered to the spring arm of the trap and the switch lever.

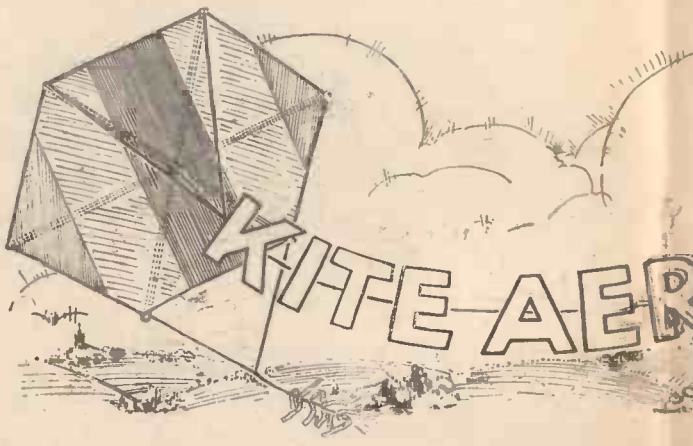


A simple and effective time switch.

The trap is mounted on a partition, as shown, and a hole drilled through the two, enabling the bell striker to be connected in a similar manner to the trigger release which normally holds the cheese.

When the alarm is set to the required time the bell striker pulls the trigger release which allows the spring to travel upwards, thus pulling the switch lever up with it. It may be found necessary to allow about an inch "play" in the connecting wire in order that the spring arm may gather sufficient impetus to operate the switch. The device may be arranged, of course, either to switch on or switch off the set; in fact, the switch, if desired, may be mounted on a rotatable block capable of being locked in the required positions.

The whole arrangement may be incorporated in a neat cabinet having a hinged back for making the necessary settings, with a hole cut in front to reveal the clock face.—WM. JUDD (Enfield).



A Brief Review of the Factors Governing Kite Aerials and Points in Erection and Flight Conditions are Given

THE efficiency of any kite aerial is immediately dependent on the behaviour of the kite itself, and whatever type of ground anchoring or biasing be employed, the ultimate degrees of steadiness, necessary for this type of aerial erection, can only be temporary and spasmodic. Therefore, manipulation of the kite line will, even under the calmest conditions, be necessary to countermand the possible slackening due to fluctuating wind pressures, and the main considerations prior to the flight of the kite should be as outlined below.

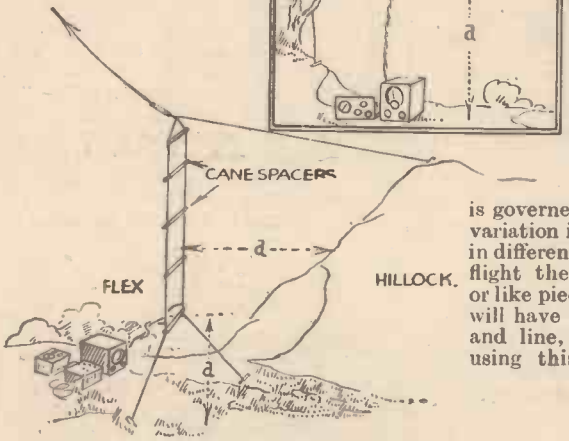


Fig. 1.—If weight has to be carried, as in the arrangements shown here, two or three kites may be needed to keep the system steady.

Weather Conditions

The wind should preferably be moderate, or slightly breezy. A gusty condition will not only make tests very discouraging, but be very damaging to the kite cover. The directional tendencies of the wind will also have to be considered, and a temporary flight of the kite will show the disposition of the upper air layers.

Vicinity of Tests

This is a very important factor since hills, tall buildings and structures may cause eddy currents, resulting in a possible violent termination of flight with a disastrous landing of the kite, but if tests are to be carried out under this type of condition, the major care should be in the "playing out" of the kite line whilst retaining a slight tension and releasing lengths of line as the pressure demands. In this way both "take off" and "landing" can be so accomplished that the kite, if of good design, will remain in flight even when within a matter of a few feet from the operator.

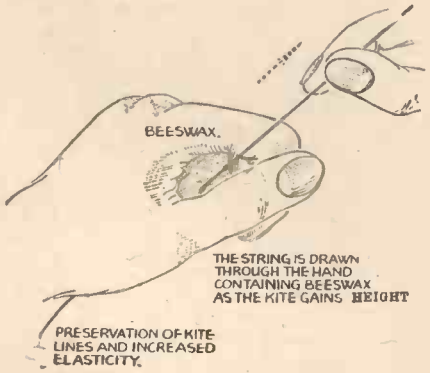


Fig. 2.—A kite line may be preserved by allowing it to run out through a piece of beeswax held in the hands.

The kite itself need not be greater than from 18 to 36ins. in diameter, and should be of the type offering the greatest area with the minimum of weight in cross members, etc. A good example is illustrated in the heading and the behaviour of this well-known model leaves very little to be desired.

Now the steadying of all kites is governed primarily by the tail, and any variation in the length of the tail will result in difference in response, so that for steady flight the fixture of a small handkerchief or like piece of cloth to the end of the tail will have the effect of steadying the kite and line, which is most necessary when using this for aerial anchoring, particularly when working the shorter wavelengths.

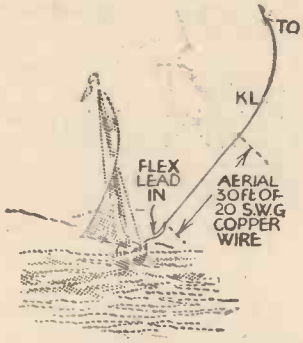


Fig. 3.—A short-wave aerial used in conjunction with a boat.

The Kite Line

This should be of strong but light gauge string, with a fair percentage of elasticity, and about 300 to 400 feet in length. Preservation of the lines and kite structure is another important point, since when tests are being carried out whilst the experimenter is, say, touring, it would be most disheartening to lose one's only means of aerial erection in an isolated spot due to the fraying or ultimate breaking of the main kite line, though not brought about by

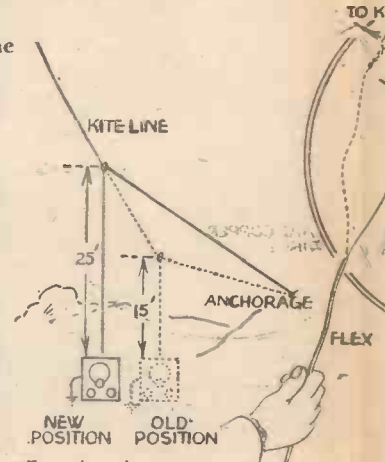


Fig. 4.—A suggestion for using short aerials for S.W. work.

NEW INDIAN BROAD

THE first of the new All-India Radio Broadcasting Stations will be in operation towards the end of this year, and the remaining ones will follow one after the other as quickly as they can be handled. New broadcasting centres will be inaugurated at Madras, Lucknow, Lahore, Trichinopoly and Dacca, comprising both studios and transmitting stations. At Madras a 10 kW short-wave station will be provided to give a long-distance service and a small 200-watt medium-wave transmitter located in the studio building to provide a service to the city of Madras. Medium-wave transmitters of 5 kW power will be provided near Lucknow, Lahore, Trichinopoly and Dacca.

The existing medium-wave stations at Delhi of 20 kW power, and at Bombay and Calcutta of 1.5 kW power, will be augmented by the addition of 10 kW short-wave stations to provide an All India Service. A second 5 kW short-wave station at Delhi is being installed for special transmissions.

Wavelengths for New Stations

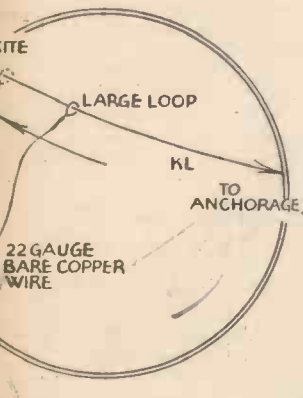
After extensive listening tests by the research department of All-India Radio with a view to find wavelengths for new Indian stations which would be free from interference at night from distant European medium-wave stations, the following wavelengths have been chosen:—

Medium Waves: Trichinopoly, 397 metres; Delhi, 340 metres; Lucknow, 295 metres; Lahore, 275 metres; Dacca, 257 metres; Bombay, 244 metres; Calcutta, 235 metres; Madras, 211 metres; and Peshawar, 200 metres.

The new short-wave stations will operate within the following wavebands, viz., 25, 31, 49, 60, 90 metres. None of the Indian stations will operate on the long wavelengths.

As the successful expansion of broadcasting in India, after the establishment of

nd Some Interesting
n This Article.



climatic conditions. Fig. 2 shows one method of preserving all lines leading from the kite.

There are numerous methods of anchoring, line biasing, ballast arranging, and stress eliminating, and two methods are clearly depicted in Figs. 6 and 7. It will be seen that in Fig. 6 the aerial wire is maintained horizontally by the employment of two stress lines S_1 and S_2, but the disadvantage of this method is the inconsistency in the tension resulting in "dipping," as indicated by the arrows, and unless a light gauge of wire is used, "crinkle" is bound to occur when the kite line KL slackens. An alternative method could be adopted, and this is illustrated in Fig. 7, whence it will be seen that a coiled type of aerial, permitting resilience and variation in strain, is more beneficial, although here again slackening of the kite line KL will cause sag and give rise to a variable capacity between antenna and earth, resulting in erratic signal control. Such a condition, however, is bound to arise in all aerials dependent on the stability of the kite.

Adjusting the Aerial Length

Among the different ways of lengthening or shortening an aerial without affecting the kite erection are two which necessitate little waste of time, and constitute possibly the best methods in kite antenna design, since quick tests at various levels above the ground may be accomplished, thus permitting signal strength logs to be compiled, as, for example, in short-wave work where distant transmissions are only received at certain heights above the ground. See Figs. 4 and 3.

Of the two types in question, the vertical aerial is more favourable for DX work, but for height and length, the aerial included in the kite line is predominant, and initial adjustments may be made simply from the point of anchorage, and any variation in direction can be effected with ease. The method of "working" the loop end of the vertical antenna wire along the kite line is novel, and on first consideration one would imagine that the wire would tend to slip back to the original position; this, however, does not happen, and an admirable aerial is obtained in this manner.

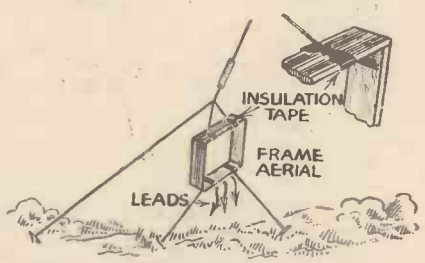


Fig. 5.—How to suspend a frame aerial so that it remains steady.

Di-pole Aerial System

Should a twin feeder doublet or di-pole aerial system be required, the principles

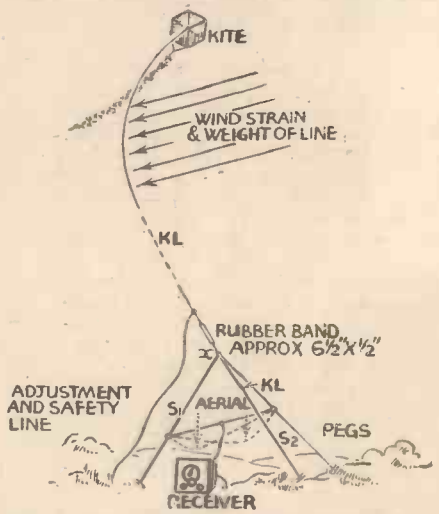


Fig. 6.—One method of anchoring the line and avoiding stress.

shown in Fig. 1 and inset could satisfactorily be employed, and in the event of there being an anchoring point for one end, as shown, high above the ground, this method would better the systems outlined in the opening paragraphs. However, the utilisation of trees or high structures necessitates care in erection inasmuch as the distances "d", as depicted in the diagrams, are arranged, and these should be as great as possible but with a minimum resultant "sag" in the aerial itself.

Another use to which kite lines are put is in the suspension of frame aerials and concave antennas in ultra-short-wave work, and numerous systems have been tried, some of which boast of two and three kites, and the inclusion of one such arrangement will show the basic principles adopted. This is clearly shown in Fig. 1.

Finally, it should be remembered that whatever dependency is placed on a kite so far as aerial erection is concerned, absolute stability is impossible, and short-wave reception may be erratic.

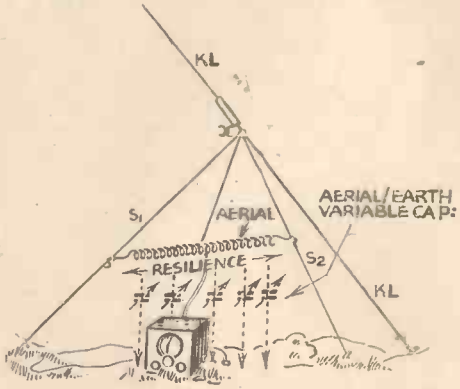


Fig. 7.—An alternative method of effecting a safe anchorage.

CASTING STATIONS

the new transmitting stations, will be to a great extent dependent upon the type of broadcast receiver available, and whether its price will be within reach of a sufficient number of people, All-India Radio has issued general requirements of three representative types of receivers which would be suitable for Indian conditions.

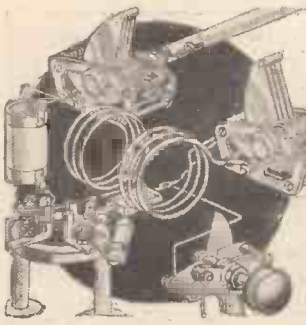
Types of Receivers

The first of these has been termed the "local receiver," which is intended for picking up the local medium-wave stations and, under favourable conditions, other medium-wave stations operating on wavelengths between 200 and 550 metres. This set must be of a minimum cost to be within reach of the greatest number of people.

The second type of receiver covers the medium-wave band and the short wavelengths which will be used in India. Three ranges should be provided: (*a*) 25 to 42 metres, (*b*) 40 to 100 metres, (*c*) 200 to 550 metres. The third type of receiver, or "All-wave Receiver," is the standard type at present available on the market. For Indian conditions, however, it is essential that the "All-wave Receiver" shall be capable of picking up a minimum wavelength of 13 metres and the wave range from 13 to 550 metres should be covered continuously without gaps.

With the opening of the nine new stations, with their respective transmitters for which orders have already been placed, there will obviously be a large expansion in the demand for wireless receivers in India, and the broadcasting authorities are endeavouring to ensure that receivers satisfactory both from the technical point of view and price range may be available to anyone in the country.

There is thus an excellent opportunity for radio set manufacturers who will take pains to supply receivers suited to India's growing requirements and her climatic conditions.



Short Wave Section

EXPERIMENTAL SUPER-REGENERATIVE CIRCUITS

In this Article Various Points Concerning Quality Reception Below 10 metres are Discussed. By S. C. CLARK

DURING the last couple of years, interest has been steadily increasing in that large band of frequencies below 10 metres. Two things have accounted for this, first, the growth of amateur transmissions on 5 metres, and, secondly, the television transmissions from the Alexandra Palace.

The amateur interest taken in the ultra-short wavebands has been mainly due to the fact that it has been possible to use extremely simple apparatus, both for transmission as well as reception. The progress of television, bringing with it the low gain 8 or 10 valve superheterodyne, having to cover a wide frequency range, has perhaps put rather a damper on the home experimenter's efforts to receive on the higher frequencies.

It is felt that there is still room for the simple super-regenerative receiver for ultra-high-frequency reception, particularly if it could be modernised and adapted for A.C. valves.

The writer has for some considerable time been carrying out experiments with all A.C. super-regenerative receivers for the possibility of long-distance television reception, although in this respect the results may be said to have been slightly disappointing. Nevertheless, the circuit arrangement worked so well, at times bringing in the 10-metre police stations with such strength that it was thought well worth describing.

From the circuit diagram, Fig. 1, it will be seen that the detector valve of a super-regenerative circuit is connected through an I.F. transformer to the succeeding circuits of a normal superheterodyne receiver. This is quite a straightforward proceeding, although the possibilities seemed to have been somewhat missed by the amateur in the past.

Simple To Build

The super-regenerative circuit itself consists of a Hartley oscillator, anode modulated by a separate quench valve. This circuit is very simple to build, and gives the greatest flexibility of adjustment combined with, if necessary, quick coil changing if it is desired to cover the 5- and 10-metre bands.

The circuit constants, with the exception of the tuning condenser and coil, are not very critical. A tuning condenser with a 35 micro-microfarad capacity will be perfectly suitable. A 4-turn coil will cover the 5-metre amateur band, and an 8-turn coil will cover the 10-metre band down to possibly 6 metres.

With this circuit it must be remembered that the coil should be mounted directly on its tuning condenser, and the leads to the anode and grid of the valve should be very short. The tap on the coil can be taken to the centre; this also will not be found to be critical.

Suitable valves are the A.C./H.L. type, though in the quench circuit a small A.C. power valve may be used with advantage. When the circuit is being tried out a certain amount of hum may be experienced, in which case a .1-microfarad condenser should be connected across each half of the filament transformer to the centre, though it was found that no more hum troubles were experienced than on the normal short-wave bands.

When the ultra-short-wave set is being connected to the standard superhet, it is important that the lead from the I.F.

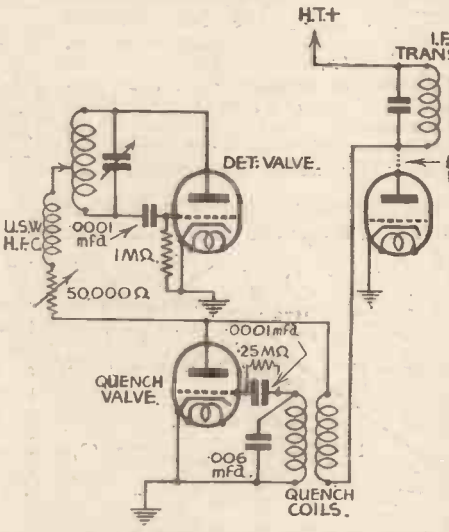


Fig. 1.—A super-regenerative circuit for feeding into a standard superhet receiver.

transformer to the anode of the original detector valve should be broken; this will, of course, isolate the superhet detector stage, leaving the I.F. and L.F. portions of the receiver free for amplification of the ultra-short-wave signals.

Self-quenching Circuit

Fig. 2 shows a self-quenching type of circuit that was also found to be very efficient in the above arrangement, the only point was that it was not possible to obtain such a smooth control of the quench regeneration. Actually, it had a slightly greater sensitivity than the circuit first described. Also, it was found better to tap the aerial direct on the grid coil; with the circuit of Fig. 1, a loose-coupled coil gave the best results, particularly with an aerial of the dipole kind. These may seem small points, but they are very important when operating these circuits on the ultra-short waves.

In operating this super-regenerative superhet, the hiss due to the quenching action will naturally be very loud, depending on the amplification of the superhet portion of the receiver. Yet, when a carrier is being tuned in the quench noise will completely disappear in the usual manner. This was amply demonstrated when listening to a 14-metre American broadcast station in daylight, when the almost perfect A.V.C. action, which is a natural property of the super-regenerative receiver, was very apparent.

In tuning this receiver circuit there will, of course, be second channels at various points on the dial, which, it must be remembered, will be indicated in the usual way by the stopping of the quench noise. These may also be produced by harmonics of the quench valve beating against the detector, which is in an oscillating condition.

Receiving Alexandra Palace Transmissions

It was said at the beginning of this article that results with this circuit arrangement were disappointing as far as television was concerned, but this referred to tests carried out at a distance of over 100 miles from the Alexandra Palace. A super-regenerative superhet will most certainly give a very much louder signal than a straight two or three-valve receiver, for those who are within reasonable distance of the television transmissions. Such a receiver circuit is naturally only suitable for the sound transmissions, but with careful tuning the quality of the sound reception can be made equally as good as that obtained from the normal broadcast set; the super-regenerative circuit has always been alleged to give bad quality, but this is not true.

Considering the amplification that can be obtained on the ultra-short waves with the above circuit arrangement, it might be wondered why long-distance reception on the higher frequencies does not become very much easier. The whole trouble is that satisfactory amplification cannot be obtained at signal frequency. The super-regenerative circuit, for instance, requires a certain signal strength from the transmitter, otherwise nothing at all will be heard; in other words, the signal either comes in or it doesn't, there is no tailing off in volume between the loudest and weakest signals as in normal practice.

To attempt to boost the detector input with an H.F. stage invariably brings about a decrease in amplification. This is partly due to the fact that a great deal of energy gets by-passed in the H.T. and L.T. leads to the power supply. Unfortunately H.F. chokes and by-pass condensers do not help a great deal on these ultra-high frequencies. Valve efficiency is also poor, though one manufacturer recently has put on the market battery valves designed for short and ultra-short-wave reception. There is a very great need for a mains valve that will give real high gain below 10 metres, together with special equipment for this type of circuit.

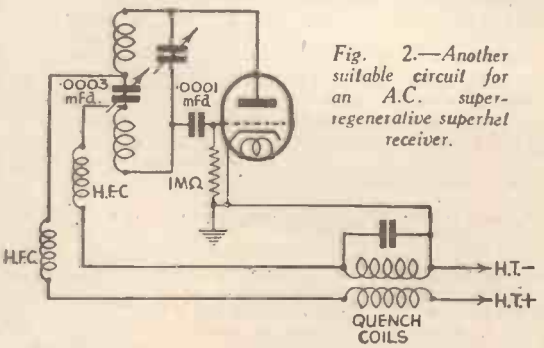


Fig. 2.—Another suitable circuit for an A.C. super-regenerative superhet receiver.

Leaves from a Short-wave Log

Broadcasts from Down Under

SLIGHT alterations have been made in the timing of the VK2ME, Sydney, programme schedule. During June the station will transmit every Sunday from G.M.T. 06.00-08.00, 10.00-14.00 and from 15.30-17.30. The channel used is 31.28 m. (9.59 mc/s). VK3ME, Melbourne, working on weekdays only, will continue to broadcast from G.M.T. 09.00-12.00 on 31.55 m. (9.49 mc/s). VK3LR, Lyndhurst (Victoria), on 31.32 m. (9.58 mc/s), may be heard daily from Monday to Friday inclusive, from G.M.T. 08.15-12.30, and on Saturdays (irregularly), from G.M.T. 03.00-12.30. The interval signal is the song of the Australian lyre bird which, as a rule, opens the programme; at midnight (local time) chimes are relayed from the Melbourne Central Post Office clock. VK5DI, Adelaide, a newcomer to the ether, is testing on 21.42 m. (14.01 mc/s), on Sundays, between G.M.T. 03.15-06.45, relaying VK5AD, Adelaide; it uses occasionally 41.24 m. VK6ME, Perth, operating on the same channel as VK2ME, has been picked up between G.M.T. 11.00-13.00; it does not work on Sundays.

New International Prefix

So far amateur experimental transmitters located in the Belgian Congo have used the same prefix for their calls as their Belgian colleagues—namely, ON; in future the International prefix will be OQ, to distinguish them from those in the Motherland.

Algiers Testing on Short Waves

Experimental transmissions of a relay of the *Radio Alger* (Algiers) programme, on 318 m. (941 kc/s), have been carried out on 24.75 m. (12.12 mc/s) and 33.48 m. (8.96 mc/s). In future any radio entertainment from the medium-wave station likely to interest listeners overseas will be simultaneously broadcast on one or both of these short-wave channels. Reports of reception should be addressed to: *Direction des Services Techniques Régionaux et Spéciaux*, 137, *rue de Constantine, Algiers* (*North Africa*).

Is It a Printer's Error?

According to a North American paper the power of COCQ, Havana (Cuba), now reported on 31.78 m. (9.44 mc/s) is to be raised to 25 kilowatts. Probably this should read 2.5 kilowatts.

Radio Gdynia

German listeners state that experimental broadcasts have been picked up on 24.37 m. (12.31 mc/s) at around G.M.T. 19.30, and which were identified as emanating from a new Polish station, SPF, situated at Gdynia, on the Baltic.

Good Health and Good Luck from Siam

HS8PJ, Saladeng, Bangkok (Siam), on 32 m. (9.35 mc/s) gives out its announcements in Siamese, French, and English, but the last language is the one most used for its Thursday broadcasts between G.M.T. 14.00-19.30. A news bulletin in English often constitutes the first item in the programme. The interval signal consists of three flute-like notes on an ascending scale. The announcer on closing down may wish you a simple "Good night from Siam," but when I last heard him it was coupled to two extra wishes, namely, "good health and good luck."

Three Portuguese Broadcasts

From three different sources programmes are now obtainable from Lisbon. The National transmitter, CSW, uses two channels, namely, 27.28 m. (10.995 mc/s) for its daily broadcast from B.S.T. 18.00-24.00, and 31.41 metres (9.55 mc/s) from 00.10-02.00. CT1AA, Radio-Colonial, Lisbon, is now on the air from B.S.T. 21.00-24.00 on Tuesdays, Thursdays, and Saturdays on 31.09 m. (9.65 mc/s), but also occasionally tests on 24.75 m. (12.12 mc/s), and on other channels. Listeners also report the reception of programmes from *Radio Catolica Portuguese* on 50.25 m. (5.97 mc/s); this station would also appear to be situated in the Portuguese capital.

The Prague S.-W. Transmissions

The present schedule carried out by the Podebrady-Prague station is as follows: OLR5A, 19.69 m. (15.23 mc/s) B.S.T. 12.55, news, orchestra; 13.20, 14.00, and 14.20 news and concerts. Closes down at 14.45. At B.S.T. 19.30, OLR4A on 25.34 m. (11.84 mc/s) takes over the programmes with transmissions at 19.40; 20.00, 20.20 and 21.00, when through OLR3A the wavelength is switched over to 31.41 m. (9.55 mc/s) and broadcasts are carried out until 22.00.

On the Ultra-shorts

The U.S.A. Federal Communications Commission has issued licences to a number of stations desiring to broadcast on channels below 10 m. Most of these have been authorised to use three frequencies, namely, 31.6 mc/s (9.5 m.); 35.6 mc/s (8.4 m.) and 38.6 mc/s (7.720 m.). The principal stations now operating are: W2XDO relaying WABC, New York (Columbia key station); W3XES (WCAO) Baltimore; W4XCH (WMC) Memphis; W6XKG (KCFG) Los Angeles; W8XAI (WHAM) Rochester; W8XH (WBEN) Buffalo; W8XWJ (WWJ) Detroit; W9XAZ (WTMJ) Milwaukee; W9XPD (KSD) St. Louis; W9XAZ, although announcing 26.4 mc/s, would appear to be working on 26.6 mc/s; it was previously advertised on 31.6 mc/s (9.5 m.).

Denmark's S.-W. Transmissions

Within the next few weeks OXY, Skamlebaek, on 5 kW. will start broadcasting special programmes between B.S.T. 02.00-05.00. From 02.00-03.30 the transmissions will be directed to South America and the Far East; from 03.30-05.00 to the United States and Canada for the benefit of Danish residents overseas.

Worthy of Your Log

If a search be made between G.M.T. 22.45-23.00, on 31.58 m. (9.5 mc/s) you may capture a test from a new Dominican Republic short-wave station giving out the call *Emisora H15G en Concepcion de la Vega*. It has been trying out the channel usually associated with HJ1ABE, Cartagena (Col), and PRF5, Rio de Janeiro (Brazil).

Romania Tries Out a New Frequency

Listeners report having heard a test carried out by a transmitter at Bucharest (Romania) on several evenings recently at about G.M.T. 19.45. So far the actual wavelength used has not been definitely fixed, but it would appear to be in the neighbourhood of 19.90-20 m. (15.075-15 mc/s). No mention of this station is made in any official list.

TRANSMITTING TOPICS

The Subjects Dealt With in This Article Include Telegraphic Modulation, Keying Filters, and Remote Keying Controls - - - By L. ORMOND SPARKS

WHEN modulation is being considered, it is quite a common thing to think of additional frequencies being superimposed on the fundamental or carrier frequency, and one is inclined to apply the term to telephony only, overlooking the fact that modulation also takes place during telegraphic transmissions.

When it is realised that "*amplitude*" *modulation* is the form most widely used, it will be more readily appreciated how the operation of the key during Morse radiations produces the desired effect, especially if Fig. 1 is considered.

The curve (Fig. 1) shows the graphical representation of a carrier wave, i.e., having constant amplitude or, in other words, unmodulated.

If the key is now operated to send, say, the letter "B," *dash dot dot dot*, the resultant effect is similar to that shown by the curve in Fig. 2, the dotted lines indicating the shape of the modulation envelope.

It is quite possible for the waveform, or the shape of the modulation envelope, to be a distorted reproduction of the ideal, due in the majority of cases to the lack of a key filter, or the use of one of poor design, unsatisfactory regulation in the H.T. supply, or the type of keying arrangement used. In certain circuits, the current will rise and fall too rapidly, producing a waveform as indicated by Fig. 3, while "peaks" are often present (Fig. 4) when poor regulation of the H.T. supply is present.

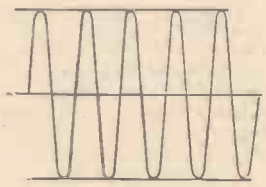


Fig. 1.—Diagrammatic representation of an unmodulated carrier wave.

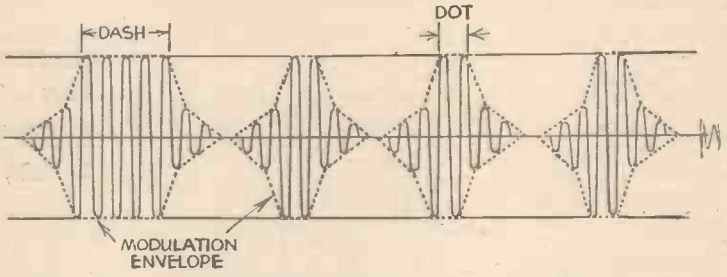


Fig. 2—Diagram showing the effect of the letter "B" in modulating the carrier.

With regard to the waveform shown in Fig. 3 it is highly probable that interference will be caused to nearby receivers—even those tuned to ordinary broadcast wavelengths—in the form of key clicks; therefore it is very desirable to avoid such distortion of the waveform.

Keying Filters.

With the keying circuits given in the previous article, the trouble can be eliminated by the use of a suitable keying filter, but, if primary keying is employed, then it will be necessary to give particular attention to the capacity of the smoothing condensers.

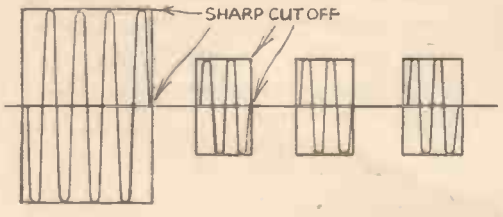
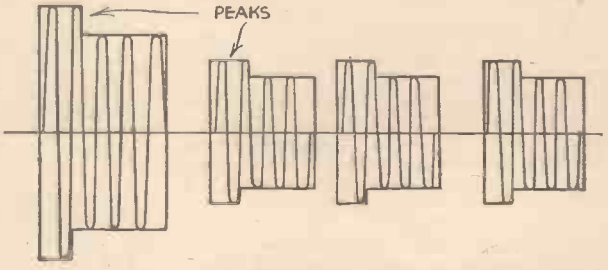


Fig. 3 (left)—In some arrangements a sharp cut-off will be obtained, whilst if poor regulation of the H.T. supply is provided, peaks will be produced as shown in Fig. 4 on the right.



A simple but very effective filter is shown in Fig. 5. The L.F. Choke "L" should have an inductance between 10 and 20 henries. In low-powered outfits, a lower value will often prove quite satisfactory; in fact, the primary of quite a small mains transformer will do or, if one is inclined, it is not a difficult matter to make up the component from the junk box.

It will be remembered by those who have read previous articles relating to the design and objects of L.F. chokes, that the inductance provided by the winding and core has the property of opposing sudden current changes, and use is made of this in the keying filter.

When the key is closed, a certain amount of energy is stored in the inductance, and the electromagnetic field, of the choke, but when the key is opened the energy will be discharged, so to speak, back into the circuit.

If the current in the circuit is of appreciable value, the sudden release of the stored energy will, no doubt, cause sparking at the key contacts which will not only harm the contacts but also kill the object of the filter, as such sparking would cause interference.

To overcome this little snag, it is only necessary, fortunately, to connect a condenser across the key contacts, the capacity depending on individual conditions. Values between .25 mfd. and 2 mfds. should be tried.

Eliminating Sparking

It will be appreciated that the condenser really prevents a sudden cut-off or cessation of the power, thus tending to round off the corners (Fig. 3) and eliminate sparking at the moment the key is opened.

If the circuit is now considered with the key open, it will be clear that if voltage is present across the key contacts when the key is open, the condenser will receive a charge; therefore, when the circuit is closed again, the charge will tend to produce sparking at the contacts. If, however, a suitable resistance is wired in series with the condenser, most of the trouble will disappear, as the energy will be absorbed by the resistance.

It is impossible to give hard-and-fast values, as so much depends on individual circuits and arrangements, therefore, it will be necessary for experiments to be made to determine those most suitable. Anything from a 100 to 1,000 ohms may be necessary. In fact, it is a very wise idea to make the resistance variable.

Remote Controls

A very interesting subject after, of course, one's outfit is working satisfactorily, is the design of suitable controlling devices to enable the transmitter to be operated from some remote point.

While in the majority of cases such arrangements are not necessary, conditions often force the station owner to house the transmitter in a site not always ideal or suitable for the operating table as well.

It may be that the transmitter proper is housed in the cellar, attic or in an outbuilding, and that the receiver is situated in a room more congenial as regards personal comfort, and more suited to receiving aerial arrangements. Under such conditions a remote control is, to say the least, most valuable, as it allows one to operate in comfort which also means better concentration and more hours "on duty." It is not intended in this article to deal with the numerous forms of remote control, but to suggest individual experiments along the lines of the simple arrangement shown in Fig. 6, the number of relays being adjusted to suit local conditions.

Twin Relays

In the circuit shown it will be noted that only two relays are provided, one being used to bring the transmitter into operation, and the other to replace the key at the transmitting end of the control line.

One or two batteries can be provided to supply the energising current for the relays, it being better to use two if the control line is long, and its resistance sufficient to produce an appreciable voltage drop.

The relay "R1" must be so designed that it will operate at a lower current value than "R1 2," and it is necessary to select

the resistances "R" and "Rk" so that sufficient current to operate "*R1*" *only* flows when the switch "S" is closed.

The relay "R1 2," requiring a higher current than "R1," will not, of course, operate when the switch is closed, but as soon as the key "K" is closed the resistance "Rk" is short-circuited, thus allowing an increase in current in the

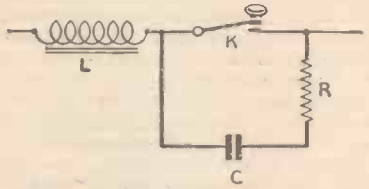


Fig. 5.—A simple keying filter circuit.

circuit, the value of which is sufficient to cause "R1 2" to come into action.

Knowing the current required for each relay, the values of the resistances can be calculated quite easily for a given energising voltage, bearing in mind the resistance of the line and the relay windings.

If so desired, "R" and "Rk" can be of the variable type, thus allowing easy adjustment and compensation to be made when the supply voltage drops.

Master Switching

The relay "R1" is intended to operate the master switching of the transmitter, and it will depend on the type of relay

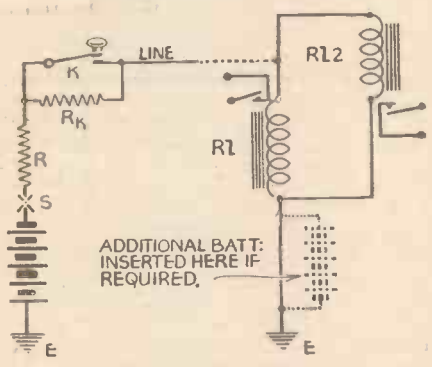


Fig. 6.—Keying may be effected from a distance through a remote-control circuit such as is shown here.

used, and/or the switching arrangements, whether it is carried out by "R1," or with the aid of additional relays.

The actual making and breaking of the keying circuit at the transmitter end of the line is carried out by "R1 2," which is wired in the normal keying circuit in place of the more usual key.

It will be appreciated that it is essential for good relays to be used, particularly in the case of "R1 2," otherwise, if poor contacts and adjustments are embodied, very unsatisfactory keying will result.

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.

Darenth Valley Radio Club

THE above club has held three successful meetings. All classes of radio have been catered for, but the chief topic is short-wave work, the fundamentals of which are being explained by the Chairman, who also proposes to form a morse class. Those interested in the above, and also in amateur transmitting, should write for an application form to the Hon. Sec., K. N. Hollands, 14, Highfield Cottages, Wilmington, Dartford, Kent.

Proposed Short-wave Club for Slough

A NUMBER of young enthusiasts are desirous of forming a short-wave club in the Slough district. As none of them are yet 16 years old they would be glad to get in touch with older amateurs who could offer suggestions concerning the formation of a club. Interested readers are invited to communicate with Mr. J. Gilbert, 26, King Edward Street, Slough, Bucks.

BRIEF RADIO BIOGRAPHIES—10

By RUTH MASCHWITZ

Jean Colin

JEAN COLIN had no idea of going on the stage until Ralph Lynn's niece, who was in ballet, came to stay opposite her home in Brighton. Six weeks later Mary Lynn had taught Jean classical dancing, and for a joke the latter went for an audition in pantomime. The result was that she and Mary both appeared in the Brighton "Cinderella."

Jean's next experience of an audition was in London. She had a call to appear at a theatre and went in her simplest dress. She was dismayed to find that everyone else was garbed in silks and satins. In sheer panic she was just about to creep out when her name was called. Trembling in every limb she went forward and sang her song. The manager—de Courville—called her aside when she had finished and said: "You'll do; I'll pay you six pounds a week!" Jean was overwhelmed and when she could speak, murmured, "Shall I be in the chorus?" To her great discomfort, de Courville roared with laughter and said, "I'm afraid I don't pay my chorus girls as well as that!"

She told me about an incident that occurred when she played in "Cinderella" again a year or so ago, but this time in the name part. During the banqueting scene a dish was brought on with a cover which was removed with a flourish. Underneath was a kitten. One night the animal got bored with this procedure, so that when Cinderella made her entrance down a flight of steps to meet the Prince at the ball, the kitten followed just behind. Instead of an appreciative hush, Jean was horrified to be received with yells of laughter!

After engagements in various touring companies, Jean began film work, and has subsequently appeared in numerous musical shows in London, including "Many Happy Returns," "The Five O'clock Girl," "Sweet Seventeen," and "It's You I Want."

RADIO FAULT TRACING—3

INSTABILITY will manifest itself in the form of whistling, howling, or motor-boating. In the case of the superhet receiver, however, there are a number of whistle possibilities not associated with instability, but these will be dealt with separately in a later article.

It is well to keep very much in mind, when endeavouring to locate the cause of receiver instability, that there are certain components and certain features of assembly design deliberately introduced for the purpose of preventing instability; consequently when instability does occur these items should be gone over very thoroughly.

There are various ways in which instability can occur, but there is one fact common to all cases, and that is there must be one circuit which is producing an A.C. e.m.f. in another circuit. Thus, unwanted couplings of some kind or other must be ferreted out and "killed" if the instability is to be cured. Now, two circuits will couple together if an alternating magnetic field, or an alternating electric field, of one links with the other; also if there is some impedance which is so connected that it is common to the two circuits.

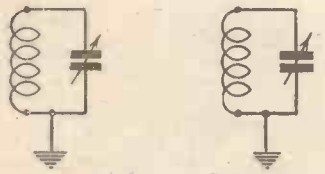


Fig. 1.—Two H.F. circuits which may need decoupling.

Decoupling Methods

Decoupling resistances and condensers are provided to cut out the couplings that would be set up between circuits by the impedance of a common H.T. supply, etc. Screening cans, screening partitions, and screened sleeving are introduced to cut out inductive couplings; also certain leads may be well spaced, and some kept to a minimum of length with a view to reducing unwanted couplings to a negligible value. Also, certain by-pass condensers will play an important part in preventing instability.

An open-circuited decoupling or by-pass condenser is easy to trace, as a test with another condenser in shunt will remove the effect of the fault. As a matter of fact, whenever instability is experienced it is a good plan, as a first move, to work round the chassis, shunt-testing all "likely" condensers. The contacts between screening cans, screening partitions, and the chassis should be checked; also the contacts between screened sleeving and chassis. Decoupling resistances should not be overlooked, and H.F. filter coils and condensers should be tested.

Elusive Faults

Should the fault prove to be elusive the following notes may contain the key to the solution:—

The fact that two H.F. circuits may be shown in the receiver's theoretical diagram as completely separate does not necessarily mean that in the receiver itself they have no common part. If each of the two circuits has one side earthed it may well be that there is a wire in the chassis assembly which is a common earthing wire

In this, the Third Article of the Series, Decoupling Troubles, and Various Methods of Testing Fixed Condensers are Dealt With

for the two circuits. The designer will have seen to it that, under normal conditions, this wire has insufficient resistance to form an appreciable coupling between the two circuits. Suppose, however, that bad contact develops at either end of the wire, then there is quite a possibility that one effect of the resistance introduced will be to couple up the two circuits sufficiently to cause trouble. If Fig. 1 represents the two circuits then Fig. 2 may represent the arrangement as it holds in the receiver itself. Should the common "earth" of the two condensers develop an appreciable resistance the arrangement is then as shown in Fig. 3, in which obvious coupling exists between the two circuits. If all "earthing" bonds are regarded as potential danger points, and given close attention, any such fault should not cause any bad delay in fault clearance work.

Any radical displacement of the wiring of H.F. circuits is apt, in some cases, to cause instability. This point, however, will probably need consideration only if there have been any component changes made in the receiver. A broken connection between the coating of a metallised valve and the valve pin is one of those often overlooked faults which will sometimes be responsible for instability.

Testing Fixed Condensers

A fixed condenser may be faulty in one of the following respects: internal short circuit, internal open circuit, excessive D.C. leakage (i.e., resistance between

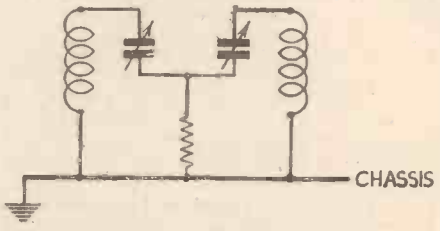


Fig. 3.—Showing how a common earth can couple the two circuits through the resistance set up in the defective connection.

terminals "down"), incorrect capacity value, power factor too high.

To take the last item first, the question of testing for power factor does not usually worry the average service engineer who has limited testing gear. He usually relies on substitution checking to help him if he has any suspicions regarding a condenser on this score. An internal short-circuit is easy enough to locate as a simple ohmmeter test will reveal the fault.

Excessive D.C. leakage at low voltages will also show up on an ohmmeter test, but care should be taken that shunt circuits do not give rise to false indications if test is made while the condenser is still in place and connected up in the receiver. There is always the possibility that a condenser which proves to be in order on a low voltage test may develop excessive D.C. leakage at a higher voltage, and a test with a milliammeter connected in series with the condenser under working conditions may show trouble. With such a test as this, however, all due precautions should be taken to guard against meter damage.

For routine testing of condensers (as separate items) for excessive D.C. leakage a source of D.C. (batteries or an A.C. H.T. eliminator) is most useful on the service bench. A milliammeter should be joined in series with the condenser and the D.C. source together with a series resistance of sufficient value to restrict the current to the value of the maximum meter reading, should the condenser choose to short. Alternatively, a voltmeter could be used, in series, as a current indicator. In this case the voltmeter range should embrace the voltage of the testing supply. In the case of electrolytic condensers it must be remembered that these have polarity and that any test voltage, including even that of a simple ohmmeter test, should be applied in the correct sense.

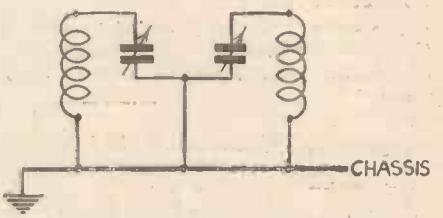


Fig. 2.—How the two circuits are connected in the receiver.

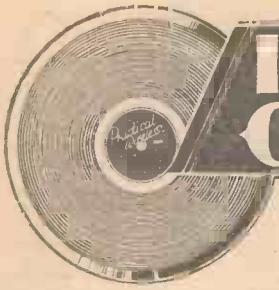
Capacity Values

An internal open circuit can easily be detected if the condenser is of large capacity, but it is not such an easy proposition if the condenser is of small value, unless a capacity tester is available. In the latter event, of course, it is simply a matter of testing for capacity value.

Assuming that a capacity tester is not available, an ohmmeter test of high capacity condensers will show whether or not there is an internal disconnection. If the condenser is in order, the pulse of charging current taken from the ohmmeter's voltage source will give a noticeable "kick" of the needle when the test leads are applied to the condenser. If the needle kicks over and then falls back it is a sign that the condenser has taken a charging pulse and therefore cannot be internally disconnected. The difficulty with the testing of small capacity condensers by this method is that the charging pulse is too small to give any noticeable indication on the normal type of ohmmeter. Fortunately, a shunt capacity test with the suspected condenser connected in the receiver will overcome any difficulties that may arise in this way.

Checking for incorrect capacity value is an awkward proposition as far as accurate tests are concerned unless a capacity tester is available. Assuming the absence of a capacity tester, the matter is not so serious as it may perhaps seem, because actually it is only with fixed condensers used for high-frequency adjustment, tracking, etc., that critical values are necessary. In those cases, of course, a good capacity tester should be used.

(To be continued.)



IMPRESSIONS ON THE WAX

By T. Onearm

Parlophone

RICHARD TAUBER is again prominent in the new Parlophone releases, and has chosen for his latest records four tunes from C. B. Cochran's new production "Paganini." They are "Girls were made to Cling and Kiss" and "Beautiful Italy" on *Parlophone RO* 20338, and "Nobody Could Love you More" and "All my Soul Comes out of Hiding" on *Parlophone RO* 20339.

Fascinating and melodious tangos—in strict dance tempo, no vocal—are played by Heinz Hupperty and his Orchestra—"San Fernando" and "Punto Arenas" on *Parlophone R* 2343, and Roberto Firpo Orquesta Tipica have recorded "Loco Lindo" and "Arrepentido" on *Parlophone OT* 151.

A Shirley Temple Medley

A MEDLEY of Shirley Temple songs is recorded by the Henderson Twins on *Parlophone F* 779, and "Hutch" has made a record of the song he sung in his Coronation broadcast, "Where is the Sun?" on *Parlophone F* 790. On the other side of this record he sings "Tomorrow is Another Day."

Harry Roy and his Band have made three interesting records introducing most of the latest hit tunes. They are: "The Love Bug will Bite You" and "Let's Swing It" on *Parlophone F* 778, "All's Fair in Love and War" and "With Plenty of Money and You" on *Parlophone F* 780, and "Let's Put our Heads Together" coupled with "Speaking of the Weather" on *Parlophone F* 781.

Decca and Brunswick

RALPH READER, the well-known West End producer, who is even better known as the guiding spirit behind the "Gang Shows," makes his debut this month on two Decca records. As might be expected, the songs he has chosen, "That Song in My Heart" and "With a Twinkle in Your Eye"—*Decca F* 6381, and "Birds of a Feather" and "The Crest of a Wave"—*Decca F* 6382, are from the screen version of "Gang Show."

Another fine selection of tip-top tunes played by Ambrose and his Orchestra appear in the new Decca list. The latest rage of America, "The Love Bug will Bite You" is coupled with "Sailor where Art Thou?" on *Decca F* 6374, and the newest hill-billy "Across the Great Divide," with Sam Browne singing in fine fettle, and "I Need You," is featured on *Decca F* 6375.

From the Films

THE popular band leader of the Café de Paris, Lew Stone, presents the hit tune from "The Jungle Princess," "Moonlight and Shadows," together with a catchy little melody "In the Sweet Long Ago," on *Decca F* 6376.

Bing Crosby gives a great rendering of an Hawaiian song from his latest picture "Wakiki Wedding." "Sweet Heilani" (pronounced Hay-lah-nee) is about the most beautiful and effective Hawaiian vocal that can be imagined, with a native orchestra playing and crooning a soft accompaniment in the background. The song starts with two native soloists before Bing Crosby takes up the haunting melody. On the other side of the record—*Brunswick* 02412—is "The One Rose."

"Don't Let Old Age Creep on You" and "Yes-suk" on *Brunswick* 02407 is the second record made by The Ink Spots (the first was issued in October, 1936). The dusky quartet present plenty of style and should appeal to all lovers of good male quartet singing.

H.M.V.

THIS month Paderewski records some Chopin, the greatest of the Polonaises, the "Heroic," in A flat, Op. 53, on *H.M.V. DB* 3134, which is particularly noteworthy for its remarkable four-note figure for the left hand. Although this great pianist is 76, his performance is really remarkable.

Eric Coates's "Summer Days Suite" has been a favourite for some years in light orchestral programmes. It is recorded by the Light Symphony Orchestra and conducted by the composer on *H.M.V. C* 2901. Barnabas Von Geczy's Orchestra plays two attractive tangos, "Cari Mari" and "Monika," on *H.M.V. B* 8560.

Lehar's new operetta, "Paganini," has some very good tunes, which can be enjoyed in the selection played by Alfredo and his Orchestra on *H.M.V. B* 8559.

"Globe Trotting with the Tiger" is a comedy number describing the adventures of the famous tiger of "Tiger Rag" on a trip round the world, in which he gets hopelessly involved with the music of various nationalities. It is played by the New Mayfair Orchestra on *H.M.V. BD* 421.

"Lilac Domino"

A SELECTION from "Lilac Domino" is played by the London Palladium Orchestra on *H.M.V. C* 2900. It will be remembered that when it was first produced on the stage this was one of the outstanding war-time successes and it has now been transferred to the "talkies." There are also selections from two recent films, "Splinters in the Air" and "Take My Tip," played by Louis Levy and his Gaumont British Symphony on *H.M.V. BD* 425.

Reginald Foort plays his own signature tune, "Keep Smiling," and the "A.B.C. March," which will no doubt be familiar to all radio listeners, on the new B.B.C. Theatre Organ on *H.M.V. BD* 424.

Fine Vocal Records

ADMIRERS of Gigli will be pleased with his latest record of two Spanish songs in characteristic national rhythm—"Ouisiers Alvidor tus ojos" (tango) and "Eres Tu" (bolero), on *H.M.V. DA* 1295. Kirston Flagstad shows her versatility by singing two of Grieg's songs in Norwegian—"Lys hat" (Bright Night) and "Der Gynger en Bad Pa Bolge" (There goes a boat on the waves), on *H.M.V. DA* 1515.

Lawrence Tibbett's latest record is of (to us) a new setting of Kipling's poem, "On the Road to Mandalay," by the American composer, Oley Speaks, on *H.M.V. DB* 3036.

Facts and Figures

COMPONENTS TESTED IN OUR NEW LABORATORY

Brentford Condensers

BRENTFORD TRANSFORMERS, LTD, have sent us a sample of a new tubular condenser which they are marketing, and which possesses some interesting features. The condensers are non-inductive and are mounted in moisture-proof cases, furnished with wire ends. The ends of the foil are attached to these wire ends by means of solder, apparently poured over the end of the condenser after it is placed inside the case, thus ensuring that every turn is short-circuited and a true non-inductive assembly so obtained. The bakelised tube is a very close fit and leaves no air space between the internal parts, thus preventing condensation and other troubles, whilst the ends are sealed with a wax medium after the process of assembly is completed. The manufacturers inform us that the condenser is subjected to a heat process that solidifies the wrapping under vacuum before a further impregnation process takes place, and thus the condenser is rendered safe against all normal atmospheric influences for a considerable period. The samples submitted were tested and found to be quite satisfactory in use after tests to prove their method of assembly, and the wire ends are rigidly held and will not break adrift. This firm can also supply power-factor types, interference-suppressor types and mica dielectric for all purposes.

Radio Service Depot

WE are asked to point out that the Radio Service Depot of Cork has now moved to larger premises, and will now be found at 24, Marlboro' Street, where all communications should be sent.

Ostar-Ganz—Change of Address

THE offices of Ostar-Ganz Universal High Voltage Valves, and of the Universal High Voltage Radio Company, have been transferred to Goschen Buildings, 1-13, Henrietta Street, London, W.C.2. The works remain at 42, Maiden Lane, W.C.2.

Bulgin Power Choke

A NEW model has been added to the recently-introduced iron-core chokes manufactured by Messrs. A. F. Bulgin. This is known as type LF.47s, and is designed for use where a high current is passed. The normal rating of this component is .25 henrics when carrying ¾ amp., and the D.C. resistance is approximately 6 ohms. There are, of course, a number of uses for a component of this type in D.C. and Universal mains receivers, as well as in experimental apparatus. A sample submitted has been tested and found to be well within the maker's rating. The D.C. resistance was 6.1 ohms and a current of nearly one amp. was passed without undue heating. At the correct rating, .75 amps., no temperature rise was noticed over a period of nearly an hour. The connecting points are made by means of rubber-covered leads, welded to the ends of the choke winding, thus preventing troubles due to the leading-out wire being pulled adrift. The price of this component is 10s. 6d., plus the slight rise recently introduced by this firm due to the increased price of raw materials.

Belling-Lee Flat Pin Plug

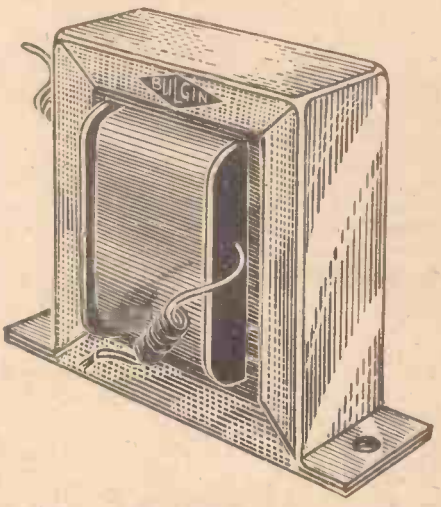
WITH reference to the report recently published concerning flat pin plugs and sockets, manufactured by Messrs. Belling and Lee, we understand that the makers are now able to supply these in cream finish as an alternative to the standard brown bakelite referred to in our report. These are identical in every respect but have a neat cream colour, rendering them very suitable for use in some rooms where a light colour predominates, or where an alternative to the usual dark colour is desired. There is an additional charge of 10d. for this finish.

Ediswan Cathode-ray Tube

IN our issue dated May 22nd, we made mention of the model 10H cathode-ray tube of Ediswan make. It was stated that the rating is 1.5 volts; but this should have read 2 volts at 1.5 amps. The price of this particular tube is £12.

Radiolab Valve Tester

A VALVE tester designed on the lines mentioned in the article in last week's issue has also been produced by Messrs. Everett, Edgcumbe and Co., Ltd. This tester gives readings which are instantly readable from both sides of the counter, thus enabling the customer as well as the dealer to see the condition of the valve. It will accommodate practically every type of valve met with in general use and is A.C. mains operated. The sockets will accommodate American, Octal and Hivac midget valves as well as the standard and side-pin English types. The indicator shows whether the emission and slope are good or bad and also identifies cathode leaks when the valve is hot. Another valuable feature is an indication of inter-electrode insulation. The tester costs £4 18s. 9d.



The new Bulgin power choke, type L.F.47s.

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

From the City of Jute

SIR,—Herewith is a 20-metre amateur 'phone log from the "City of Jute on the banks of the Silvery Tay in Bonnie Scotland." Receiver is an 0-v-1 (trans.), working with 'phones from a single-wave inverted L-type aerial about 80ft. long and 60ft. effective height, orientated due East and West. Concerning the CQ call my experience, as that of all DX S.W.L's must be, is that it is widely, almost habitually, used by all non-British amateurs who, however, often employ the "Calling Test" formula when seeking contact with stations in the United Kingdom.

W1KFE, IFD, BLO, MW, AQM, DBV, ADM, GH, KJ, FZ, NW, W2FPB, CBO, OJ, IXY, FHI, IKV, JME, FD, HTO, DSB, MJ, CWC, W3PRG, MD, HGE, FIH, CFE, BLQ, BM, BBB, CTA, W4AH, BYY, AGB, W5JC, W8CYT, VE1JA, 2EX, 1CR, 1CI, 2DC, VO6L, 1I, SM5SV, YS, SI, YU, 6QP, 7UC, OZ1NW, PA0WD, HA89, I1MG, KS, YR5AA, OE3AH, LY1HB, SU1CH, SG, KG, HB9AY, CT1AY, PK, CV, EARR, LA1D, 1G, ON4VC, SS, US, NC, MD, F8KW, MG, QD, DL, F3OO, CP, and JD.—GORDON BIRRELL (Angus).

A 20-metre Log

SIR,—Perhaps my 20-metre log for three days may be of interest in view of the good DX conditions now prevailing.

Saturday, May 15th, 22.15-23.00:—OQ5AA (Belgian Congo), VP6YB (Barbados).

Sunday, May 16th, 07.30-09.00:—VK3MR, VK5AI, VK5AW, VK3KX (Australia), HK1AM (Colombia), W6LR (California). Also TI2OFR on 40m. at 07.55.

Monday, May 17th, 08.00-08.30:—VK2TI (R6), VK2XQ, VK3XD.

All these apart from W's, Europeans, etc., and all at R4-6, QSA4-5.

My receiver is an 0-v-1 'phones, 50ft. roof aerial (inverted L) and 2-band coil.

Perhaps a general reception report for this locality might be of interest. The 49-metre band has been very lively, the Europeans being good signals at 18.00, and the Americans have been well heard till 08.00. COCD was R8/N/N at 06.55 on Sunday. VQ7LO was heard once at R5, QSA3-4. On 31 m. the locals have been good, but the Americans have not come in till 23.00 and the Australians have been very poor.

The lower wavebands have provided generally good signals. On Sunday JZJ was R7/SF, QRM1, QSA5, but JVM was only R4/F/X, QSA3. W1XAL, at 21.45, was R6/F, QRM1. The 21-m. amateurs have been good DX, although the W's have been less prominent. On 42 metres at 07.40 on Sunday, several South American amateurs were well heard, including TI2OFR announcing a test on 20 metres. On the 19-metre band W2XAD, as usual, has been the "star" of the Americans, peaking to R8 at 16.00. W8XK and W3XAL have been fairly well heard in the early evenings.

Trusting these notes will be of use. Yours faithfully.—N. J. RUTTER (Swindon).

SIR,—I wish to thank you for publishing my letter *re* the American one-valver and for forwarding Mr. Jas. A. Bruce's letter. I have forwarded him book and circuit. Quite a few S.W.L's have looked me up here in Paignton. A Mr. Pluck asked about W4BYY. Yes, he does QSL. I have received a card since he increased his power from 200 to 500 watts. I have also received a card from W4DLH, which is well worth trying for, it is in folder form with pictures of interior of shack, the operator Bill Barkhart, the aerial, and one of Miami. On the front is his call-sign in red and a background of four dark lean horses under palm trees. All S.W.L. reports are welcome and acknowledged by QSL cards, since my last letter I have logged the following:—W2YXY, W2DSB, W2CBO, W2BZ, W4DC, W2DX, HB9AY, LA1G, OE3AH, FNSU, W3CQL, W4SY, W4DLH, W8HZU, SU1CH, W1ADM, W1ABM, W2CB, W2FPB (portable), W1HAC, W2IKV, W2MJ, W2ZC, EI6J, W4UK, W3ABO, VE3NB, W1BIO, W2OJ, EA8AE, CO8EC, F3KQ, W1BES, W9DIB, W8MKI, W3ABA, and 70 G stations. These were all logged on the same set as before. Can any reader say if SU1CH sends QSL cards?—J. E. BORODENS (Paignton).

CUT THIS OUT EACH WEEK

Do you know

—THAT a special self-contained oscillator unit for lining up superhets may be obtained quite cheaply.

—THAT this type of unit is fixed tuned and thus simplifies the important adjustments of a superhet receiver.

—THAT corrosion increases the H.F. resistance of wire used for tuning coils, etc.

—THAT the above fact accounts for the silver plating used in short-wave apparatus.

—THAT a new television camera has now been perfected which enables pictures to be transmitted from a dimly-lighted room.

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., Tower House, 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.

E. A. S. (Ipswich). The dates of the issues in question are, December 26th, 1936, January 2nd and 9th 1937, and may still be obtained price 4d. each by post.

L. M. (Clontarf). The adapter described in our issue dated May 15th last will no doubt be of interest in your case.

G. M. (Brincana). We cannot help you in your difficulty, and suggest you communicate direct with the Marconiphone company or their nearest local service agent.

F. L. (Rugby). The meter is probably rather too low in resistance to be of much use, but you could connect it in the anode circuit of the I.F. valve for the purpose indicated. A much lower reading instrument would undoubtedly be of greater use to you.

B. O. S. (E. Port). The instrument should prove very satisfactory, but without full details of the tests you would wish to carry out we cannot advise definitely.

A. D. (Erdington). We have published many circuits which would prove suitable. Probably our last Christmas number would be of the greatest interest to you in this connection.

A. B. (Sandy). We regret that there is no blueprint available for the receiver in question.

E. W. K. (Ealing). We have no blueprints or details of a device of the type mentioned. Perhaps the article in our issue dated July 4th last would be of interest as this dealt with Public Address equipments for the amateur.

S. C. (Glasgow). 100 to 150 turns of 28 enamelled wire would be suitable for the choke. The resistance is used for decoupling, and is part of the decoupling circuit of which the condenser is the remaining component.

H. P. (Herne Bay). To cause the meter to read volts a series resistance is used, and the application of Ohm's Law indicates that the total resistance of the circuit must be such that the current flowing will fall within the meter range. Thus, if the full scale reading of the meter is 10 mA and its resistance is 1,000 ohms, to read 100 volts the total resistance must be 10,000 ohms (resistance equals voltage divided by current). As the meter has a resistance of 1,000 ohms you would need a series resistance of 9,000 ohms and can, no doubt, ascertain the values of the remaining ranges from these details.

R. G. (Cheltenham). We have no details of the coils and suggest that you communicate direct with the Cossor company who will, no doubt, be able to help you.

E. F. (Southampton). We are at present experimenting with a design which is proving satisfactory, and details will be given in the near future in these pages.

J. H. F. (Caithness). The L.T. leads are joined to an accumulator (with an on-off switch in one lead), and the 'phones are joined to the H.F. choke and the other side to H.T. positive.

C. P. (Newton Abbot). The Simplest Short-waver described in our issue dated December 12th, 1936, would be ideal for your purpose.

R. M. (Kidderminster). We cannot supply blueprint of transmitting apparatus.

G. B. C. (Brockley, S.E.4). We cannot identify the trouble, but it would appear quite possible that a switch is faulty, or one section of the switch if a multi-contact unit is in use.

C. W. R. (E.13). The details are beyond the scope of a reply, but we may publish constructional details at some future date.

A. S. H. (Southampton). The trouble would appear to be due to rectification in the L.F. stage or stages. The H.F. stopper in the adapter is obviously not carrying out its function and a more efficient H.F. choke should be used.

S. C. L. (Cowes). We have not used the coil in any of our receivers. Messrs. Wright and Weaire can, we believe, supply a Blackprint of a receiver using that particular coil.

C. B. (S. India). The article was originally published in September, 1935, but this issue is now entirely out of print. We regret that we have not seen the details of the American set referred to, but it would appear to be a crystal receiver with a "permanent" type of detector.

P. (Gainsboro'). We do not anticipate publishing an article on a receiver of the type mentioned. The efficiency of such a set would be very low, and we recommend the set described in our issue dated January 9th last.

P. L. V. H. (Bushey). The issue in question is still available, price 4d. by post from this address.

M. A. (Perak). The reaction condenser would, undoubtedly, be too small to give adequate control, and you should use one of the value specified.

A. W. C. (Hunstanton). The readings will depend upon the condenser, but the full range as mentioned for the coils should be spread over the dial. You cannot be guided by the dial readings as these are not designed for the coils in use.

Practical and Amateur Wireless
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., Tower House, Southampton Street, Strand, W.C.2.

PRACTICAL WIRELESS

	Date of Issue.	No. of Blueprint.
CRYSTAL SETS		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprint, 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.		
The Long-Range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	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	PM1
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 (HF Pen, D (Pen), Pen)	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
The "Colt" All-Wave Three (D 2 LF (RC & Trans))	5.12.36	PW72
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P)	1.5.37	PW4
Fury Four (2 SG, D, Pen)	8.5.37	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)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	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 (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
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)	5.6.37	PW40
F. J. Camm's 2-valve Superhet Two-valve	13.7.35	PW52
F. J. Camm's £4 Superhet	—	PW58
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valver)	—	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	—	PW50
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve : Blueprint, 1s.		
Midget Short-wave Two (D, Pen)	—	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
"Tele-Cent" S.W.3 (SG, D (SG), Pen)	30.1.37	PW74
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)	15.5.37	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	—	WM409
Three-valve : Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	AW383
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)	—	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, QP21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	*June* '35	WM398
Certainty Three (SG, D, Pen)	—	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
2HF Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2 HF, D, QP21)	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, 2LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, 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 (2HF, D, RC, Trans)	*May* '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
New Class-B Five (2SG, D, LF, Class B)	*Nov.* '33	WM340
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)	—	WM394
Three-valve : Blueprints, 1s. each.		
Home-Lover's New All-electric Three (SG, D, Trans) A.C.	—	AW383
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.* '35	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
SHORT-WAVE SETS—Battery Operated.		
One-valve : Blueprints, 1s. each.		
S.W. One-valver converter (Price 6d.)	—	AW329
S.W. One-valve for America	23.1.37	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-waver 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
Listeners' 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v.) for WM392	*Nov.* '35	WM398
Harris Electrogram (battery amplifier) (1/-)	*Dec.* '35	WM390
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/-)	—	WM408

QUERIES and ENQUIRIES

Decoupling Components

"I have just bought a mains unit for use with my four-valve battery set, and I want to feed this from a single H.T. lead to avoid instability and to make things easier. I know that the stages should be decoupled to avoid instability, but do not know what values to use. Is there any formula for the resistance and condenser of a decoupler?"—A. W. (Torquay).

THERE is no formula for working out the values of the decoupling components, although Ohms Law will have to be called into use. It is necessary to calculate the voltage required at the anode of the valve and subtract this from the voltage available on the H.T. line. The value of resistance to be included in the anode circuit can then be calculated roughly by remembering that 1 volt will be dropped through every 1,000 ohms resistance for every 1 mA flowing. Alternatively, the voltage to be dropped, divided by the current flowing (in milliamps), will give you the number of thousands of ohms required. From this value the anode coupling component must be deducted. The higher the value of the decoupling resistance the more effective the decoupling. The condenser value depends upon the resistance, but generally a value from .1 to 1 mfd. on the H.F. side and from 1 to 2 mfd. on the L.F. side will prove satisfactory.

Wearite Coils

"I wonder if you can help me with regard to the markings on some coils I have? The first is type WLT and the markings are R, HT, E, T, and VC. The second is WLR and marked C and VC, whilst the third is WLQ, marked VC, C, A, and E. I believe the last two coils are band-pass components, but am not certain."—A. H. (Rhyl).

THE coils are undoubtedly the Wearite Air-core type, and arranged for a three-valve receiver with band-pass tuning. Coils Q and R are the band-pass pair, designed for capacity coupling, and coil T is the detector stage coil having a reaction winding. Terminals VC indicate the connecting points for the variable or tuning condenser, and points E are for earth. Terminals C are linked through a suitable coupling condenser, whilst on coil T terminal R is joined to the reaction condenser, the other side of which is joined to the detector anode. Terminal H.T. is connected to the H.T. supply and terminal T is joined to the grid condenser to relieve the damping. This is a tapping on the medium-wave winding.

Car Interference

"I am situated near to a main road, and whilst experimenting on the short and ultra-short wavelengths I find considerable interference from motor-cars which pass by. Can you suggest the best method of overcoming this trouble? Will a dipole aerial do the trick?"—G. R. F. (Cricklewood).

A DIPOLE will only cut down the interference if it is of such a length that it provides maximum signal strength on a frequency fairly widely separated from that upon which the car interference is experienced. Thus, for television, for instance, a dipole chosen to provide maximum response on 7 metres would give very little interference from car ignition systems. As, however, you appear to need some aerial system for use on a variety of wavelengths, we think the only satisfactory solution in your case would be to erect a good aerial, say 15 to 20ft. in length, as far from the roadway as possible. Some experiment may also be required to determine the most effective height and direction for this wire. It should be connected to the receiver through a suitable impedance-matching transformer and screened feeder cable, or by means of a transposed feeder line.

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 queriists.

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., Tower House, Southampton Street, Strand, London, W.C.2.

The Coupon must be enclosed with every query.

Metal Rectifier

"I have an H.T. 12 rectifier taken from an old mains unit, and should like to use this in constructing a new set. I prefer this to be a mains receiver using indirectly-heated A.C. valves, and should be glad to know whether it would be suitable; or if not, how to modify it to obtain the necessary voltage."—F. R. H. (Southampton).

THE rectifier in question will provide an output of 200 volts at 30 mA, which should be adequate for your purpose, provided that suitable valves are selected. The input to obtain this rating is 140 volts at 120 mA (using a voltage-doubler circuit), or 250 volts 80 mA using a half-wave circuit, and the transformer should, therefore, be chosen accordingly.

Voltage Trebling

"In reading a book recently I came across the term voltage trebling, and as I cannot find trace of this in your Encyclopædia would be glad if you could explain the point. I understand ordinary half-wave and voltage-coupling, although even in the latter case I am a little uncertain how one obtains it with ordinary diode valves. If not too complicated, perhaps you could also make this point clear."—L. P. O. (Hunstanton).

THE arrangement referred to is used in high-powered work such as is needed in medical (X-ray) apparatus. Two half-wave rectifiers are arranged across each side of a centre-tapped transformer secondary winding, with the return circuit completed through a fixed condenser. There is thus double the transformer voltage across each rectifier (peak reverse voltage), and the output is taken from the two valves and from the ends of the winding, giving the sum of treble the original voltage. The output is naturally a pulsating one. For the full-wave circuit you refer to, the anodes of two of the half-wave rectifiers are joined together and provide one output, whilst the filaments of the other two valves are linked to provide the other side of the output. The input is taken to the two anodes of these latter valves and to the filaments of the first two.

Erratic Tuning

"I have built a short-wave receiver and experience a peculiar difficulty. When tuned to a station (correctly) I find that there is sometimes a peculiar waving effect which I have now found can be overcome by holding the tuning knob and following the signal over a few degrees each side of the correct point. Thus, the wavelength seems to move up and down the scale. This is not due to the aerial moving, because this is anchored fairly rigidly with special glass insulators. Can you suggest any cause for it?"—G. F. E. (Gainsborough).

YOU do not state whether the receiver is a superhet or not. If it is, a shifting of the wavelength may be due to a faulty oscillator valve, and we have met this trouble on more than one occasion in this connection. If, however, the receiver is a straight one, the shifting may be due to a connecting wire in the tuning circuit being moved by vibration—either from the speaker sound-waves or from traffic vibration transmitted to the floor. It is also often found that the sound waves from a speaker on good volume can cause the vanes of the tuning condenser to vibrate and cause frequency shifting. The remedy is to mount the condenser on a resilient base, using rubber washers between the condenser and chassis, and leaving the holding-down bolts loose, or to enclose the condenser entirely so that the sound waves cannot impinge on the vanes.

Unaccepted Wrinkles

"I wrote to you some time ago and sent you a wrinkle about how to make a home-made blow-lamp. You might tell me whether my wrinkle was entered or not, as if so, I have not received the money awarded as a prize. Please could you let me know about it?"—J. G. S. (Brentwood).

WRINKLES which are sent to us are examined, and if unsuitable for publication are destroyed unless a stamped and addressed envelope is enclosed for return. Payment is made for those wrinkles which are published the week following publication.

The coupon on Cover iii must be attached to every query.

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Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

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44, HOLLOWAY HEAD, BIRMINGHAM 1

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ALL goods previously advertised are standard lines, still available. Post card for list free. **VAUXHALL UTILITIES**, 163a, Strand, W.C.2. Over Denny's the Booksellers. Temple Bar 9338.

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SOUTHERN RADIO'S Wireless Bargains. All lines advertised in previous issues of "Practical and Amateur Wireless" still available.—Southern Radio, 323, Euston Road, London, N.W.1 (near Warren Street Tube). 'Phone: Euston 3775—and Branches.

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PRACTICAL AND AMATEUR WIRELESS, 5/6/37.

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Published every Wednesday by GEORGE NEWNES, LIMITED, Tower House, Southampton Street, Strand, London, W.C.2, and Printed in England by THE NEWNES & PEARSON PRINTING CO., LTD., Exmoor Street, London, W.10. Sole Agents for Australia and New Zealand: GORDON & GOTCH, LTD. South Africa: CENTRAL NEWS AGENCY, LTD. *Practical and Amateur Wireless* can be sent to any part of the World, post free, for 17s. 8d. per annum; six months, 8s. 10d. Registered at the General Post Office as a newspaper and for the Canadian Magazine Post.

Practical and Amateur Wireless, June 12th, 1937.

MAKING ALL-WAVE AERIALS

See Page 300.

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

3D. EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

Vol. 10. No. 247. June 12th, 1937.

REPRODUCING REALITIES—See page 295

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. X. No. 247. June 12th, 1937.

ROUND *the* WORLD *of* WIRELESS

Electrical Interference

THE short-wave listener is finding great difficulty in some parts of the country in obtaining noise-free reception, due to the increasing use of electrical signs and other interfering apparatus. Although legislation is proposed to prevent the employment of apparatus which can give rise to such interference, it is not likely that this will come just yet. In the meantime the listener must take what measures he can to prevent the trouble, and one of the simplest is to erect the aerial as far away as possible from the source of the trouble and connect his receiver through the medium of a screened cable or some other feeder which itself will not pick up or carry the trouble to the receiver. When it is necessary to use a receiver on all wavelengths the design of the aerial is complicated, and on page 300 this week we give some interesting details of all-wave aerial designs which are on the market or which may be erected by the constructor, together with details for making the special transformers necessary for use with them.

Radio for Lifeboats

AS an added aid in the saving of life at sea the National Lifeboat Institution is proposing to instal short-wave transmitters and receivers in a number of its lifeboats. They will enable the pilot to keep in touch with the shore station and with any other similar vessel which may be called to a wreck, and no doubt in fog and other troublesome weather this increased aid will prove of great benefit.

Speakers as Microphones

IN a recent article we referred to the use of a moving-coil speaker as a microphone. Several readers wrote and said the idea was no good as the speaker would not give good reproduction. In tests we have carried out a number of well-known commercial speakers have found to give very good results without modification, and we now learn that a well-known American firm is supplying "equalizers" for use with their particular loudspeaker so that it may be used as a microphone for "talk-back" systems.

Douglas Swallow and his Band

THIS band, which has frequently broadcast and is at present at the Palais de Danse, Birmingham, from which it contributed to "Britain Dances" on Coronation Day, will play a programme of dance music from the Midland Regional on June 18th.

Western Regional Director

IT is announced that Mr. G. C. Beadle, Director of Staff Training, has been appointed to succeed Mr. E. R. Appleton as West of England Regional Director. The date of his transfer to Bristol will be announced later. He joined the B.B.C. in October, 1923, and for a time was Station Director in South Africa at the Durban station.

Belgrade's Record

THE technical report of the Marconi broadcast station at Radio Belgrad, Yugoslavia, states that the transmitter was radiating for 3,823 hours during 1936 and that the programme interruptions during that time due to technical defects amounted to only 15 minutes. Valve replacements accounted for only 50 minutes lost time. At the end of the year, this transmitter, designed and built at the Marconi Works at Chelmsford, had been on the air for 27,540 hours. A new transmitter is shortly to be installed at this station.

ON OTHER PAGES

German Interference in Uruguay

IT is stated that the German short-wave stations are causing interference with transmissions from the U.S.A. to which listeners in Uruguay desire to listen. Short waves are almost exclusively used in Uruguay, due to the fact that the listeners wish to hear the American programmes and those broadcast in Spanish.

A Show from "Down Under"

THE "Sing-Song" shows of the past, which have depicted life in South Africa and in Canada, are to be followed by an Australian feature which Archie Campbell will produce in the Regional programme on June 11th. Charles Zwar, a young Australian musician, whose work is well-known in Melbourne and throughout the Commonwealth, is visiting London and he is preparing the music. All the artists taking part will be Australians, and the setting will be an "out-back" sheep station. A jackaroo (apprentice) will be the central figure of the comedy.

Memories of the Imperial Ballet

AS ballerina, Madame Lydia Lopokova has a rich store of memories of the Imperial Ballet, and it will be easy for her to indulge in reminiscences during the programme called "Imperial Ballet" which is to be produced by Archie Campbell twice during June, on the 28th in the Regional and on the 30th in the National programme. Her stories will be illustrated musically by the B.B.C. Theatre Orchestra, conducted by Walford Hyden.

Orchestral Concert from Bournemouth

JACK GREENSTONE and his Orchestra will broadcast on June 18th from Bright's Café, Bournemouth, where they have been engaged for the past three years. A feature of this Western programme will be "Spring Flowers," by Austin Jowett, who is arranger to the orchestra, and plays accordion solos and piano duets with Frank Senior. Mr. Senior also plays novelty items on the comparatively rare sleigh bells.

Binding Cases and Indexes

BINDING cases and indexes for volume 9 of PRACTICAL AND AMATEUR WIRELESS are now available. The binding case, complete with title page and index, costs 3s. 6d., and the index alone 7d. by post.

ROUND the WORLD of WIRELESS (Continued)

Paste and Paper

IN the Midland Regional programme The Hon. Harold Nicolson, M.P. for West Leicester, will continue on June 18th his exmination of personal scrapbooks which have been lent to him by their owners. This is the fifth of his series of talks which are also being taken in the main Regional programme.

Flute and Horn

TWO members of the B.B.C. Northern Orchestra will be the soloists in a concert by the orchestra on June 10th. Vernon Harris will play Mozart's Concerto No. 2 in D for flute and orchestra, while Raymond Meert will be the soloist in Mozart's Concerto in E flat for horn and orchestra.

Concert from Torquay

ANOTHER popular concert by the Torquay Municipal Orchestra, led by Harold F. Petts, will be given from the Pavilion, Torquay, in the Western programme on June 13th. Leonard Gowings, tenor, will be the soloist.

Organ Recital from Glasgow

ALLAN KENNEDY will play on the organ of the Regal Cinema, Glasgow, on June 14th, "Savoy Community Medley," "Music Hall Memories," "Serenade," and "Taking a Stroll Round the Park."

Mr. Jimmy Phillips, the well-known music publisher, and Mr. Michael Carr showing great interest in the "Pilot" receiver which was presented to Mr. Edward P. Genn, who is having it installed in the main ward of Charing Cross Hospital.

Music from the Seaside

THE Whitley Bay (near Newcastle) Municipal Orchestra which, under the Northern "Summer Outside Broadcast Scheme," is to broadcast from the Empress Ballroom, Whitley Bay, on June 17th, was formed a few years ago. Its members are professional musicians drawn from various orchestras, including those at Harrogate and Eastbourne and de Groot's Orchestra. The Director, Percival Goffin, studied at the Royal College of Music in London and also in Germany; he toured in Europe, Africa and Australia, and after the War organised the Percival Goffin Celebrity Concerts at Whitley Bay.

INTERESTING and TOPICAL NEWS and NOTES.

Cricket Interval

A FEATURE in this Midland programme which will be presented by Denis Morris on June 17th, will be a talk on umpiring in first-class cricket by "Tiger" Smith. Smith was for many years the Warwickshire wicket-keeper and he went as wicket-keeper to Australia. Frank Foster, in his book on that series of Test Matches, pays a tribute to his brilliant achievements behind the stumps.

Growing Popularity of Short-wave Listening

ACCORDING to its thousands of enthusiasts, which are steadily increasing, short-wave listening is one of the simplest yet most fascinating hobbies. A growing interest in international affairs and more assiduous reading of daily newspapers to keep in touch with world events have followed in the footsteps of this national pastime. Foreign broadcasts whet the desire for geographical knowledge as well as encourage a closer understanding of the habits and commercial practices of other countries.

A popular receiver for short-wave listening is Philco's new model with improved spread-band dial with station markings well spaced, and station names on the dial in easy-to-read letters. Foreign programmes are best heard between the wavelengths of 14 and 49, or 5.5 and 22 megacycles.

Ice Factory Broadcast

IF the weather is hot on June 15th, Northern Ireland listeners will be in the mood for Tom Chalmers's programme in the series entitled "The Wheels Go Round," for it will deal with the inside organization of an ice factory and cold storage depot.

B.B.C. Scottish Orchestra

ON June 16th the B.B.C. Scottish Orchestra, conducted by Ian Whyte, will play the Overture, "The Yeomen of the Guard," by Sullivan, "Symphony No. 2 in D Major," Op. 36, by Beethoven, Two Old Scots Airs—"Spynelet Reforme" and "Wally's Humour," arranged Ian Whyte, and a waltz, "Les Patineurs," by Waldteufel.

Miss Lesley Brook, Warner Bros. First National star, finds rest and relaxation in the company of her Marconiphone Model 537.

SOLVE THIS!

PROBLEM No. 247

After building a four-valve A.C. mains receiver from brief data collected from various sources, Tallboy tested out the set. It worked well for two or three days, and then he noticed that signals were becoming distorted. Furthermore, there was a smell of burning rubber, and on turning over the chassis for an examination, he found that one of the resistors (10,000 ohms) connected in the H.T. positive feed was badly discoloured, and had obviously become damaged. He decided that the wattage rating was too low, and, accordingly, obtained two 20,000 ohm resistors of equivalent wattage, and connected them in series in order to halve the wattage dissipation across them, but when he switched on he found that signals were not nearly so good as when he first tested the set. Why was this? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL AND AMATEUR WIRELESS, Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 247 in the bottom left-hand corner, and must be posted to reach this office not later than Monday, June 14th, 1937.

Solution to Problem No. 246

The cathode in the rectifying valve which Brown had included in his universal receiver was shorted to the anode, thus preventing its function on A.C. mains.

The following three readers successfully solved Problem No. 245, and books are accordingly being forwarded to them: R. B. Holman, Ashfield, Kingsbridge, Devon; F. S. Roberts, 20, Ferrers Road, Oswestry; D. McMullan, Laundimer House, Oundle, Northant.

Making a Simple Single-valve Set

This Week the Experimenters Tell You What Parts You Require and How to Assemble Them in Completing a Neat Little Receiver, the Operation of which Will Be Described in Their Next Article

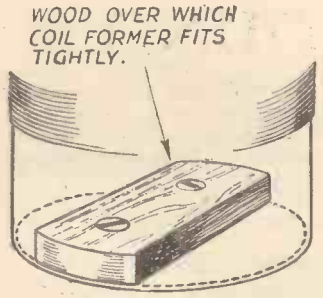


Fig. 2.—A simple and convenient method of mounting the coil over a piece of wood screwed to the baseboard.

HAVE you finished making the coil we described last week? We hope so, and trust that you did not meet with any difficulties. By the way, if any "snags" do arise in connection with the construction of the set we are describing, don't hesitate to drop us a line, care of the Editor; we will do all we can to set you right.

Well, if the coil is ready, we can proceed to collect the other small parts required. They are few in number, and their choice is not a critical matter. First, you will require a baseboard of lin.-thick wood measuring 10ins. by 6ins; then a sheet of plywood, 10ins. by 7ins. For the ply it is worth while to use oak or mahogany-faced material, since this can be stained and polished to present a very attractive appearance. Alternatively, you might prefer to use a sheet of wood which is already polished, or a piece of ebonite or paxolin. Any of these is equally effective, especially since the panel need not be of insulating material.

What You Need

The other parts are: one .0005 mfd. panel-mounting variable condenser with knob and dial (suitable types are J.B. "Popular," Polar No. 2, Ormond No. 5, Formo type SU5); one .0003 mfd. bakelite-dielectric reaction condenser with knob (J.B. "Dilecon," Graham Farish "Litlos," etc.); one Q.M.B. on-off switch (Bulgin S.80); one three-point Q.M.B. on-off switch, for wave-changing (Bulgin S.87); one baseboard-mounting four-pin valve-holder; one .0002 mfd. fixed condenser; one .0001 mfd. fixed condenser; one 2-megohm grid leak; one high-frequency choke (such as Bulgin, Wearite, Varley, Goltone, etc.); two terminal mounts, with terminals marked A and E, and Phones or L.S. (Belling-Lee); two spade terminals, marked L.T. + and L.T. —; two wander plugs, marked H.T. + and H.T. —; about 4yds. of single flex, wood-screws and oddments.

With regard to the components for which we have not suggested makers' names, we should add that any make will serve satisfactorily. Even for the others, substitutes can be used if they happen to be on hand, although if new parts have to be bought, we advise you to follow our recommendations.

Preparing the Panel

First the panel must be prepared, and this can best be done by marking it out as shown in Fig. 1. The marking should be on the back of the panel, and can be in pencil, although it is better to make scratches with a compass point when using paxolin or ebonite. Holes should be drilled at the points indicated to receive the mounting bushes of the switches and condensers, and three holes should be drilled near the base to receive wood-screws.

In drilling the holes, place the panel on an odd sheet of hardwood, and run a small

by The Experimenters

drill through each centre from the back of the panel; alternatively, make small holes with a pricker. Then drill holes of the correct size from the front, again using the hardwood to support the panel. An ordinary twist drill, held in a mechanic's brace, is most convenient, but a joiner's brace and centre bit can be used for the larger holes if preferred.

After the holes have been made, the panel should be rubbed down with fine glass-paper if it is of plywood, after which it can be given a coat of stain and one of varnish, or it can simply be treated with furniture polish or prepared wax. Then attach it to the baseboard with three ⅝in. brass wood-screws, and mount the components on it. The other few components should next be fixed to the baseboard, starting with the coil. A simple method of mounting this is by cutting a strip of wood to the shape shown in Fig. 2, and screwing this to the baseboard, so that the coil fits fairly tightly over it. If you wish, you can pass short screws through the coil former into the wood.

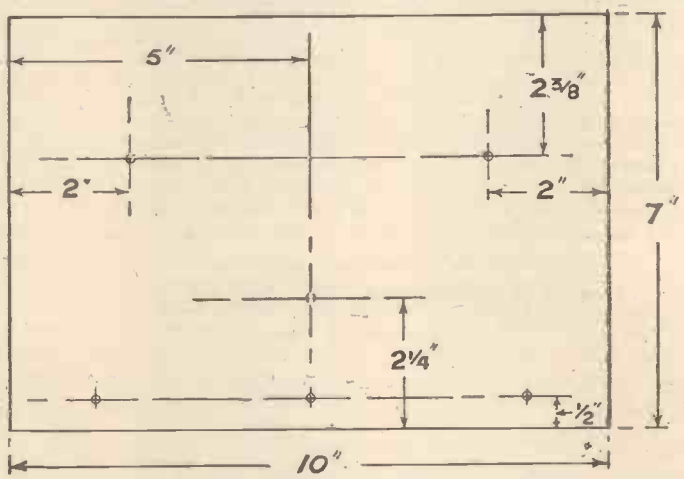


Fig. 1.—How the plywood or paxolin is marked out preparatory to drilling.

Mounting the Components

Next mount the valve-holder, H.F. choke and terminal mounts with short wood-screws. The two fixed condensers and grid leak can be supported in the wiring later, but if the condensers are not of the tubular kind shown in Fig. 3 it is better to screw these to the baseboard instead. It is not necessary to space the parts with precision accuracy, but follow the approximate layout shown, so that there will be sufficient space left for the other parts needed when a second valve is added at a later stage.

Everything clear so far? The work should have been straightforward enough. All right—we can now do the wiring. This is shown quite clearly in Fig. 3, and can be carried out with either a portion of the single flex specified above, or with special connecting wire sold for the purpose in 10ft. lengths for about sixpence a coil. In any case, the leads should be dealt with one at a time, cutting the wire slightly longer than is necessary to reach between each pair of terminals to be joined. Then scrape away the insulation for a distance of about ½in. from each end. When using flex, this can be done by scraping the wire with a blunt knife blade; when using connecting wire, the insulation can generally be pushed back from the ends to leave a short length bared.

Wiring

With flex, the strands should be well twisted together before forming loops for fitting over the terminal shanks. Make the loops clockwise, so that the wire does not tend to be pushed off the terminal when the nut is tightened. You will probably find it a good plan to ink in each wire shown in Fig. 3 as it is fitted, in order to avoid confusion. Leave the four battery leads until last, and make them just long enough to reach the batteries without their having to be pulled tight. Take particular care that the H.T. and L.T. leads are not reversed, and that the wander plugs and spade terminals are attached to the correct wires. We give you this warning, because if a mistake were made, the valve would probably be ruined as soon as the set was switched on. There will be no danger if one L.T. lead goes to a filament terminal on the valve-holder, and the other goes to the on-off switch; also notice that the H.T.+ lead goes to one of the 'phone terminals.

When the wiring is finished, carefully check it over; as a further precaution, you

(Continued overleaf)

MAKING A SIMPLE SINGLE-VALVE SET

(Continued from previous page)

might care to ask a friend to re-check. If any "old hands" are reading this, they will probably think that we are "old-womanish" in emphasising these little points, but they must remember that we are now catering especially for beginners—and we all have to make a start sometime!

Condenser Knobs

Everything in order? We can now fit the condenser knobs. These are attached to the spindles by means of small grub screws in the sides. The screws are generally recessed, so a very small screwdriver or bradawl is required. Before tightening the knob on the .0005-mfd. tuning condenser, turn the spindle until the plates are completely out of mesh and set the pointer or scale to zero. If there is a circular dial on the condenser, a mark or pointer should be made on the panel directly above the mounting hole. A neat cut with a knife blade will suffice, and the line can be made to show up more clearly if a little chalk or white paint is rubbed into it.

The knob for the reaction condenser will probably have a "beak" or pointer; turn the spindle fully anti-clockwise and set the pointer upward before tightening the grub screw.

Batteries, Valve and 'Phones

Now we want the batteries, a valve and a pair of 'phones. A 60-volt H.T. battery could be used, but as a 100-volt battery will be required later you might prefer to buy that right away to avoid double expense, or the connection of two batteries in series. A battery of standard capacity will be adequate, but do buy one of good make, such as "Drydex." There are different qualities in every make, but the best is most economical in the long run. A "Drydex" from the "Green Triangle" series can be relied upon to give good and economical service, but if you buy one of another make it will pay you to spend not less than 6s. 6d. for a 99- or 108-volt battery (different makers produce batteries of slightly-different maximum voltage, and any figure between the two mentioned will be suitable).

The low-tension battery or accumulator need not be a big one, but should be of reputable make. You can buy one for five-shillings or so, but if you pay about ten shillings less-frequent charging will be necessary, and so running costs will be reduced. The choice is yours, and it will depend upon how much you are prepared to spend.

Then there is the valve. We can give equal recommendation to the Cossor 210 Det., Osram H.L. 2, and Hivac D. 210; so you can choose from these. If you happen to have another valve on hand it can be tried, provided that it is of the detector or general-purpose type. Fit the valve into its holder before the batteries are connected; it will fit only when placed the right way round, and this can easily be seen by examining the positions of the valve pins and the valve-holder sockets.

The 'phones should be of the high-resistance type, 2,000 or 4,000 ohms. They can be obtained from Peto-Scott at various prices, but unless you expect to take an interest in short-wave work at a later date, we suggest that you buy fairly cheap ones, because they will serve the present purpose perfectly well.

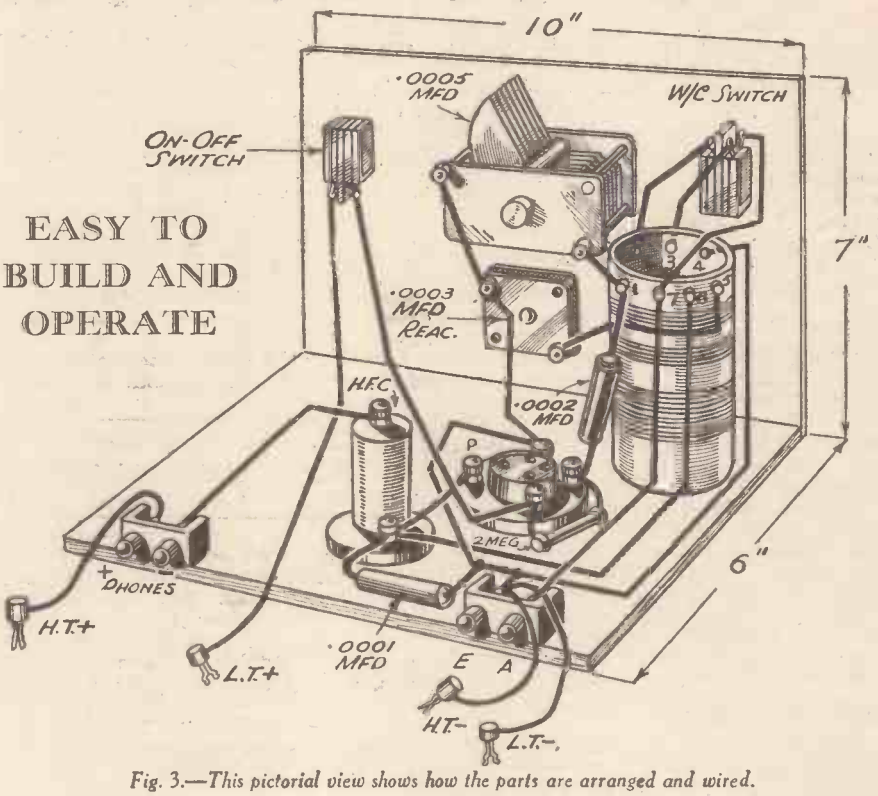


Fig. 3.—This pictorial view shows how the parts are arranged and wired.

We have insufficient space to tell you how to use the set, so we will leave those instructions until our next chat. In any case, you will want a little time to obtain all the parts and to carry out the constructional work.

Remember, in case of difficulty, we shall be glad to help you. Cheerio for the present!

(To be continued)

PROGRAMME NOTES

Melody and Rhythm

IN this Midland Regional programme on June 16th the artists will be Harry Engleman and Leila Brittain (duets on two pianos), and The Four Rhythm Boys, who are young factory workers from the Derby district.

Music Items

EIGHTEENTH-CENTURY music for flute, violin, viola da gamba and cembalo will be broadcast by the Musica Antiqua Ensemble on June 10th (National). The English Ensemble, led by Marjorie Hayward, with Kathleen Long (pianoforte) will play a Chausson Quartet on June 11th (National). In the same programme, Leila Megane will sing modern French songs.

A selection of chamber music compositions of Armstrong Gibbs will be broadcast on June 12th (National), when Henry Cummings will sing a group of his songs, and John Fry (violin), Norman Chapple (violin), Watson Forbes (viola), Edward Robinson ('cello), and Henry Bronkhurst (piano) will play "The Yorkshire Dales" (trio), and "Henry Brocken," a suite for string Quartet and Pianoforte, arranged from the incidental music to the story by Walter de la Mare. Armstrong Gibbs, who is well-known as a song-writer, is the author of the comic opera "The Blue Peter" (libretto by A. P. Herbert), which was published under the Carnegie Trust in 1924, and he also wrote the music for "Midsummer Madness," a comedy by Clifford Bax, which was successfully produced at the Lyric Theatre, Hammersmith, in 1924.

Concert from Bristol

EILEEN JERRIM (soprano) and Margaret Harris and Edgar Glasspool (pianofortes) will give a concert from a studio on June 13th. In October, 1936, Eileen Jerrim gave a recital at the Aeolian Hall. Margaret Harris and Edgar Glasspool specialise in two-pianoforte works, and have broadcast on many occasions.

Down to the Sea—In a Bus

"FOLLOW THE CROWD" is the title of an amusing National broadcast on June 11th. Devised by Leonard Henry and Ernest Longstaffe, it will portray the care-free escapades of a typical crowd of trippers, not only to and from the coast, but during donkey rides on the beach, the inevitable comedy of posing for a beach photographer, the ceremony of buying local rock, and so on.

Among those travelling by the bus will be Alma Vane, Clarence Wright, Sydney Burchall (one of Ernest Longstaffe's recent "discoveries"; he has a fine baritone voice); John Rorke; Bertha Ricardo—her first broadcast; the Three Admirals; and, of course, Leonard Henry. The B.B.C. Revue Chorus and the B.B.C. Variety Orchestra will be conducted by Ernest Longstaffe and the programme will be repeated on the Regional wavelength on June 12th.

Another Popular Manx Programme

VICTOR SMYTHE is presenting another "Isle of Man Nights" entertainment on June 11th. This will include dance music by Cunningham's Camp Band from Cunningham's Camp, Switzerland, Isle of Man; George Tootell, at the organ of the Regal Cinema, Douglas; and a Concert Party show from the Coliseum, Douglas. This broadcast will be given in the Northern programme.

Constructional Details of "Practical Wireless" Receivers—8

An Ideal Three-valve Receiver for the Beginner, Offering the Minimum of Constructional Work, is the Hall-Mark Three. The Main Details are Given in this Article

IN the Hall-Mark Three receiver we have a design which is eminently suitable for the newcomer who wishes to make his own receiver to provide a fair number of stations, without difficult constructional work and without difficulty in trimming or tuning. The standard H.F., Detector and L.F. circuit provides the basis for the receiver, and the first stage employs an S.G. valve, with triodes in the other two stages. In order to make the receiver economical to build special coils have been employed, and these are of the unscreened type, interaction between them being prevented by mounting them one on each side of the ganged condenser. This acts quite efficiently as a screen, and the wide spacing which is thereby provided between the coils ensures that they will work just as well as the more elaborate screened coil. The accompanying illustration shows that apart from the simplicity of the design the overall dimensions have been kept down to a very small level, and the chassis for this particular receiver measures only 8½in. by 6½in.

The coils are of the transformer type, having separate primary and secondary windings, and they are still obtainable from the manufacturers. If you wish to prepare your own chassis from one of the standard metallised units, two 1½in. holes must be drilled to accommodate the coils, and the positions will be found from the Blueprint No. 41, obtainable from this office, price 1s. For the valveholders, 1¼in. holes must be drilled, and in addition to these one small hole is required near the ganged condenser through which a connecting wire is passed, whilst a ⅜in. hole is drilled near the end valveholder to accommodate the multi-battery cord. On the rear chassis runner holes must be drilled to accommodate the terminal socket strips, and the constructor may adopt his own ideas here. Either separate holes for the sockets may be drilled, or slots may be cut.

Wiring

The wiring to the valveholders should be carried out first, and the L.F. transformer then screwed to the rear chassis runner.

This view of the Hall-Mark Three shows the simple layout of components.

The three controls may next be mounted on the front runner, and the remainder of the wiring carried out as far as possible. Next, the coils should be attached by means of the small metal brackets provided, and it will be noted that earth returns are made to the bracket holding coil No. 1. It is essential that these leads be securely anchored, and a large washer should be placed beneath the nut to avoid the wire loops being forced out when the nut is tightened. No terminals are provided on these coils, but the individual connecting leads are coloured, and the colour references have been reproduced on the circuit diagram given on this page to avoid any misunderstanding, as they are not given on the blueprint. They should, however, appear in the positions indicated on the blueprint drawing, and this should prevent any difficulty.

Testing Out

When the wiring is completed, it should be checked back carefully with the diagram, and if all is in order the set may be tested. The battery leads are connected as follows: Lead H.T.1 should be inserted into the H.T. battery at the 60-volt socket and lead H.T.2 into the maximum (120-volt socket). The G.B.— plug should be inserted into the 6-volt socket on the grid-bias battery and the G.B.+ should be inserted into the positive socket of the grid-bias battery. A good aerial and earth should be used to ensure good results, and the local station should be tuned in without any difficulty.

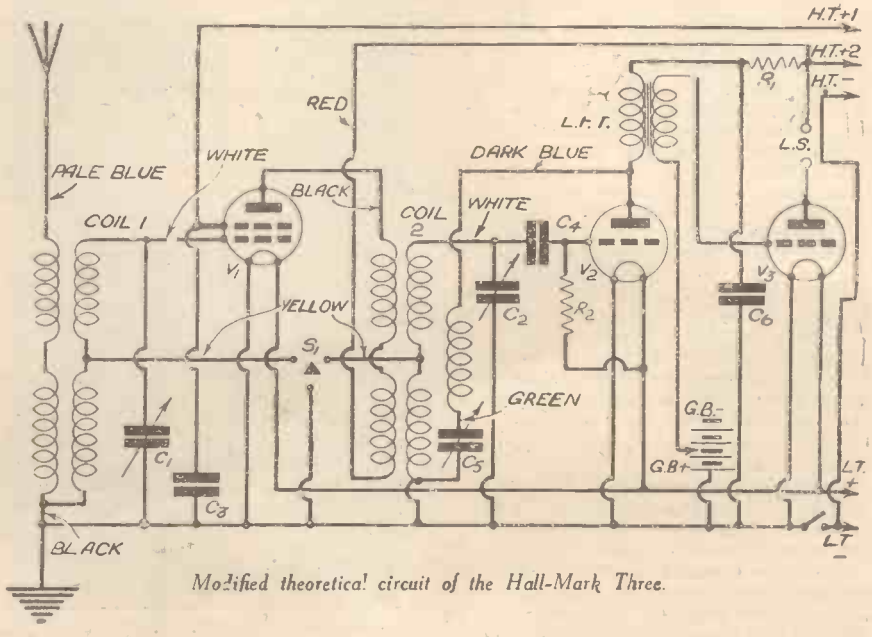
Trimming

When located, the trimmer on that part of the ganged condenser marked C2 should be adjusted with an insulated screwdriver or a sharpened stick of wood until maximum volume is obtained, after which no further trimming is required. Signal strength may be increased by means of the reaction control.

LIST OF COMPONENTS FOR THE HALL-MARK THREE.

Two Hall-mark Coils—B.T.S.
Two-gang Condenser—Polar "Midget."
One Polar Hall-mark Dial.
Reaction Condenser .0003—Graham Farish.
3-point Wave Switch—Graham Farish.
2-point On/off Switch—Graham Farish.
L.F. Transformer 5/1—Varley Niclet.
Tubular Condensers—.5 mfd. (type 250), .1 mfd. (type 250), .0003 mfd. (type 300)—T.C.C.
Resistances, 2 meg. (type G.1), 30,000 (type G.5)—Ferranti.
Valveholders, 3 four-pin—Clix.
Terminal Strips, A.E, L.S.—Clix.
Plugs, H.T.1, H.T.2, H.T.—, G.B.+, G.B.—, —Belling-Lee.
Spades, L.T.+, L.T.—.—Belling Lee.
Battery Leads—Belling-Lee.
Metaplex Chassis, 8½in. x 6½in. 2 runners, 8½in. x 2in.—Peto-Scott.
Valves, VP215 (4 pin), D210, PP220—Hivac.
Batteries, H.T. 120 volts, G.B. 9 volts—Exide.
Speaker, Rola, F5B.P.M. 288.

THE HALL-MARK THREE



Modified theoretical circuit of the Hall-Mark Three.

Practical Television

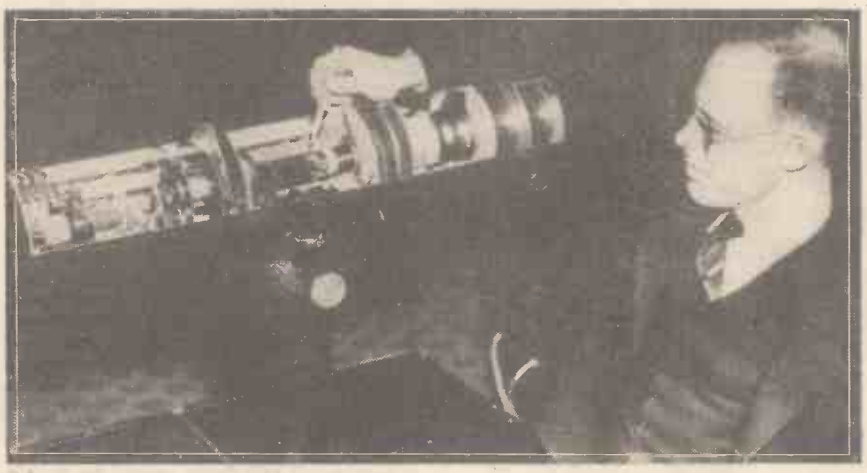
June 12th, 1937. Vol. 3. No. 54.

Colour Television Again

ACCORDING to a report in the daily papers, colour television has come to the fore again. No details of the discovery have yet been disclosed, but it is known that the picture reproducer was a cathode-ray tube. In practice, of course, a picture of any desired *single* colour can be shown with a C.R. tube by the simple expedient of adjusting the percentages of the various ingredients used in the powder sprayed on the front of the tube, and shown in a fluorescent condition by the impact of the beam of electrons tracing out the picture in line form. It was this fact which gave the clue for a colour television scheme proposed on the Continent. Three cathode-ray tubes were to be employed, and each screen was to be manufactured from a different powder so that the pictures were in the three primary colours of red, blue and green. With the aid of an elaborate lens combination the observer saw these pictures superimposed one over the other, and a vivid colour effect was secured. It will be seen at once, however, that unless each tube is made to respond to each section of the picture which is its own particular colour, the resultant mixture will in no way be a true portrayal of the original colours. In the days of low definition we had Baird's demonstration of colour television in which a disc scanner having red, blue and green filters was employed at the transmitting end, and a composite picture made up from differing light modulating sources at the receiving end. Within the limits of definition then in use the principles were satisfactory, but there seems little hope of applying the idea to modern schemes of high-definition television. Bearing in mind the difficulties associated with present-day monochromatic television, it would appear a better plan to devote the time of original research to solving the major problems and leave the prospects of colour television to a distant future, when it can be evolved as a natural development without any of the undue complications which it now embraces.

In Japan

SOME four or five years ago the Japanese were in the limelight because of the experiments they were then undertaking in daylight television. On a 60-line picture definition standard outside television broadcasts were being attempted, using a disc scanner, and high hopes were expressed that the ideas then being exploited would bring satisfactory results which could be embodied in a public service. This did not materialise, however, and for some time little has been heard concerning the work undertaken in that country. It is now learnt, however, that a sum amounting to nearly three quarters of a million pounds has been granted by the Japan Broadcasting Association, with a view to popularising both television sets and transmissions. This therefore brings another country into line with the many others who see in television a science which can be applied not only to entertainment, but to the more important commercial aspects of visual communication which can supplement aural schemes now so well established.



Dr. R. R. Law, of the R.C.A. Laboratories, New York, with his "Electron Gun," which is part of an instrument called a "Kinescope," which projects television images on to a screen, enlarging the size of the received picture many times.

Screening and Height

IT has been pointed out several times in these columns that owing to the nature of the ultra-short waves used for radiating the television signals, it is important to ensure that the receiving aerial is located in a reasonably high position. There are other factors which must be taken into account, however, and one of the most important of these is screening. If trees, metal or brick buildings obscure the aerial from the direction of the propagated signals, then it may be better to choose a lower position, which, although giving a lower input signal, may have the advantage of an unscreened path. The same remarks apply to the sources of electrical interference, especially that arising from the ignition systems of motor-cars. This has been brought to light by aerial surveys, conducted on the high flat roofs of large buildings situated on main or busy thoroughfares. At first it seems the correct procedure to have a high mast guyed suitably on the roof and position the aerial at the top of this. If the mast and aerial are set well back from the roof coping adjacent to the road, then all will be well, for the building acts as an effective screen from the motor-car ignition systems. In other words, the aerial is in the shadow of the electrical fields which would upset reception, but is suitably disposed for a relatively large signal pick-up from the Alexandra Palace station. If the roof shape prevents the mast being well set back, however, then the signal to interference ratio will in most cases give the same degree of shielding from the interference. Whenever circumstances permit it is a distinct advantage to carry out a number of tests before deciding on the final aerial site, and for this purpose a portable aerial with a length of flexible feeder cable is necessary.

Dr. Law is here seen examining a projected image.

Reproducing Realities

The Various Causes of Indifferent Reception, and Their Remedies, are Discussed in This Article. By G. V. COLLE

THE subject of faithful reproduction can best be examined in the light of the old proverb—"a chain is only as strong as its weakest link." Few will disagree that the weakest link in a radio receiving "chain" is the loudspeaker, bearing in mind that whereas the receiver proper is capable of innumerable changes, it is not possible to modify the loudspeaker to anything like the same extent.

If we visualise the transmission of an orchestral rendering, the microphones (which in themselves create distortion) replace our ears, the sounds are collected, amplified and transmitted (further sources of modification), and assuming our own apparatus is perfect, pass to the loudspeaker, which is expected to radiate the sounds in similar perspective to those originally created. In other words, although the orchestra is spread over an area, we are expected to believe that it is huddled up within one small point, viz. the loudspeaker. Technical details of experiments which were conducted to overcome this objection have been previously given in this journal.

There are occasions when receivers and amplifiers are not intended to provide other than clarity of reproduction and adequate volume. Public address equipment is typical in this sphere, since its main object is to relay important functions to a large crowd which might otherwise be excluded from participating. It is important that the reader should exclude thoughts of "P.A." in studying reproduction, and for the reasons given.

In our own homes, and in so far as modern methods of transmission permit (and over which we have no active control), we want our apparatus and loudspeaker to be free from distortion, crackles and noises, colouration and slurring. The mains hum must be inaudible even at a distance of, say, six inches from the loudspeaker, so that the personality of those entertaining us is left "free" and not as if we are being addressed from behind a curtain. When the aerial lead is removed from the set, or during an interval in the programme, the loudspeaker should be dead silent. Furthermore, a difficult condition to fulfil is that it should be possible to reduce the volume of loud transmissions without affecting the quality of reproduction.

Before proceeding to analyse the above-mentioned factors it is important to calculate the requirements of the receiver and loudspeaker, since by doing so it allows a specification to be drafted, and in which provision can be made automatically for them.

Specifcation Requirements

Briefly tabulated, the receiver specification must allow for a volume output sufficient to fill the room in which the apparatus is housed (from 3 to 6 watts output), but without reverberation or echo, the frequency range must be flat and extend between approx. 25 and 10,000 cycles with provision for sharply restricting it at the top end to exclude interferences, a volume control to be provided which does not modify the response at "low" positions or, alternatively, which corrects to compensate for circuit variations, and provision for correcting or balancing with a pick-up. Detailed requirements are: adequate H.T. smoothing to prevent residual low pitched hum which, while inaudible, causes the loudspeaker diaphragm to lightly oscillate; decoupling to an extent which removes every minute trace of feedback or instability; ample H.T. voltage with careful regulation of grid bias to avoid second harmonic distortion, and the avoidance of saturation in anode chokes and output transformers by ample iron cross-sectional area; and parallel-feed or push-pull systems.

A loss of quality consequent upon a reduction in volume will sometimes be due

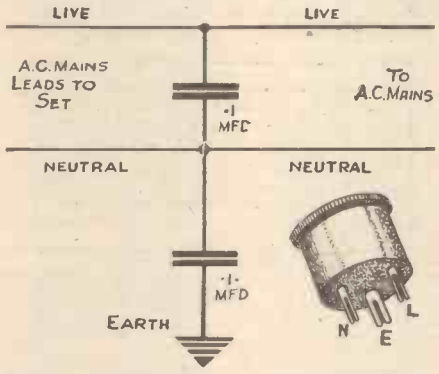


Fig. 1.—One method of suppressing mains modulation hum as described in text. The condensers must be of adequate A.C. working voltage.

to a limitation in the amplifier portion of the receiver, but in most cases it can be attributed to the action of the loudspeaker, which may not have a linear response. In such cases it is necessary to include additional filter circuits which will compensate for the loudspeaker deficiencies.

A draft specification for a moving-coil loudspeaker to suit our requirements should read as follows: Mechanically rigid; an intense magnetic field in the annular gap; a lightly sprung cone and coil of extremely low mass (or weight); the cone-to-coil joint to be rigid; the cone to be

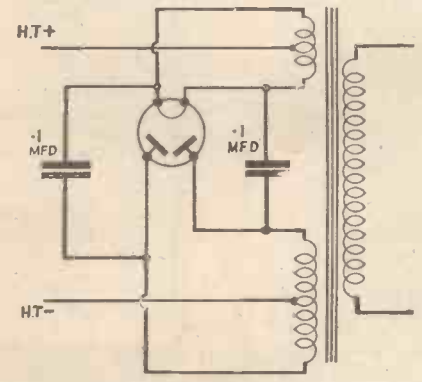


Fig. 2.—Another method of suppressing modulation hum where a full-wave rectifier valve is employed.

atmosphere proof and yet pliable enough to avoid creating its own frequency (note); no hum if field energised, and no movement of cone at inaudible ripple levels; a level frequency curve from 25 to 10,000 cycles, with a response up to 12,000 cycles; a good transient or "attack" response; and ability to handle its maximum proposed input without distress.

Speaker Baffles

By reducing the cone and coil mass, the response at low volume levels becomes increasingly linear, as less input energy is required to displace the cone, which then has less inertia. The full development of low frequencies (bass) depends on the possible movement of the cone which will need to be displaced about $\frac{5}{16}$in. to $\frac{3}{4}$in. per oscillation at 25 cycles, and the provision of a baffle about 4ft. square. Colouration can be avoided by preventing box resonances, and vibration of the baffle. By making the latter $\frac{3}{4}$in. to 1in. thick and of plywood or a combination of wood and felt or similar non-resonant material, the natural frequency can be kept below the lowest frequency response of the loudspeaker unit. Research into baffle design has shown that where it is constructed to rectangular shape rather than square, and the unit mounted out of centre, say, about one-third from one end, an improved bass frequency response results.

Horn Loudspeakers

Contrary to popular belief, horn loudspeakers can be considered as being excellent reproducers, provided they are suitably loaded. The horn can be straight or folded, but it must be physically long enough to ensure a proper exponential shape and flare size to provide adequate development of bass frequencies.

Internally the walls should be smooth and preferably polished, and the coupling between the horn and its driving unit must be rigid, non resonant, and of suitable shape. Natural resonances can be avoided by suitable bracings and cross-battens at vulnerable points, or even by fillings of plaster of Paris. Due to the not inconsiderable room required, horn loudspeakers are more confined to commercial use rather than domestic application.

Reducing Interference

It is incumbent upon the person installing a set to take all reasonable steps to exclude electrical interferences. Many of those who build their own receivers, and users of certain commercial makes, have some knowledge of available suppression devices, but there are innumerable non-technical listeners who still labour under a misapprehension that sudden or constant noises are part and parcel of radio reception. The fact remains that about 90 per cent. of man-made static, which can mar what might otherwise be an excellent equipment, is definitely reducible to an inaudible level.

A suggestion of immediate practical value to those whose reception is affected is that they should apply to one or more

(Continued on next page)

REPRODUCING REALITIES

(*Continued from previous page*)

of the firms specialising in suppression apparatus for full details of the available devices. Additionally, if there is doubt as to the most effective scheme of suppression, a request for an interference elimination form (to be returned for free advice) will generally lead to a successful end to avoidable electrical noises.

Distortion

Mis-tuning of sharply-resonant circuits, and in sets of fixed selectivity, will create peculiar forms of distortion. The provision of a visual tuning indicator and, preferably, means of variable selectivity are a great help in extracting the maximum entertainment value from a programme.

Sometimes a hum will accompany the reception of a station and disappear on tuning to another transmitter. It could, of course, be due to the particular station received, although if the hum persists at several points but not between stations, the possibility of a mains modulated hum must not be overlooked. Such noises rarely occur in commercial sets, as they are normally created by induction or capacity effects to detector components due to faulty layout. The cure is to rearrange or screen the parts in question and place a condenser filter across the mains leads or across the rectifier valve (if used) as shown in Figs. 1 and 2.

Avoiding Box Resonance

Colouration and slurring, the last of our possible criticisms, are usually attributable to the loudspeaker or its method of "housing." Where a purchased receiver gives satisfaction other than in its reproduction, it is well worth considering the possibility of throwing the loudspeaker out of circuit and connecting another, suitably mounted on an external baffle, in its place. There is the alternative of removing the existing one from the cabinet and using this on the separate baffle, merely extending the leads.

Provided the baffle area is adequate and suitably designed, as previously described, both schemes will inevitably remove many of the existing criticisms, plus the box resonance (however slight) which one has been accustomed to expect.

If a new speaker is employed, it is advisable to see that it is properly matched to the power valve.

The choice of a suitable unit will be governed by the amount of power to be handled (estimated from the output valve), whether it requires field energising, and, if the latter, how it is to be operated. A separate rectifier equipment may be used, although more economically, by choosing an M.C. unit having a field resistance (and current capacity) similar to the existing unit, the leads may be transferred.

Few readers will mind spending a few shillings, plus a little time and patience, in bettering their reception, and with existing parts if it can be arranged without detriment to the set or surroundings. Even the most enthusiastic connoisseur of good music might quail, however, at the domestic upheaval resulting from the use of a baffle 4ft. by 4ft., despite proof that such a size is only compatible with the proper development of bass notes. Fortunately, by arranging a smaller baffle, say, 2ft. wide by 2 or 3ft. high, diagonally across a corner and preferably at hand level (or slightly above surrounding objects) a nearly similar result may be obtained, as the walls then act as part of the baffle. Such reproducing arrangements can be disguised according to the individual ingenuity of the reader, who should remember that while some covering is desirable to hide the cone of the reproducer unit, it should not be so heavily woven that the sounds are muffled. For particularly fine M.C. units having a response up to 12,000 cycles, there is much to be said in favour of omitting baffle-cone coverings altogether, as even the finest muslin has a tendency to mask the upper register.

Room Furnishings

The furnishings of a room play a large part in the final reproduction. A modern scheme of decoration with the minimum of furniture and hangings may sometimes lead to reverberation or re-echoes. In such cases a fitted or loose carpet with curtain hangings drawn over the windows should improve matters, although, if the effects described persist despite these fitments, a square of felt, a rug or a small carpet placed under the loudspeaker baffle (and one even hung behind it) will often overcome the difficulty. Ornaments of metal or porcelain which are apt to resonate at a particular frequency (and for which the M.C. unit may be blamed) can be "deadened" by mounting on small mats.

On Your Wavelength

By THERMION

Licences Mania

I NOTICE that certain schoolmasters are arrogating unto themselves the power to issue licences to their scholars before the latter are entitled to use their cycles to travel to and from school. This is quite illegal, for a schoolmaster has no jurisdiction over his scholars outside of school hours and the school precincts. As they are permitted to get away with it and the Educational Authorities do not intervene, the idea opens up interesting possibilities in the radio field. We all have to possess a receiving licence, and once we have bought it we can operate our sets in any way we choose; we can use excessive reaction and interfere with our neighbour's programmes by re-radiation. We can make the night hideous by turning up the wick after midnight when a sick neighbour next door wishes to sleep. So what about giving the police powers to issue Listeners' Licences; before one of which is granted every householder would have to pass a test in listening and operating? If more than three neighbours complain about the manner in which a certain set is operated the licence holder would lose his licence. After all, a few more forms to sign wouldn't matter much. We spend three months of the year working to pay Income Tax, and at least another month filling up one form or another; we might as well give the police a little more work to do filling up a few more forms and helping to keep the police courts busy. It would also enable magistrates to hold forth on a few more subjects they know nothing about, apart from motoring. Thanks to Mr. Butler for his devastating criticism in his "Miscellaneous Thoughts," in which he refers to magistrates in the following terms:

"Authority intoxicates,
And makes mere sots of magistrates.
The fumes of it invade the brain,
And make men giddy, proud and vain."

That, of course, applies to crooners, radio stars, film stars, and authors, for I notice that most of the latter like to have themselves photographed smoking a pipe with a long stem, and seated before a sheet of blank notepaper with pen in right hand and trying to look really clever. All is vanity and vexation of spirit.

Accompanied by the organ.

Unemployment Among Musicians

A FEW weeks ago a variety programme was broadcast which was accompanied throughout by the cinema organ recently installed by the B.B.C. There was a complete absence of orchestra, and I was not surprised to read in the daily press a few days later that musicians were complaining of unemployment. Hard, but true. You cannot stop progress. When processes change, labour suffers for a time. We all remember the story of Richard Arkwright, when he invented the spinning loom. The mill hands were so incensed that they smashed his machinery; this did not, however, stop the production of spinning machinery. A handful of musicians (the easiest and most overpaid profession in the world) cannot stop radio or canned music. If they complain of unemployment they should see to it that they took up some other profession. Most people who enter the entertaining profession, do so in the desire to earn a lot of money for a little work. They want the days to themselves, and to put in a couple of hours' work on the stage in the evenings. They are usually vain people who wish to thrive upon the inconsequential hand-clapping of the audience, who nowadays have no powers of discrimination and will equally applaud the rotten acts and the good ones.

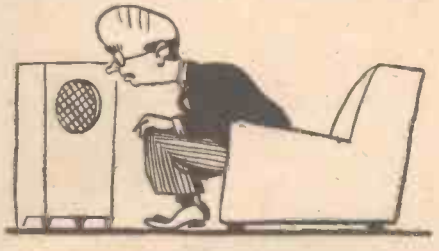
The Schoolboy Serial

I KNOW of several men who dashed home to hear the latest instalment of the schoolboy's thriller broadcast in serial form in the Children's Hour recently.

Conversely, I know of several schoolboys who asked to be allowed to remain up to hear the broadcast on international politics, whilst paterfamilias went to bed. It is a topsy-turvy world.

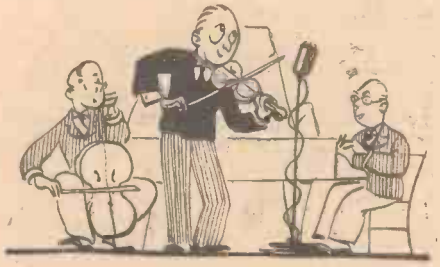
Bunk About Rays

YOU will remember how the editor debunked the nonsense talked about rays. They were, according to the daily papers, able to bring down aeroplanes, to stop motor-cars and battleships. It is amusing, therefore, to learn that Marconi has ceased his experiments along these lines, as the most he was able to do was to kill a rat at a distance of 3ft.! Accordingly, I am amused at a statement made at a recent meeting of The British Association of Chemists that high-



A thrilling serial.

frequency rays projected to sufficient strength could bring down a fleet of 'planes loaded with bombs and gas. A London evening paper, in a leader on the subject, said : " Those whose nightmares are haunted by wings over London may take heart from the thought that man has never yet invented any weapon to which human ingenuity could not provide a defence." The newspaper evidently took the remark as seriously as did the British Association of Chemists. They were not only talking through their hats, but talking upon a subject they knew nothing about. I advise them to confine their attention to finding a cure for the common cold, chilblains, bunions and corns, and leave high-frequency rays to that more intelligent section of the community which understands them. They are nothing to do with chemistry. Even barbers are now talking about high-frequency treatment for baldness. Wireless has a lot to answer for.



A trio from all stations.

Costly Relays

I OFTEN wonder why the B.B.C. considers it worth while to relay from long distances programmes which are not worth listening to. There was one from Belfast recently. The turn was not a well-known one, and could not have commanded a high fee. It certainly could not have been selected on merit.

City and Guilds Examinations in Radio Service Work

I HAVE received from Mr. M. A. Vernon, of the Department of Technology, City and Guilds of London Institute, 31, Brechin Place, South Kensington, S.W.7, a pamphlet giving details of an examination which the Institute will be offering in 1938, and onwards, in the new subject of radio service work. It is hoped that this will to some extent help to meet the need for trained and certificated service engineers. The time of instruction it is suggested should be sub-divided in the following manner :

Radio theory 20 per cent., demonstration 10 per cent., calculations

Lightning Arresters

IN the early days of broadcasting, nearly every aerial-earth system was fitted with a lightning arrester or an aerial earthing switch, but nowadays very few of these are used. This is probably due to the fact that few, if any, cases of damage have been traced to an aerial charge. There are still many listeners who think that the aerial is a source of great danger, however, but the surprising fact is that most of these are under the impression that the danger is entirely eliminated by disconnecting the aerial lead from the set. This impression is, of course, quite wrong —the danger is far greater when the aerial end is free than when it is joined to earth through the receiver. A heavy charge can certainly accumulate on the aerial, especially if it is a long outdoor type, and therefore, it is advisable to fit an arrester or an aerial-earth shorting switch. Even if the accumulated charge is not strong enough to produce a spark discharge, a nasty shock can be experienced by touching the aerial lead.

Voltage Measurement

A PROBLEM which still seems to cause considerable confusion to beginners is that which concerns the measurement of the voltage applied to a detector anode, or to the screen of an S.G. valve. The beginner claims, for instance, that although he is using 120 volts H.T., with a resistance of 50,000 ohms between the detector anode and the H.T. line, he finds when connecting a meter from anode to earth that the voltage is only about 10. He then suspects that the resistor is faulty or that the H.T. supply is insufficient. What has happened is that he has used a cheap meter and the reading is false for the following reason. An ordinary type of dual-reading voltmeter may take as much as 30 mA. for a full-scale deflection (that is, for a reading of 120 volts). Consequently, when joined between the anode and earth, it is in series with the anode resistor and a very much higher current will be passed than is the case when the valve alone is in circuit. The valve may be regarded as a resistance, the normal impedance being equivalent to its internal resistance. An average detector valve has an impedance of, say, 15,000 to 30,000 ohms, and thus the current will be only a few milliamps. Therefore, to obtain a true reading of the voltage dropped across the valve (or, in other words, the voltage at the anode) the same current must be taken.

20 per cent., practical work 50 per cent. Every candidate for the examination will be required to have satisfactorily attended an approved course of lectures and laboratory instructions in the subject of examination and teachers will be asked to submit percentage marks awarded for each candidate's practical work in the class. Failure to obtain 50 per cent. of the possible marks for practical work will carry with it failure in the examination as a whole. The Institute reserves the right to call for any candidate's practical notebooks and to readjust the marks awarded by his teacher for practical work after inspection of these notebooks. Interested readers should write to the Institute for their pamphlet.

Television Exhibition

IN connection with the Exhibition to be held at the Science Museum, a Handbook has been compiled by Mr. G. R. M. Garratt, M.A., assisted by members of the Exhibition Committee. The Handbook contains a

More talk about rays.

brief account of early proposals for television, chapters on photo-electricity and light control, the cathode-ray tube and electron cameras, the television transmitter, television receivers, aerials, and a short description of the London Television Station at Alexandra Palace. Copies will be on sale at the Science Museum, or may be obtained from the publishers, H.M. Stationery Office, price 6d. (by post, 7d.).

Crooners, and Other Matters

I HAVE received the following letter from a reader who signs himself Serviceman :—

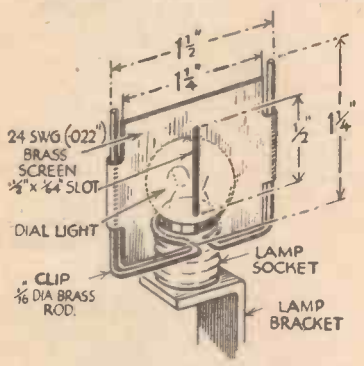
" A line from an old reader who read your lines some years before you became a crooner critic and a spiritual executioner of service men. In your May 22nd issue you mention the radio pillow, that contraption with headphone unit concealed in the stuffing—what a novelty it was then. I was called upon some years ago to fix a receiver into an easy chair with speaker concealed in the padding on the head-rest, with receiver under the seat."

A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — READERS WRINKLES — THE HALF-GUINEA PAGE

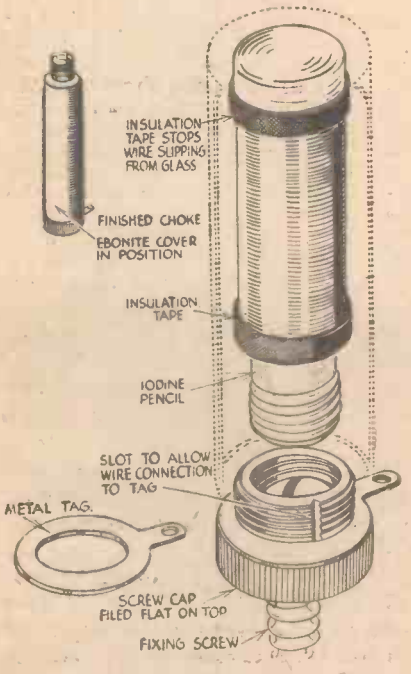
A Useful Dial-light Screen

BY interposing a suitable screen between the dial light and the condenser tuning scale, so as to permit only a thin beam of light to fall upon the rear of the



An adjustable dial-light screen.

scale, the condenser can be much more accurately tuned. An easily-made clip of ⅛in. diameter brass rod, bent to grip round the lamp-holder and support a slotted brass screen (No. 24 S.W.G.), as illustrated in the sketch, was found to be extremely satisfactory. The aperture was approximately ¼in. wide, and the screen is held in position as close as possible to the rear of the scale to produce a well-defined strip of light.—WM. A. HARRISON (Aintree).



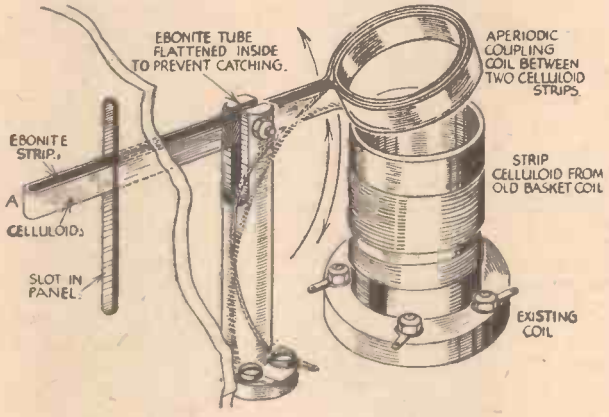
A simple method of making H.F. chokes.

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., Tower House, 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 wrinkles.

Aperiodic Aerial Coupling

THE accompanying sketch shows a simple variable aperiodic aerial coupling coil I have constructed to improve the



A simple variable aperiodic aerial coupling.

sensitivity of my receiver. Its addition to the existing tuning inductance in my receiver necessitated just the cutting of a slot in my front panel, allowing a fair movement of the celluloid protruding control piece "A."

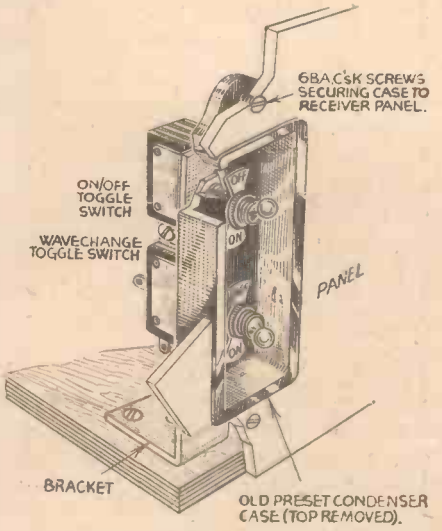
The construction of the pillar was a very simple matter, as will be seen in the sketch, and low-loss characteristics are occasioned by the minimum employment of metal in the whole assembly, even the coil being supported by two celluloid strips which, as just explained, form the means of manual adjustment. The coil was dipped in amyl acetate and left to dry before assembly was undertaken.—T. M. WILSON (Edgware).

Simple H.F. Chokes

WHEN building an H.F. amplifier unit of similar design to that of Mr. F. Hall's described in the February 27th issue, I found that I did not have any glass tube handy for the chokes. By using two empty iodine pencils and cutting the number of turns to 75 of 32 S.W.G., I overcame the lack of glass tube, and the screw at the base of the pencil facilitated mounting. The whole is insulated efficiently as the ebonite case can be screwed over the choke, as illustrated.—A. E. T. MAPLESTON (Hull).

Neat Switch Mounting

I RECENTLY had to fit two switches to my receiver, one for the battery and one for wave-changing. I did not like the complicated appearance of knobs all over the panel, and after some thought hit upon the following novel idea, which, in addition to providing a neat appearance, also provides a very efficient layout and constructional scheme. I dismantled an old preset condenser of the compression type. The holes which formerly accommodated the terminals were enlarged with a drill carefully to avoid splitting the case, and a slot was cut in the side of my cabinet to be just slightly larger than the internal measurements of the dismantled condenser case. Two toggle switches were then mounted on a component bracket and on the condenser case which was next bolted to the cabinet side as shown in the accompanying illustration. It will be seen that the switches are now flush with the cabinet and are neatly panelled in addition.—H. BEVINGTON (Leigh, Lancs).



A useful dodge for flush-mounting panel switches.

Making All-wave A

How to Erect Multiple A Make Impedance-matchi With Them.

THE increasing use of all-wave receivers has resulted in an increase in the interest of aerial design, as it is now found that the standard single-wire aerial does not afford maximum results on all of the wavebands covered by the modern receiver. Even in a modern two-band (medium and long-wave) receiver, a single horizontal wire is necessarily a compromise, and is generally erected to provide maximum resonance on the wavelength which is found to be most difficult to cover with the particular receiver in use. Of course, many listeners simply erect any length of wire which can be accommodated in the garden space which is available, and then devote their energies to designing or modifying the receiver to give the desired results. Where, however, serious interference is experienced, either from passing motor traffic, or from electric signs erected on buildings adjacent to that in which the receiver is installed, the listener is forced to adopt some form of anti-interference aerial, and is thus brought face to face with this important section of radio technique.

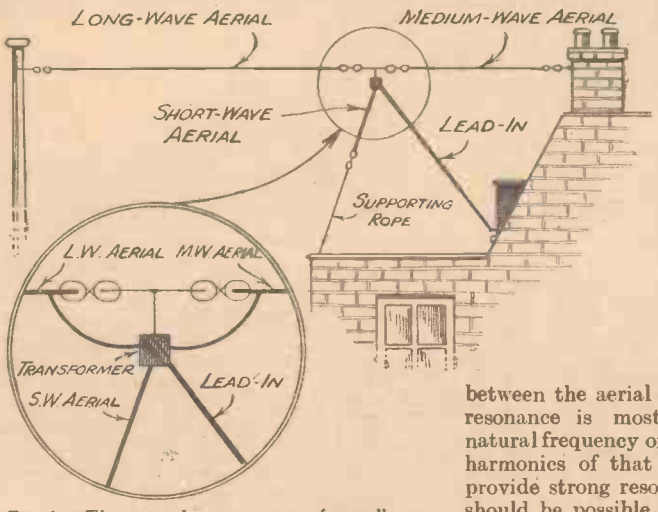


Fig. 1.—The general arrangement of an all-wave aerial such as is adopted in the H.M.V. and Marconi system.

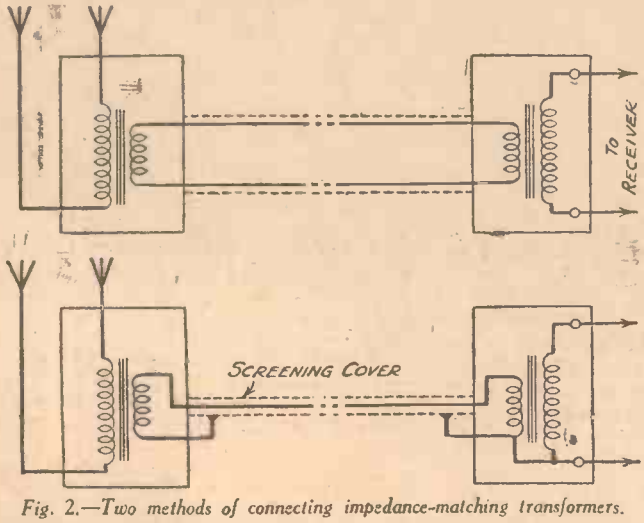


Fig. 2.—Two methods of connecting impedance-matching transformers.

All-wave Aerials

A modern all-wave receiver may be said to cover one short-wave band in addition to the two normal broadcast bands, and thus a short aerial is found very useful in providing maximum response on the short-wave band. Where two short-wave bands are included even two short-wave aerials may be found desirable, although not essential. For medium waves an aerial of about 30 feet is generally found most useful, whilst for long waves from 60 to 100 feet provides maximum results. The longer aerial often only introduces difficulty on the medium waves, due to the fact that it decreases selectivity due to the larger amount of energy which it picks up, as distinct from its resonant frequency. It should be understood, of course, that the aerial system (which includes the aerial, lead-in wire, earth wire, and the coil connected between aerial and earth terminals) will resonate at a particular frequency dependent upon its inductance and capacity. When the grid circuit to which this is coupled is tuned, the aerial is also tuned, due to the coupling between the aerial and grid coils, but the resonance is most pronounced at the natural frequency of the aerial system. At harmonics of that frequency it will also provide strong resonance, and therefore it should be possible to find a length which will give maximum response at two or three different frequencies or wavelengths. In practice this is not easy to attain, and it is preferable to use separate aerials, each chosen to resonate at a frequency roughly in the centre of the waveband covered by the tuning coil being used. Thus for a three-band receiver three separate aerials are desirable, a short wire, say 10 feet or so in length, being included in addition to the 30ft. and long wire previously mentioned. These may be arranged in many ways, and one of the most convenient for the amateur is depicted in Fig. 1. Here the two broadcast aerials are joined end to end (insulated at the junction) and the short-wave aerial is suspended from the point at which they are joined.

A Complication

If the performance to be obtained from the receiver has to reach a very high level it may be necessary to use even more than these three aerials, including other lengths to resonate at some other part of the wavebands covered. Such an aerial is very popular at the moment in America and is known as the spider-web aerial, a diagram of it being given at Fig. 6. It will be seen here, however, that the aerials each consist of a dipole, or half-wave aerial, each built up from two quarter-wave aerials, and this necessitates twin feeder wires from the centre point. The advantage of an aerial of this type is that the feeder wire (or lead-in) will not pick up any energy, as it is either screened or transposed throughout its length. This is the arrangement which has to be adopted if local interference is experienced, as the aerial array may be placed well away from the building (out of the area of interference) and the lead-in will play no active part in picking up the signals. If a very long feeder is needed it will be necessary to include two transformers in the aerial system, one at each end of the lead-in, to balance out losses. This is carried out by using a step-down transformer at the aerial end and a step-up transformer at the receiver. The two sections of the transformers which are

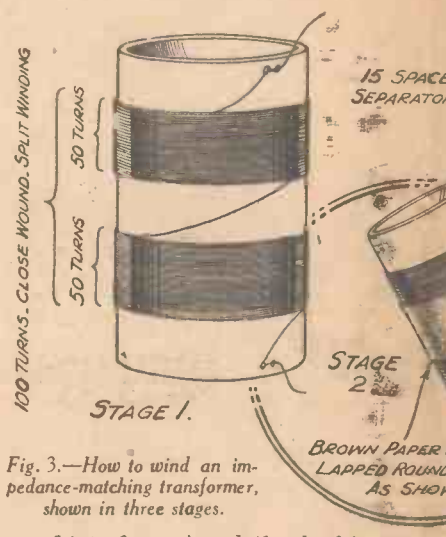


Fig. 3.—How to wind an impedance-matching transformer, shown in three stages.

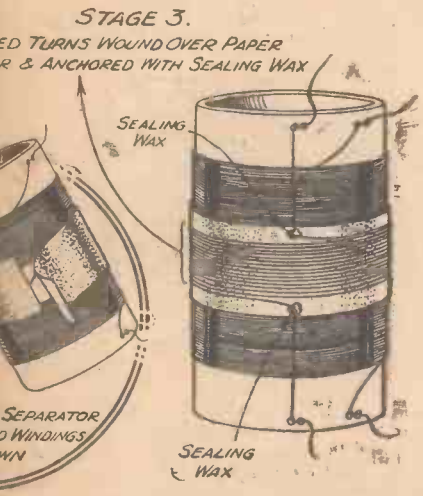
Fig. 5.—A commercial kit supplied by the New London Electron Works.

A.I. Aerial Systems

erial Systems and how to g Transformers for Use

By W. J. Delaney

connected together form a low-impedance circuit and consequently the capacity between the feeders will not have such a marked effect upon the signals which would otherwise be seriously interfered with. Transposed feeders, generally, do not need the inclusion of the transformer, provided the transposition blocks give adequate spacing between the two wires. The twin feeder consisting of two wires will require the transformer, and the usual way of arranging such a feeder is to use parallel-laid insulated wires in a heavy rubber cable. An alternative scheme is to use a single



wire laid inside an insulated cable with a braided metal screen surrounding it, and this screen may form one of the feeder wires by being connected to one side of both transformers. The separate schemes are shown in Fig. 2. In place of a simple transformer, an auto-transformer or tapped coil may be used, or a tuned transformer incorporating fixed condensers, such as is used in the B.T.S. system (Fig. 7), may be employed. The capacities will depend upon the coil windings, and it may be desirable for the amateur to experiment to find the most suitable values for his particular aerial and receiver system.

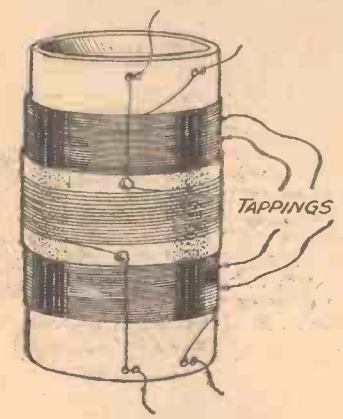
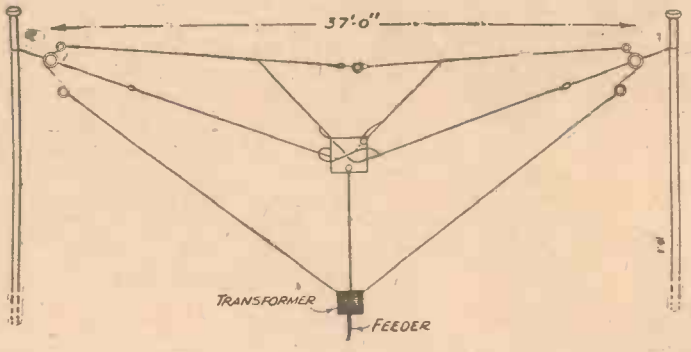


Fig. 4.—The receiver transformer design, provided with tappings.

Fig. 6.—This is the arrangement employed in the American spider-web aerial. Note that each aerial is a dipole.



Incorrect Matching

One important point which must not be overlooked is that at the receiver end the tuning circuit may be such that the maximum effect is not obtained from the impedance-matching transformer, and this fact should not be lost sight of when a commercial all-wave anti-interference system is purchased. Generally, these are designed by the makers primarily for use with their receivers, and although they may not necessarily fail to give satisfactory results on other receivers, the aerial circuit may require modification in order to provide the maximum effect. An existing aerial circuit may easily be modified by winding a small coupling coil over the present grid coil (the number of turns and the spacing again having to be found by experiment) and connecting each end of this to the aerial and earth terminals for subsequent connection to the impedance-matching transformer.

Transformer Design

The majority of modern impedance-matching transformers employ iron-cored coils, providing a high inductance-capacity ratio, and are accordingly beyond the scope of the average amateur to build. Alternative designs may be wound on small diameter formers, however, and a small low-loss switch employed on the secondary for wave-change purposes. It will be appreciated, of course, that no switching is required at the aerial end to separate the individual wires, as these automatically resonate to the frequency to which the receiver is tuned, by reason of the tight coupling existing between the aerial and the tuned circuit. A design which has been found to offer good results from an all-round point of view is to wind the aerial transformer (that is the one joined direct to the multi-aerial system) with a primary of 100 turns of 28 D.C.C. wire on a 1in. diameter former, and to split this into two equal sections, separated by ½in. Over the centre space three or four layers of thick brown paper are wound, and in the centre of this 15 turns of a similar gauge of wire are wound for the secondary. The ends of this winding should be anchored with sealing wax or Chatterton's Compound, and taken straight across the primary at right angles before being lead through anchoring holes in the former for connecting purposes.

This coil should be mounted inside a small aluminium screening can, and the bottom of this should be sealed with a disc of waxed wood or ebonite. Chatterton's compound or some similar wax will make it waterproof, and the holes through which the ends of the aerial and lead-in are passed should also be sealed.

The receiver transformer will be wound in exactly the same manner, but the larger winding (which is in this case the secondary) must be tapped to provide the necessary wave-change selection points. The ideal system is to use a two-point switch so that equal tappings are selected from each end of the secondary, although in many cases it is quite sufficient simply to transfer one connection by stages down the secondary, leaving the earthed end permanently connected. Figs. 3 and 4 show these arrangements.

The receiver transformer should be mounted as close as possible to the aerial and earth terminals of the receiver, and the leads to these terminals should also be screened.

It must be emphasised that these details will not apply to every set, and therefore the constructor must be prepared to carry out some experiments as previously mentioned.

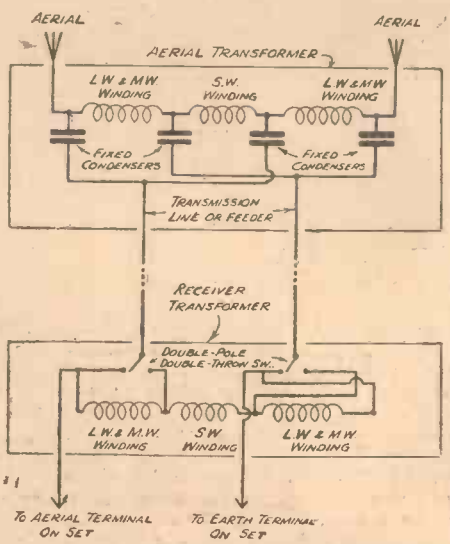
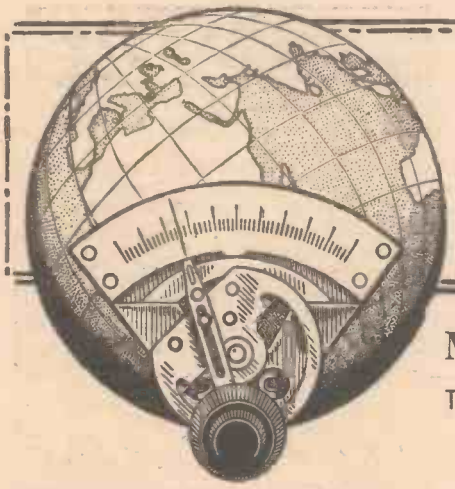


Fig. 7.—The circuit arrangement employed in the B.T.S. anti-interference all-wave aerial system.



SHORT WAVE SECTION

MEASURING THE ULTRA-SHORT WAVES

Two Alternative Systems for Accurate Wavelength Measurement Below 10 Metres

THE ultra-short-wave experimenter's greatest worry is that of locating the desired wavebands, particularly if it is his first ultra-short-wave receiver. Even if the exact capacity and inductance values of a published circuit are strictly adhered to, the same frequency range may not be covered.

On the ultra-high frequencies a difference of an inch on a grid or anode lead may make a change of as much as a metre in the tuning range. Also, if a metal chassis is used, the distance between the various components and the chassis will materially affect the frequency range.

It is an impossibility for the amateur to make really accurate frequency measurements on say, the 5-metre waveband, unless laboratory equipment is used. However, it is quite possible with a little care to obtain a reasonably accurate indication of any particular waveband, with one or more methods about to be described.

Simple Oscillating Circuit

One of the simplest ways of obtaining a waveband check on the ultra-high frequencies is to build a simple oscillating circuit and excite a half-wave aerial. Fig. 1. shows a suitable circuit using a P.X.4 in a series tuned ultra-audion type of oscillator.

This circuit will oscillate readily, the only really critical component being the H.F. choke feeding the plate coil. If this component is omitted or a wrong type of choke used, the circuit will not oscillate. Most of the commercial ultra-short-wave chokes now on the market will be quite satisfactory.

It will be seen that a half-wave aerial—for the particular waveband it is desired to check—is tapped on the centre turn of the anode coil, with a 60 mA type of fuse bulb connected in the centre of the aerial. The tuned circuit consists of two 3-turn coils of 16 tinned copper wire, split in the centre with a .0001 mfd. variable condenser.

Tuning procedure is quite simple, the condenser being rotated until the lamp lights up to its maximum brilliancy. At this point the oscillator reading should be transferred to an absorption wavemeter, one preferably with a flash-lamp bulb in series with the tuned circuit, so that a visual indication of the exact tuning point will be obtained. Plenty of H.F. energy will be obtained from this oscillator with 250 volts on the anode. One important point must be mentioned, this circuit must be used for the purpose of wave measurement only, and it must not be used for any kind of communication, as it really constitutes a miniature transmitting circuit.

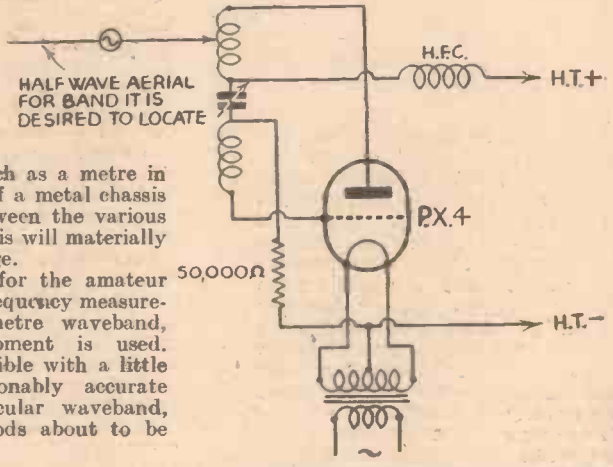


Fig. 1.—A power oscillator for wavelength measurement on the ultra-short waves.

For radiation purposes a special licence is necessary. Though even so it must be remembered that it is an unstabilised circuit and turns out a poor note for this work.

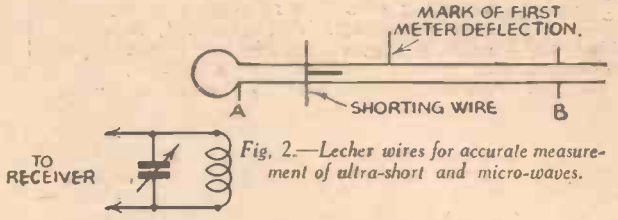


Fig. 2.—Lecher wires for accurate measurement of ultra-short and micro-waves.

Additional Waveband Check

Although the above is reasonably accurate for waveband checking, after having obtained a check a single turn coil should be placed in the centre of the aerial. When this coil is brought into close proximity with the receiver grid coil of an oscillating detector or super-regenerative circuit, it will be found that the detector valve will cease oscillating when the tuned grid circuit is brought into resonance with the natural frequency of the aerial.

This must be regarded as an additional waveband check, and will not give very great accuracy, particularly with the super-regenerative receiver, because it will be found that the aerial will not have any effect above the non-oscillation point on the receiver dial, but below this point the aerial will be inclined to pull the circuit out of oscillation all the time, if the coil is not kept at a critical distance away. This is due to a loading effect of the tuned circuit with minimum capacitance, as in using an aerial in the ordinary way.

Lecher Wire System

The most accurate way of frequency checking is to use the well-known Lecher wire system. This method of frequency measurement is usually applied to transmitting circuits, and it is not generally realised that it may be used for receiver measurement as well.

In using the Lecher wire system the detector circuit should be in an oscillating condition; this is, of course, complied with if the receiver is a superhet or a super-regenerative receiver. Two wires of 18 bare copper are stretched out side by side about two inches apart, terminating in a single turn loop which is coupled to the receiver tuned circuit, as in Fig. 2. A low-reading milliammeter is then connected in the H.T. feed to the detector anode circuit, and here it may be mentioned that if a very small amount of current is being drawn by the detector valve, things may be "hotted up" a bit by an increase in anode voltage for the purpose of the check.

A stiff, short length of bare wire is drawn down the two wires, insulated from the hand by means of a piece of ebonite tubing. At a certain point of shorting the two wires a flicker will be noted on the meter, this point on the wires should be carefully marked, and the shorting wire should be drawn still further along the wire until another flicker is noted. The two distances will then be each half wave at which the detector valve is oscillating, or the distance A. B. of Fig. 2 will indicate the exact wavelength to which the receiver is tuned.

It will be understood that this system of wave checking will be of most use to the experimenter on wavelengths of 5 metres and below. Using this method, it can easily be discovered which is the lowest wavelength that any valve or circuit will oscillate.

IMPRESSIONS ON THE WAX

By T. Onearm

THE CORONATION CEREMONY RECORDED

THE Coronation Service has been recorded by the H.M.V. Company on fourteen double-sided 12-in. records, and the King's speech on one 12in. record. The discs will bear special labels of Royal blue, scarlet and gold. I recently had the pleasure of hearing extracts from some of the records when I visited the H.M.V. studio, and they must be congratulated on performing a remarkable piece of recording.

Single Records Available

THE records cost 5s. each, and are available complete in a souvenir album for £3 15s., the album being supplied free of charge. It is possible for any record to be bought separately. The records are also obtainable specially coupled for playing on automatic record changing instruments. They were made with the King's permission, and with the co-operation of the B.B.C., at the H.M.V. recording studios at St. John's Wood.

Intervals Eliminated

THE original recording of the service took 37 sides of records, and after a staff had worked continuously for 48 hours to process these records, the whole ceremony was re-recorded in order to eliminate intervals and to ensure that, as far as possible, the two sides of each record should contain a complete section of the ceremony. At the same time it was possible to equalise the volume of certain parts of the ceremony. In some cases the original recording of certain passages were faint, and the speakers were some distance from the microphones in the Abbey.

Issued Throughout the Empire

WHILST at the studio I was informed that arrangements have been made for the metal matrices, from which the records can be pressed, to be sent to all parts of the Empire,—in many cases by air-mail—in order that records of the service and speech may be available, as soon as possible, in every quarter of the Empire.

Another set of matrices is being placed in a hermetically sealed case and will be deposited in the British Museum.

A special leather album is being prepared for the King's own personal set of records of the service. The profits from the sales of these discs will go to the Industrial Welfare Society.

Recording the Coronation Service from Westminster Abbey, and the King's Speech from Buckingham Palace, at the "His Master's Voice" studios.

"Humoreske"

THE Comedy Harmonists have made attractive arrangements of Dvorak's famous "Humoreske" and Kreisler's "Liebesleid" this month on *H.M.V. B* 8562. "South Sea Island Medley" is a pleasant arrangement of some of the better-known Hawaiian melodies. It is played by the Twilight Serenaders on *H.M.V. BD* 420.

The Light Opera Company contribute vocal gems from the new light operetta, "Paganini," on *H.M.V. C* 2902, and Max Miller continues his series of records with two of his latest songs, "How the So-and-so Can I Be Happy?" and "The Girl Next Door"—*H.M.V. BD* 419.

BRIEF RADIO BIOGRAPHIES—11

By RUTH MASCHWITZ

Claude Hulbert

CLAUDE HULBERT spent his childhood in Bexhill and from an early age his chief interest was centred in the concert parties and circuses that visited the place. In imitation of his idols at the circus he spent hours attempting acrobatic feats on the garden swing, much to his family's apprehension.

As he had not overmuch pocket money to spend, Claude evolved a clever scheme for attending these performances. He used to visit an aunt, borrow a penny, and buy two bananas. When he arrived at the box office he would offer a banana to the girl at the desk with an ingratiating smile. She was so touched by this delicate attention that she invariably gave him a free pass—and he still had a banana to eat during the show!

In 1919 Claude followed his brother, Jack, to Caius College, Cambridge, where he became a member of the Footlights Dramatic Club. Incidentally his first stage appearance in London was in one of their shows, "His Little Trip," in which he scored a big success.

It was Jack and Cicely Courtneidge who were really responsible for Claude's marriage to Enid Trevor, with whom he has given so many entertaining broadcasts. They decided, long before the two were introduced, that they would get on like a house on fire. Alas, when the meeting took place, Enid thought Claude "a silly little thing" (to quote her own words), and he reciprocated the adverse opinion. Later, when they were sending out wedding invitations they noticed the same name on each list.

"You can't have him!" exclaimed Enid. "He's mine." It transpired that the young man in question had been Claude's best friend at Cambridge and had rowed next to him in his College boat.

Claude's first professional appearance was in a sketch at a music-hall in Bradford with which he afterwards toured. Since then he has appeared in numerous shows, including "Follow a Star," "Dear Love," "Kid Boots," etc., and in films such as "Hello, Sweetheart," "Bulldog Jack" and "Lilies of the Field."

Mabel Constanduros

"I WAS nicely brought up," Mabel Constanduros told me, "in the suburbs by parents who did very well, and we got richer and richer, and lived in larger and larger suburban houses and had a lovely time and we were very happy (seven of us)!"

As a child, Mabel was always reading and writing stories, and as she grew older expressed a desire to go on the stage, which, however, was not encouraged. She married and still lived in the suburbs, but was determined to start a career. She studied at the Central School of Speech Training, and began to write monologues and sketches to amuse herself. In this way she evolved the Buggins family.

Then came the daring thought of an audition at the B.B.C. She learnt up some Shakespeare and modern poetry, but when actually faced by the microphone her nerve went and her mind became a blank. The only thing she could think of was one of her Mrs. Buggins sketches. When she had finished she went home in despair and was overcome with surprise at hearing that her audition had been a success.

Mabel first broadcast in 1925. Later in that year she and Michael Hogan were taking part in the same play. They decided to join forces and write for the microphone and Michael took the parts of Father and Bert in the Mrs. Buggins sketches. These proved some of the most popular sketches ever heard on the air, and many listeners have taken the Buggins family quite seriously. One enthusiast even went so far as to send Grandma a set of false teeth! The Buggins have been the subject of plays, gramophone records, and a book.

Together, Mabel and Michael have written several plays, perhaps the most successful being the mystery drama "The Survival." Their most nerve-wracking ordeal was an impromptu commentary in the Royal Command Variety performance.

Besides her broadcasting work, Mabel has appeared on the stage and in films. She has published a number of one-act plays, some songs, a book of children's poems, and numerous short stories.

Most of her spare time is spent at her country cottage in Sussex, where she indulges her passion for gardening, fresh air, cold water, and plain cooking.

Howard Marshall

HOWARD MARSHALL is probably best known to listeners for his eye-witness accounts and sporting commentaries. He was born at Sutton, in Surrey, and educated at Haileybury and Oriel College, Oxford. In his early days he was a fine athlete and got his "blue" for Rugger. After leaving Oxford he joined the staff of a publishing house and acted as sporting correspondent for several newspapers. He left Fleet Street temporarily owing to an accident on the football field, and it was suggested that he should apply to the B.B.C. for the job of announcer. This he did and immediately secured an appointment, but after a while was transferred to the Talks Department, where he had a hand in the news and gave brilliant commentaries on sporting events, particularly rugby football.

He tells an amusing story of how one of his cricket commentaries was unduly interrupted. A microphone had been installed in a room of a house on the edge of the cricket ground. Just as the red light was signalled for Mr. Marshall to begin, the tinkle of a piano was heard from the room above. Someone was practising scales. The engineer rushed away to intervene and in a few moments there was silence—but not for long. Suddenly an irate lady armed with an umbrella appeared outside the window and menaced Mr. Marshall. He continued to broadcast, at the same time trying to make conciliatory gestures. In a frenzy of rage she rapped on the window pane with her umbrella and shouted, "Hi, there, when are you going to finish? My little girl's wasting her music lesson!"

Mr. Marshall eventually left the B.B.C. staff to join the *Daily Telegraph* as a special writer on sport and literature, but he still continues his associations with radio. He gave a series of talks in 1932 on housing conditions as a result of his own investigations and involved the B.B.C. in considerable controversy with the local authorities.

Mr. Marshall is married and has two sons; he lives at Chobham. His chief hobby is fly fishing, which he indulges in on the Avon, near Fordingbridge.

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.

Southall Radio Society

THE above society has been concentrating recently on Direction Finding experiments on the 40 metre band. There is little doubt that the valuable data which Southall has accumulated will be of the greatest possible value to the various interested bodies. In the Direction Finding Contest run by the Golders Green and Hendon Society, Southall teams finished 1st, 2nd, 3rd and 5th, a tribute to their consistency and the hard work which they put in before the event. The Southall club's contest has been advanced to June 13th. A record entry is anticipated.

The society's excursion to Paris in connection with the Salon T.S.F. was a big success, more than thirty members and friends taking advantage of the special facilities which the organiser, Mr. S. Gould, had provided. Hon. Secretary, H. F. Reeve, 26, Green Drive, Southall.

British Short-wave League

THE above society had a very successful meeting on Tuesday evening, May 25th, and there was a large increase of new members. We are holding another meeting on June 29th, in the Braintcroft Schools, at 8.30 p.m., and are also arranging a 5-metre Field Day to take place on Sunday, June 20th, or 27th. Hon. Sec., F. A. Beane, Ridgewell, Halstead, Essex.

Proposed S.W. Club for Perth

ANY readers interested in the formation of a short-wave radio club in Perth are invited to get in touch with Mr. R. Adams, 2, Croft Park, Craigie, Perth, Scotland.

Liverpool Amateur Radio Society

THE above club is now being formed and new members will be welcomed. Meetings are to be held at the address given below, and full particulars can be obtained from the Secretary, J. McLelland, 38, Andrew Street, County Road, Walton, Liverpool, 4.

Proposed S.W. Club for Port Talbot

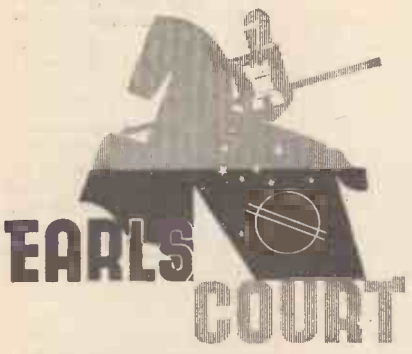
WILL any readers interested in the formation of a short-wave club in the district please communicate with Mr. W. Ryan, 47, Margam Terrace, Port Talbot?

Northampton Radio Society

READERS residing in the locality will be interested to know that the above society has just been formed in Northampton. Any keen experimenters interested in short-wave reception are invited to write for particulars to the Hon. Sec., D. W. Harries, 99, Ardington Road, Northampton.

EARLS COURT EXHIBITION

WE are informed that Earls Court, Limited, recently commissioned Mr. McKnight Kauffer to design a symbol for their great Exhibition Building now nearing completion. This mark has now been registered, and is shown in the accompanying illustration.



Asked why he chose a knight on horseback as the basis of his design, Mr. McKnight Kauffer said: "I have tried to produce a symbol which would carry on the Earls Court tradition of spectacle and sport." He described his design as "a link with the past and a challenge to the future."

"Earls Court," he said, "came into prominence with Buffalo Bill's equestrian entertainments, and although its future might see the eclipse of the horse, the romantic element would always be present; anyway, why should an artist have to explain himself or his ideas?"

TELENEWS

Hard or Soft Valves?

SOME readers still seem to experience difficulty in appreciating the main differences between time-base generators using soft valves and those using the hard variety. The term "soft valve," is, of course, applied to the gas-filled valve whose function is to bring about an ionisation discharge as soon as the charging voltage across the fixed condenser has reached an appropriate value. This type of valve is excellent when used in the time-base generator supplying the frame pulses at 50 per second, but at the high-line frequencies there is a tendency towards instability. If allowed to get too hot when boxed up in the receiver they are inclined to "choke" if due care is not paid to the design of the equipment. The "hard valve," that is, the high-vacuum valve, on the other hand, possesses increased stability owing to the absence of any ionisation delay. Furthermore, the circuit embodying them is capable of functioning at frequencies incapable of being reached by gas-filled valves. If there is, in the future, to be any increase in the degree of line definition, then the hard valve time-base generator should be capable of adapting itself more readily to any changes that may occur. It is interesting to note that this latter type of time-base generator is capable of working up to frequencies of a megacycle, and was first suggested and put into operation by Mr. Puckle, of A. C. Cossor, Ltd., for television receivers.

Important Broadcasts of the Week

NATIONAL

Wednesday, June 9th.—"Youth at the Helm," a Comedy by Hubert Griffith, adapted from the German by Paul Vulpius.
Thursday, June 10th.—"Painting the Town," a Revue by Henry McMullan.
Friday, June 11th—Chamber Music.
Saturday, June 12th.—Running commentaries on part of the first day's play in the Women's Cricket First Test Match at Northampton; and the Nuffield Trophy at Donington Park.

REGIONAL

Wednesday, June 9th.—Concert Party programmes from the South Pier and North Pier, Blackpool.
Thursday, June 10th.—"Youth at the Helm," a Comedy by Hubert Griffith, adapted from the German by Paul Vulpius.
Friday, June 11th.—"Flying Dutchman"—Act 1—from Covent Garden.
Saturday, June 12th.—Orchestral programme.

MIDLAND

Wednesday, June 9th.—"The Tune you Heard"—A Potpourri of numbers from Midland Shows.
Thursday, June 10th.—Orchestral programme.
Friday, June 11th.—Dedication Service of Wrekin College Chapel.
Saturday, June 12th.—Commentaries on Women's Cricket, the First Test Match; and the Nuffield Trophy at Donington Park.

WESTERN AND WELSH

Wednesday, June 9th—A Variety Programme from the Stage of the Hippodrome, Southampton.
Thursday, June 10th.—Choral programme from Tabernacle Chapel, Skewen.
Friday, June 11th.—A Variety programme by the Dinorwig Quarrymen.
Saturday, June 12th.—"Abracadabra," a programme of rites, spells and incantations; a trailer of the full programme to be broadcast on June 23rd.

NORTHERN

Wednesday, June 9th.—Concert Party programmes from the South Pier and the North Pier, Blackpool.
Thursday, June 10th.—Northern Notions—6, "The Isle of Man," a Recorded Studio and Actuality review of interesting Northern events past, present and future.
Friday, June 11th.—Isle of Man Night's Entertainment, including Band programme from Cunningham's Camp, Switzerland (Isle of Man); Organ Recital from the Regal Cinema, Douglas; and a Concert Party programme.
Saturday, June 12th.—Coronation Rally; South East Lancashire Girl Guides' Association, a commentary on the proceedings, followed by the Address on arrival by the Chief Guide, from Belle Vue, Manchester.

SCOTTISH

Wednesday, June 9th.—Scottish Dance Music.
Thursday, June 10th.—Variety programme.
Friday, June 11th.—Hawick Common Riding, a recorded impression.
Saturday, June 12th.—"Laguna Gold, or The King's Capital," a romance of Laguna.

NORTHERN IRELAND

Wednesday, June 9th.—Light Orchestral programme, from The Orpheus Restaurant, Belfast.
Thursday, June 10th.—Orchestral Concert.
Friday, June 11th.—"Painting the Town," a Revue.
Saturday, June 12th.—Orchestral programme.

"P. and A. W." Directory of Radio Clubs and Societies

Our revised Directory of Radio Clubs. It is not yet complete and we shall be pleased to receive the missing details as indicated

A

Anglo-American Radio and Television S.W. Club (Uxbridge).
11, Hawthorn Drive, Willowbank, Uxbridge.

B

Battersea and District Radio Society.
Hon. Sec., S. F. Harris, 93, Salcott Road, Battersea, S.W.11.
Bec Radio Society.
9, West Way, Grand Drive, Raynes Park.
Bideford and District Short-wave Society.
Hon. Sec., E. K. Jensen, 5, Furzebeam Terrace, Bideford.
Blackpool and Fylde Radio Society.
Sec., H. Fenton, 25, Abbey Road, Blackpool.
Blackwood Radio and Television Club.
Address required.
Bournville Radio Society.
Hon. Sec., C. L. Bastock, c/o Messrs. Cadbury Bros., Bournville.
Bradford Experimental Radio Society.
Hon. Sec., E. P. Burgess, 23, Baslow Grove, Heaton, Bradford.
Bradford Short-wave Club.
Hon. Sec., G. Walker (2BWR), 33, Napier Road, Thornbury, Bradford.
Brentwood Amateur Radio Society.
Hon. Sec., N. K. Read, Netherton, Herington Grove, Hutton Mount, Brentwood, Essex.
Bristol Listeners' Club.
21, Old Market Street, Bristol.
British Short-wave League.
Hon. Sec., F. A. Beane, Ridgewell, Halstead, Essex.
British Sound Recording Assoc.
Act. Sec., C. L. Appelby, 29, Valley Road, Shortlands, Kent.

C

Cambridge Short-wave Club.
C/o Mr. F. A. E. Porter, 19, Trafalgar Street, Cambridge.
Cardiff and District Short-wave Club.
Hon. Sec., H. H. Phillips, 132, Clare Road, Cardiff.
Chadwell Heath and District Radio Society.
Address required.
City of Belfast Y.M.C.A. Radio Club.
C/o F. A. Robb, 46, Victoria Avenue, Sydenham, Belfast.
City and Guilds Eng. College Radio Society.
Hon. Sec., R. H. Tanner, Exhibition Road, South Kensington, S.W.1.
Clackmannanshire Short-wave Club.
Hon. Sec., D. McIntosh, 10, Cobblecrook Gardens, Alloa, Scotland.
Coventry Amateur Radio Society.
C/o H. J. Chater, 179, Alderman's Green, Coventry.
Cranwell Amateur Radio Transmitting Society.
Radio Block, E. and W. School, R.A.F., Cranwell, Lincs.
Croydon Radio Society.
Hon. Sec., E. L. Cumbers, Maycourt, 14, Campden Road, S. Croydon.
Croydon Wireless and Physical Society.
Hon. Sec., H. J. P. Gee, c/o Messrs, Gee & Co., Staple House, Chancery Lane, W.C.1.

D

Darenth Valley Radio Club.
Hon. Sec., K. N. Hollands, 14, Highfield Cottages, Wilmington, Dartford.
Deptford Men's Institute Short-wave Radio Club.
Hon. Sec., A. S. Wilson, 11, Bennett Street, London, S.E.13.
Dollis Hill Radio Communication Society.
Hon. Sec., J. R. Hodgkyns, 102, Crest Road, Cricklewood, N.W.2.

E

Eastbourne and District Radio Society.
Hon. Sec., S. M. Thorpe, 74, Broderick Road, Hampden Park, Eastbourne.
East Sheen Radio Club (proposed).
N. G. Anslow, 35, Gilpin Avenue, East Sheen, S.W.14.
Empire Amateur Radio League.
Hon. Sec., E. N. Adcock (G2DV), 206, Atlantic Road, Erdington, Birmingham.
Exeter and District Wireless Society.
Hon. Sec., W. J. Ching, 9, Sivell Place, Heavitree, Exeter.

F

Folkestone Radio Amateurs.
Hon. Sec., S. W. Thompson, 70, Sandgate Road, Folkestone.

G

Gateshead Wireless and Television Society.
C/o G. Wilkin, 4, Ravensdale Crescent, Low Fell, Gateshead.
Glasgow and District Radio Society.
Hon. Sec., J. Hair, 42, Maryland Drive, Glasgow, S.W.2.
Golders Green and Hendon Radio and Scientific Society.
Hon. Sec., Col. H. Ashby Scarlett, 60, Pattison Road, Hampstead.

H

Hackney and District Wireless Club.
Dist. Rep., E. Penrose, 2, Coopersale Road, Homerton, E.9.
Halifax Experimental Radio Society.
Hon. Sec., J. B. Bedford, Oak House, Triangle, Halifax.
Harco Radio Club.
Hon. Sec., C. W. Kemp, 124, River Way, Greenwich, S.E.10
Hastings and St. Leonards Radio Society.
Address required.
Heathfield Radio and Television Society.
Hon. Sec., R. J. Lee, 9, Theobalds Green, Heathfield, Sussex.

I

International Short-wave Club (Brighton).
Sec., J. C. Bennett, 205, Braeside Avenue, Brighton, 6.
International Short-wave Club (Guernsey).
Hon. Sec., F. S. Le Pavoux (2BTP), 8, Upper Canichers, St. Peter-Port, Guernsey.
International Short-wave Club (London).
Hon. Sec., A. E. Bear, 100, Adams Gardens Estate, London, S.E.16.
International Short-wave Club (Manchester).
Address required.
Ipswich and District Amateur Radio Society.
Hon. Sec., D. H. Barbrook (G8AN), Radio House, St. Peter's Street, Ipswich.

K

Kentish Town and District Radio Society.
46, Lady Margaret Road, Kentish Town, London, N.W.5.
Kettering Radio and Physical Society.
C/o F. L. Loasby, 44, Reservoir Road, Kettering.
Kew Ministry of Labour Radio Society.
Ministry of Labour, Ruskin Avenue, Kew.
Kidderminster and District Radio Club,
Hon. Sec., H. A. Brown, 12, Stourport Road, Kidderminster.
Kingston and District Amateur Radio Society.
Hon. Sec., R. K. Shergold, Reculver, Manor Lane, Sunbury-on-Thames.
Knutsford Amateur Radio Club.
Hon. Sec., J. McDermott, Shaw Heath Cottages, Mobberley Road, Knutsford, Cheshire.

L

Lambda Radio Society.
4, Howley Street, York Road, S.E.1.
Leamington and Warwick Amateur Radio Society.
C/o M. C. Bunting, Rhuaine, Clarendon Square, Leamington Spa.
Leeds and District Radio Society.
Hon. Sec., J. Kavanagh, 63, Dawlish Avenue, Leeds.
Leicester Amateur Radio Society.
Lutterworth, Leicester.
Liverpool Amateur Radio Society.
Hon. Sec., J. McLelland (2CIP), 38, Andrew Street, County Road, Walton, Liverpool.
Liverpool Short-wave Radio and Transmitting Club.
Hon. Sec., C. E. Cunliffe, 368, Stanley Road, Bootle, Liverpool, 20.

M

Medway Amateurs Transmitting Society.
117A, Trafalgar Road, Gillingham, Kent.
Merchant Taylors' School Radio and Television Society.
Hon. Sec., R. B. Gardner, 91, Clarence Gate Gardens, London, N.W.1.
Midland Amateur Radio Society.
C/o D. A. G. Edwards, Selwyn House, Chester Road, Sutton Coldfield.
Milnes Radio and Television Society.
Hon. Sec., F. Ridler, 7, Royd Avenue, Gilstead, Bingley, Yorks.
Morpeth Amateur Radio Society.
Hon. Sec., C. L. Towers, 2, Edward Street, Morpeth.

N

Newark News Radio Club.
215, Market Street, Newark, New Jersey.
Newbury and District Short-wave Club.
Hon. Sec., L. Harden, 11, Highfield Avenue, Newbury, Berks.
Newcastle Radio Society.
Hon. Sec., G. C. Castle, 10, Henry Street, Gosforth, Newcastle 3.
New Eltham Ratepayers' Ass. (Radio Section).
Hon. Sec., E. A. Gillborn, 87, Montbelle Road, New Eltham, S.E.9.
Newport and District Radio Club.
Address required.
New Zealand DX Radio Association.
Hon. Sec., E. Watson, 37, Chancellor Street, Christchurch, N.Z.
Nelson and District Radio Club.
Address required.
North Manchester Radio Society.
Hon. Sec., R. Lawton, 10, Dalton Avenue, Thatch Leach Lane, Whitefield.
Newtownards Amateur Radio Club (N. Ireland).
Hon. Sec., T. L. Kirk, Chapel View, Newtownards, Ulster.
Northampton Radio Society.
Hon. Sec., D. W. Harries (B.R.S. 2179), 99, Ardington Road, Northampton.
Northern Ireland Radio Society.
Hon. Sec., F. A. Robb, 46, Victoria Avenue, Sydenham, Belfast.
New Zealand Short-wave Radio Club.
Sec., A. B. McDonagh, 4, Queen Street, Wellington, E.1., New Zealand.
North Shields Radio Society.
Hon. Sec., G. A. Lee, 9A, Saville Street W., North Shields.

O

Oxford Short-wave Radio Club.
Hon. Sec., E. G. Arthurs (2BHP), 13, Walton Well Road, Oxford.

P

Port Talbot Radio Club (proposed).
W. Ryan, 47, Margam Terrace, Port Talbot.
Peterborough and District Short-wave Club.
Jt. Hon. Sec., W. S. Cornwell (2ACP), 80, Elmfield Road, Peterborough.
Portsmouth and District Wireless and Television Society.
Hon. Sec., F. L. Moore, 78, Laburnum Grove, Portsmouth.
Prestatyn Short-wave Club.
Hon. Sec., R. J. Stellig, Romir, Victoria Road, Prestatyn.
Perth Radio Society (proposed).
R. Adams, 2, Croft Park, Cralgie, Perth.

R

Radio Physical and Television Society.
Hon. Sec., V. R. Walker, 49, Fitzjames Avenue, London, W.14.
Radio Society of Gt. Britain.
Sec., J. Clarricoats, 53, Victoria Street, London, S.W.1.
Radio Transmitters Union.
c/o W. H. Martin, Knockinagh Cloughfern, Whiteabbey, N.I.
Reading Short-wave Club.
Address required.
Redhill and District Radio Society.
Hon. Sec., H. Cartwright, Radio House, Victoria Road, Horley, Surrey.

S

Salisbury and District Short-wave Club.
Hon. Sec., C. A. Harley, 85, Fisherton Street, Salisbury, Wilts.
Scottish Short-wave Radio and Television League.
Address required.
Sheffield Short-wave Club.
Address required.
Short-Wave Radio and Television Society (Thornton Heath).
Hon Sec., J. T. Webber, 368, Brigstock Road, Thornton Heath.
Slade Radio Society.
Hon. Sec., G. Game, 40, West Drive, Heathfield Park, Handsworth, Birmingham.
Southall Radio Society.
Hon. Sec., H. F. Reeve, 26, Green Drive, Southall.
Southend and District Radio and Scientific Society.
Hon. Sec., F. S. Adams, Chippenham, Eastern Avenue, Southend-on-Sea.
South Hants Radio and Television Society.
Address required.
S.T.C. Radio Experimental Society.
Address required.
South London and District Transmitters Society.
Sec., H. Cullen, 164, West Hill, Wandsworth, S.W.
Sutton-in-Ashfield Society.
Hon. Sec., A. W. Fowler, 78, Kirkby Road, Sutton-in-Ashfield.
Stoke-on-Trent Radio Society (proposed).
H. Churton, 26, Victoria Street, Smallthorne, Stoke-on-Trent.
Surrey Radio Contact Club.
Hon. Sec., E. C. Taylor, 35, Grant Road, Addiscombe, Croydon.
Swansea Radio Club.
Hon. Sec., R. J. Davies, Messrs. Watson and Davies, Mansel Lane, Swansea.
Swindon and District Short-wave Society.
Hon. Sec., W. C. Barnes, 7, Surrey Road, Swindon.
Smethwick Wireless Society.
Hon. Sec., E. Fisher, 33, Freeth Street, Oldbury, Nr. Birmingham.

T

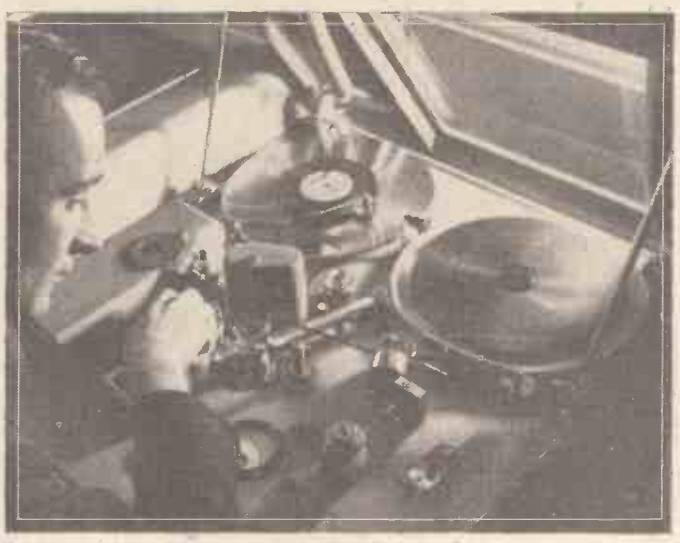
Thames Valley Amateur Radio and Television Society.
Sec., J. N. Roe, 19A, The Barons, St. Margarets-on-Thames, Middlesex.
Torrington and District Short-wave Club.
Hon. Sec., A. E. Cornish, 1, Halsdon Road, Torrington, N. Devon.
Tottenham Wireless Society.
Hon. Sec., F. E. R. Neale, 17, Whitley Road, Tottenham, N.17.
Tottenham Short-wave Club.
Hon. Sec., S. Woodhouse, 57, Pembury Road, Bruce Grove, Tottenham, N.17.
Tonyrefail Short-wave Club (proposed).
E. Powell, 44, Pritchard Street, Tonyrefail, Glam.

W

Waldron Radio Society.
Hon. Sec., W. E. Simmons, 35, Tranmere Road, Earlsfield, London, S.W.18.
Wellingborough and District Radio Society.
Hon. Sec., L. Parker, 127, Jubilee Crescent, Wellingborough.
West London Radio Society.
Hon. Sec., D. Reid, 15, Tring Avenue, Ealing Common, W.5.
Wirral Amateur Transmitting and Short-wave Club.
Hon. Sec., B. O'Brien, Caldy, Irby Road, Heswall.
World Friendship Society of Radio Amateurs.
Hon Sec., A. H. Bird (G6AQ), 35, Bellwood Road, Waverley Park, Nunhead, S.E.15.

NEW LONDON RECORDING STUDIO

THE accompanying illustrations show a general view of the new J. Walter Thompson Studio, and part of the equipment which is used, beneath Bush House in the Aldwych. This studio has been built especially for recording sponsored programmes, and it is claimed that it is the only one of its kind in Europe. Designed to incorporate the very latest principles, the studio and its accompanying rooms bristle with novel features. The walls of the studio are panelled in such a way that the panels may be reversed, and one side is "quilted" to reduce echo, whilst the other side is panelled to provide echo, and thus any desired studio acoustics may be obtained in an instant. The effective area of the studio may be modified by means of panels adjusted at angles in the lower section of the wall, and the roof as well as the walls are insulated from the main building. The floor is also insulated, being built over a swimming bath which at one time was used by employees in this building. Velocity microphones are used in the studio, and in addition to a monitoring room there is a "dubbing" or editing room in which are a number of special disc recorders as well as sound-on-film recorders. The latter utilise the Philips-Miller system in which film stock is employed, but instead of the sound variations being photographed on to emulsion in the usual way a stylus cuts away a thin coating of graphite, thus combining the advantages of the mechanical system with those of the sound-on-film system.



The recordist checking a recording a few seconds after it has been made.

A general view of the studio, with a band session being recorded.

Other Advantages

This system also has the advantage that the record may be played back instantly, and at the opening demonstration Foster Richardson, the well-known singer, recorded an item which was reproduced through the loudspeakers in the studio almost before he had time to sit down. The advantages of such a scheme, which needs no processing of any kind, are obvious.

The special recorders are fitted with two heads so that two copies may be made at one time, or the second head may be used to play back in another room whilst the record is being made. The control engineer, by means of a remote control, can intersperse any desired sound effects from the gramophone record discs or films in the "dubbing room" without leaving his room at the opposite end of the studio, whilst announcements may be dropped in when desired from another room.

Other details of the studio worth mentioning are the special sound-proof doors and the rubber-sprung floor, which is built up on layers of rubber alternating with thick layers of cork down to a depth of two feet. Although below ground-level, the air is kept pure and at constant temperature by means of an elaborate air-filtering system which takes in air from the roof of Bush House, eight stories above the level of the street.

RADIO FAULT TRACING—4

This Week We Deal With Ganging Adjustments

MODERN receivers with H.F. amplification invariably have ganged tuning, and poor performance can be due to the high-frequency circuits being out of alignment. This trouble may be found to have been caused by misguided efforts on the part of an inexpert person who has been experimenting with the adjustments; sometimes a component fault will be responsible for the receiver being "out of gang"; sometimes it will be found that a trimmer condenser adjustment has shifted, under the effects of vibration. Finally, a component replacement made in a high-frequency circuit will very often put the receiver out of alignment, necessitating reganging.

To put the cart before the horse, the procedure for reganging will be considered first and faults that may make reganging necessary will be dealt with afterwards. For ganging work in any other than the simplest of cases a calibrated modulated H.F. oscillator is virtually a necessity, and the oscillator should have a variable output amplitude control.

This instrument makes it possible to apply to the receiver circuits modulated H.F. inputs of selected frequencies and of suitable amplitudes. Obviously it will be necessary to have some means of observing the effects of ganging adjustments, but the idea of judging the optimum settings by listening to the sound of the signals in the speaker is to be deprecated as most unsatisfactory. A much used and good method is to use an output meter (A.C. voltmeter) connected across the speaker.

Eliminating A.V.C.

Before we go into details of ganging procedure there are a number of general points which are worth noting. If A.V.C. is incorporated in the receiver it must be remembered that an A.V.C. action tends to counteract the effects of H.F. carrier amplitude changes, as far as the receiver output is concerned. To say the least of it, such an effect is most undesirable when ganging adjustments are being made. There are three alternative ways of overcoming this difficulty. The most obvious is to cut out the A.V.C. by temporary circuit modifications. Another solution of the problem is to use, instead of the output meter, a D.C. milliammeter, or a D.C. voltmeter, and to take the anode current, or the anode voltage, of one of the controlled valves as the indication for ganging. Undoubtedly, however, the best way is to use the output meter and to keep the testing signal down to a sufficiently low amplitude that the A.V.C. detector is not operated.

If the receiver ganging is badly out to begin with, care should be taken as the circuits are brought closer and closer into alignment that the increasing oscillation amplitude does not start up the A.V.C. action. A useful rule is to keep cutting down the oscillator's amplitude whenever the receiver circuit improvements permit.

In the majority of cases only one setting of any particular trimming condenser will give a peak indication on the output meter and this setting will be the correct one for ganging purposes, but there are exceptions.

In the case of a superhet oscillator circuit, there may be two trimmer settings which give output meter peaks and one of these settings is definitely the wrong one to use. The other exception is one that can sometimes prove to be rather troublesome if elaborate test gear is not available, and this case arises with tightly coupled circuits designed for band-pass response. Here the tuning adjustment of each circuit, for any given frequency, is affected by the coupling influence of the other circuit; moreover the correct adjustments of the two circuits are those which will give the actual band-pass response characteristic for which the circuits and coupling were designed. Adjusting for a single maximum peak on the output meter will not be correct in such a case. With the average straight receiver, it will not normally be found that the presence of any coupled tuned circuits will introduce any difficulties, but with certain types of superhet receivers which employ band-pass I.F. transformers the latter may present rather a problem. A cathode-ray oscillograph, with "sweep" control on the testing oscillator frequency, provides, of course, the perfect solution of the problem, because with such apparatus the actual frequency response curve of any individual coupling, or of the receiver as a whole, can be made visible on the oscillograph screen. Thus, the complete effects of any trimmer adjustment can be watched. To have an oscillograph available is not, however, the good fortune of everybody, so we must consider how to get along without it although it must be admitted that in certain cases the lack of an oscillograph represents a considerable disadvantage.

It is to be noted that correct ganging is more than a matter of getting circuits into alignment, for perfect alignment could be secured and the receiver could still be incorrectly adjusted. The most obvious case of this would be that of lining up I.F. circuits on a ganging signal adjusted to a frequency which is not the actual I.F. specified for the receiver. Where signal frequency circuits are concerned, one could possibly line up the circuits with too much capacity in every trimmer and the effect of this would be that the receiver would not then tune down to the lowest wavelength which it was designed to cover on the particular waveband concerned. It is advisable to aim at keeping each trimmer at as low a capacity as possible with the important reservation that the final setting must be an optimum one.

For adjustment of trimmers in signal-frequency circuits a test signal frequency corresponding to a wavelength near the lower end of the wavelength band should be used. A manufacturers' service manual usually gives instructions as to the frequencies which should be used for reganging work on the receiver concerned, but if such information is not available, chose some frequency which tunes in near the minimum end of the tuning dial of the receiver. On the normal medium and long wave-bands frequencies of 1,400 kc/sec. (214 metres) and 300 kc/sec. (1,000 metres), respectively, are generally satisfactory.

Reganging the Straight Receiver

An output meter should be connected across the speaker (a large capacity condenser should be used in series to keep D.C. out of the meter), and the testing oscillator's leads connected to the A and E terminals of the receiver. The oscillator lead to the A terminal should be taken either via a dummy aerial unit or via a .0002 mfd. condenser, if the former is not available.

(To be continued)

Mantovani, who recently returned to his band activities, is here seen during his illness, passing away the dull hours listening on a Pilot receiver. He was enabled through this receiver to hear his own band broadcasting from Birmingham.

LETTERS FROM READERS

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

"Silent Radio"

SIR,—I note with interest your remarks under the heading "Silent Radio" in a recent issue of PRACTICAL AND AMATEUR WIRELESS.

I was employed at the particular dance hall where this experiment was carried out, and I should like to correct one small point, viz.: "The music to which they danced was picked up by a *small device in one of the earphones.*"

The music was supplied from gramophone records via a pick-up and amplifier, and the output was fed into a huge coil which was run the whole length of the dance floor under the boards. The receiving part of the equipment was a very simple affair and merely consisted of a pair of 600-ohm phones connected to a coil of 26-gauge cotton-covered wire which was decorated to represent a garland. The wire-cored garland was simply slipped over the shoulders so that when one stepped on to the dance floor music was picked up solely by inductance supplied from the coil under the floor.

I cannot give you many details concerning the actual amplifying circuit, as I was engaged on other effects at the time, but to the best of my knowledge it was designed by Professor Low, who was in charge at the time.—H. TIBSON (East Sheen).

"Local Station Quality Sets"

SIR,—I have read Mr. Hill's letter regarding my recent article, "Local Station Quality Sets," with interest.

In the first place, I am still of the opinion that, even with a good loudspeaker such as the Rola G.12, which I use (or the Magnavox 66), 6 watts undistorted output is still necessary for quality reproduction. With an average output of 100 milliwatts, which is all I require in a very small room, I find that peaks of 3 watts often occur. In a larger room, where 250 milliwatts is the average, peaks of 6 watts and over are encountered, whereas peaks of 5 watts are quite general. The reserve in hand is, therefore, really quite small.

I certainly should not have cared to have been in the back row of the hall Mr. Hill refers to. If the amplifier was not overloaded, I am afraid speech would have been scarcely audible. I cannot imagine that Mr. Hill would have been guilty of overloading—a fault all too common with public-address systems.

I have yet to hear a cinema equipment which could claim to give quality reproduction. The effect on loud passages is, as Mr. Hill says, "overpowering." The "noise" is indescribable and cannot be called music. Further, announcements over the mike always have a very definite tone colouration due to the increased volume level of the voice, and in no way due to baffle resonance or the use of uncompensated volume controls.

Regarding the intervalve coupling, I have myself obtained very excellent results from the "paraphrase" circuit, but find that, due to the necessity of *mica* condensers for coupling, and an extra valve, it is much more expensive than a straight transformer-coupled push-pull amplifier. A Ferranti transformer type A.F.5 has a practically straight response curve, and enables true reproduction to be obtained quite cheaply and easily.

Any multi-grid valve introduces distortion and for that reason I cannot agree that an H.F. valve and a diode detector are any better than a leaky-grid detector. I advocated in my article the latter form of detection for a set which was in use in close proximity to a transmitter and was intended for reproduction of that station only. In such a case, the distortion introduced by a properly designed leaky-grid detector stage is negligible. The "modern tendency in quality designs to use a straight circuit with one or more H.F. stages and a diode detector" is solely due to the fact that there are very few listeners who are content to confine their listening to the local station—far too few for any manufacturer to consider marketing such a receiver.

In conclusion, may I add that I welcome Mr. Hill's remarks. The points he has raised are all open to criticism but, from my own experience, and such must of necessity govern my own opinions, I still maintain that the conclusions arrived at in my article are sound.—W. G. FLINT (Tottenham).

CUT THIS OUT EACH WEEK.

Do you know

—THAT during the dry weather the earth connection should be well watered periodically in order to keep it moist.

—THAT to avoid the above trouble, some form of hygroscopic chemical may be buried round the earth plate, or a chemical earth connection employed.

—THAT a variable grid leak may be used for volume control in a resistance-capacity-coupled stage.

—THAT mica condensers in the L.F. coupling circuits will prevent the application of positive potentials to the grids and thus avoid distortion.

—THAT quality may be controlled in a super-het by modifying the coupling in the I.F. transformers.

—THAT the quality of reproduction of a set may be modified, simply by stiffening the diaphragm or making it thinner in places.

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., Tower House, 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.

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Amateur Wireless	4d. " "
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Wireless Magazine	1/3 " "

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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., Tower House, Southampton Street, Strand, W.C.2.

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Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
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Genet Midget (D, 2 LF (Trans)) ..	*June* '35	PM1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
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Battery All-Wave Three (D, 2 LF (RC))	—	PW55
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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
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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)	—	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, QP21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen) ..	*June* '35	WM398
Certainty Three (SG, D, Pen) ..	—	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
2HF Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2 HF, D, QP21)	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, 2LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, 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 (2HF, D, RC, Trans)	*May* '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
New Class-B Five (2SG, D, LF, Class B)	*Nov.* '33	WM340
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Consolectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C.-D.C. Two (D Pen)..	—	WM394
Three-valve : Blueprints, 1s. each.		
Home-Lover's New All-electric Three (S.G, D, Trans) A.C. ..	—	AW383
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.* '35	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
SHORT-WAVE SETS—Battery Operated.		
One-valve : Blueprints, 1s. each.		
S.W. One-valver converter (Price 6d.)	—	AW329
S.W. One-valve for America ..	23.1.37	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) ..	—	AW410
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 (H.F. 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-waver 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
Listeners' 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v.) for WM392 ..	*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 Adaptor (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	WM403
The W.M.A.C. Short-Wave Converter (1/-)	—	WM408

QUERIES and ENQUIRIES

Faulty Condenser

"I have an all-mains wireless set. Recently it stopped working and I found there was no H.T. voltage on the S.G. anode. The resistance feeding this had melted and the solder run on to a nearby resistance. I have replaced the melted one with one of 25,000 ohms, but am not sure if this is the correct value. I am sending it to you so that you can tell me the value. The set is a commercial model, five years old." E. G. H. (Freshfield).

AS the resistance has been so badly damaged, it is obvious that a very high current has been passed through it. A current of this value could not be passed by the H.F. valve, and therefore there must have been a short-circuit of the H.T. system, which you will probably find is due to the fact that a decoupling condenser was joined between the anode side of the resistance and earth. This condenser has no doubt punctured and is thus shorting the H.T. supply. Therefore, before replacing the resistance you must test this condenser and replace it if it is found faulty. We are unfortunately unable to test the resistance, as the damage it has sustained has interrupted continuity. The enamel has burnt off, preventing identification from this point of view, and therefore it will be necessary to get into touch with the makers. Their address is Tottenham Court-Road, London, W.1.

Using Headphones

"I have an all-mains superhet and would like to work a pair of headphones from it for a deaf person. I have tried them in the extension speaker sockets, but they are very weak. The set works a moving-coil speaker very well, less output transformer, as the set has already got one, and I think the 'phones are 2,000 ohms. I should be pleased if you would tell me what kind of 'phones would work with this set."—S. S. (Sheffield).

IN view of the fact that the receiver is fitted with an output transformer and the high-resistance 'phones fail to work satisfactorily, we imagine that the transformer is of the step-down type and that a low-resistance speaker is intended to be used with it. The resistance of such a speaker is generally about 10 or 15 ohms, and you would therefore need 'phones of low resistance. If you do not wish to tamper with the set, and must use the high-resistance 'phones, the only way is to connect another transformer of step-up type between the output terminals and the H.F. 'phones, but this is a very unsatisfactory scheme.

Obtaining Components

"I am a regular reader of your paper and I have tried to get some parts for a set you recommend but cannot get them. I have tried half a dozen places and they say that they do not keep them now. It is no good putting them in your sets if they are not made. The parts are a rotary three-point switch, S.86, by Bulgin, and a Formo slow-motion condenser with Mystic Dial."—J. L. M. (Lymington).

WE regret that we cannot undertake to control the supply of components to dealers in every part of the country. The manufacturers see to this part of the business, but in the event of any difficulty you can always get in touch direct with the makers, or, alternatively, with Messrs. Peto-Scott, whose advertisements appear in every issue of this paper. This firm specialises in the supply of kits for our receivers and can supply everything we specify. If you wish to write direct to the makers (which will result in double postal charges), the address of Messrs. Bulgin is Abbey Road, Barking, and Formo Products is situated at Masons Hill, Bromley, Kent.

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.

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., Tower House, Southampton Street, Strand, London, W.C.2.

The Coupon must be enclosed with every query.

Varley Coil Units

"In your December 19th issue you gave two circuits using some new Varley coils. I should like to obtain a blueprint of a receiver using the BP.113 coil unit, and should like to know whether you have a print of this type. If not, can you tell me where I can get one?"—J. B. (Leek, Staffs).

WE have not used this particular unit in any of our receivers and therefore cannot recommend one of our blueprints. The combination employed is a band-pass pair followed by a detector coil (H.F. transformer) with reaction, and therefore it should not be a difficult matter to incorporate these in any receiver in which an H.F. detector and L.F. circuit is employed. We cannot recommend any of our receivers to be modified in this manner, but if you write to Messrs. Varley they can supply a leaflet giving a circuit diagram of a three-valve mains receiver, with all values marked, using this particular unit. Their address is Bloomfield Road, S.E.18.

Short-wave Adapter

"I am using an S.G. receiver and I want to use a short-wave adapter. The adapter plug has four pins, whilst my S.G. detector has seven pins. How would I connect it up? Also, I get an interference from some nearby apparatus which is only heard on the medium waves, and I have not been troubled with it since the light nights are here—only in winter, when reception is best. Can I listen on the short waves without trouble?"—J. S. (Hull).

YOU will have to replace the four-pin adapter plug by a seven-pin component, obtainable from Messrs. A. F. Bulgin, of Abbey Road, Barking. The two leads connected to the filament terminals should be connected to the filament terminals on the seven-pin plug, but the lead joined to the anode pin on the four-pin adapter plug will have to be removed and must be connected to the top cap of your seven-pin valve. As the interference is now only experienced on the medium waves, you may find that as you tune lower in the scale the interference will be worse. The remedy in such a case is to erect your aerial well out of the area of interference and adopt some form of interference-eliminating feeder on the lines indicated in the centre pages of this issue.

The coupon on page 303 must be attached to every query.

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.

L. N. (Hockley). Valve may be obtained from Mazda, and coils from Varley. We have no blueprint we could recommend.

W. J. G. (Marlboro'). Conditions vary in different parts of the country and a list of stations would be of little use to you. The total cost of the combined apparatus in question is £28 approximately. Another portable will be described in next week's issue.

J. V. K. W. (Edinburgh). The valve should be of the general purpose type—any make. Tuning condenser, .0005, reaction condenser, .0003, grid condenser, .0001 mfd., and grid leak, 2 megohms. A midget coil (Bulgin) is required and ordinary connecting wire for wiring up.

G. R. M. (N.W.1). The mike should be screened (acoustically) on five sides, leaving only the front open. The loudspeaker(s) should be well to the rear of the speaker, and the leads to the amplifier should be screened.

— S. (Poznan). The condenser is apparently too large. Stray capacities between the wiring, especially in the tuning circuit, must be avoided in order to get down to the lower wavelengths, and a small aerial should be employed.

K. S. (Roffay). We are unable to identify the coils and consequently cannot give you the connections. Write to the suppliers, who may have a wiring diagram for this particular unit.

M. N. (Dublin). The wording is very elaborate but the device appears to be nothing more than the anti-interference system described on the centre pages this week. It is to be noted that the advert. says that it eliminates "man-made" static from the *lead in*, and thus one assumes that an aerial must be erected outside the field of interference as mentioned in the article referred to.

A. P. (S.W.4). The issue in which construction was described is now out of print. We have a blueprint, No. AW.450, which costs 6d., and this may be of use to you.

E. J. P. (E.1). We regret that we cannot understand your query. The date given has nothing to do with the blueprint, which was relative to the Self-contained Four described in the August 1933 issue of the *Wireless Magazine*.

B. H. (Halstead). Full details are given in this issue, together with a list of the components.

I. F. van A. (Buckhurst Hill). A small variable condenser in the aerial lead should enable you to carry out the desired modification without cutting the actual wire.

J. G. F. (Cornafean). We suggest you follow the design now being given by the experimenters. We do not recommend the use of the plug-in coils.

C. T. J. (H.M.S. London). We regret that there is no receiver in our blueprint list which would meet your requirements. We suggest you get into touch with Southern Radio or Peto-Scott.

A. McT. (Elgin). We regret that we cannot trace the booklet referred to in your letter.

J. W. S. (Rugby). You cannot use the tappings for your battery valves, as these are on the A.C. side of the supply and your valves must be fed with D.C. You cannot satisfactorily smooth this supply to eliminate hum and the only solution is to keep your accumulator charged by the trickle charger section.

J. D. L. (Port Talbot). We regret that we cannot give the connections in view of the absence of type number of the unit.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

RADIOMART

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 amplifications, neutralizations, superhet alignment, etc. The most comprehensive manual published, written by practical engineers, price 6d., post free, 7½d. including catalogue.

1937 Short-wave Catalogue only (3 times enlarged) price 1½d., post free.

44, HOLLOWAY HEAD, BIRMINGHAM 1

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.

WARD, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

REPAIRS to Moving Coil Speakers, Cones and Coils fitted or rewound. Fields altered. Prices Quoted including Eliminators, Loudspeakers Repaired, 4/-. L.F. and Speech Transformers, 4/- post free. Trade invited. Guaranteed. Satisfaction. Prompt Service. Estimates Free. L.S. Repair Service, 5, Balham Grove, London, S.W.12. Battersea 1321.

ALL goods previously advertised are standard lines, still available. Post card for list free. VAUXHALL UTILITIES, 163a, Strand, W.C.2. Over Denny's the Booksellers. Temple Bar 2338.

SOUTHERN RADIO'S Wireless Bargains. All lines advertised in previous issues of "Practical and Amateur Wireless" still available.—Southern Radio, 323, Euston Road, London, N.W.1 (near Warren Street Tube). 'Phone: Euston 3775—and Branches.

NEW RECEIVERS, COMPONENTS AND ACCESSORIES

ROLA 1937, 35/-, moving coil with transformer, 21/-, post free.—Lawrence, Station Street, Saffron Walden, Essex.

BANKRUPT Bargains. List free. All goods new. Large stock radiograms, receivers, components, valves, speakers, etc., at lowest prices. Part exchange, easily cheapest. Established 1929.—Butlin, 6, Stanford Avenue, Brighton.

VALVES

NOTHING better available. SIX MONTHS' GUARANTEE, complete range of BATTERY, A.C. MAINS, RECTIFIERS, always in stock, 2 volt Det., H.F., L.F., 2/3. POWER, 2/9. SCREEN GRID PENTODE, H.F. PENTODE, 5/-. American types, six months' guarantee, 5/6 each. Nos. 18, 24A, 35, 42, 43, 45, 47, 56, 57, 58, 75, 77, 78, 80, 2A5, 2A6, 2A7, 6A7, 2B7, 6B7, 6C6, 6D6, 25Z5, 25Y5. Write for other prices to Dulci Electrical Co., Devonshire Works, Duke's Avenue, Chiswick, London, W.4.

6L6 . . . 2s. 9d., all other popular types American valves, 3s. 90 day guarantee. Eimac, Taylor, Raytheon and R.C.A. in stock.—Radiographic, Ltd., 66, Osborne Street, Glasgow, C.1. Bell 948.

PREMIER SUPPLY STORES

All goods guaranteed perfect; carr. paid over 5/-; under 5/- postage 6d. extra.

ALL POST ORDERS TO **JUBILEE WORKS, 167, LOWER CLAPTON RD., LONDON, E.5. 'Phone: Amherst 4723.**

CALLERS, AS USUAL, TO 165 & 165a, FLEET ST., E.C.4 (Next door to Anderton's Hotel), Central 2833. New Branch: 50, HIGH ST., CLAPHAM, S.W.4 (Macaulay 2381).

Have you had our GIANT ILLUSTRATED CATALOGUE AND VALVE LIST? Send 4d. IN STAMPS FOR THIS BARGAIN LIST.

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, 1¼in. 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. S.W. H.F. CHOKES, 9d.

MAINS VALVES, famous Europa 4 v. A.C. types, 4/6 each. H.L., L., S.O., 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., H.L., Power and Pen. 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, Octode Frequency Changers.

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, 5/-.

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. OCTOL bases, 9d. each.

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. Completely Wired and Tested, £5/5/0.

COSMOCORD PICK-UPS, with tonearm and volume control, 10/6 each. **PICK-UP HEADS** only, 4/6 each.

PREMIER MAINS TRANSFORMERS, 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. 1 a., 4 v. 2 a., and 4 v. 4 a., all C.T., 8/6. 350-350 v. 120 m.a., 4v. 1a., 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., 4v., 2-3 a., 4 v., 2-3 a., 4 v., 2-3 a., 4 v. 3-4 a., all C.T., 17/6. **SPECIAL OFFER PHILIPS MAINS TRANSFORMERS.** 250-250 v. or 300-300 v. at 80 m.a., 4 v. 5 a., C.T.; 4 v. 1 a. Tapped Primary 100-250 volts 6/11. 450-450 v. at 150 m.a. or 500-500 v. 100 m.a., 4 v. 4 a. C.T. 4 v. 4 a. and 4 v. 3 a. Screened Primary. Tapped input 100-250 v., 12/6. **AUTO TRANSFORMERS**, step up or down, 60 watts, 7/6; 100 watts, 10/-. **SMOOTHING CHOKES**, 25 ma., 2/3; 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.

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

SPECIAL OFFER. LISSEN TWO-GANG SCREENED ALL-WAVE COILS, 12 to 2,000 metres, complete with switching and wiring diagrams, 6/11 per set.

Special Offer BTH Energised Moving Coils. 10in. diam. 1,650 ohms field. Power or Pentode transformer (state which), 14/6.

ROLA latest type P.M.s, 15/-. **GOODMANS'** 8in. mains-energised 1,000 ohms field, 10/6 each; **Jensen P.M.s, 19/6.**

W.B. 1936 STENTORIAN SPEAKERS. Standard model (list, 32/6), 22/6. Senior model (list, 42/-), 28/6. Brand new in original sealed cartons.

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

OUTPUT TRANSFORMERS for Power or Pentode, 2/6; Multi-Ratio, 4/6.

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.

NEW 1937 1-VALVE SHORT-WAVE RECEIVER OR ADAPTOR KIT 13 to 86 Metres without coil changing. Complete Kit and Circuit, 12/6. **VALVE GIVEN FREE! DE LUXE MODEL** 14 to 150 Metres, complete Kit with Chassis, 4 Coils and all parts, 17/6.

SUPERHET CONVERTER KIT, 13/6. De Luxe Model, 18/6. **S.W. SUPERHET CONVERTER KIT**, for A.C. Mains Receivers, 20/-. A.C. Valve given FREE!

NEW 1937 2-VALVE S.W. KIT, 13 to 86 Metres without coil changing. Complete Kit and Circuit, 19/6. **VALVES GIVEN FREE. DE LUXE MODEL**, 14 to 150 Metres, complete Kit and Chassis, 4 Coils and all parts, 25/-. **VALVES GIVEN FREE. 3-VALVE S.W. KIT**, S.G. Det. and Pen., 42/-. **VALVES GIVEN FREE!**

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

RADIO CLEARANCE

63, HIGH HOLBORN, W.C.1.

HOLBORN 4631.

SPECIAL SUMMER BARGAINS.

49/6, LISSEN BAND-PASS BATTERY 3 RECEIVER, comprising 3 valves, V.M.S.G., Detector, Pentode Output, fitted in Handsome Walnut Cabinet, etc., Large Type P.M.M.C. Speaker, Dial Calibrated in Wavelengths. This is a really splendid little Receiver, selective and with plenty of punch. **CARRIAGE 1/3 extra.**

67/6, LISSEN 3-VALVE S.G. Detector, Pentode Receiver, in Handsome Walnut Cabinet of Upright Design, Clock Face. Tuning, Large Type P.M.M.C. Speaker, etc. **COMPLETE WITH HIGH-GRADE BATTERIES.**

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ADVERTISEMENT INDEX

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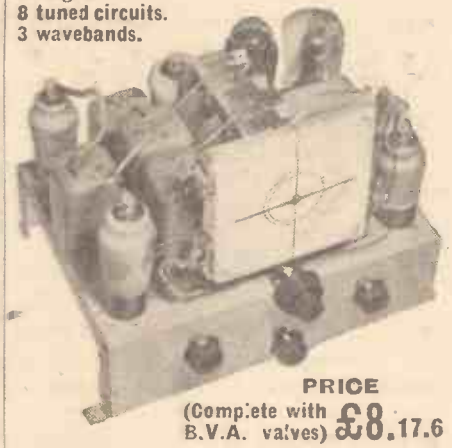

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Practical and Amateur Wireless, June 19th, 1937.

12/ rare

OPERATING THE SINGLE-VALVE SET—See Page 316

Practical and Amateur Wireless

3d EVERY WEDNESDAY

Edited by F.J. CAMM

A GEORGE NEWNES Publication

Vol. 10. No. 248. June 19th. 1937.

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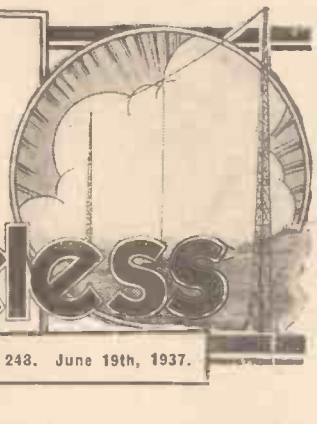
Practical and Amateur Wireless

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. X. No. 248. June 19th, 1937.



ROUND *the* WORLD *of* WIRELESS

The Portable Season

THIS time of the year might well be called the Portable Season, as the great outdoor trek which is induced by the fine weather calls to hand the portable wireless receiver. The novelty of radio out of doors has now gone, and the majority of listeners now take a portable receiver for a definite purpose, generally in order to listen to one or two important items which they would otherwise be unable to hear. It is true that on picnics or other similar occasions the portable might be used to provide a continuous musical background, but the small batteries which may be accommodated in a portable do not lend themselves to long periods of indiscriminate listening of this character. Where a car is being employed, of course, the battery problem does not arise, but for the hiker or small camper, a lightweight portable is a necessity, and then the hours of listening must be kept to a minimum. However, by suitable design the portable can give reasonably long life and can greatly add to the enjoyment out of doors, and in this issue will be found constructional details of our latest portable design built to provide real portability combined with high efficiency. Turn to page 323 and read about the Parvo Flyweight Midget Portable.

Broadcasting Foreman

MR. W. JAMES, of Brentford, is London's first foreman "crooner." He is broadcasting from the new temporary Wandsworth Bridge by microphone loudspeaker equipment to the 250 workmen who are engaged in a rush-against-time job of laying new mains cables. The temporary footbridge, to be in service while the main bridge is being reconstructed, is due to be opened in a few days and the 66,000 volt power cables stretching 450 yards across the bridge must be laid before then. The oil-filled cables are to carry current from the new Fulham power station. The drums on which they are mounted weigh 17 tons each and are believed to be the largest ever handled in London.

At the North Pole

THE disturbances in the working of radio apparatus and the passing of waves, experienced by the expedition at the North Pole, and believed to be caused by the peculiarities of atmospheric electricity in the central polar basin, is to be studied by the Academy of Sciences of the U.S.S.R., which has appointed a special commission for the purpose. The commission includes N. D. Apalexi (chairman), member-correspondent of the Academy of Sciences; Academicians A. I. Mandelstamm and A. A. Chernyshev; member-correspondents V. V. Shuleikin, L. A. Bonch-Bruyevich, I. E. Tamm, J. I. Frenkel, V. A. Vedensky, M. A. Divilkovsky, P. N. Tverskoi (director of the Geophysical Laboratory); Professor P. A. Molchanov; Mr. Vorobyov, of the Northern Sea Route Administration, and Mr. Khakin, the chief engineer of the Radio Administration.

ON OTHER PAGES

Mr. Barley Again

ON June 22nd, in the National programme and two days later in the Regional programme, last year's summer success, "Mr. Barley's Abroad," will be re-broadcast. This story was specially written for broadcasting by Henrik Ege, based on a story by Tom Arnold. The music is by Geoffrey Henman, and lyrics by Christopher Hassell. As far as possible, the original cast will take part.

Philco Aerials

PHILCO engineers have found that the large benefits to be derived from their new receivers are in most cases lost owing to the fact that the purchaser uses an inefficient aerial. For this reason Philco are advising purchasers of their receivers to permit the dealer to erect and install both aerial and receiver so that the greatest advantage may be obtained from modern designs.

New Turkish Station

MARCONI'S Wireless Telegraph Company have secured another broadcasting contract, this time from the Turkish Government. A long-wave high-power broadcast transmitter, as well as a high-power short-wave broadcast transmitter have been ordered, and a Broadcasting House for Ankara. The two transmitters will be installed in one building at Etimessut, 15 miles from the Broadcasting House at Ankara, the two points to be connected by a high-class music cable. The long-wave station is to operate on 1,639 metres with an unmodulated aerial carrier of 120 kW. The short-wave transmitter is designed to cover a waveband from 14 to 100 metres and is fitted with crystal drive with two pairs of crystals for two spot wavelengths.

Fees for Broadcasts

ACCORDING to the Annual Report of the Performing Rights Society recently read, the sum of £182,500 was available for distribution as general fees among the members and the twenty-one affiliated foreign societies for the year ended January 5th, 1937. The Society's income from the B.B.C. for the year was £128,226. The report added that a substantially improved basis of payment by the B.B.C. had been reached and will remain in force for a period of two years from January last.

New Director of Variety

MR. ERIC MASCHWITZ will cease, from July 1st, to be Director of variety, and his place will be taken by Mr. John Watt. Mr. Charles Brewer will remain as Assistant to the Director. No definite details have been received concerning Mr. Maschwitz's future activities, although it is stated that he is to enter the film world. He will still, however, be connected with the B.B.C. as a writer and contributor of programmes.

ROUND the WORLD of WIRELESS (Continued)

Variety from Douglas, I.O.M.

VARIETY will be broadcast from the Derby Castle, Douglas, I.O.M., on June 24th. It is not yet possible to give specific details but the bill from which an excerpt will be taken includes: Jack Edge (comedian); Kaye and Don (musical act); Mayer and Kitson (vocal and piano act), Hal Miller (comedian), and El Ray (ventriloquist).

Three Aspects of Cricket

THIS programme from the Midland Regional on June 19th will give glimpses of a first-class match, Notts v. New Zealand, at Trent Bridge; a match between teams representing Working Men's Clubs in Leicester and Manchester; and also a Staffordshire League cricket match.

Harry Roy's Band was recently televised with Princess Pearl (Mrs. Harry Roy). They are here seen as they appear in the film "Rhythm Racketeer," which is being produced by Joe Rock at the Rock Studios at Elstree.

Dance Music

BILLY MERRIN AND HIS COMMANDERS will visit a studio on June 21st, and give a programme of dance music before they go to Ramsgate for the summer. With this popular band will be Rita Williams, Eddie Clare and the Palm Beach Boys.

Band Programme from Derby

THE Arboretum at Derby is a popular resort for the citizens on summer evenings; and the band concerts there are a great attraction. The concert on June 23rd by the Band of the 1st Battalion The Oxfordshire and Buckinghamshire Light Infantry, will be conducted by the Bandmaster, D. J. Plater. It will open with his composition, "The March of the King's Men," and will close with the traditional slow and quick marches of the regiment.

INTERESTING and TOPICAL NEWS and NOTES.

The Band has been touring the chief resorts. It broadcast in the National programme last year when it was visiting Leamington Spa.

Orchestral Concert

THE programme on June 22nd by the B.B.C. Midland Orchestra, conducted by Leslie Heward, will include an unpublished work by Stanley Wilson, entitled "Two Impressions"—one of Gull Cove and the other of Bracadale.

Cabaret Programme

A "WESTERN CABARET" programme will be broadcast from the Headland Hotel, Newquay, on June 22nd. The artists will be Shirley Waldron and his Band, and Stanford and MacNaughton. Listeners may remember that the act was formerly Bennett and MacNaughton, but the partners have split to form separate acts, and are now Bennett and Williams, and Stanford and MacNaughton.

Organ Recital from Glasgow

FRANK OLSEN will play on the New Cinerama Organ, Glasgow, on June 17th: Selection, "This Year of Grace," "Lightning Switch," "Change your Partner," and "Tunes of Not so Long Ago."

A Little Revue

ON June 25th, Martyn C. Webster will produce a half-hour revue entitled "Follow On." The book is by Francis Durbridge, author of many Midland radio plays and revues, and the music and lyrics by Jack Hill, a young pianist and composer, who wrote the music for Emile Littler's pantomimes at the Prince of Wales Theatre, Birmingham. The topicalities in episode and song in the revue will be connected on the "That Reminds Me" principle, so that each follows on the one before. In the cast will be Marjery Wyn, Dorothy Summers, Denis Folwell, and John Bentley, and the instrumental music will be by the Revue Nonet led by Norris Stanley.

B.B.C. Scottish Orchestra

THE B.B.C. Scottish Orchestra (augmented) will broadcast in the Scottish programme on June 26th. The first part of the concert will include: Overture and Danses Polovtsiennes from "Prince Igor" by Borodin; Symphony in C, Op. 66, No. 1 (Letter R), by Haydn; and Rondo—Waltz, "Der Mandelbaum," by Guy Warrack. And the second: Suite from "The Rake's Progress," by Gavin Gordon, including Allegro (The Inheritance), Menuetto Galante (The Dancing Lesson), Louré (The Pure Girl), Gigue (The Gambling Den), Saraband (Outside the Prison Gates), and Rondo (The Orgy).

Music Items

ON June 23rd (National) Audrey Piggott will be the soloist in d'Erlanger's "Ballade" for 'cello and orchestra, which will be conducted by Sir Adrian Boult, and on the same day a programme of modern music played by the famous Garde Républicaine will be broadcast from Paris. This concert will be the last of the present season of the B.B.C. contemporary music series, and forms part of the International Society for Contemporary Music Festival which is being held this year in Paris.

An interesting programme of Chamber Music will be broadcast on June 21st (National), when the London Flute Quartet will play a programme of music arranged for this unusual ensemble. Its members are Robert Murchie and Frank Almgill (members of the B.B.C. Symphony Orchestra), Gordon Walker and Charles Stainer.

On June 25th (National) the distinguished German violinist Carl Flesch will give a recital, and on June 19th (National) Henri Mondi (baritone) will be giving his first broadcast recital in this country.

Variety from Hanley

PICKARD'S CHINESE SYNCOPATORS will be the principal "turn" in a variety bill to be broadcast on June 22nd, from the Theatre Royal, Hanley.

Had London Been Calling in 1837

LISTENERS to the National programme on June 20 (and to the Regional on June 22nd) will hear the kind of programme which, in all probability, they would have heard had they tuned in their radio sets on a summer's evening one hundred years ago. "London Calling, 1837" is the title of this impression of the type of broadcast that might have been "on the air" had radio been invented in the year when Queen Victoria came to the throne. Considerable research by Jonquil Antony has been necessary during the preparation of the programme, and adaptation and production will be by Moray McLaren and M. H. Allen.

SOLVE THIS!

PROBLEM No. 248

Kennedy's battery receiver, used in conjunction with an A.C. mains unit, became very weak. Suspecting the output pentode (a 220 H.P.T.), he replaced it by a 220 P.T. which he had on hand, and obtained satisfactory reception. He sent the old valve to the manufacturers for test and was told that it was in good order. 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, Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 248 in the bottom left-hand corner, and must be posted to reach this office not later than the first post on Monday, June 21st, 1937.

Solution to Problem No. 247

The two new resistances should have been connected in parallel.

The following three readers successfully solved Problem No. 246, and books are accordingly being forwarded to them: W. J. Tonkin, 90, Windmill Rd., Gillingham, Kent. J. M. Somerville, 13, Richmond Drive, Glasgow. J. F. Grindrod, 8, Bernard St., West Bromwich.

The Valve as an L.F. Amplifier

This Article, Specially Written for Beginners, Explains the Functions of a Triode, and Gives Particulars of a Simple Test Panel. By "Radio Engineer"

BEFORE one can consider using a valve as an amplifier, it is necessary for a slight modification to be made to the simple *diode* arrangement which forms the fundamental rectifier or detector of the thermionic valve group.

In my article, "The Valve as a Rectifier," it was explained that a diode has two electrodes only, a filament or cathode, and an anode. Such an arrangement allows alternating currents to be rectified only; no amplification of the input being obtained under normal operating conditions.

While that is all that is required when one is concerned with rectification, it is not good enough when the input is so small that the rectified output is too weak to give any audible indication of its presence. It becomes necessary to amplify the output, and such amplification can readily be obtained by using the ordinary diode valve *plus* an additional electrode, which converts the diode into a *triode*, i.e., three electrodes.

The third electrode is known as the *grid*, and it is made in the form of a spiral mesh formed with very fine wire, the size or gauge of the mesh playing an important part in the characteristic of the valve.

The grid is placed between the filament (or cathode, in the case of mains-operated valves) and the anode, and its object is to control the *space charge*, which can be likened to a cluster or cloud of electrons in the vicinity of the filament.

The space charge is negatively charged—it is built up of electrons—and, if the anode is slightly positive only, it will not offer sufficient attraction to cause the electrons to flow across or to overcome the effect of the space charge which tends to repulse the electrons leaving the filament, thus causing them to fall back on the filament or cathode.

The "Control Grid"

When a higher voltage, i.e., the correct value, is applied to the anode, the space charge effect is overcome, and a steady current will flow from filament to anode.

It has been found, however, that if a grid is embodied and, if it is made positive and/or negative with respect to the filament, it is possible to increase or decrease the current flow. In other words, the grid acts as a control, in fact, it is often called the "*control grid*."

Why this fine wire mesh acts in this manner is not difficult to understand. When it is made positive by the positive part of the signal or input, it tends to neutralise the space charge, thus assisting the attraction of the anode and increasing the current flow. If, on the other hand, it is made more negative, either by the signal or by some external source, then it has the effect of strengthening the space charge and causes a reduction in the filament-anode current.

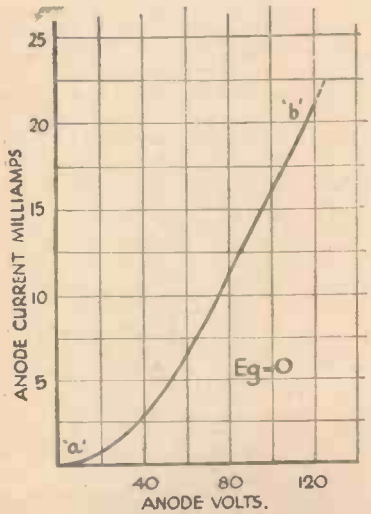


Fig. 1.—Anode current/anode volts curve.

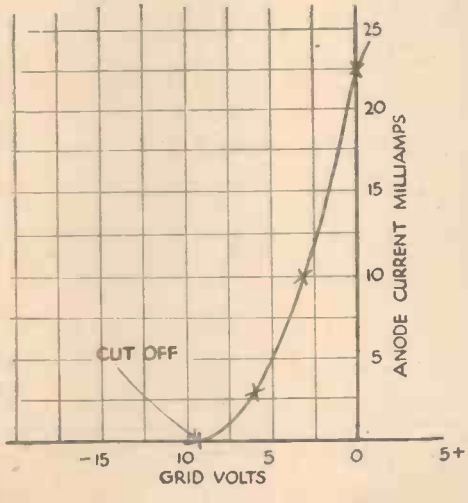


Fig. 2.—Grid volts/anode current curve.

Characteristic Curves

To understand this more fully, I must refer to what is known as a *characteristic curve*, and it is really essential that every constructor should know how to read such curves and how they are formed.

In Fig. 1, it will be seen that a vertical line has been marked off in milliamperes, to represent the anode current flow, while the horizontal base is marked off in volts to indicate the H.T. applied to the anode.

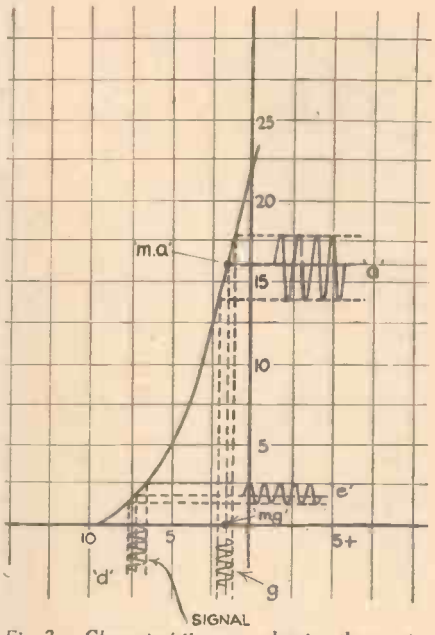


Fig. 3.—Characteristic curve showing the varying amplitude of the input signal.

If the H.T. is increased, from zero, by regular steps of, say, 10 volts, it will be found that the current also increases, and the curve is obtained by plotting the H.T. voltage against the anode current. For example, with 22 volts the current is 1 milliampere, so a dot is made on the vertical line of the 22 volt mark *opposite* the 1 milliamp mark on the anode current scale. This procedure is repeated at 40, 60, 80 volts until the maximum anode voltage, for the valve is concerned, is reached, then a line is drawn through all the points plotted, the result being the curve indicated by the line "a," "b."

From this curve it is possible to see what anode current will flow at any particular value of H.T. voltage, when the grid is at zero potential, i.e., when it is connected to the negative side of the filament and no additional bias voltage applied. Most valve makers publish several curves of this type. One being taken under the above conditions, and others with the grid receiving different values of bias.

A better idea can be obtained from what is known as the Grid Volts/Anode Current curve, which is shown in Fig. 2, the curve being formed by plotting Grid Volts (bias) against Anode Current. The effect of positive and negative bias should be noted; the length of the straight portion and the shape of the bend at the bottom of the curve are important, while the *cut-off point*, i.e., the bias value for zero anode current, must also be appreciated. If a signal or source of alternating voltage is now applied across the grid and filament, *but* in *series* with sufficient negative bias to bring the operating point near the centre of the straight portion, the grid potential will rise and fall about its mean or normal value and the effect of this will be to cause a similar, but *amplified variation* about the mean anode current. A study of the curve shown in Fig. 3 will explain why an amplified variation is obtained. The size or amplitude of the input signal curve should be compared with that of the anode current variation curve, "g" and "a" respectively.

To make the reason why it is essential to work on the straight portion of the curve—when considering amplification—more clear, let us see the effect of applying the signal at the bottom of the curve.

(*Continued on page 327*)

OPERATING THE *Single-valve Set*

This Week the Experimenters Tell Readers How to Obtain the Best Results with the Little Set Described in the Two Preceding Issues

by The Experimenters

WE expect that by this time you will have completed the constructional work, and will be feeling a keen desire to have the little receiver in use. No doubt you have an aerial and also an earth lead; if not, they must receive attention first. There is probably no need to describe in detail how and where the aerial should be erected, but perhaps we had better give a few of the more important details for the benefit of those who have only recently become regular readers of PRACTICAL AND AMATEUR WIRELESS.

When you are using a multi-valve set almost any kind of aerial will serve, for

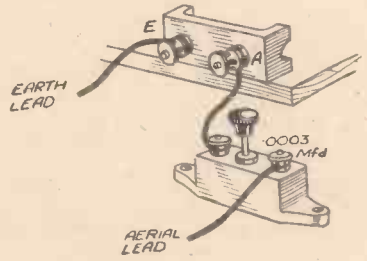


Fig. 1.—How to improve selectivity by adding a series aerial condenser.

there is plenty of power to spare. With a single valve you cannot afford to waste even a fraction of the available signal energy, so the aerial should be placed as high as possible. By height we do not just mean height above ground, but the height of the wire above surrounding objects, such as roofs and trees. See that the aerial wire is well insulated, and try to arrange to have a total length of wire, including the down-lead from the aerial itself to the set, of about 70ft. If the length is much less than this, signal strength will be lost; if it is more, tuning will be less sharp than it should be.

Have the down-lead as far away from the wall of the house as convenient. This means that it should be about 18ins. from the wall, and it might be supported by a metal rod or wooden stay fitted with an insulator. A suitable arrangement is shown in Fig. 4. It is best to keep the down-lead fairly taut, so that it does not have a tendency to blow backward and forward in a light wind. All of the wire can be the so-called 7/22, which means that there are seven twisted strands of 22-gauge wire. For preference the wire should be enamelled, because the covering protects the copper from corrosion. An alternative material is "Electron," which is stranded wire covered with insulation. This can be used without insulators if desired, whilst it is much better than 7/22 if the wire cannot be kept completely clear of buildings or projections. There are other rather similar materials, of which "Aerialite," is well known, which can be used successfully, whilst it is also possible to buy complete aerial kits.

Where the lead-in is carried through the window frame it should be insulated. Insulation can be provided by using an ebonite lead-in tube, or rubber-covered wire; when using one of the ready-insulated wires, additional insulation is not required. If any joints have to be made, it is important that the wire should first be thoroughly cleaned, and that it should be gripped tightly by the terminals or, better still, it should be well soldered.

The Earth Lead

The earth connection is still more important. It should be as short as possible, and should be made to a cold-water pipe, to one of the many special copper earthing spikes which can be driven into the ground, or to one of the many "chemical" earths. A water-pipe earth is often most convenient, but it is far better to use one of the alternative systems than to run a wire for several yards to the nearest water pipe. If the lead does not exceed a length of about five yards it is satisfactory to use a length of wire similar to that employed for the aerial. For longer distances it is better either to use stouter multi-strand wire, or to run two lengths of the aerial wire.

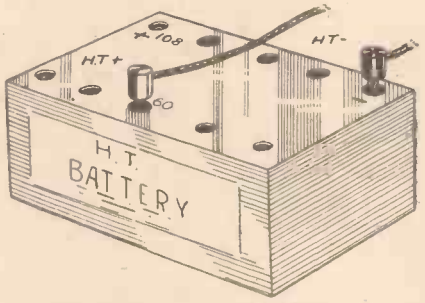


Fig. 2.—How to connect up the H.T. battery.

To ensure a good connection to earth, the earthing device should be placed in a fairly damp place, or otherwise a bucketful of water should occasionally be poured over it during the summer months. "Chemical" earths, which consist of a small copper can which is buried in the ground, are less troublesome in this respect, because they contain chemicals which attract moisture. If there is any doubt concerning the efficiency of the earth it is worth while to experiment with the connection in different positions.

'Phone and Battery Connections

Now that we have got that off our chests we can return to the set itself. Attach the bared ends of the aerial and earth leads to the two terminals marked A and E

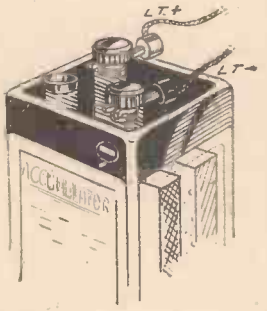


Fig. 3.—This diagram shows how to connect up the accumulator or L.T. battery.

respectively, join the 'phone tags to the other pair of terminals, and then connect the batteries. With regard to the 'phones, these are sometimes marked + and —, or the leads are coloured red and black, or one lead has a red thread running through it. In such cases, the +, red or red-streaked lead should be connected to the 'phone terminal from which the flexible H.T. lead is taken. When wired in this way, the H.T. current passing through the 'phones assists the magnetism of the magnets within the ear-pieces.

Figs. 2 and 3 show you how the batteries are joined up to the four flexible leads, and it can be seen that the L.T. leads go to the 2-volt accumulator, and the H.T. leads to the dry battery. The positive (+) L.T. spade terminal is connected to the red terminal of the accumulator. A 108-volt H.T. battery is indicated, and the H.T. — wander plug is pushed into the — socket, the H.T. + plug being inserted into a socket marked 60v. As a matter of fact, the positive connection can be made to a socket providing anything between 54 and 66 volts, so you need not worry if your battery is marked differently from that illustrated. If a 60-volt battery is used, the H.T.+ plug should simply be applied to the socket marked +, or 60+, according to the particular make of battery.

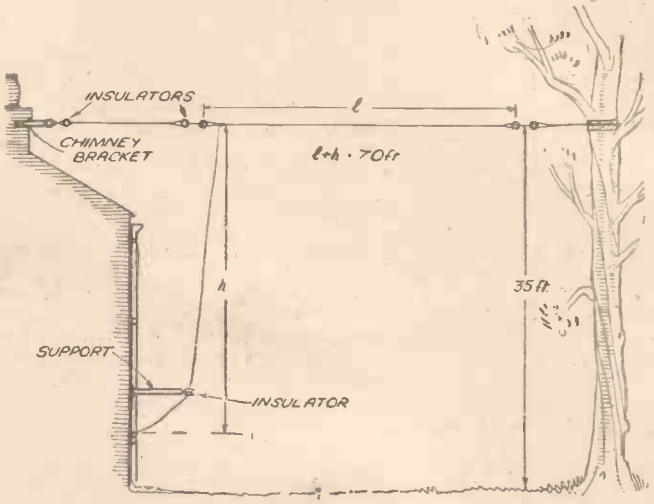


Fig. 4.—A suitable method of erecting the aerial.

(To be continued)

RADIO FAULT TRACING—5

DIFFICULTIES WITH THE SUPERHET

THE work of re-ganging a superhet, assuming that it requires readjusting right through, must be divided into several distinct parts:—

(1) Lining up the I.F. stages to the correct I.F. value and, possibly, for a good shape of response curve.

(2) Oscillator trimming.

(3) Signal frequency circuits' trimming.

(4) (With certain exceptions) Oscillator tracking.

If band-pass complications are not anticipated the procedure described below should be satisfactory in all normal cases:—

Connect up an output meter to the speaker, and cut out the receiver oscillator temporarily by joining a large-capacity condenser from oscillator grid to chassis. Connect the testing oscillator output leads to the signal grid of the frequency changer, or first detector, and to E, respectively. The lead to the grid should be taken *via* a condenser (a 0.1 mfd. should do). Tune the testing oscillator to the correct intermediate frequency value and keep down the test signal amplitude to the lowest possible value, consistent with a satisfactory output-meter indication.

Adjust the I.F. trimmers in turn for peak response, starting at the last I.F. secondary and working back to the first primary. Next, run the testing oscillator frequency through resonance and back, and watch the output-meter needle for any signs of bad asymmetry of response. This step should be taken as a precaution against getting "caught" should the I.F. transformers prove to be tighter coupled than was anticipated.

If it is known that the I.F. amplifier is designed for a pronounced band-pass characteristic, there are two ways in which the adjustments can be tackled, assuming that oscillograph gear is not available: (1) Trim for peak response and then readjust by trial and error to get as symmetrical and as steep-sided a response curve as it is possible to judge by watching the output meter while running the test-oscillator frequency to and fro through resonance. Care should be taken, however, that in the enthusiasm of getting a symmetrical variation of the output-meter needle, that the I.F. amplifier is not dropped in sensitivity too much. As a matter of fact, it will pay whenever a slight readjustment of a trimmer does not appear to be very helpful to let the trimmer "stay put" as it was. (2) Impose fairly heavy damping on each I.F. circuit in turn while its companion is being trimmed for peak response. A shunt resistance of from 10,000 to 50,000 ohms should be tried, connecting it across a primary while the corresponding secondary is being tuned, and *vice versa*.

Oscillator Trimming

If it so happens that the receiver has a variable-coupling control on one or more of the I.F. transformers, then the latter should be tuned for peak response with the coupling kept at minimum.

As a reminder—always be ready to reduce the signal amplitude whenever circumstances permit.

When the I.F. circuits have been adjusted the oscillator trimming must be tackled. Connect up the testing-oscillator leads to the A and E terminals, as described for the ganging of a straight receiver, and take away the shunt condenser which was temporarily connected to the oscillator circuit.

Check the pointer setting of the receiver.

The medium waveband should be dealt with first, and it is to be assumed that the rest of the adjustments described below apply to the one waveband. Apply a test signal as you would for a straight receiver, and turn the main tuning control of the receiver to the dial reading corresponding to this. Start with the oscillator trimmer of the receiver at minimum capacity and increase the capacity until an output-meter peak is obtained. By commencing at the lowest capacity and stopping at the first peak setting, the risk, which arises in some cases, of tuning to the second channel oscillator frequency will be avoided.

The oscillator circuit must now be left severely alone while the signal-frequency circuits are lined up in the normal manner.

This brings the position up to the matter of oscillator tracking. By the process already gone through the difference between the signal and the receiver oscillator frequencies has been made equal to the intermediate frequency. It is necessary that this relationship shall hold reasonably closely all over the waveband. When the ganged condenser has identical sections the "tracking" of the oscillator is secured with the aid of extra series capacity in the oscillator circuit. In some receivers, and on certain wavebands, the series-tracking condenser will be a fixed condenser. In such a case, if there is no component defect and the right value of the I.F. has been used, the tracking will come right when the oscillator trimming has been done.

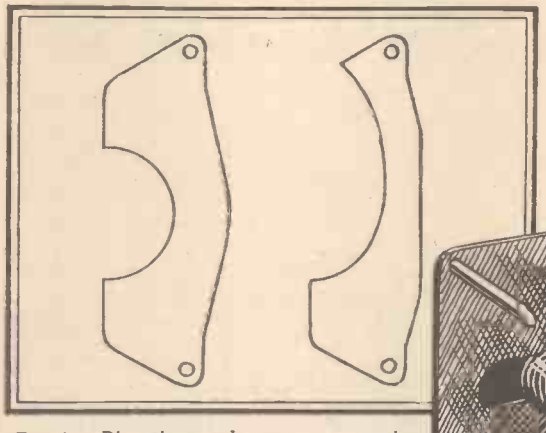


Fig. 1.—Plate shape and section o a superhet condenser designed to provide an intermediate frequency of 465 kc/s.

Assuming, however, that the tracking condenser is variable, it should be adjusted on a test signal near the top end of the waveband. The tracking condenser should be adjusted for a peak response on the output meter, and since it is most important not to disturb the settings of the trimmers while this job is being done, it is advisable to rock the main tuning control of the receiver slightly and obtain the best combination of tracking condenser and tuning-control settings. The adjusting of the tracking condenser is liable to affect the optimum setting of the oscillator-trimming condenser, and a return should therefore be made to the lower end of the waveband and the oscillator trimmer readjusted, if necessary.

Many receivers contain ganged condensers in which the oscillator tuning section differs from the others in the respect that it has specially shaped plates designed to give the correct oscillator tracking without it being necessary to use an additional series tracking condenser. "Shaped plate tracking," however, normally only holds good over one waveband (usually the medium), and extra tracking condensers are brought in for other wavebands. In a case of this nature the oscillator adjustment on the medium waveband is merely that of trimming, but other wavebands will involve both trimming and tracking adjustments.

Dealing with the general matter of re-ganging a superhet, it is to be understood that once the receiver has been adjusted right through on one waveband, the I.F. stages are finished with. The other wavebands, however, must be dealt with individually, as far as signal frequency and oscillator circuit adjustments are concerned.

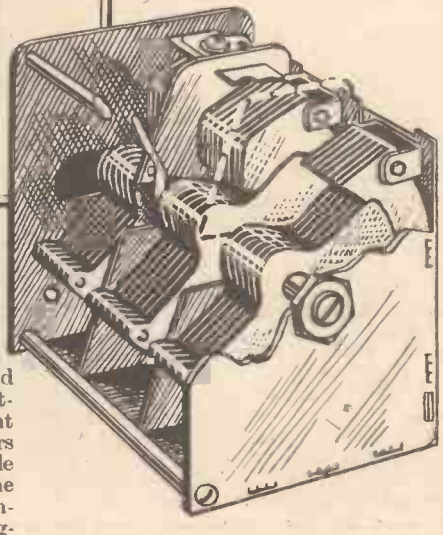
Faults Which Affect Ganging

There are two possible ways in which faults affecting ganging may show up. In one case it may be found impossible to get an optimum adjustment on a trimmer. In the other case it may be found that while the receiver will gang up perfectly on one test frequency it gets out of gang at other frequencies. This type of trouble can occur with straight receivers just as much as with superhets.

When searching for faults affecting ganging, all coils and condensers associated with the high-frequency circuits must be regarded as potential trouble points. It is to be assumed, however, that any such drastic types of fault as breaks or short-circuits would most probably have drawn attention to themselves before one would have got so far as to bother about ganging. A disconnected trimmer is a possible exception.

If any particular circuit refuses to give satisfactory response to trimmer adjustments, common sense will suggest that the trimmer itself and its connections should be inspected. If these

(*Continued on next page*)



RADIO FAULT TRACING—5

(Continued from previous page)

are in order it is reasonable to assume that there is excessive shunt capacity across the circuit. A bad displacement or alteration of wiring may be responsible for this.

If ganging will not hold constant over a waveband the trouble may be due to a faulty ganged condenser. If the plates have been abnormally bent, if there is end play on the spindle, or if a set of "fixed" plates has shifted position (sometimes the "fixed" plates are adjustable), it is not to be expected that the various circuits tuned by the ganged condenser will keep in line, even if they have been lined up properly at one particular frequency. Close inspection of the ganged condenser may, therefore, be worth while. Certain ganged condensers have split end vanes, the segments of which can be bent to bring about capacity matching between the sections of the whole condenser. If, due to mishandling, one or more of these segments have been shifted from the proper position, trouble with the ganging is inevitable. The occasion calls for the job of bending the offending segments back into place. In a bad case it will be necessary to go through a series of ganging-check processes, working the condenser round from minimum to maximum and segment by segment and to make trial-and-error adjustments of the end vane segments until the matching is secured.

Tracking Adjustments

In the case of the superhet oscillator circuit, bad tracking may be experienced and there are a number of possible types of fault which could be responsible for this. A defect in the oscillator section of the ganged condenser is, of course, a possibility, and so is that of a defective oscillator coil. Where fixed tracking condensers are used it will need no more than a capacity change of one of these to throw the tracking out. Incidentally, it will sometimes be found that a combination of a fixed and variable condenser is used for tracking. If, when carrying out tracking adjustments, it is found that the variable condenser will not give a peak setting, then the fixed condenser associated with it should be suspected before anything else.

It should be noted that the tracking will be wrong if the oscillator has, by some mischance, been tuned to the wrong beat, and the advice given earlier in this article to work from minimum capacity of the oscillator trimmer towards the first peak setting is important, although it must be admitted that in some cases it would not be found possible to tune to the second peak. However, it as as well to be careful on this point.

If coils have become unmatched there may be a little difficulty in locating the faulty one, although probably the clue will be obtained from the behaviour of the trimmer in the circuit which contains the faulty coil. Any suspected coil should be closely inspected for such faults as displaced turns, loose turns, or turn-insulation defects. With certain kinds of iron-core coils it is possible for trouble to be produced by a core displacement.

If any particularly obstinate case is met with when endeavouring to find the cause of ganging defects, the possibility of valve trouble may be well worth investigating. Due to the effects of inter-electrode capacity the valves do have an influence on ganging adjustments and it is even possible that incorrect valve-operating voltages may indirectly have some effect on the ganging. Again, the anode by-pass condenser associated with triode detectors has a bearing on the actual tuning of the grid circuit and should not be overlooked in a troublesome case.

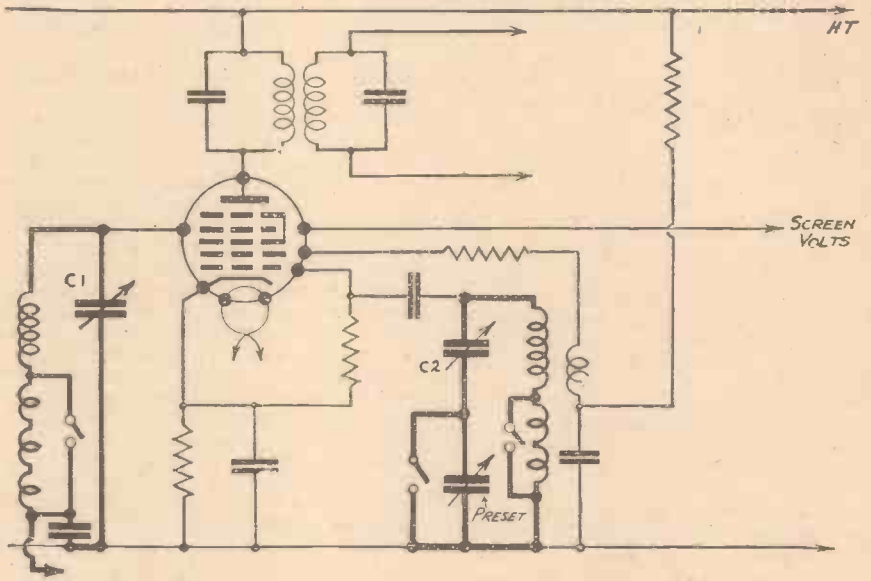


Fig. 2.—This skeleton diagram shows a superhet frequency-changer stage, with C1 and C2, the two tuning condensers illustrated in Fig. 1.

Important Broadcasts of the Week

NATIONAL

Wednesday, June 16th.—London Music Festival, 1937, organised by the British Broadcasting Corporation: Last Concert from the Queen's Hall, London.

Thursday, June 17th.—Dance Band programme.

Friday, June 18th.—"To-morrow's Luck," a Musical Comedy.

Saturday, June 19th.—Music Hall programme.

REGIONAL

Wednesday, June 16th.—"To-morrow's Luck," a Musical Comedy.

Thursday, June 17th.—Canterbury Festival Concert, from the Cloisters, Canterbury Cathedral.

Friday, June 18th.—Running Commentaries on the Senior International Auto-Cycle Tourist Trophy Race from the Isle of Man.

Saturday, June 19th.—Edinburgh Castle, feature programme.

MIDLAND

Wednesday, June 16th.—"Melody and Rhythm": instrumental programme.

Thursday, June 17th.—A Concert by Gloucestershire Artists, from the Town Hall, Cheltenham.

Friday, June 18th.—Dance Band programme.

Saturday, June 19th.—Three Aspects of Cricket: Running commentaries on a Working Men's Club Match at Leicester; Burslem v. Leek in North Staffs and District League at Coleridge, Stoke-on-Trent; Nottingham v. New Zealand at Trent Bridge.

WESTERN AND WELSH

Wednesday, June 16th.—"The Woodlanders," a Radio play by Louise Drury, adapted from Thomas Hardy's novel of the same title.

Thursday, June 17th.—Festival of Song, from the Henry Rees Memorial Chapel, Llansannan, Denbighshire.

Friday, June 18th.—"Crug-y-bar," a Romantic Play by Rhys Davys-Williams.

Saturday, June 19th.—The Torbay International Regatta, a talk from Torquay.

NORTHERN

Wednesday, June 16th.—Running Commentaries on the Lightweight International Tourist Trophy Race from the Isle of Man.

Thursday, June 17th.—"Sheep Fratch," an argument about the merits of fell sheep.

Friday, June 18th.—International Tourist Trophy Races: The presentation of the Trophies by Sir Montagu Butler, from the Villa Marina, Isle of Man.

Saturday, June 19th.—Musical Festival from the Lowther Pavilion, Lytham St. Annes-on-Sea.

SCOTTISH

Wednesday, June 16th.—Organ Recital, from the Usher Hall, Edinburgh.

Thursday, June 17th.—"The Empire Exhibition—Scotland, 1938": a Talk.

Friday, June 18th.—"Hey Day": A Pastoral of Hay Harvest, by English Poets and Buchan Players.

Saturday, June 19th.—Edinburgh Castle: feature programme.

NORTHERN IRELAND

Wednesday, June 16th.—Military Band concert.

Thursday, June 17th.—Light Orchestral programme, from the Chalet, Crawfordsburn.

Friday, June 18th.—"Insurance Money": An Ulster Comedy, by George Shiels.

Saturday, June 19th.—A running commentary on the Ulster Trophy Motor Car Race.

On Your Wavelength

By THERMION

What They Think of Us!

HERE is a cutting from an Irish paper which I reproduce without comment. It appears under the heading "The Night the Fleet Disappeared" :—

"There is no mistake that some English newspapers were hard up for a sensation when they devoted such space to the curtailment of the commentary on the illuminations of the Fleet at Spithead recently. Thousands of listeners heard the commentary—and wondered. But what of it all? Those with any knowledge of life had a shrewd idea of what occurred, and were anything but flabbergasted. Broadcasts can't always go according to schedule. The Spithead commentary, for that reason, shows that even the British are human sometimes!"

Our Directory of Clubs

DO please give that Secretary bloke belonging to your local club a poke in the ribs, and tell him that it is a friendly reminder from his old pal Thermion that we are still in need of certain facts concerning his club. Otherwise, details of the club will be omitted from the directory we are compiling. This is positively the last notice I shall give, so if your club suffers social obloquy as a result don't blame me. Here are the clubs which have failed to respond to my repeated invitations for the name and address of the Secretaries :—

International Short-wave Club (Manchester); Nelson and District Radio Club; Reading Short-wave Club; The Scottish Short-wave Radio and Television League; Sheffield Short-wave Club; South Hants Radio and Television Society; S.T.C. Radio Experimental Society.

Set for 5 to 20 Metres?

D. F. B., of Cranleigh, writes: "I think that if your excellent paper produced a guaranteed set for 5 to 15 or 20 metres reception, it would meet with success; a two- or three-valve super-regenerative on the lines of those in this week's PRACTICAL AND AMATEUR WIRELESS, preferably mains driven as those illustrated. I very much appreciate your constructional details of past receivers, such as the £5 Superhet Three and the Fury Four, which give us ideas of how to build sets—after you have crossed the 'Pons asinorum.' I hope you will entertain this idea. Also I think that the 'Experimenters,' now they have come down to earth again, will be very popular with beginners. The only criticism I have is that they were not introduced a year or two ago when I first started taking PRACTICAL AND AMATEUR WIRELESS. But they make a very good refresher course for those who have got beyond that stage, which the 'pukka' superhet fans might realise."

Humour

ANOTHER reader, J. W. L., of Llandudno, thinks that I might introduce a weekly joke into my feature. He wishes to start the ball rolling with the following :—

"I know you are fond of a little humour in exchange for what we readers enjoy from you, so perhaps this little howler (quite an unconscious effort on the speaker's part) may amuse readers. It was a few years back when television was very young; in fact, the scientist's toy. I and a few others were talking wireless in general and so one subject went to another. One of the others who was interested in our conversation said to me: 'What's your opinion on television.' 'Well,' I replied, 'it is hard to say yet.' 'Yes,' my friend replied. 'It is still in the infantry!' I hope, dear Thermion, this little howler may start others going."

Television at the Show

SPEAKING of television reminds me that between now and the Wireless Exhibition prices are likely to drop very considerably, and there is also the possibility that the programmes will improve in quality. One firm is already producing a small cathode-ray tube for between £2 and £3, enabling the constructor to build a television receiver comparable to a crystal set or a one-valve headphone set. And it is not such a far cry to the Wireless Show; from what I know, but am not permitted to tell you, it is likely to be even more interesting this year. The sets will be smaller, the prices probably lower, and there will be less of the ornate exterior. At least I hope so.

Radio for Anti-gas Room

AN anti-gas room prepared in case of air raids at the head office of the Yorkshire Penny Bank, Leeds, includes in its elaborate equipment a G.E.C. all-wave receiver, so that contact may be kept with the outside world. Thus does modern science cater for the saving of life in time of need, as well as provide us with jazz and other forms of mental torture.

Heartbeats

DID you hear the heartbeats the other night on your radio? They were those of Michael Carr, the song writer; J. E. Lovelock, the famous runner; and Robertson Hare, the stage and screen actor. They were specially recorded at King's College Hospital, and illustrate how hearts are speeded up by exertion—or excitement. Not very amusing, but interesting!

A Record Recording

HERE are some interesting details concerning the arrangements made for recording the King's Speech and the Coronation Service by the H.M.V. engineers.

It would not have been practic-

able to duplicate solely for recording purposes the very elaborate technical preparations made within the Abbey by the B.B.C. for broadcasting purposes, and so H.M.V. were able, through the courtesy and co-operation of the B.B.C., to receive the Service, exactly as it was broadcast, direct by private line from the Abbey to their studios in St. John's Wood. Although this was a great advantage it did not, however, overcome all of the difficulties, for—as is well known—telephone lines normally are unsuitable for the transmission of music, as they depreciate the upper register or frequencies to a greater extent than the middle register. In order to overcome the difficulty, careful measurement of the telephone line characteristics were made, and special apparatus (called "equalisers") had to be built and installed. The "equalisers" had the effect of eliminating the distortion and allowing the music signals to enter the recording amplifiers as originally heard, i.e., undistorted by the telephone lines. At the point of reception the music currents were split into halves, each being fed into a standard recording channel.

Four Machines Used

EACH channel in turn operated two recorders on two recording machines, so that four machines were in use. The recorders and machines were specially balanced, controlled and matched, so that on the finished record it is impossible to detect any difference in quality between one pair of machines and another.

The amplifier power outputs to drive the recorders were of such dimensions as to provide a considerable safety factor against any possibility of blast or overloading due to sudden fortes or the like.

Special Waxes

THE waxes for the recording of the Coronation were specially selected and aged suitably by warming very gradually. It took several days to reach the correct temperature under thermostatic control.

One of the greatest difficulties of recordings of this type, bearing in mind the circumstances, is to maintain proper volume on the record, for it must be neither too weak nor too loud. Although special meters called volume indicators have been devised and are very helpful, the most important factor for this part of the control is the experience of the operators. On the Coronation Day H.M.V. had all their most experienced operating staff—in some instances men who have been recording for 45 years, and who brought to bear their vast store of knowledge and experience.

At normal recording sessions rehearsals are frequent; a play-back from the wax is heard by artist and operator as a means of noting and correcting imperfections; errors may be corrected by re-takes; after trial, adjustments of tone and volume are frequently necessary to get best results. But, at the Coronation Ceremony, none of these advantages was available. Once recording started nothing could be done to correct anything overlooked or misjudged. Everything depended on the skill of the men actually recording to make the best of the conditions then available. All the records were made in duplicate, and while recording one pair of waxes, the following pair was being prepared. Depth of cut of the groove in the wax had to be adjusted within one ten thousandth of an inch, and warping of the wax, invisible to the eye, had to be measured and checked under a microscope.

These, and many other incidental items, had to be satisfactorily dealt with in the few seconds available between the start and finish of a side.

Due to the careful advance organisation and preparation, the actual recording proceeded smoothly.

Notes from the Test Bench

Hum-bucking Coil

WHEN a permanent magnet moving-coil speaker is replaced by an energised model, it is often found that the hum level is materially increased. This increase is generally due to interaction between the field winding of the energised speaker and its speech coil, and may be practically eliminated by adding a hum-bucking coil. Many speakers have this coil fitted, but it is seldom found on inexpensive models. Fortunately, however, it is not a difficult matter to add a suitable coil. One end of the speech winding should be disconnected from the speaker transformer secondary and joined to the end of a wire approximately equal in length to the speech winding. This wire should then be wound round the field winding in an opposite direction to the turns of the speech winding and its free end should be joined to the speaker transformer lead from which the speech winding was disconnected. The new winding should, of course, be insulated from the field winding and the chassis of the speaker.

Dry Batteries for L.T.

MOST battery type valves are designed for a filament voltage of 2 volts. They have been standardised in this manner because 2 volts can easily be supplied direct from a lead-acid accumulator. It is sometimes found that a dry battery supply is more convenient, however—for example, in signal generators and certain types of portable receiver. Great care must be taken when dry batteries are used for filament supply, as the voltage of each cell is 1½ volts. Two cells must therefore, be used for 2-volt valves, with a resistance connected in one of the leads to drop the voltage to the required 2 volts. The required resistance value is governed by the current which will pass through it; that is, by the filament current consumption of the valves. In signal generators it is customary to fit a variable resistance so that the voltage can be set at exactly 2 volts.

Pentode Substitution

A READER who had replaced a mains power pentode by a high efficiency type was surprised to find that results were not satisfactory, instability and distortion being experienced. He had overlooked the fact that the high efficiency pentode requires a much lower bias voltage than the power type, however. When this substitution is made, the value of the bias resistance should be lowered to that specified for the new valve.

Headphone Receivers

WITH reference to my recent note anent headphone receivers for silent dancing, a reader sends the following interesting details: "I well remember these. An elaborate local transmitter was installed in the room with dancers, with a network antenna under floor covering, the dancers wearing semi-tuned headphones (Hale patent). This could be probably used again, using crystal tuned, maybe crystal detection also, working on a frequency outside the used ranges. What about the harmonics? Well, I shall leave this to the designer to sort out. For years we cultivated the listener for better reproduction; to-day, when a customer 'dares' to remark on the queer noises received, he is looked at sternly and told that this is unavoidable in superhet receivers; in fact, many people to-day do not know it is possible to obtain silent background reception. It is that first craze of station pulling that sells the superhet.

"The metal chassis is helping amateur work and introducing new young bloods. The baseboard belongs to the amateur."

A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

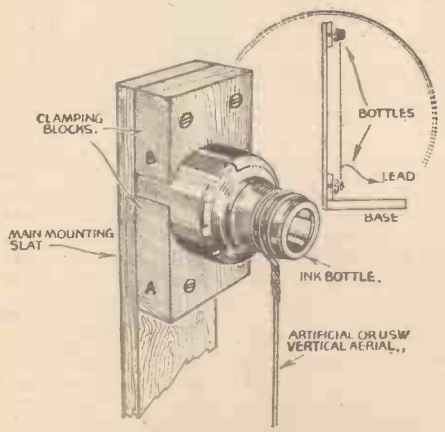
A Simple Low-loss Stand-off Insulator

REQUIRING some stand-off insulators for the construction of an artificial aerial for R.F. experiments, I hit upon the idea illustrated, and I was surprised at the neat and efficient "hook-up" which these small ink-bottles afforded. Firstly, I mounted block "A," then, holding the bottle in position, slightly forced block "B" to attain rigidity, then screwed both blocks down securely, the same operation being performed with the base end of the assembly.

An improvement which I have decided to try is in the employment of pieces of cork between the bottle and the blocks to counteract any slight strain on the bottles, but this is an afterthought.—A. G. MEATON (Ipswich).

A Simple Measuring Instrument

IT has been frequently stressed in these pages that voltmeters must have a high resistance. There is a simple instrument which can be used to measure potential extremely accurately, as it takes no current whatsoever. The construction is fairly simple. The potentiometer must have a value of 50,000 to 100,000 ohms, and follow *linear* law. The spindle of this is actuated by a good reduction drive and scale. The end of the potentiometer connected to the switch must be joined to the meter with as low resistance as possible when the scale reads 0. In use, the battery E3 drives a current through the potentiometer, causing a uniform



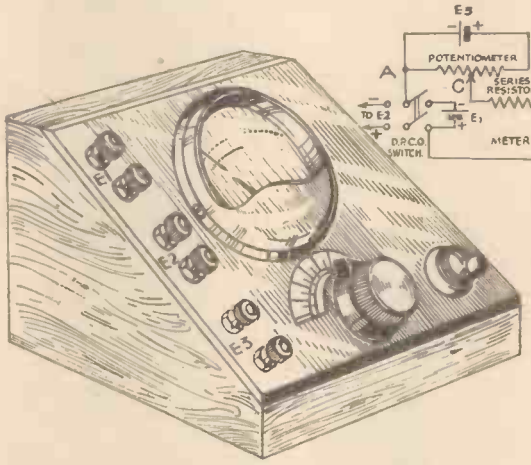
How to make stand-off insulators from old ink-bottles.

potential drop across this. This battery E1 is brought into the circuit and the potentiometer adjusted until no current passes through the meter, indicating that the potential across AC is equal to the potential of E1. The switch is now thrown over to bring E2 into the circuit and a position reached on the potentiometer

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., Tower House, 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 wrinkles.

when no current flows through the meter. The voltage E3 may now be calculated from the formula $\frac{E1}{E2}=\frac{C1}{C2}$ where C1 is the reading on the scale for the potential E1,



Mr. Wilding's suggestion for making a useful measuring instrument.

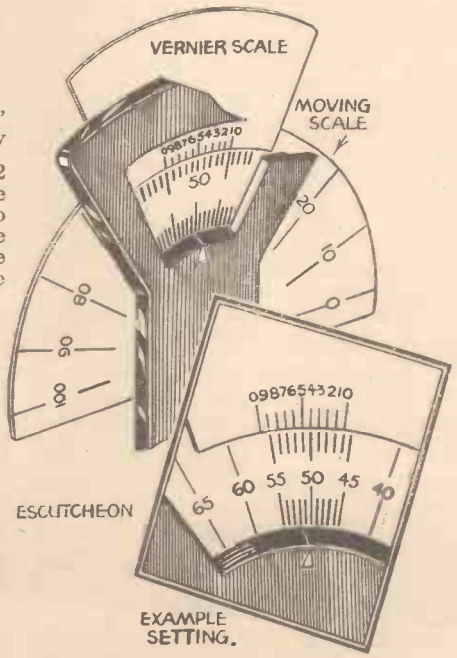
and C2 the reading obtained with E3. This, more simply, is $E2=\frac{C2\ E1}{C1}$. Before actually using the instrument the voltage E2 should be roughly determined, and the batteries E1, E2 made as nearly equal to it as possible. The negative end of the potentials E1, E2 must be connected to the negative pole of the battery. E2 may be

the voltage across a resistor, or in any part of the circuit, but must not be alternating. The series resistor is to protect the meter in case of a wrong connection, but should not have too high a value.—A. M. WILDING (Wallasey).

A Vernier Tuning Device

ON S.W. bands very accurate tuning is of utmost importance, and it is here that a vernier reading scale is seen to greatest advantage. Here is a useful way of incorporating an old idea: it is conveniently inserted between the celluloid dial and the fixed escutcheon plate, to which it is secured.

The vernier consists of a graduated arc shaped scale, the inside radius of which is slightly less than the radius of the circular dial of the condenser. It is thus visible through the escutcheon aperture. The scale is arranged to cover the angular measure of 9 degrees of the dial, and is sub-divided into 10 equal divisions which are marked from 1 to 9; the extreme points being zero positions. It will be seen that when the pointer upon the escutcheon is exactly at, say, 51 degrees, the zero positions (ends) of the vernier are directly in line with the divisions upon the main tuning scale. As the condenser dial rotates, the vernier indications line up with those upon the main scale; thus the decimal reading is given by the vernier setting at its point of alignment. —WM. A. HARRISON (Aintree).



Fine tuning may be accomplished by making a Vernier as shown here.

Practical Television

June 19th, 1937. Vol. 3. No. 55.

An Engineering Feat

TO hoist a cable weighing twelve tons, over 1,300ft. long and 6ins. thick, to the summit of the Eiffel Tower, Paris, is an engineering feat of no mean calibre. This has been done by the Post & Telegraphs Department, so that the ultra-short-wave radio transmitter for the new television service which is soon to operate in France can be linked to the aerial at the top of the Tower. In spite of a strong buffeting wind and pouring rain the work was carried out in six hours without a mishap. This television feeder cable, designed and made in Germany, has a core of plaited copper strips with steatite insulators positioned at regular intervals to ensure that the requisite low capacity is maintained. An outer covering of braided steel wire forms an effective protecting sheath and this is again covered by a form of tarred jute. So far this is the only installation which has been undertaken in connection with the new proposed French television service. Five different companies and systems are demonstrating their equipment at an exhibition, and it is anticipated that from these one will be chosen. The standards for the radiated picture will then be settled, and there is every likelihood that they will be the same as in this country. The previous power of 7 kilowatts and a 180-line 25-frame picture will then be completely superseded, and due to the height of the aerial it is anticipated that the signal range will exceed that already discovered in England.

Keystone Effects

FROM time to time reference has been made to the keystone effect when dealing with either cathode-ray tubes or the Iconoscope type of camera. Many readers have failed to understand what is implied by this expression. It is associated with the scanning field and means that the area covered by the scanning beam of electrons is wedge-shaped, like the keystone of an arch—hence the particular name given to it. More than one effect can bring this about in the case of a cathode-ray tube with the relatively complicated electrode system of an electrostatically-operated tube. With the Iconoscope or Emitron camera, however, the very nature of its construction introduces this form of distortion. The mosaic plate, on to which the scene to be televised is focused optically, is inclined at an angle to the scanning beam of electrons, which neutralises the charges acquired by the individual cells in order to produce the required signal. For a given *angle* of sweep, therefore, the top line scanned would be longer than the bottom one. This has to be compensated for by an ingenious electrical control, so that while the electron beam is carrying out its scan in a series of lines from the top to the bottom of the picture, the length of the line must be made to increase. The degree of success which has attended the incorporation of this compensating control is quite apparent, for the picture as seen on the receiving sets (assuming these are in no way defective) is perfectly rectangular, and shows not the slightest trace of wedge or keystone formation.

Television Abroad

AFTER a period of enforced inactivity, while the essential alterations were being made to the transmitters to accommodate them to the new American picture standard of 441 lines in lieu of the old 343 lines, signal strength tests in the field have been restarted by the N.B.C. of America. Reception from the Empire State Building will be checked on some six or seven dozen receivers located at various vantage points in and around New York. This will continue until the end of the summer when the results will be collated carefully and definite recommendations made. It is certain that the recent television broadcast successes secured by the B.B.C. have given a fillip to work in America, and as evidence of a further desire to develop comes the announcement that Mr. F. Niblo has become America's first director of television, the opposite number to our own Gerald Cock.

In Italy television stations are being erected in Rome, Turin and Milan, and the first-named is expected to commence operations very shortly. The picture definition is to be 400 lines, while the ratio of height to breadth is unity. Commercial receivers are not yet on the market, but it is hoped that they will soon be available, and giving a picture about ten inches square will be priced at figures similar to those now ruling in this country.

Scanning

THE normal method of scanning, which has a sequence of movement of left to right for each line and top to bottom for each frame in a manner identical to the human eye reading the pages of a book, is by now so familiar to readers that little thought has been given to the fact that countless other schemes have been propounded and tried with varying degrees of success. It is quite natural to assume that the simpler and more orthodox the method employed, the greater will be the chances of material success when used in any television service, and this factor has been borne out in practice. An unorthodox scanning sequence, while it may reduce the "line" effect in a picture and even show an absence of flicker at relatively low frame speeds, generally presents prime difficulties in two other directions. First of all, it is not a simple matter to produce scanning generators which will make the exploring spot move in such a way that it covers a picture in a weird pattern, and secondly the problems of synchronising are increased enormously. On the other hand, under special conditions, such as secret visual communications for Government or commercial purposes, scanning sequence scrambling assumes a degree of importance.

Bowyer and Ravell, Ballroom and Acrobatic Dancers, being televised in a Variety programme from the Alexandra Palace.

"THE WASP'S NEST."

Hercule Poirot, the little Belgian detective of the Agatha Christie mystery stories, makes his appearance in television on June 18th in the first public presentation of Agatha Christie's new one-act play "The Wasp's Nest." This ingenious thriller involves four persons only and although, as might be expected, it is a murder hunt, there is this difference: Poirot is on the scene before the projected murder has taken place. The audience shares with Poirot the knowledge of what is impending and begins to wonder whether any of the characters will escape with their lives. Whether they do, and if so how, viewers will discover on June 18th. The part of Hercule Poirot will be played by Francis L. Sullivan. The play will be produced by George More O'Ferrall.

Building F. J. CAMM'S "PARVO" FLYWEIGHT MIDGET Portable

THE LATEST IN OUR PIONEER SERIES OF MIDGET FLYWEIGHT ALL-PURPOSE PORTABLES

By F. J. Camm

FOUR years ago I set about the task of producing a lightweight series of portable receivers, and introduced that series with the Featherweight. Many hundreds of sets were built, and still function satisfactorily. Up to that time the receivers which masqueraded under the title of portable were in most cases heavier than a table receiver, and the title was something of a misnomer. So I made it my first problem to reduce the weight, and bearing in mind that I had to make use at that time of existing wireless components, themselves rather heavy, it will be agreed that I achieved a large measure of success. But I realised that large chunks of weight could be saved if I could persuade manufacturers to make smaller components. I did a lot of steady work behind the scenes, and as everyone now knows, the constructor interested in making a really midget portable set—a little fellow with a big voice !—has available a large range of really midget components which acquit themselves of their particular function in the circuit most creditably. Not only was it necessary to produce smaller components to save weight, but also so that the physical dimensions of the set could be correspondingly reduced. It was no use fitting midget components into a receiver unless you could persuade the speaker manufacturers to produce an efficient but tiny speaker. A tiny speaker would have been useless without small valves, a small accumulator, a small H.T. battery, a midget transformer, a midget tuning coil, midget tuning condensers, and so on. All of these are now available, and you will note by comparing the portables I have designed in previous years that the size and the weight have been gradually reduced. The "Parvo" is the smallest yet, and it is more efficient than previous portables. I hope that you will be able to twig the origin of the name with which I have christened it. It is an abbreviation of the old Latin tag *multum in parvo*—meaning much in little—and that very accurately describes the performance of the receiver. Externally it measures 8 ins. high by 6½ ins. wide by 6½ ins. deep, and you could carry it about all day without any fatigue. It weighs only 7 lbs. all on.

I would say at once in order to forestall any questions on the point that it is designed to function as a portable-receiver and not as a family set for combing oodles of stations from the ether. A portable receiver is intended to reproduce at loudspeaker strength the local station with the choice of three or four alternative stations. The number of stations received is limited by the size of the frame aerial, so that if you use an outside aerial and an earth the receiver will acquit itself almost as well as a much larger receiver. With the national fitness campaign in full swing, the open air movement is developing. Cycling, hiking, motoring, boating ; in fact, all forms of outdoor exercise are claiming thousands more followers. The "Parvo" is an ideal companion for the river, for that holiday under canvas, for the interval after the game of tennis, for the car picnic, for that lazy hour in the garden on a Sunday afternoon, or as an auxiliary set for the bedroom when that mid-summer cold assails you. You will not cavil at the cost of building it, for the priced list of components appears on page 324.

The circuit diagram introduces nothing novel ; it is a well-tried and trusty circuit. The components have been selected and arranged after a large number of experiments, and the Parvo carries my guarantee.

Let us examine the circuit. There are three valves : a screen-grid valve acting as H.F. amplifier, a triode

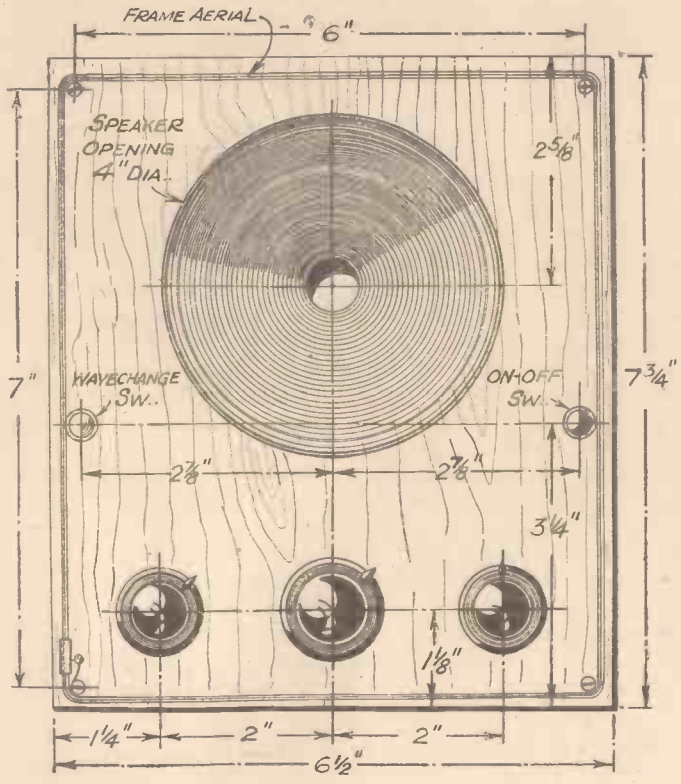
THE LATEST IN SELF-CONTA

Note the simple and clean layout of the chassis when the batteries are removed.

as detector, and a pentode in the output stage. For high selectivity I decided to employ two tuned circuits, the frame-aerial winding being tuned by a .0005 mfd. condenser, and the intervalve coil tuned by a second .0005 mfd. condenser. They are not ganged, nor do they need to be. The reaction winding is also arranged on this intervalve coil, thereby considerably simplifying the construction of the frame aerial. Not forgetting the constructor who resides in distant parts, I have made provision for a throw-out aerial to improve sensitivity, although within normal distances of a broadcasting station this is not necessary. A high-efficiency midget speaker or headphones may be used. I have selected the W.B. as one of the best possible speakers for a midget portable.

The layout is most attractive, yet simple. A chassis is employed, and the components are assembled on the sub-chassis principle. A wooden panel is attached to the front of the chassis, to carry the speaker and to provide the necessary rigidity for the very light cabinet. This wooden panel also carries the frame-aerial winding, which is pile wound. I do not see that any useful purpose would be served in increasing the depth of the cabinet in order to space-wind the aerial, since the increase in weight would not be worth the slight gain in sensitivity. The chassis comes to you already bent and drilled, and it is only the work of about three hours to complete the whole receiver.

This view shows the underside a which are emp



Dimensions for drilling panel and making frame-aerial winding.

Construction

Coming now to the actual constructional work, this will be found extremely simple, and at the same time interesting, on account of the very novel form taken by this particular receiver. The accompanying illustrations show that the frame aerial is wound on the panel, and the theoretical diagram shows that the coil and the L.F. transformer are provided with colour-coded leads in place of the more usual terminals. This has been

LIST OF PARTS FOR "PARVO" FLYWEIGHT MIDGET PORTABLE.

One "Parvo" coil (B.T.S.), 3s. 9d.
60ft. 28 S.W.G. D.C.C. Wire (Peto-Scott), 1s. 3d.
Two .0005 mfd. Compax tuning condensers (C1 and C2) (Polar), 5s. 0d.
One .0003 mfd. Compax reaction condenser (C6) (Polar), 2s. 6d.
Four fixed condensers (tubular type): .00005 mfd. (C3), .0001 mfd. (C5), .005 mfd. (C7), .5 mfd. (C4) (T.C.C.), 5s. 0d.
Three fixed resistors, 1-watt type: two 1 megohm (R1 and R2), one 15,000 ohms (R3) (Bulgin), 3s. 6d.
One L.F. transformer, type L.F.33 (Bulgin), 4s. 9d.
One terminal socket strip (A.E.) (Belling-Lee), 9d.
Three valveholders, midget type: two 4-pin, one 5-pin (Clix), 1s. 10d.
Two switches, type S.22 (Bulgin), 2s. 11d.
Three midget valves, XSG (V1), XD (V2), XY (V3) (Hivac), 41s. 6d.
One metal chassis, 6½in. x 4¼in. x 2¼in., and panel 6½in. x 7¾in. (Peto-Scott), 7s. 6d.
One pair headphones (B.T.S.), 7s. 6d.
One midget loudspeaker, type 37M (W.B.), 17s. 6d.
One H.T. battery (72 volts), type H1139 (Exide), 6s. 0d.
One 3 A.H. accumulator, type PRP3 (Exide), 7s. 0d.
One cabinet (Peto-Scott), 19s. 6d.

...INED MIDGET PORTABLES

...nd the few components ...oyed.

done in order to reduce weight and to avoid making extra connections, as the makers have already connected leads to the components, and as shown in the diagram these are coloured for identification. The chassis is supplied by the makers ready drilled, and the only components to be mounted upon it are the L.F. transformer, valveholders and the coil. Nuts and bolts should be used for these, and the tuning and reaction condensers which are mounted on the front should not be attached until the panel has been finished. Therefore, the wiring should be commenced as soon as the main chassis-mounted components have been fitted in position.

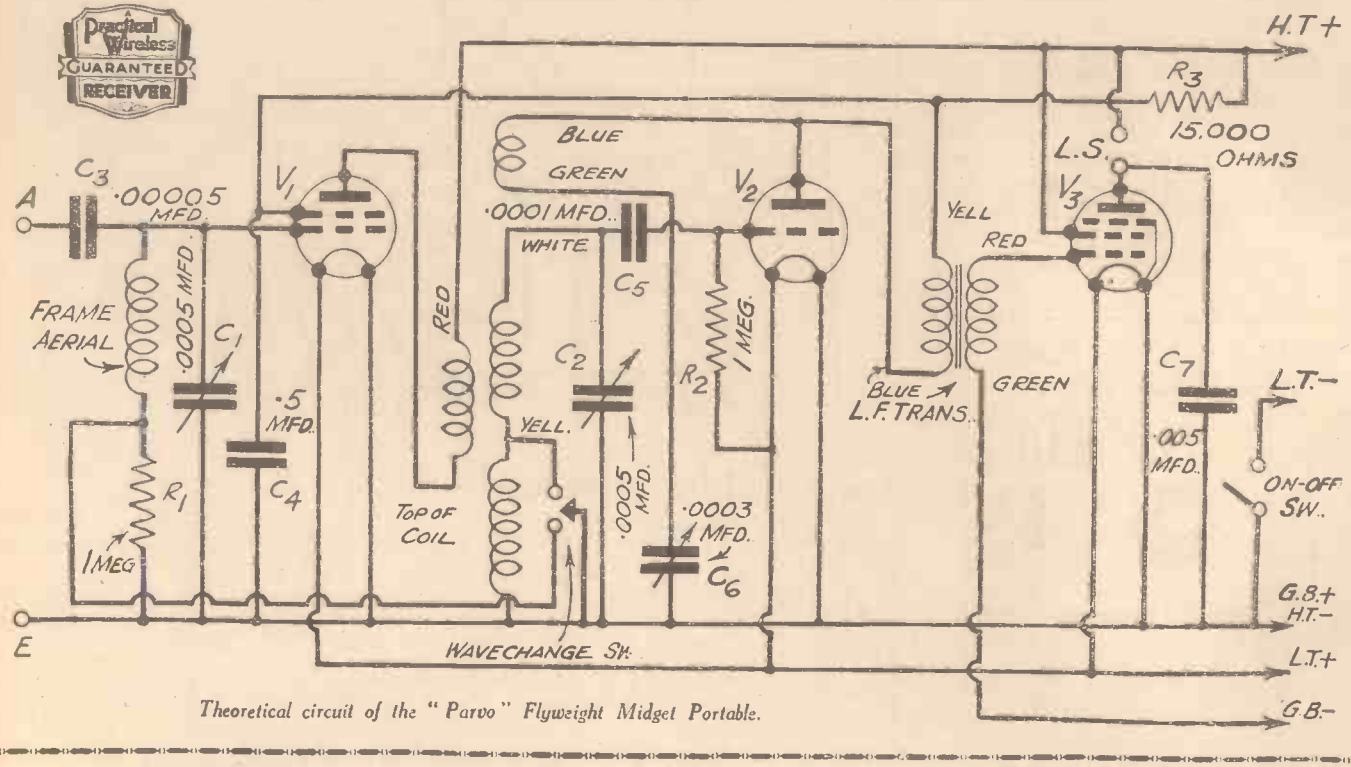
Frame Aerial

It will be noted that the frame aerial is wound on screws fitted to the front of the wooden panel. An alternative scheme may suggest itself to the handyman—for instance, short ebonite rods may be tapped and bolted to the panel, or lengths of ordinary B.A. studding may be cut off and held in position with locknuts at front and rear. Whatever course is adopted, the length should be approximately the same as the control spindles of the condensers. If metal is employed for these supports, some insulating material should be placed over them. Ordinary insulating tape may be wrapped round

Another view of the "Parvo" to show the neat layout of the controls.

two or three times, or lengths of thin glass tubing may be slipped over and held in position with sealing wax, Chatterton's Compound, or some similar medium. The panel is attached to the front of the metal chassis by means of the frame-aerial supporting bolts, and also by the fixing nuts on the three condensers. The frame-aerial winding is commenced from the switch position, one end of the covered wire being passed through the hole and anchored to the lower terminal on the on-off switch. It is then taken down round the lower support, across to the opposite side, and so on round the four supports until twenty-three turns have been put on.

(Continued on next page)



Theoretical circuit of the "Parvo" Flyweight Midget Portable.

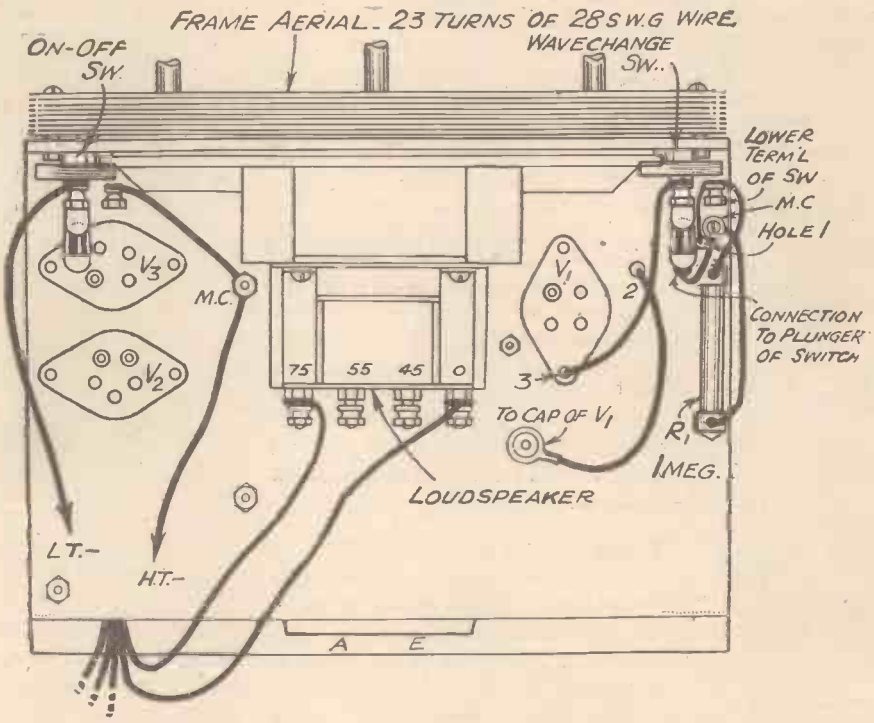
The end of the winding, when the wire comes down to the hole where the beginning is taken through, should be taken into the inside of the chassis and attached to the fixed-plate terminal on the first tuning condenser.

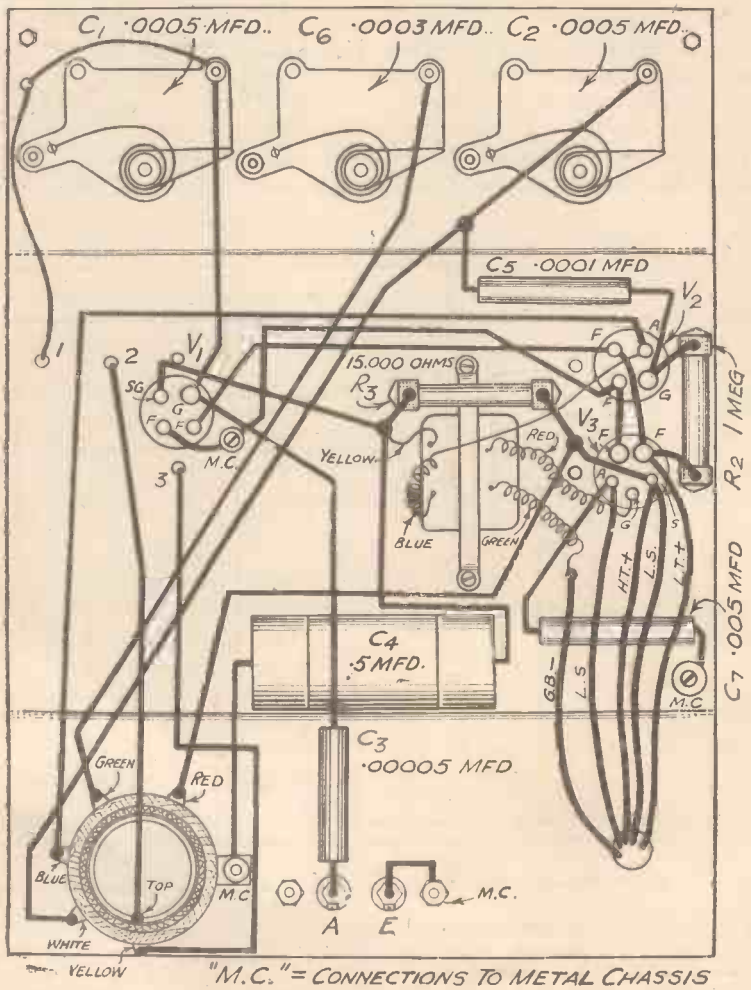
Great care must be taken to make the correct connections to the coil, and it will be noted that the wave-change switch is of the two-point type, although it is employed in this case as a three-point switch. For this purpose a flexible lead is soldered to the metal plunger of the switch and this is joined to earth. One terminal on the switch is then joined to the yellow lead on the tuning coil, whilst the other switch terminal is joined to the junction of the frame-aerial winding and the resistance R1.

Long-wave Reception

It will be noted that the frame aerial is wound only for the medium waves, and thus for long waves the resistance in series is used as a loading component. This has proved quite satisfactory in use and saves the constructor a considerable amount of difficulty in winding the aerial. Obviously, to obtain maximum results under these conditions a throw-out aerial is desirable, and it will be noted in the diagram that a fixed condenser, C3, has been included between the frame-aerial winding and the aerial socket. The value given in the diagram and list of parts is .00005 mfd., but if any difficulty is experienced in obtaining a tubular condenser of this type, the ordinary mica type of condenser may be used, or some other value tried. In some parts of the country it may be found that best results will be obtained with some alternative value, and up to .0002 mfd. may be tried. Similarly, the earth connection may be connected to some earthed body in order to obtain greater signal strength, although, again, much will depend upon the location where the set is being used.

WIRING DIAGRAMS OF THE "PARVO"





THE VALVE AS AN L.F. AMPLIFIER

(*Continued from page 315*)

The input signal is represented by the curve "d" and the output by "e," and it is not difficult to see that, through operating on the bottom bend of the curve, the positive half of the signal has far greater effect on the anode current than the negative half or, in other words, the variation about the mean anode current is no longer a faithful reproduction of the signal, it is *distorted*.

Mean Values

The beginner must not be confused with the expression "mean" value. Think of it in the following way.

To secure the operating conditions given above, it is necessary to a certain value of grid bias, well, that can be thought of as the normal or mean value. The incoming signal either increases or decreases it. With the anode circuit, it can be seen from the curves that a steady current is always flowing—that is the mean, in that case, and any variation takes place above or below that mean value. The points "m.g." and "m.a." indicate the respective mean values.

Some valves are capable of amplifying more than others, therefore, it has been necessary to fix some measure of their amplifying properties. The measure, universally used, is known as the *amplification factor* and is nothing more than the ratio of the change in anode voltage necessary to produce a given change in anode current, to the change in grid voltage necessary to produce the *same* anode current change.

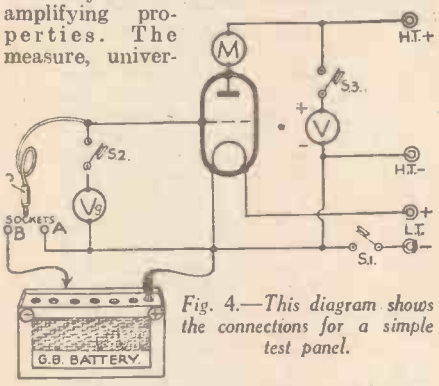


Fig. 4.—This diagram shows the connections for a simple test panel.

Simple Test Panel

It is not a difficult matter to make a simple test panel to check this characteristic of a valve. The arrangement shown in Fig. 4 is all that is required, the procedure being as follows. With the plug "P" in socket "A" and all switches, except S.1 open, adjust the H.T. supply to 100 volts. The valve being checked by closing S.3. The anode current shown by the milliammeter "M" is noted, then the H.T. is increased by, say, 20 volts, and the fresh reading of M observed.

Opening S.1 for a moment, the plug P is then put into socket B and, with S.1 closed again, the bias is adjusted until the reading of M is reduced to its original value. The bias voltage necessary, being read by the voltmeter Vg.

This gives the change in plate voltage, in this case 20 volts, and the change in grid voltage, to bring about the same change in plate current, the amplification factor being:

$$\frac{\text{Change in Plate voltage}}{\text{Change in Grid voltage.}}$$

As this characteristic is very closely related to others, equally as important, the beginner will do well to get familiar with the method of determining it himself. In fact, the simple test panel mentioned, will prove valuable during all experimental work.

TELENEWS

An Improved Device

THE standard form of photo-electric cell either of the vacuum or gas-filled type, and which the lay press have so frequently called "the electric eye," while greatly increased in sensitivity by modern methods of production, failed to give sufficient output for certain purposes. Even after amplifying the light-converted signal through the medium of thermionic valve amplifiers in certain cases limitations are found, especially when the frequency range to be covered is comparable with high-definition television requirements. The multiplier photo-electric cell has changed all this, however, and the importance of this device is increasing rapidly. The multiplier, which is integral with the cell itself, depends on secondary emission by impact for its operation, and the degree of amplification achieved, in addition to being controllable, reaches high figures without all the attendant defects associated with valve amplifiers, particularly the Schott effect. In France, for example, where mechanical transmitting scanners are still being employed, these multiplier type cells, according to an address given by Barthélemy in that country, enable discs with much smaller dimensions to be used with marked success. Reduced hole size and a reduction in the amount of light employed are two important factors, especially where the transmission of films are concerned. The ratio of signal to background noise (seen as a fine mesh pattern on the picture screen) has been improved by their use and this has extended their application to many other fields. For example, the Americans claim to have invented a device called a Petoscope which is said to detect the approach of aircraft and give alarm signals in a state of emergency. This is simply an adaptation of the super-sensitive properties of the multiplier photo-electric cell.

Storage

ONE of the great advantages of the Iconoscope type of television scanner is the fact that the photo-electric cathode or mosaic has the discharging beam of electrons operating on each element for only a small fraction of the total picture time. This enables the elements to build up a relatively large signal charge before it is converted into the picture signal. Several other schemes have been developed which aim at embodying this storage effect, and in one of these the scene to be televised is first of all focused on to a photo-electric cathode surface located at what we know as the screen end of a cathode-ray tube. The electron image so produced is then made to traverse a line anode instead of the more usual minute aperture. This anode in one of its forms is a series of tiny conductors electrically isolated from each other but forming a number of small condensers in conjunction with a signal element or plate. These condensers will acquire individual charges which are proportional to the variations of light and shade in the complete line of the initial picture. By means of a beam of electrons generated, propelled forward, and moved to and fro in the usual manner, the electrons lost by each condenser element, due to the picture-charging action, are replaced. This generates the line-element picture signal and the scheme has the advantage of increasing the time during which a picture element can build up its condenser charge prior to being converted into a signal.

By **T. Onearm**

Permanent Music

A COMPLETE recording of Stravinsky's Ballet Music, "Apollo Musagetes," is made by Decca this month, in response to a large number of requests they have received. Stravinsky's music is essentially light music, and is also extremely tuneful; in addition there are moments of real grandeur, especially in the Apotheosis. I am not going to relate here the story of "Apollo Musagetes," as the leaflet supplied with the records gives every scrap of information. The records, played by The Boyd Neel String Orchestra, are *Decca X* 167 *to X* 170.

Number two of Brahms Clarinet Sonatas included in Opus 120 is recorded for the first time on *Decca X* 171 *to X* 173. The two artists featured have been specially chosen for the job. Frederick Thurston is a great clarinet player and Myers Toggin is a Brahms pianist of the first order.

Outstanding Tunes

OF the many new issues by Ambrose and his Orchestra, I would draw attention in particular to *Decca F* 6374, because both tunes recorded thereon are really outstanding. "The Love Bug will Bite You" is the biggest tune of the moment; in fact, it looks like being the best hit for some time. Coupled with the most active topical tune is one of those exhilarating comedy numbers that Ambrose presents with perfection. "Sailor, Where Art Thou?" is good, and is something that can be heard again and again. I draw attention also to *Decca F* 6386, "With Plenty of Money," which is one of the chief numbers from the Dick Powell film "Gold Diggers of 1937," is coupled with "Sweet Heilani," from the new Bing Crosby film, "Waikiki Wedding." By the way, this is a Hawaiian tune and the guitar is played by Roy Smeck, the eminent American artist who is touring this country in vaudeville. Finally, I recommend *Decca F* 6387, "Taking a Stroll Around the Park," and "Swing is in the Air," the latter being the "title" song of the London Palladium production of that name.

It is of interest to note that Ambrose's band has been selected to appear at the Paris International Exhibition.

Gracie Fields

GRACIE FIELDS, who has recently returned from America and upon whom her native town of Rochdale has conferred the honour of Civic Freedom, presents on *Decca F* 6388 this month, "The Desert Song," and "Ah! Sweet Mystery of Life." Both these tunes are what might be called old, but they are also evergreens.

Although there are many records of the "Coronation Waltz," I do suggest that you hear the Rudy Vallee version on *Decca F* 6397. Rudy Vallee paid a short visit to this country a few weeks ago—his first appearance since he played with the original Savoy Orpheans. He plays on the reverse side, "Speaking of the Weather."

Brunswick

"MOONLIGHT AND SHADOWS" and "Panamanice," on *Brunswick* 02416, introduces yet another film star in Dorothy Lamour. She will be remembered for her part in "Jungle Princess."

Erna Sack, the German coloratura soprano, has made an interesting record of "In the Spring," from the film "Everything in Life," and "Southern Roses," on *Brunswick* 02414.

I thoroughly enjoyed the Mills Brothers' version of "The Love Bug Will Bite You," on *Brunswick* 02415. Coupled with it is a striking number called "Rockin' Chair Swing."

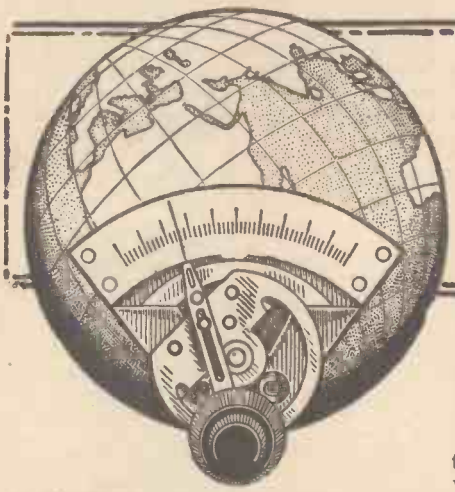
From the Films

FILMS supply the majority of the new light vocal records. Jeanette MacDonald and Nelson Eddy sing "Will You Remember?" from their new film "Maytime," in which they are co-stars, and "Farewell to Dreams," on *H.M.V. DA* 1559. Cicely Courtneidge and Jack Hulbert have made two numbers, "Birdie Out of a Cage," and "I Was Anything But Sentimental," both from "Take My Tip," on *H.M.V. B* 8577. Paul Robeson has recorded "Golden River" and "My Way," from his latest film "Jericho," and Peter Dawson deserts the concert ballad for the Talkies by giving excellent renderings of "Tomorrow is Another Day," and "Blue Venetian," from "A Day at The Races," on *H.M.V. B* 8576. Stuart Robertson also chooses Talkie hits with "That Song in My Heart," from "The Gang Show," and "Dolores," from "Millions," on *H.M.V. D* 8566. Walter Glynne has a light tenor voice and is heard to advantage in two new songs, "The Valley Where Wishes Come True," and "I'll Walk Beside You"—*H.M.V. B* 8573. The famous Comedy Harmonists are very effective in a vocal arrangement of Ketelbey's popular "In a Persian Market," and Duke Ellington's "Solitude"—*H.M.V. B* 8575. The new song "The Love Bug Will Bite You" gives Max Miller some fine chances in his own inimitable quips. It is coupled with "Julietta"—*H.M.V. BD* 427.

Coronation Records

THE H.M.V. recording engineers consider that some of these records incorporate the finest examples of choral singing yet made. We refer especially to the opening anthem, "I Was Glad when they Said," which incorporates the "Vivats," by the King's Scholars of Westminster School, and the Handel chorus, "Zadok the Priest," by the full choir of over 400 voices, orchestra of 60, and the new organ of the Abbey.

For sheer beauty, an H.M.V. expert on music chose the choir's record of Wesley's lovely setting of "Thou wilt keep Him Perfect Peace." It is believed that the records which will be in demand will be those of "The Oath" and "The Declaration" in which the King's voice is clearly heard.



SHORT WAVE SECTION

S.W. RECEPTION DIFFICULTIES

An Explanation of Some of the Peculiarities of Short-wave Radiations, and Means for Improving Present Results - - - - By W. J. DELANEY

MUCH is made of the difficulties of receiving short-wave stations, and it is often possible to hear two short-wave enthusiasts from the same district discussing their results on similar receivers. It appears that one amateur can hear practically any American station he desires, whereas the other can only just receive the Continental stations, and as conditions are apparently identical it is often assumed that one knows how to handle his receiver whereas the other fails to do so. There is, indeed, a certain amount of truth in such a statement, but there are other points which are often lost sight of by the amateur, and which must be attended to if the maximum performance is to be obtained from the receiver. Conditions on the short wavelengths are totally different from those existing in the case of the medium or long waves, and where an aerial system, for instance, has been proved ideal for the ordinary broadcast ranges, it may be completely useless for the short waves.

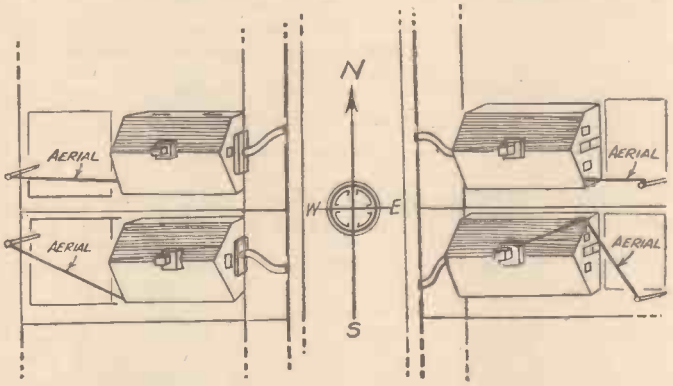


Fig. 1.—Diagram illustrating the screening effect of houses. Listeners on the western side of the street illustrated will in many cases obtain weaker signals from the east than those listeners on the opposite side of the road, and vice versa.

Reaction Difficulties

First of all, let us deal with the handling of the receiver. Probably the majority of beginners (and even many old hands) use the simple Detector plus L.F. receiver, and it is surprising what such a set can bring in—*when properly handled.* A beginner might well find that he hears nothing at first try—simply because the reaction control is set right back to minimum and the tuning dial is turned fairly quickly throughout the entire scale. The two faults here are firstly, the rapid turning of the tuning dial, and secondly, the failure to set the reaction so that the receiver is just off the oscillation point. A detector valve without reaction is very little better than a well-adjusted crystal detector, but when the reaction circuit is included and a moderate degree of feed-back introduced, the detector valve can be a very powerful device. Remember, then, to turn up the reaction condenser or control until a faint breathing sound can be heard in the 'phones or loudspeaker. If you are unable to arrive at this position without the familiar "plop," then the receiver must be modified in some way. H.T. voltages should be varied, the grid leak value changed, or some other modification made. It should be possible to turn the reaction control slowly until the breathing sound is built up to maximum, the "plop" should then follow, and upon turning back the control the noise should return exactly where it left off when the "plop" took place. It is true that in many cases this ideal state of affairs cannot be obtained, but if the control has to be turned back a long way before the set "unplops," for want of a better word, then the fine critical adjustment which means everything in getting long-distance signals will not be obtained, and much enjoyment will be lost.

Another point which is often missed is that when the reaction control is adjusted to the position just mentioned a signal is received in the form of a heterodyned carrier-wave. That is, the station arrives in the form of a whistle which drops in pitch as the tuning control is advanced, and at a certain stage it commences to rise again. The silent point between these two whistles is the exact tuning point, but if reaction is adjusted too far it may be impossible to resolve the signal. It will also be impossible to hear the station if it is very weak, although a whistle may be heard. This peculiarity is more noticeable on the very short wavelengths.

Hand-capacity

Another difficulty connected with the use of reaction is known as hand-capacity. The user finds that he tunes a station which is very weak, and proceeds to turn the reaction control in order to build it up to a suitable pitch. Having obtained the desired volume, he removes his hand from the control, only to find that the station disappears or that the set immediately bursts into oscillation. If the earth connection is above suspicion, the cure in a case of this nature is to set back the reaction condenser upon a mounting bracket to the rear of the chassis or baseboard, and to control it by means of an extension handle of ebonite. A metal screen may also be found desirable behind the panel.

Screening

Outside of the receiver there are also many other difficulties, one of the most important of which is the screening effects of chimneys, trees or other buildings. This often accounts for the difference in reception between two identical sets in the same street. A listener on one side of the road will find that his reception in a certain direction is much better than that obtained on the other side of the road, simply because the stations in one direction are unobstructed by the houses which intervene in the case of his neighbour. Those listeners who are using television receivers will have found this a very prominent effect where the special television aerial has to be mounted on the wall and is therefore below the level of the roof. If, therefore, you are particularly anxious to hear, for instance, the American stations, and you find that your house comes between your

(*Continued overleaf*)

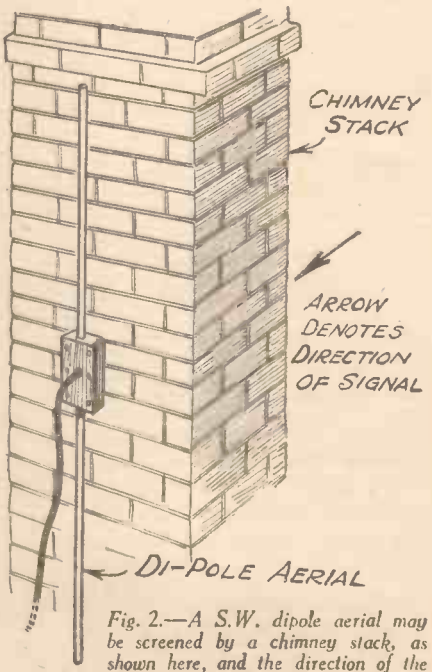


Fig. 2.—A S.W. dipole aerial may be screened by a chimney stack, as shown here, and the direction of the transmitting station should, therefore, be ascertained before the aerial is erected.

SHORT-WAVE SECTION

(Continued from previous page)

aerial and the American continent, it may prove well worth while to place the aerial right at the bottom of the garden, out of the "shadow" of the house, and use some form of matched lead-in to counteract the additional length of wire in use. Television enthusiasts who are using a chimney stack for the support of a dipole may also find that it will repay them to mount the aerial on another side of the stack, but the examination of a map and the use of a small pocket compass will enable them to check the direction of the transmitter and arrange the aerial to the best advantage.

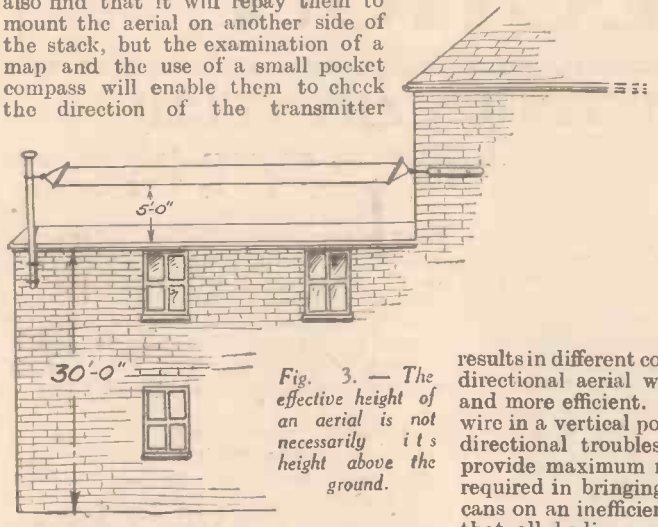


Fig. 3. — The effective height of an aerial is not necessarily its height above the ground.

Breakthrough

Other difficulties met with include the breaking through of medium-wave transmitters when listening to the short waves, especially in the case of those who are living close to a large B.B.C. station. In some cases, this is due to the use of a very large aerial, and in other cases to the direction in which the aerial runs. If it is directional to the local transmitter there will be every possibility of the station being heard on practically every wavelength, and if at the same time the resonant frequency of the aerial-earth system is such that it provides maximum volume on that station, it will be practically impossible to cut it out. A wavetrap is not the best way of overcoming this trouble. A much better scheme is to cut down the aerial or modify its direction. An ideal scheme would, of course, be to have a number of aerials, all adjusted for maximum results in different conditions, but a variable directional aerial would be less unsightly and more efficient. Alternatively, a single wire in a vertical position will prevent the directional troubles although it will not provide maximum results such as may be required in bringing in the weaker Americans on an inefficient receiver. Remember that all bodies connected to earth, that is, trees, stack pipes, walls and so on, will project a shadow which is most pronounced on the short waves, and, therefore, you should aim at putting the aerial outside the shadow. A temporary aerial fixed to the top of a length of 2in. by 2in. can be carried round a garden and, connected to a small portable, can illustrate the weird effects which can be introduced by screening, and will also enable you to select the best position irrespective of the height. In the latter connection, it must also be remembered that height must be considered above the nearest earthed body, and a horizontal wire, supported on 5ft. posts across a roof, will only have an effective height of 5ft., not 5ft. plus the height of the house. The various illustrations accompanying this article will show how these various points are covered, and finally, the time of listening should be mentioned once more. The general rule to follow is that below 25 metres reception will be best (but by no means certain) when the transmitter and receiver are in daylight. On the 50-metre band, reception is generally best during the period immediately following sunset. Above 25 metres, signals are heard at much better strength and with greater reliability after dark.

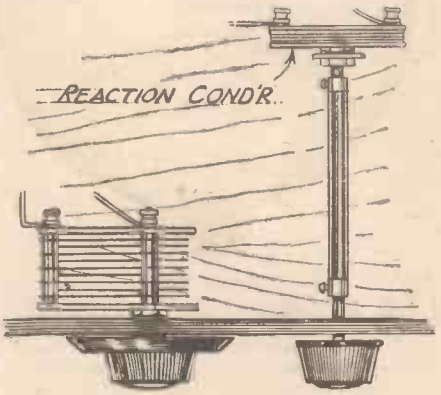


Fig. 4.—Hand-capacity difficulties in reaction control may be overcome by using an extension handle.

Leaves from a Short-wave Log

Another Spanish War Transmitter

ON roughly 42 m. —the wavelength has varied from time to time—between G.M.T. 18.00-21.00, a Spanish station giving its call-sign as EAR4, and alternately as SRI, has been heard broadcasting items of war news as well as an appeal for assistance to the Government party. It is stated that the transmitter is operated by a committee styling itself the International Red Assistance Group in Spain.

Another Cuban to Log

Slightly above GBC, Rugby, heard working with liners on 34.56 m. (8.68 mc/s), you should experience little difficulty in finding COJQ, Camaguey (Cuba), of which broadcasts are well received on 34.62 m. (8.665 mc/s) between G.M.T. 01.00-02.00. A bugle call is used as an interval signal. Announcements are given out in both Spanish and English, the programmes being mainly relayed from the medium-wave station CMJA. Reception reports should be addressed to Sr. Rafael Grimany, 4, rua General Gomez, or to Apartado Postal (P.O. Box), 64, Camaguey, Cuba.

Mystery Station in Costa Rica

A reader writes stating that he has heard a broadcast of light music, possibly gramophone records, on a recent Sunday between G.M.T. 03.00-04.00 on a wavelength of about 50 metres. The call: *Radioemisora Paraket* (?), was supplemented by some letters thought to be TILX, and the station was located, according to the announcement, at San José, Costa Rica. Has any listener further information to offer, as the station cannot be traced in official lists?

Nanking on the Air

XGOX, Nanking, previously operating on 21.45 m. (13.985 mc/s), has now adopted a longer channel, namely, 43.99 m. (6.82 mc/s), and works daily between G.M.T. 10.30-14.40. Address: The Central Broadcasting Administration (Central Executive Committee of Kuomintang), Nanking, China.

A Newcomer in Panama

The arrival on the ether of a short-wave station at Chicigui (Republic of Panama) is mentioned in wireless circles. The call heard was HP5L, and the address given: Apartado Postal, 129. Announcements were made in both Spanish and English. The transmission consisted of the usual type of South American musical programme interspersed with advertisements.

Summer Time in Spain

For the first time in seven years since the bill was introduced in that country Summer Time has been adopted in that part of Spain controlled by the Nationalist authorities, and the clocks now coincide with those in the British Isles during the B.S.T. period. The schedule of transmissions advertised for stations situated in Barcelona, Madrid, Bilbao, and other places under Government rule is not affected.

Signals from the North Pole

According to recent broadcasts from Moscow the U.S.S.R. Aerial Polar Expedition radio station *Radio UPOL* has been installed on Rudolf Island over 500 miles from the main base camp.

Weather reports, news bulletins, and private messages will be transmitted daily, under call-letter RAEM, on three channels comprised respectively in the 20, 40, and 75 metre bands. The power of the station is roughly 70 watts.

Madagascar Broadcasts to Europe

Radio Tananarive since April 1st last, has been carrying out tests of short-wave transmission on three channels, namely, 25.4 m. (11.81 mc/s); 31.5 m. (9.523 mc/s) and 50 m. (6 mc/s). These broadcasts are specially destined to European listeners. The tests are being made daily between G.M.T. 18.30-19.30, the call being: *Ici Madagascar, Radio Tananarive.* Reports of reception have already been received by the station from wireless amateurs in France.

New South African Short-waver

A station calling *Radio Pretoria* is stated to be testing on both 34.4 m. (9.72 mc/s) and 60 m. (5 mc/s) daily at roughly G.M.T. 13.50-14.00. Should you succeed in logging it you are earnestly requested to write details to the Chief Engineer, General Post Office, Pretoria, Union of South Africa.

Facts and Figures

COMPONENTS TESTED IN OUR NEW LABORATORY

New Belling-Lee Fuses

A NEW type of cartridge fuse is announced by Messrs. Belling & Lee, and the main feature is a time lag which enables a momentary overload to be carried. This also enables the fuse rating in a radio receiver or other appliance to be halved. It is, of course, well known that slight overloads in certain parts of a radio receiver can cause heavy overloads in the primary which although not in themselves sufficient to cause the mains fuse to blow, may nevertheless be sufficient to cause the flex to heat or the primary to heat to such a point that a fire could be caused. The usual type of 1 amp. fuse which is fitted to a receiver carrying, say, .5 amps., will resist the sudden overload caused by a surge when switching on, but requires a current of 1¾ amps. to blow it within a minute, so that 100 per cent. overload will flow continuously without blowing the fuse. A smaller fuse would blow by the surge. Therefore the Belling-Lee engineers have experimented to find a fuse of about .5 amp. rating which would have a delay characteristic which would prevent it blowing on a short period overload reaching 1 or even 2 amps. for a fraction of a second, and as a result the Mag-Nickel fuse has been developed. It consists of a non-oxidising filament of nickel mounted on some tiny explosive blobs of powdered magnesium held in a suitable binder. The melting point of the nickel is some 1,500 degrees C., but the flash point of the magnesium is only 650 degrees C. Thus an overload of appreciable duration causes the magnesium to flash off and this melts the fuse wire.

They are supplied in three ratings, 250 mA, 500 mA and 750 mA, and the price of all ratings is 9d. each. The dimensions are the same as for normal cartridge fuses, namely, 1¼ins. long and ¼in. in diameter, with cylindrical end caps and glass tubes. The standard fuse colour coding is adopted to identify the individual types.

New Cossor Valves

TWO new mains valves are announced by the Cossor Company, and both are of the H.F. pentode type. They are screened pentodes, one with straight characteristics and the other with variable-mu characteristics, and the main difference in design between this and standard valves now obtainable is that the grid is connected to the top cap instead of the anode. The main characteristics are as follows:—

M.S.-Pen. B

Heater voltage—4.
Heater current (amps.)—1.
Maximum anode voltage—200.
Maximum auxiliary grid voltage—100.

M.V.S.-Pen. B

Heater voltage—4.
Heater current (amps.)—1.
Maximum anode voltage—200.
Maximum auxiliary grid voltage—100.
Grid voltage (variable)—0 to 20.

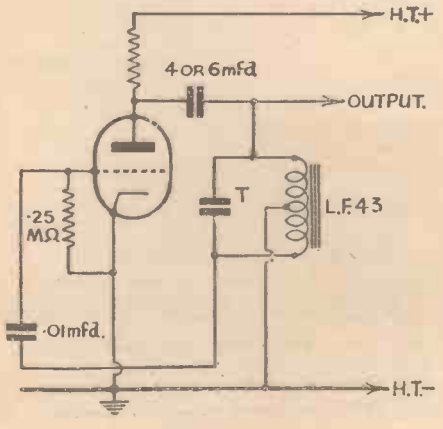
Standard 7-pin bases are fitted, and the anode, metallised coating, auxiliary grid, cathode, heaters and suppressor grid, are joined to these pins.

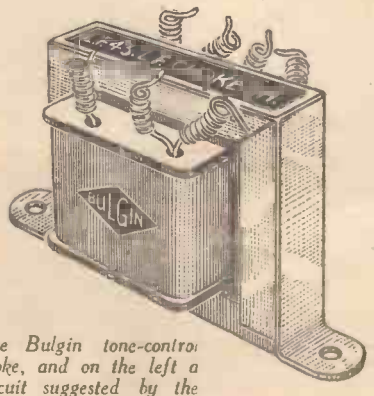
Price Correction

OWING to an error, the price of the "Little Princess" Portable Radio, manufactured by Messrs. Peto-Scott Co. Ltd., was advertised at £6 6s. 0d. in last week's issue. The price of the "Little Princess" is £7 7s. 0d. and the terms are 10s. down and 15 monthly payments of 10s. 6d. All orders received before the appearance of this notification will be executed at the price and terms advertised previously.

Bulgin Tone-control Choke

THE 3-henry choke illustrated is supplied by Messrs. Bulgin at 6s. 5d. This component is tapped to provide inductance values of .5, 1, 1.5, 2, and 2.5 henries, and its main use is in connection with tone-control circuits. Two suggested arrangements are illustrated and it should be noted that the capacity of the condenser used with the choke will govern resonant frequency of the circuit. Another use for the choke is in connection with the design of L.F. oscillators, and the makers supply a table on the instruction sheet issued with the choke giving the various values of condenser required for different frequencies. The choke is provided with colour-coded leads and is neat and compact. The type number is L.F.43.





The Bulgin tone-control choke, and on the left a circuit suggested by the makers for this component.

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

A S.-W. Log from Gloucestershire

SIR,—I have not seen a 14 m.c. report from this district, so I send mine, which is as follows:—

W6CQI, W6AL, W6AH, W6KOW, W6PQI, W52A, W5AGF, W5GMB, VU2CQ, VU2HQ, HA8N, PK1FH, PK4DG, PK1MX, VE4OC, YU7VA, OZ1ID, OZ1LW, SPIHH, FT4AA, FT4AG, EA8AE, VS7AB, SV1CA, SV1J, and HB9AB.

These stations were heard at various times from April 20th to May 25th. My receiver is an o-v-1, using a 66ft. sloping aerial 50ft. high at the west end and 8ft. at the east end. The aerial points due west. All the above stations were received on 'phones.—A. ROZIER (Icomb, Glos.).

Wireless and Fire-engines

SIR,—I note that in the issue of PRACTICAL AND AMATEUR WIRELESS dated May 29th, 1937, you make some comments in the "Round the World of Wireless" page of wireless being used in connection with fire-engines at Cape Town.

I beg to inform you that wireless has been in use by the Yeovil (Somerset) Brigade for over a year.

When attending a country fire, it happens sometimes that the tender cannot be taken right to the conflagration, but must of necessity be left perhaps half a mile away.

Then it is that wireless is used as a means of communication between the fire-fighters and the tender. Of course, the above-mentioned medium is used also to communicate between the base and the fire.—G. LANE (Combe St. Nicholas).

Station EA2BH

SIR,—I wonder if any other readers have heard a short-wave station on 21 metres, giving a call of either EA2BH or EA2BA, at 12.30 a.m., Friday, May 21st, and at 11.30 p.m. on Saturday, May 22nd. This station was giving Spanish war news, and seemed to belong to General Franco. I would appreciate any news readers could give me as to the address of the above station.—JOHN CORSTON (60, Falconar Street, Newcastle-on-Tyne, 2).

Advanced Radio Theory: A Good S.-W. Log

SIR,—With reference to Mr. A. M. Wilding's letter in the May 8th issue of your excellent paper, I, too, should be pleased to see articles on advanced work appearing in PRACTICAL AND AMATEUR WIRELESS.

Although it will be some time before I run a transmitter, I greatly appreciated your articles on amateur transmitting—they will, no doubt, be of considerable use to me later.

I built my first short-wave set about eighteen months ago, and as I notice that logs from this district do not often appear in your paper, I append mine. Stations were received on an o-v-2 (det.-pen.) with an aerial 40ft. in length, the higher end being about 14ft. from the ground. My room is so situated that it is impossible to obtain a satisfactory earth.

I recently constructed an "R" meter, and I find it extremely useful. I would advise any constructor who has not thought of this before to make one as it is quite a simple job, and will amply repay the time spent in building it. If anyone should require further details of this meter, I shall be pleased to forward them.

My log is as follows:—

W8XK (19, 25 and 49 m. bands), W3XAL (16 and 49 m. bands), W2XE (19 and 25 m. bands), W1XA (25 m. band), W2XAD, W2XAF, W1XK, W9XF, W8XAL, SUV, VQ7LO, VP3MR, LSX, COCD, VK2ME, VK3LR, JVJ, JZK, VUB, and also many European stations.

Amateurs (40 m.): PAORP, PAOIDW, PAOWJ, PAOFP, F8TY, F8DJ, F8PI, F8IE, F3BC, F8QL, F8MI, F8MM, F8SN, F8HH, F3BC, F3DI, F3RM, ON4MD, ON4US, and over 100 "G" stations.

Amateurs (20 m.): LY1J, SU1SG, VE3JV, and 31 "W" stations.—R. P. M. Tilley (Pashmare, Thunder Lane, Thorpe-next-Norwich).

Back Numbers Wanted

SIR,—I am in want of the back number of *Amateur Wireless* describing the Short-Wave World-Beater 4. If any reader has this copy to spare I should be very grateful to receive same, and I will refund cost of postage.—W. H. RUSSELL (Marcamb, High Street, Mablethorpe).

[We also have requests for back issues of *Amateur Wireless* dated January 28th, 1933, containing particulars of the Melody Ranger. Will any reader having one of these copies to spare kindly forward it to our offices; address given in the notice at the foot of this page—ED.].

Variable Directional Aerials

SIR,—I recently received an inquiry *re* Variable Directional aerials from a Wolverhampton reader of PRACTICAL AND AMATEUR WIRELESS, Mr. P. Watkins. This was replied to the same day but has been returned by the G.P.O. as undelivered. The letter has been re-directed, but if in the meantime this reader has not received our letter, I will be glad if he will communicate with me again, as I have had difficulty in making out his address.—A. W. MANN (Middlesbrough).

"Local Station Quality Sets"

SIR,—As a fellow quality fiend, I find Mr. Hill's letter very interesting.

I find no fault with his various remarks except that his final remark re "correction in the audio stages" made me shiver a little.

My private little contention is that anything needing "correction," "compensating," or similar stunts, is right away dud. However, I forgive Mr. Hill the tremors caused me. His heart is in the right place.

Mr. Hill quotes Messrs. Voight, Hartley Turner and Sound Sales as using paraphase. Now, as he says, these people are really quality specialists. Next he goes on to say that modern quality designs use straight circuits.

Probably the straight sets of these people are far superior, where purely quality is concerned, to the finest superhet made—even superior to their own superhets. We have an "oscillator" in the superhet. Isn't the word alone enough to make the quality-minded constructor's flesh creep?

I have a well-known make of radiogram in addition to my home-made local quality set, and frankly I can't bear to listen to the former.

The whole point is this, the radiogram *looks* good to visitors and members of the household. They are "listeners," not constructors, and to the listener it seems that a set "*sounds* as good as it *looks*." Rather an Irishism, but very true.

It is argued that a superhet can be as good as a "straight" set—that transformer coupling can be as good as R.C.—that the modern pentode (output) can compare with the triode, but it seems like the old advice: "Don't do as I do—do as I tell you," because when a quality set comes to be designed, it is "straight" R.C.. and triode.

Mr. Hill's "one or more R.F. stages, diode detector and paraphase" is a tip-top suggestion (leaving out his base suggestion of "tone correction").

However, this is likely to prove a fairly expensive job, so I'd suggest we have, say, "one R.F. diode detector, one small-power valve R.C. coupled to another and larger power, say, PX4."

I don't think any appreciable quality is going to be lost by not having "paraphase," and as Mr. Hill points out, there is no necessity for too many watts.—H. A. RUSSELL (Llansamlet, Glam.).

CUT THIS OUT EACH WEEK.

Do you know

—THAT different degrees of harmonic distortion are present in different types of amplifier.

—THAT in the opinion of many experts second harmonic distortion is the least important.

—THAT when using mixed L.F. couplings the better coupling should always be placed in the early stage.

—THAT if the above rule is not followed the distortion given by the inferior coupling will be amplified by the following stage.

—THAT a wire-wound resistance may be made non-inductive by doubling the wire in the centre and winding it in its doubled form.

—THAT C.W. signals cannot be received on a superhet receiver unless some form of oscillation is introduced in the I.F. stages.

—THAT if the circuit is modified for the above purpose the oscillation will have to be stopped to receive telephony signals.

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., Tower House, 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.

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.

Wirral Amateur Transmitting and Short-wave Society

AN interesting talk on design and building of transmitting equipment was given to the members at the monthly meeting by Mr. J. Davies (G2OA).

Mr. Davies, who brought along with him the exciter section of his own transmitter, gave many valuable hints as well on neutralising methods, keying, and power measurement. An interesting discussion followed.

It was announced that two more members had now obtained their full transmitting licences.

So that new members to the club will not feel uncomfortable or "out of it," the committee has appointed a genial member, Mr. A. D. Taylor (2BDT), to act as host. Meetings are held at King's Square Café, Birkenhead, on the last Wednesday evening in each month.—Hon. Publicity Sec., W. Rogers, 12, Meadowside, Wallasey, Cheshire.

Proposed Club for Faringdon

IF sufficient interest is forthcoming, an effort will be made to form a short-wave club in Faringdon.

Persons interested may apply for full particulars by writing or calling at the following address any evening after 7 p.m. —D. T. Boffin, Market Square, Faringdon, Berks.

Newcastle Radio Society

ONLY a few more members are required to enable this club to obtain permanent headquarters in Newcastle-on-Tyne. Meanwhile, the Thursday meetings, 7 to 10 p.m., are being held at the residence of the hon. treasurer, W. C. English, 191, Stone Street, Newcastle, while continuing on Sundays, 6 to 9.30 p.m., at Gosforth. The Whiteley Electrical Radio Co., Ltd., recently forwarded a 1937 Stentorian Senior Loudspeaker Chassis, type 37SC, for test and some interesting demonstrations have taken place. The final tests will be made with the 37SC mounted on a baffle 5 ft. square. Radio dealers in the district have shown willingness to help by displaying notices in prominent positions. Readers of PRACTICAL AND AMATEUR WIRELESS who are interested are asked to call or write for full particulars as early as possible. We wish to enter new quarters because our activities are stifled through lack of space now.—Hon. Sec., G. C. Castle, 10, Hedry Street, Gosforth, Newcastle-on-Tyne.

BRIEF RADIO BIOGRAPHIES—12

By RUTH MASCHWITZ

Harry Hemsley

HARRY HEMSLEY'S father was an artist, and from an early age the son decided to follow in his father's footsteps. However, he had no intention of confining himself entirely to drawing, and at the age of eight he was appearing with his brothers in pantomime at Islington, where his father designed the scenery. At least he did his best to appear—at the Battle of Trafalgar—but though he was supposed to be one of the victorious English, being small he was often laid out in the wings before he could get near the stage!

All the Hemsley family developed singing voices at an early age, with the result that Harry became a chorister, and for a time was sent to the American Church in Paris as a solo boy. All this while he was cherishing his ambition to become an artist, and it was a bitter blow when his mother insisted that he should be articled to an architect. However, above his office an artist had his studio and it was not long before Harry, on some flimsy excuse, made his way there and struck up an acquaintance. He and the artist became fast friends, and every morning the stroke of eight found him on the mat full of ideas and suggestions for cartoons.

It was entirely by chance that he started his career as a child impersonator. An artists' club to which he belonged was giving a party, and it was suggested that some of the members should form a cabaret. Harry gave his first performance of a child crying for a penny. Having made many drawings of children when he could not afford to pay for models, he had learned to know and understand them intimately, and with his flair for impersonation he gave a wonderful show. Such was his success that he was showered with invitations to appear at entertainments and parties, and ultimately he found it a more remunerative means of earning a living than art—though he still declares that he wishes to end his days as a painter.

Hermione Gingold

HERMIONE GINGOLD started her stage career at a very early age when she ran away from school to join Sir Herbert Tree's company at His Majesty's Theatre. Henry Ainley, meeting her for the first time on the stage, remarked in surprised tones, "Good Lord, they're turning this theatre into a crêche!"

She played the Herald in Pinkie and the Fairies, and Robin, the page, in "The Merry Wives of Windsor." Part of her job was to usher Sir Herbert on to the stage with the words, "Here is my master." Great was her astonishment when on one occasion he suddenly appeared through the fireplace!

Hermione's first broadcasting part was that of a bullfrog! She paid a visit to Savoy Hill in the days when the Effects Department was less highly organised than it is at present, and in the middle of a performance a harassed producer dashed in to ask whether someone could imitate a bullfrog. Hermione immediately offered her services and retired to the basement, where she croaked until she lost her voice. Since then she had broadcast consistently in every type of radio show. She made another name for herself in several vaudeville programmes as "Mrs. Pullpleasure—Violinist," and has written radio plays.

Her voice, which is extremely distinctive, has become so familiar to listeners that one day, happening to go into a country post office to buy some stamps, she was greeted by the girl behind the counter with "Certainly, Miss Gingold, it's a pleasure to serve you!"

Practical and Amateur Wireless
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., Tower House, Southampton Street, Strand, W.C.2.

PRACTICAL WIRELESS

	Date of Issue.	No. of Blueprint.
CRYSTAL SETS		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-valve: Blueprint, 1s.		
All-wave Unipen (Pentode)	—	PW31A
Two-valve: Blueprint, 1s.		
Four-range Super Mag Two (D, Pen)	11.8.34	PW36B
The Signet Two	29.8.36	PW76
Three-valve: Blueprints, 1s. each.		
The Long-Range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	20.5.37	PW39
Hall-Mark Three (SG, D, Pow)	12.6.37	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	PM1
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 (HF Pen, D (Pen), Pen)	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
The "Colt" All-Wave Three (D 2 LF (RC & Trans))	5.12.36	PW72
Four-valve: Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P)	1.5.37	PW4
Fury Four (2 SG, D, Pen)	8.5.37	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)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve: Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	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 (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
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)	6.6.37	PW40
F. J. Camm's 2-valve Superhet Two-valve	13.7.35	PW52
F. J. Camm's £4 Superhet	—	PW58
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
Mains Sets: Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valver)	—	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
"Qualitone" Universal Four	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve: Blueprint, 1s.		
Midget Short-wave Two (D, Pen)	—	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
"Tele-Cent" S.W.3 (SG, D (SG), Pen)	30.1.37	PW74
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)	15.5.37	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	—	WM409
Three-valve: Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	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)	—	AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)	—	AW419
Lucerno 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, QP21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	*June* '35	WM398
Certainty Three (SG, D, Pen)	—	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
2HF Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2 HF, D, QP21)	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, 2LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, 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 (2HF, D, RC, Trans)	*May* '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
New Class-B Five (2SG, D, LF, Class B)	*Nov.* '33	WM340
Mains Operated.		
Two-valve: Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM283
Unicorn A.C.-D.C. Two (D Pen)	—	WM391
Three-valve: Blueprints, 1s. each.		
Home-Lover's New All-electric Three (S.G, D, Trans) A.C.	—	AW383
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.* '35	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
SHORT-WAVE SETS—Battery Operated.		
One-valve: Blueprints, 1s. each.		
S.W. One-valver converter (Price 6d.)	—	AW329
S.W. One-valve for America	23.1.37	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 (H.F. 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-waver 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." Loug-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
Listeners' 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v.) for WM392	*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 Adaptor (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/-)		WM408

QUERIES and ENQUIRIES

H.F. Losses

"I have built a short-wave receiver as shown on the diagram accompanying this letter, but find it very difficult to get down to the very low wavelengths. Just above 25 metres things are all right, but then the set refuses to oscillate below that. I have tried different H.T. voltages, changed the aerial and earth, and put various condensers in the aerial lead. I even bought a variable grid leak to see if the value of that would help matters, but I am unable to get the low waves. Is it possible to suggest from the sketch how I can improve matters?"—F. E. W. (Gainsboro').

THE diagram shows that the receiver is built upon a metallised or foil-covered chassis, and that a large number of earth returns are taken to this chassis. There is a possibility that the junction between the connecting wires and the chassis is badly made or that corrosion has set in and thus certain points are separated by a resistance set up by the poor connection. We, therefore, suggest that you connect together each of the earthing points, using good heavy tinned copper wire, and soldering the wire to the earthing screws or bolts. This is probably the only fault present in the receiver.

Cutting the Low Notes

"The receiver I am now using fails to give me the tone of reproduction which I desire. I feel that it is too deep, or that the high notes are not sufficiently well-reproduced. I do not want to alter the wiring if I can help it and wonder if you can suggest some form of external tone-control which I can build to modify the results I am now obtaining."—T. F. (Gillingham).

A SIMPLE tone-control of the type mentioned could be connected across the loudspeaker terminals of the receiver. A 50,000 ohm resistance of the variable or volume-control type could be connected in series with an iron-core choke, but the value of the choke would have to be carefully chosen. You could wind a simple one on a half-inch bundle of iron wires, using 5,000 turns of 38 enamelled wire, and tap this at every thousand turns to provide different inductance values. Alternatively, you could use one of the special commercial components made for the purpose.

Avoiding Surges

"I am always getting trouble with my A.C. set which seems impossible to avoid. The set is a five-valve with push-pull output, and the trouble concerns certain condensers. These are always breaking down, and I have tried all sorts of voltage ratings, even up to three times the working voltage. Is there any way in which I can avoid this trouble, without going to a lot of expense?"—G. P. R. (Swansea).

IF the working voltage rating of the condenser is correctly chosen the trouble should not arise, and we, therefore, assume that there is some peculiar feature in the design of the mains section which results in a very heavy surge when switching on.

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.

A stamped addressed envelope must be enclosed for the reply. 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 separate department.

Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

This may be avoided by adopting a thermal-delay switch, either of the mechanical type or of the vacuum (valve) type. The function of this device is to prevent the circuit from being completed until the valves have reached maximum temperature, when the H.T. circuit is completed.

Negative Feed-back

"I have seen a reference lately to negative feed-back amplification, and no account of this seems to have appeared in your pages. I wonder if you could tell me what it is, its advantages, and any other details concerning it. If details have been published, perhaps you could let me have the date of issue so that I could turn it up."—J. G. B. (Lowestoft).

THE system is designed to avoid certain forms of distortion met with in pentode amplifiers, and to give increased amplification. It is too detailed to give in the form of a reply, but an article dealing with the subject will be published shortly.

The coupon on Cover iii must be attached to every query.

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.

G. H. (Golcar). The trouble usually indicates that a resistor or inductive winding has broken down. Examine chokes and transformers as well as all resistances in the H.T. positive leads.

J. S. W. (Wembley). So far as we can trace the hook is no longer available. We are, however, making further inquiries.

M. G. (South Africa). All of the parts may be obtained from Messrs. Peto-Scott, who can supply you with details concerning duties, etc.

T. A. J. (Oxford). The condenser from anode to earth is quite in order, and we presume that you have placed the pentode in the output stage, with the triode in place of the pentode. If this is not done, there will be a possibility of overloading the triode in the stage which you have added.

R. J. G. (Nottingham). All of the details were given in our issues dated 26th Dec., 1936, Jan. 2nd and Jan. 9th, 1937.

E. G. W. (Selly Oak). The details were given in our issues dated Feb. 6th and Feb. 20th, 1937.

E. J. N. (South Shields). We cannot identify the winding and suggest you write direct to the Marconi Company at Tottenham Court Road, London, W.1.

V. R. (W.12). The trouble may be some form of distortion in the receiver which is now apparent, but which formerly was masked by the speaker in use. H.F. in the L.F. stages could cause the trouble, but we think the former is more likely to be the cause in your particular case.

G. P. W. (Norwich). We have published the details several times and they are included in the latest edition of the Encyclopædia. We may publish them again at some future date.

L. E. (Tow Law). There may be some fault in your wiring, but without a diagram we cannot solve the problem. The set should not tune without the condenser.

G. M. (Ipswich). All of the parts may be obtained from Messrs. Peto-Scott. The coil should be satisfactory for your purpose.

T. H. D. (Monkwearmouth). A tapped and split adapter (Bulgin Type A.50—2s. 6d.) would enable you to carry out the desired arrangement. The makers will supply a diagram with the adapter.

C. E. D. (Tipton). We have no details of the set, and can only suggest that you follow the maker's advice.

H. R. (Monkseaton). An inefficient earth connection can give rise to the trouble indicated, and we suggest you modify this and also follow the notes given in this week's short-wave section.

P. B. (Nr. Woodbridge). The device will probably fail to function satisfactorily as the set is a Universal model. Care should be taken not to short-circuit the mains. We cannot give instructions for modifying the set. The coils are suitable for battery or mains sets.

P. J. N. C. (Shoreham). The range depends upon the coil in use. A choke must not be used for by-pass purposes, but a condenser in the case mentioned must be used.

R. A. W. (Wellingboro'). We cannot advise you definitely, but do not think it wise to mix the coils as mentioned by you.

T. S. W. (Meharris). You cannot use the microphone as you mention. It should be connected to the receiver through a pick-up adapter plugged into the detector valveholder.

K. S. (Roffey). We are not familiar with the coils, and suggest you write direct to the suppliers.

C. R. (Dundee). Full details of the coil are given on page 215 of our issue dated May 15th last.

J. C. H. (Dartmouth). We suggest you make a set of coils, following the lines of the coil recently described by the Experimenters in these pages. You could then cover medium and long waves.

E. P. (Sherborne). There is no receiver in our blueprint list which would answer your requirements.

J. W. (Manchester, 10). We hope to describe the construction of the unit mentioned in the near future, but cannot guarantee any special date.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

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PRACTICAL AND AMATEUR WIRELESS, 19/6/37.

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Published every Wednesday by GEORGE NEWNES, LIMITED, Tower House, Southampton Street, Strand, London, W.C.2, and Printed in England by THE NEWNES & PEARSON PRINTING CO., LTD., Exmoor Street, London, W.10. Sole Agents for Australia and New Zealand: GORDON & GOTCH, LTD. South Africa: CENTRAL NEWS AGENCY, LTD. *Practical and Amateur Wireless* can be sent to any part of the World, post free, for 17s. 8d. per annum; six months, 8s. 10d. Registered at the General Post Office as a newspaper and for the Canadian Magazine Post.

TRACING RECEIVER FAULTS—See page 354

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

3D. EVERY WEDNESDAY

Edited by F.J. CAMM

A GEORGE NEWNES Publication

Vol. 10. No. 249. June 26th, 1937.

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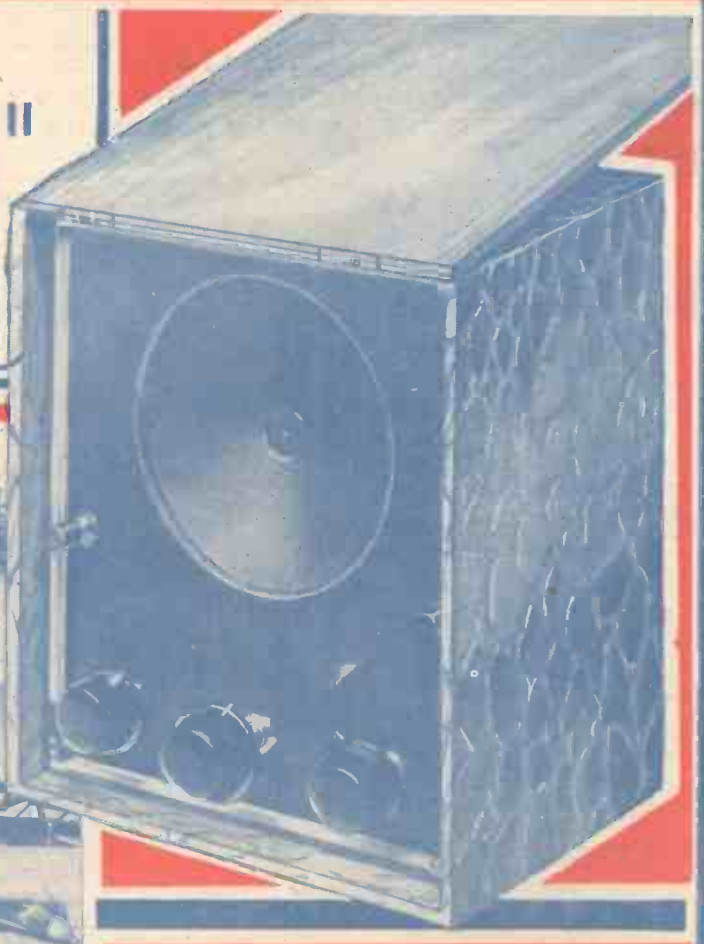


METAL RECTIFIERS IN TELEVISION—See page 343

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. X. No. 249. June 26th, 1937.

ROUND *the* WORLD *of* WIRELESS

L.F. Amplifiers

A PROBLEM which is always being considered by every type of listener is "What is the best type of amplifier?" One listener prefers a pentode, another claims that the triode is unbeatable, whilst others will use nothing but push-pull stages. In the latter class there are many different forms, generally referred to as Class B, Class C, Class BC and other terms, many of which are used indiscriminately and which mean nothing. The paraphase form of push-pull amplifier is undoubtedly very good, and when properly designed and adjusted ensures that each of the push-pull valves receives the correct signal phase, but of late there has been frequent reference in some quarters to a form of push-pull amplifier referred to as the "Negative Feed-back" circuit. This aims at reducing certain forms of distortion present in a pentode push-pull stage, and as a result a greater degree of amplification is obtainable. The principles and some circuits employing this type of amplifier are explained in the article on page 339.

Savoy Hill Memories

DO you remember the early days of broadcasting from the B.B.C. studios at Savoy Hill? For those whose memory does not take them back so far, or who were too young to be interested in the wireless programmes in 1920, the special programme to be broadcast on July 1st (National) and July 2nd (Regional) should prove of exceptional interest. The old sketches and popular tunes of that time will be heard again, performed by the original artists, but we are not told whether they will also use the old microphone and amplifier circuits which were then employed. This would be an interesting broadcast and would enable the listener of to-day to judge of the tremendous progress which has been made in the past 17 years.

Radio in the Bush

AN interesting story of the use of radio in life-saving comes from Western Australia. A sheep-station hand was reported missing from the Roebourne Tableland, and the police at Port Dedland were informed. Before setting out on what might have been a long and fruitless search they broadcast messages to listeners with short-wave receivers in the vicinity asking them to put up smoke signals if they could receive the messages. Later a second message was sent out asking the listeners to put up a second smoke signal if they heard that the missing man had been located. When this signal was seen, the search was abandoned and thus much waste of time was avoided and the missing man was located speedily.

Radio City, New York

IT is claimed that Radio City attracts a larger number of visitors than any other of the famous sights in the world. Even the statue of Liberty and the famous Empire State Building which have each held records in the past, have been surpassed. In 1936 it is claimed that well over half a million people visited the City, and that this year the number is likely to be greatly exceeded.

ON OTHER PAGES

Radio in Spain

WE understand that the Rebel army is using a network of six portable short-wave transmitters for communication between the northern and southern armies and between Spain and Spanish Morocco. The frequency is changed daily and signals are transmitted by both code and speech. The transmitters are of American make and are operated by Spanish army operators. The Loyalist army does not employ radio as a direct means of communication but depends upon the telephone and telegraph system. It is claimed that the Rebel army has seized all radio apparatus of any kind and thus there is no amateur radio activity in Spain.

SOS

THE figures for the broadcasts of S O S and police messages for the first quarter of 1937 are now available. They show a total of 285 broadcasts, including "special" messages. The latter include several warnings about lost drugs, including an urgent appeal for a supply of asses' milk for a child in Great Ormond Street Hospital. Of 213 appeals relating to sick persons, 134 were successful, while the results of 16 could not be discovered. There were 55 appeals for witnesses of accidents, seven messages in connection with crime, and 16 special broadcasts.

Tokio on Your Doorstep

Since the Japanese Broadcasting Corporation brought its new 50-kilowatt transmitter, JZK, into operation on 19.79 m. (15.16 mc/s), the broadcasts can be heard at a volume almost equal to that of the local station. If you have logged W8XK or DJB, a very slight movement of your condenser should bring in these signals towards G.M.T. 19.00. The station closes down at G.M.T. 20.30 with the Japanese Anthem. JYS, operating on 9.84 mc/s (30.49 m.), is carrying out tests with relays of the daily programme from JIAA, the medium-wave station at Tokio. Reception reports, if verified, are confirmed to the sender by means of a very original card. Write to Japanese Broadcasting Corporation, Hibya Park, Atagoyama, Tokio, Japan.

Speedway at Belle Vue

THE Speedway Test Match between England and Australia, at Belle Vue, Manchester, will be the subject of a broadcast commentary from the North Regional on July 3rd. The commentator will be Bernard Gray, a Manchester journalist, who specialises in speedway racing and flying.

ROUND the WORLD of WIRELESS (Continued)

Life Conquers the Air

IN what ways does an acroplane resemble and differ from a flying animal, such as a bird or insect? How do birds take off from the ground? Do flying fish really fly? These are some of the questions which Professor A. D. Peacock will discuss with Scottish schoolchildren on June 23rd.

Kaleidoscope

THE Victorian toy called the kaleidoscope has inspired previous radio broadcasts. On July 7th its influence is to be thrown on the Light Entertainment Department which has taken the parallel that, as the old-fashioned kaleidoscope produced beautiful patterns with the same pieces of coloured glass, so it will endeavour, with the infinite variety of music at its disposal, to attempt to broadcast a musical kaleidoscope.

The instrument this time will be turned not by the Victorian child, but by the Lally Brothers and their Orchestra. The Lally Brothers were at one time at the Dorchester Hotel.

Rock-a-Bye Rhythm

THIS is the title of a programme to be broadcast in the Midland programme on June 28th. It will be a non-stop selection of melodies old and new specially arranged by Jack Hill, and with a theme number composed by him. Martyn C. Webster presents the programme. Jack Hill's combination consists of clarinet, trumpet and violin, and rhythm section. The arranger is a well-known Birmingham pianist and composer; he wrote the music for Emile Littler's last three Birmingham pantomimes, and for a number of radio revues. The vocalist is Alex Penney, the Derby soprano.

Felix Mendelssohn (descendant of the great composer), well-known in radio and theatrical circles, has just formed his own dance band, and is recording for Decca. He is also appearing in his first film, "Songwriters on Parade," now being produced at the British Lion Studios.

INTERESTING and TOPICAL NEWS and NOTES

"Private View"

COMPLAINTS are often made of the irritation caused by the various people who minister to the needs of the public: they, on the other hand, may have equally strong criticism to make of the people they serve. In a new series of talks entitled "Private View," some of those who serve the public will come to the Western microphone, and the first, on June 29th, will be a barber.

"Blackpool Entertains"

BLACKPOOL will be the source of another big outside broadcast feature from the North Regional on June 29th. Listeners will then hear excerpts from the Royal Follies Concert Party show at the Central Pier (with Phil Stricklan, Jack Hayes, Evelyn Bury and others); part of a revue, "Punch and Beauty," from Feldman's Theatre (featuring Reg Bolton, Elsie Prince and Terry Wilson); and an excerpt from Jack Taylor's 1937 revue, "King Cheer," at the Opera House (featuring George Formby, Frank Randle and Randolph Sutton).

Pipes of Pan

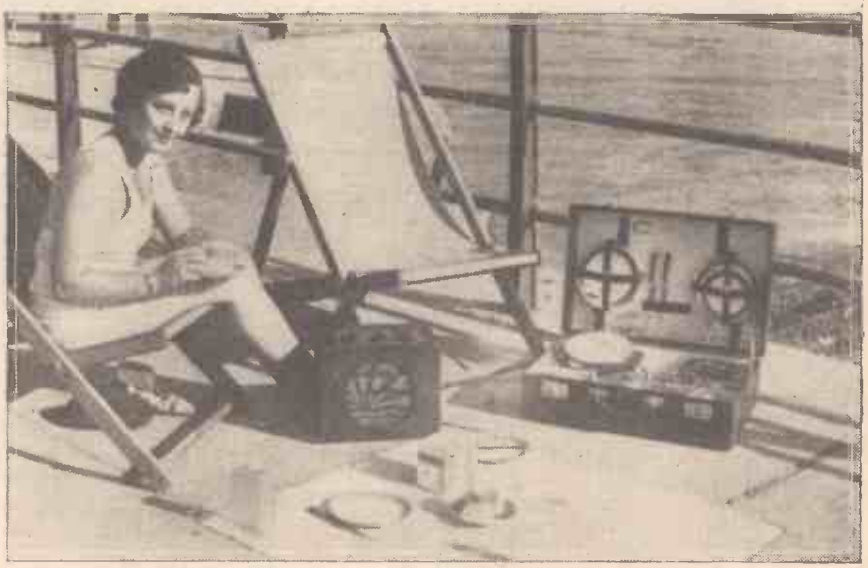
A GRAMOPHONE programme of pipe music, from the pipes of Pan to the mighty Wurlitzer, will be broadcast in the Scottish programme on June 28th. It is made up of the more unusual music that can be produced from pipes of varying shapes and sizes.

Return of Spinnle

FOR some reason or other that amazing old man, Alexander Spinnle Shanks, Esquire, of Aberdeen, has been silent for quite a long time. Knowing his garrulous propensity, some listeners may have supposed that Spinnle has paid, or is about to pay, man's debt to nature. They may be informed that Mr. Shanks is as well as ever. On June 28th (Scottish programme) he will recall the time when he touched up the tourist traffic.

Organ Recital from Handsworth

THE first organ recital broadcast from St. James's Church, Handsworth, will be by Edgar Morgan in the Midland programme on June 30th. The programme will consist of four eighteenth-century compositions and three modern works. Mr. Morgan is the Assistant Organist of Lichfield Cathedral; and he conducts the B.B.C. Midland Singers. The organ is a three-manual built in 1909. St. James's Church, Handsworth, celebrates its centenary next year.



The Pye Baby "Q" Portable in a summer setting.

"Coming Events"

IN "Coming Events" on June 28th, an impression of forthcoming programmes from the West of England will be given to Western listeners. The Programme Director will bring Heads of Departments to the microphone in turn to give a forecast of their plans for the quarter.

SOLVE THIS!

PROBLEM No. 249

Cross designed a receiver using two PX4 valves in push-pull in the output stage in conjunction with three other valves consuming 20 mA. He wished to energise the field of a moving-coil speaker by connecting the field winding as a choke in the common H.T. + line to the five valves. What should be the field winding resistance and wattage rating of the speaker, and what should be the rating of the rectifier? Three books will be awarded for the first three correct solutions opened. Address your solutions to the Editor, PRACTICAL AND AMATEUR WIRELESS, Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 249 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, June 28th, 1937.

Solution to Problem No. 248

The output voltage from the mains unit was low, and, therefore, the bias voltage was too high for the 220HPT.

The following three readers successfully solved Problem No. 247, and books are accordingly being forwarded to them: H. Cross, 151, Wellington Street, Long Eaton, Nottingham; T. P. Byrne, 84, Alltyryn View, Newport, Mon.; J. Mathers, 18, Stair Street, Glasgow, N.W.

Negative Feed-back Amplification

A Simple Explanation of This Form of Push-pull Amplification, and Some Other Forms of L.F. Amplifier which are very popular

By W. J. DELANEY

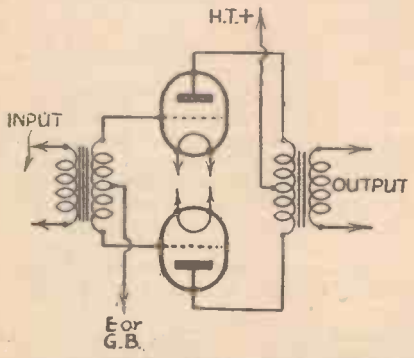


Fig. 1.—The standard transformer-coupled push-pull amplifier.

THERE has been an increased interest lately in the negative feed-back form of push-pull amplifier, and recent advertisements by a well-known valve manufacturer have resulted in a large number of queries from listeners who are not familiar with this form of amplification. So far we have not published a design for an amplifier of this type, although we have given ordinary push-pull and paraphase amplifiers. For the benefit of newcomers, therefore, it may be briefly stated that the straight push-pull amplifier utilises an L.F. transformer having a centre-tapped secondary winding which feeds two valves working "back to back." That is to say, the ends of the secondary winding are joined to the grids of the two valves, and the centre of the winding is joined to earth (or grid bias in the case of battery-operated valves), as in Fig. 1. Consequently, each of these two valves receives (or theoretically should receive) an identical signal voltage, but exactly 180 degrees out of phase. In other words, one valve receives a positive signal voltage of, say, 3 volts, whilst the other receives a negative signal voltage of the same value. Therefore, as the anode current of one valve rises to a certain value (as explained in the article entitled "The Valve as L.F. Amplifier," in last week's issue) the anode current of the other valve will fall by a like amount. The output from these two valves is fed to a loudspeaker through a transformer which is also centre-tapped to accommodate the two halves of the signal in the same manner as they are fed to the valves.

Paraphase Working

It will be seen, therefore, that the two valves should receive the two impulses exactly 180 degrees out of phase for the proper working conditions to obtain. In practice this is not always possible to attain, owing to differences in valve characteristics and other factors. In the paraphase circuit the output from a valve used as a phase reverser is fed to another valve in such a manner that the desired operating condition is obtained (see Fig. 2). Again, the ideal condition is not always easy to attain, although very good results are experienced with a well-designed paraphase amplifier. In the resistance-capacity coupled push-pull stage, the out-of-phase signal is generally obtained by taking the output from the anode and from the cathode of an indirectly-heated valve, as in Fig. 3, and again, although theoretically correct slight differences in the arrangement of the two parts of the valve will upset the true working of the stage. The negative feed-back circuit aims at reducing certain forms of distortion present in the push-pull stage, and enables a greater volume to be obtained with a diminution in the harmonic distortion, and at present is favoured mainly when pentode push-pull valves are employed.

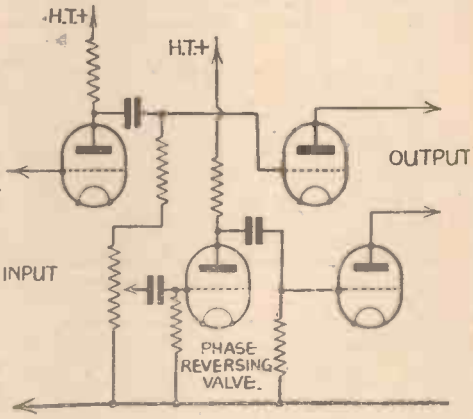


Fig. 2.—The paraphase circuit is shown above.

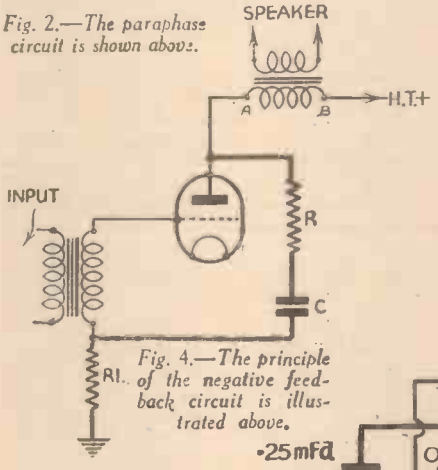


Fig. 4.—The principle of the negative feed-back circuit is illustrated above.

How it Works

To understand how the negative-feed back circuit functions it is desirable to consider each valve separately, as the push-pull stage simply consists of two valves arranged similarly, and therefore what applies to one valve must apply to the other. The ordinary detector valve which is familiar to every listener generally incorporates a reaction circuit, in which a coil is joined between the anode and the filament circuit, and this coil is coupled to the grid circuit or grid coil. Thus a transfer of energy takes place from the anode back into the grid and, as is well known, this increases the signal strength. When sufficient feed-back is obtained the valve bursts into oscillation. In the negative feed-back circuit a somewhat similar arrangement is employed, the anode of the output valve being coupled back to the grid, but instead of using a coil and condenser, we employ a resistance and condenser, and the general outline of the scheme is shown in Fig. 4. It will be noted, however, that there is an additional resistance joined between the grid circuit and the earth line, or H.T. negative.

When a signal arrives at the anode it passes to the output transformer and also to the resistance R, and as the current increases the voltage dropped across the output transformer will vary. One end of the output transformer (which, as already mentioned, is now being considered "in half," as it were) is joined to H.T. positive and is therefore more positive than the end joined to the anode. As the current

(Continued overleaf)

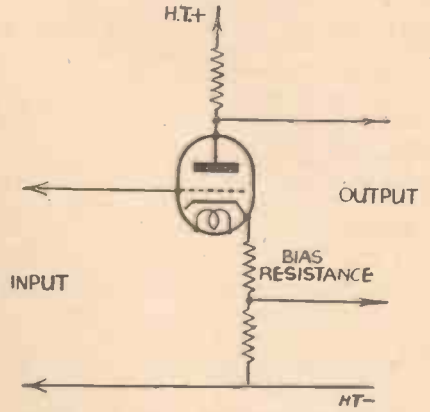


Fig. 3.—An alternative method of obtaining a push-pull signal.

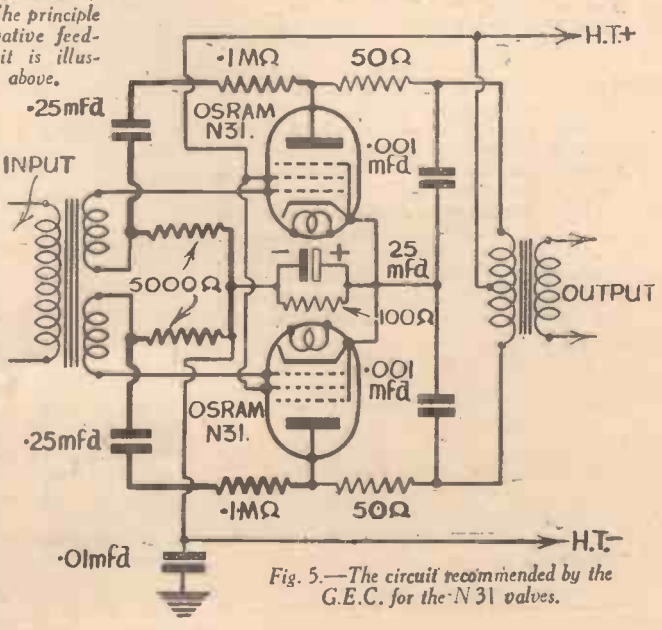


Fig. 5.—The circuit recommended by the G.E.C. for the N 31 valves.

NEGATIVE FEED-BACK AMPLIFICATION

(*Continued from previous page*)

increases the end of the transformer marked "A" will become more negative than end "B" and thus, as this is joined back to the grid we obtain the negative feed-back from which the circuit takes its name. There are various formulæ which may be introduced to ascertain the values of the resistances and the condenser.

Harmonic Distortion

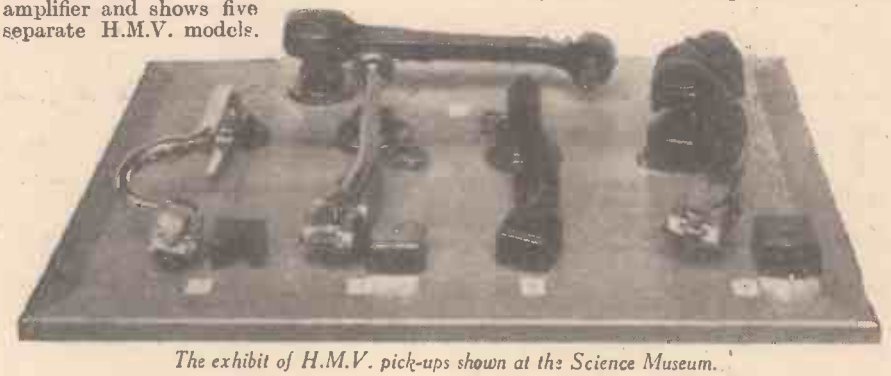
An important feature of this particular form of amplification is the reduction of harmonic distortion which arises in this way. The output circuit will contain an amplified signal voltage containing a certain degree of harmonic distortion, and as the resistance R is in the anode circuit it also will contain this harmonic distortion. If the preceding stages in the amplifier are properly designed there will be no harmonic distortion present in the input circuit (or the grid circuit) and thus the harmonics will be fed back in full, and the effect of this is that the degree of distortion of the harmonics in the final signal will be reduced due to the greater degree of amplification which the harmonics have received.

Fig. 5 shows the full push-pull circuit recommended by the General Electric Company for use with their N.31 A.C./D.C. pentodes, and the feed-back components are shown in heavy lines to distinguish them from the ordinary components. To simplify this circuit the heaters are shown unconnected. It is essential to adhere to the values of feed-back components recommended by the makers, as any variation will modify the degree of feed-back and, consequently, the amount of additional amplification which is obtained and the degree of harmonic distortion which is present in the final loudspeaker signal. When properly arranged the quality given by two pentodes working in this way is almost as good as that obtained with two high-efficiency triodes working in a normal circuit, with the added advantage that considerably more volume may be obtained.

H.M.V. PICK-UP PROGRESS

Details of the Various Models which May Now be Seen at South Kensington

IN accordance with the policy of the Science Museum to maintain a representative collection of all scientific apparatus, they have recently added to the exhibits a group of H.M.V. gramophone pick-ups, an illustration of which appears below. This group is intended to illustrate the development of the pick-up for reproducing gramophone records through the medium of the broadcast receiver or amplifier and shows five separate H.M.V. models.



The exhibit of H.M.V. pick-ups shown at the Science Museum.

The earliest pick-up was a somewhat crude affair, consisting of a converted telephone carpiece, to the diaphragm of which an armature removed from a standard sound-box was attached. The main aim of designers at this time was to reduce the rigidity or damping of the needle and after considerable research the H.M.V. engineers produced a pick-up in which the damping was provided by an oil-filled chamber and consequently record wear was practically negligible. This instrument is seen at the rear of the board.

Magnetic Damping

The next step was to dispense with the oil, retain the same good qualities, yet provide sufficient damping to prevent the formation of spurious harmonics and yet provide good quality. As a result a magnetically damped instrument was produced and this is seen to the left of the illustration. The problem of record wear was still acute, however, and the next step was to reduce the weight of the pick-up. As the magnet itself forms a considerable portion of the overall weight, a counterweight at the opposite end of the arm was the obvious solution, and the next model produced was designed on the lines seen in the next instrument on the right.

Various other improvements have since taken place, and all present H.M.V. radiograms, with the exception of Model 801, are fitted with the standard instrument which is the third from the left in the group. Model 801 is provided with the de-luxe model seen on the right.

Important Broadcasts of the Week

NATIONAL

Wednesday, June 23rd.—Prince Igor, Act 2 (Borodin), from Covent Garden.
Thursday, June 24th.—A commentary on the competition for the Edward, Prince of Wales Challenge Cup, at the International Horse Show, from Olympia.
Friday, June 25th.—Die Entfuchrung, Act 2 (Mozart), from Glyndebourne.
Saturday, June 26th.—Commentaries on the First Cricket Test Match, England v. New Zealand, from Lords; the All-England Lawn Tennis Club Championship Meeting from the Centre Court, Wimbledon; some of the events at the Royal Air Force Display, Hendon Aerodrome; the Coronation Polo Cup, from Hurlingham.

REGIONAL

Wednesday, June 23rd.—Concert Party programme, from Aberdeen.
Thursday, June 24th.—Darts Commentary from Islington Agricultural Hall.
Friday, June 25th.—The Silver Box, a play by John Galsworthy.
Saturday, June 26th.—Dance Band programme.

MIDLAND

Wednesday, June 23rd.—Band programme from Derby.
Thursday, June 24th.—Children's Hour: An All-School programme.
Friday, June 25th.—Follow On, a Little Revue.
Saturday, June 26th.—The Midland Counties A.A.A. Championships: Eye-witness account.

WESTERN AND WELSH

Wednesday, June 23rd.—Abracadabra, a programme of rites, spells and incantations.
Thursday, June 24th.—A Concert of the Works of Christian Carpenter.
Friday, June 25th.—Choral programme: Madrigals, from the Royal Fort, Bristol.
Saturday, June 26th.—A Programme of Light Music from Bangor.

NORTHERN

Wednesday, June 23rd.—A running commentary on the Northumberland Plate Race, from Gosforth Racecourse, Newcastle-upon-Tyne.
Thursday, June 24th.—Variety programme, from Derby Castle, Douglas, Isle of Man.
Friday, June 25th.—Special Occasions, "On the Village Green": Orchestral Concert.
Saturday, June 26th.—Concert Party Programme; Lincolnshire Night's Entertainment, from the Pier Pavilion, Skegness, and Variety from the Theatre Royal, Cleethorpes.

SCOTTISH

Wednesday, June 23rd.—Fool Moon, a medley of moonshine and music.
Thursday, June 24th.—Ballad Days, a Musicale in the Victorian Manner.
Friday, June 25th.—Band programme.
Saturday, June 26th.—Orchestral Concert.

NORTHERN IRELAND

Wednesday, June 23rd.—"In Lighter Vein": Orchestral concert.
Thursday, June 24th.—Variety programme, from the Town Hall, Portadown.
Friday, June 25th.—An eye-witness account of the Irish Ladies' Close Golf Championship, at Portrush.
Saturday, June 26th.—An Organ Recital from St. Anne's Cathedral, Belfast.

Adding an L.F. Amplifier

This Week the Experimenters Explain how to Adjust the Single-valve Receiver Described in the Two Previous Issues and How to Convert it into a Two-valver Capable of Operating a Loudspeaker

WE are now ready to commence tuning on this receiver, and this is carried out in the following manner:—

First turn the knob of the tuning condenser—the upper one—so that a midway reading is shown on the scale, and turn the lower—reaction—knob as far as it will go in an anti-clockwise direction. Switch on by means of the right-hand switch, and set the left-hand switch to the medium-wave position; this means that the lever should be pressed downward. Listening carefully in the 'phones, turn the tuning knob backward and forward quite slowly until signals are heard. You should very soon find the local station, but reception will be very faint unless your aerial is within ten miles or so of the nearest transmitter. When the station has been picked up, move the reaction knob until signal strength is increased sufficiently to provide comfortable reception.

It will soon be noticed that signal strength builds up as the reaction knob is turned in a clockwise direction, until a point is reached at which the signals become distorted or "rough." That indicates that the valve has commenced to oscillate, and that the reaction knob should at once be turned back. If it were turned still further in a clockwise direction, a squeak or whistle would probably be heard—not only by you, but by nearby listeners whose receivers were tuned to the same programme. Great care should therefore be taken to avoid oscillation, and no difficulty need be experienced in this respect if care is taken until proficiency has been gained in operating the set.

A point which should be noticed is that it will probably be found necessary slightly to alter the tuning as the reaction control is advanced; actually, a rather lower scale reading will be required when reaction is increased. The necessary alteration in tuning is very slight, and so the tuning knob should be turned as slowly as possible.

Reaching Out

Having tuned in the local station, you can try your luck at others. This is best done after about 11 p.m. during the preliminary trial, so that if you do oscillate fewer people will be inconvenienced. Besides, distant stations can be received much more easily after dark than during the daytime. Turn the tuning knob to such a position that nothing can be heard, and then slowly advance reaction until a faint "hissing" or "breathing" sound is heard; that indicates that the set is nearly at the oscillation point, and that it is in its most sensitive condition. If the reaction knob is turned too far, the noise will become weaker again.

While the "hissing" can be heard, slowly turn the tuning knob and at the same time, if necessary, to keep the set in its most sensitive condition, gently alter the setting of the reaction knob. It will not be long before other stations will be heard, and after they have been located, further slight re-tuning and re-adjustment of reaction will bring signals up to the greatest strength. If by any chance the reaction knob is advanced too far a whistle will be heard as a station is found. That means that reaction should immediately be eased off, and the tuning slightly modified.

Coil Adjustment

It should be found that the average position of the reaction knob is about halfway between full clockwise and full anti-clockwise. If this is not the case, the inner coil will have to be moved slightly. If more than half reaction is needed, move the coil upward; if less, move the coil downward. A few positions might have to be tried before the most suitable is found.

by The Experimenters

After having become accustomed to tuning on the medium-wave band, turn the left-hand switch lever upward, to bring long waves into use. You can then repeat the tuning operations described above. It might then be found that another slight alteration in the position of the reaction coil is desirable, but in this case increased reaction is obtained by moving the tube downward. Should it be found that a nice compromise cannot be found to suit both wavebands, an alteration in H.T. voltage might be required. When reaction cannot be obtained easily enough, the voltage should be increased by steps until a maximum of 80 volts has been reached. If oscillation is obtained with the reaction condenser well "out" the voltage should be reduced. In any event it is well worth while to experiment with different H.T. voltages, since long-distance reception is mainly influenced, in a simple set such as this, by the nicety of reaction control. When the optimum voltage has been found, the "hissing" should start gradually as the reaction control is operated. If the voltage is too high or too low, there might be a sudden "plop" as the valve bursts into oscillation. In this condition the set will not work at its best.

Selectivity Variation

Another little experiment you might like to try is in connection with varying the selectivity or sharpness of tuning. You might find, for instance, that distant stations whose tuning points are fairly near to that of the local station cannot be heard free from interference. This means that the degree of selectivity is inadequate, although it must be understood that a receiver of the type under consideration can never provide "razor-edge" tuning. However, if there is any noticeable interference, obtain a .003-mfd. pre-set condenser, and connect it between the aerial lead-in and the aerial terminal on the set, as shown last week. Screw the small knob right down first of all, and then experiment with other settings, giving the knob about one complete turn between each test. Tuning should be sharpened by unscrewing the knob, but if you go too far you will find that signal strength is reduced at the same time. After a little experimenting it should be possible to find a setting which ensures sufficiently-sharp tuning combined with good signal strength.

Now that we have finished the little single-valver, and found that it operates successfully, we can consider the addition of a second valve. There are various ways in which this can be done, but we might as well adopt the simplest in the first place, so that there will be little likelihood of any difficulty presenting itself.

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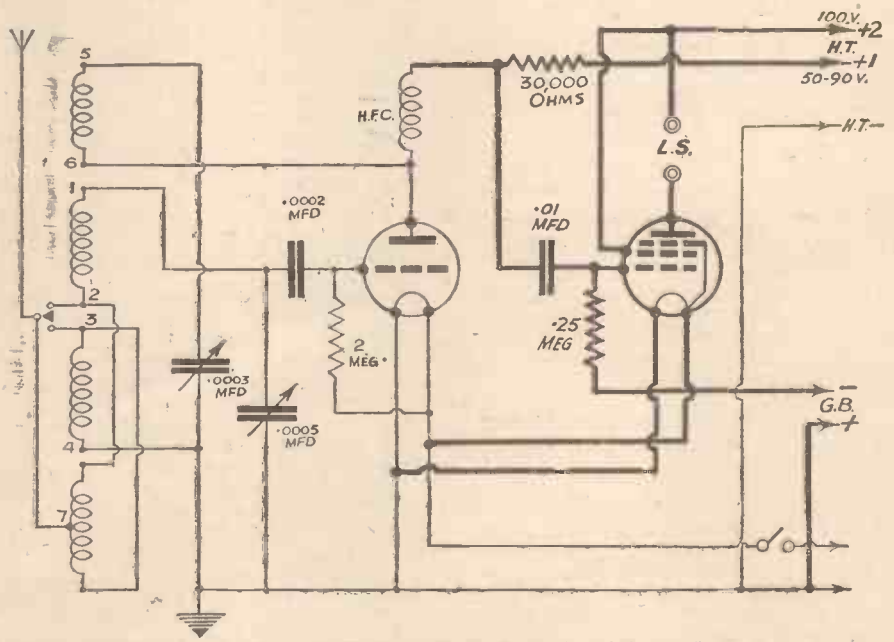


Fig. 1.—Theoretical circuit of the complete two-valver, with the additional circuit shown in heavy lines.

ADDING AN L.F. AMPLIFIER

(*Continued from previous page*)

The second valve could be a high-frequency or a low-frequency amplifier; the first gives increased range and selectivity, whilst the second increases the power output. If we were to add an H.F. valve, we should probably find that the signal strength remained unaltered on the nearer stations, although more-distant ones would be received more easily and at greater strength. In any event, the signal strength would be insufficient to permit the satisfactory use of a loudspeaker. But by adding an L.F. stage a speaker can be operated quite satisfactorily on the nearer stations at least and, in favourable conditions, on some of the more powerful transmissions from further afield.

Simple and Inexpensive

Let us "go for" L.F., then. Here we have the choice of at least three differing forms of coupling. We will choose the simplest, partly because it is the simplest, and partly because it is the least expensive. If desired, we can modify it later by adding a few other components, but without having to scrap any of those bought for the original amplifier.

Resistance-capacity coupling provides the simplest arrangement, and the theoretical diagram of the two-valver is shown in Fig. 1, where the portion relating to the detector valve is shown in faint lines, the additional section being in heavier lines. You can see that the only new parts required are: a 30,000-ohm resistance, a .01 mfd. fixed condenser, a .25 megohm grid leak, a five-pin valveholder, a five-pin pentode valve, a 9-volt grid-bias battery, three wander plugs and odd pieces of wire, and a few screws. Those of you who do not care for theoretical diagrams had better refer to Fig. 2, which shows the lay-out and wiring of the complete two-valver.

All of the original components, as well as the baseboard and panel, are retained and only two of the original wires are altered; these are the wires which previously were connected to the 'phone terminals. They are now connected to the ends of a 30,000 ohm, 1 watt metallised resistance, which is attached to the baseboard by means of a small fibre strap. Instead of the fibre, a wooden bridge could be used, or a resistance holder could be employed. The five-pin valveholder is placed in line with the four-pin holder used all along, and its grid terminal is connected to the top terminal on the H.F. choke through the .01 mfd. tubular condenser.

Wiring Alterations

Two wires are joined between the filament terminals of the two valveholders, and the anode terminal of the five-pin holder is connected to one of the two terminals previously used for 'phones, and now employed for the speaker. Another high-tension positive lead is taken from the second speaker terminal, this terminal also being connected to the auxiliary-grid terminal of the five-pin valveholder. If the name "auxiliary grid" sounds too technical, you can ignore its full meaning, and simply note that the appropriate terminal is situated between the anode and filament terminals, and that it is the only terminal which is different from those on the valveholder used originally.

You can make the new connections by following exactly the same method as in wiring-up the single-valver. In screwing down the few components you should follow the approximate layout illustrated, not because the positioning of the parts is critical, but because the remaining space will be required later when an L.F. transformer is added to the set.

As to the new valve—a pentode—the choice is not restricted, but we recommend a Cossor 220HPT, since this gives considerable amplification for a modest consumption of high-tension current. If you wish to use an alternative, choose a Mullard PM22A, Osram PT2, Hivac Y220, or a Mazda Pen220; of these, the Mullard requires least H.T. current.

Battery Connections

Fit the valve in its holder and connect the batteries as shown in Fig. 2. The H.T. + 1 wander plug should be plugged into a socket giving about 80 volts, whilst the other H.T. + plug (which we will call H.T. + 2) should be inserted into the battery socket which provides the full voltage of the battery. Insert the G.B. + wander plug into the + socket on the grid-bias battery, and fit the G.B.— plug into the 4½-volt socket.

When using these voltages, and assuming the maximum voltage of the H.T. battery to be about 100, the total high-tension current consumption should not greatly exceed 8 milliamps. In consequence, the battery should have a long and useful life. If, by any chance, you are using a 120-volt battery, place the G.B.— plug into the 6-volt socket of the grid-bias battery. It is worth remembering that the higher the G.B. voltage is made, the lower is the consumption of high-tension current.

Now that the batteries are connected, you can attach the leads from any kind of permanent-magnet moving-coil speaker to the speaker terminals, join up the aerial and earth leads, and switch on. Operate the controls in precisely the same manner as before, when it should be found that the transmissions which could previously be heard at good strength on the 'phones can be heard comfortably from the speaker. Do not expect great volume, however, because that will not be possible. At the same time, the reproduction should be loud enough to be enjoyed in a room of modest size.

Two Warnings

There is one important point which should receive attention. This is that greater care than previously must be taken to ensure that the set does not oscillate. Thus, until a little more experience has been gained it will be wise to confine your attention to the local stations when using the speaker. If other transmissions are required, use the 'phones for tuning, and then connect the speaker after the signal has been accurately tuned-in. Another warning: do not connect or disconnect the 'phones or speaker without first switching off the set. If you do there will be a danger of damaging the pentode valve, because a sudden current surge, with a corresponding voltage surge, will take place.

After the two-valve receiver has been found to operate satisfactorily, you should try the effect of varying the voltage applied to the detector valve through the H.T.+1 wander plug. You will have noticed that we suggested that a voltage of about 80 should be used initially, and you might have wondered why this voltage was advised, when a voltage of 60 or so was ample previously. Well, we'll tell you. The anode current to the detector valve now has to pass through a 30,000-ohm resistance, whereas before it went through the 4,000-ohm resistance of the 'phones. Additional voltage is needed to drive a similar current through a higher resistance.

Voltage Tests

You should try the effect of varying the voltage between about 50 and 90, the aim being to find the voltage which gives the greatest signal strength combined with the smoothest control over reaction. The optimum value depends very largely upon the particular detector valve used, so it would be no use our giving any hard-and-fast rule.

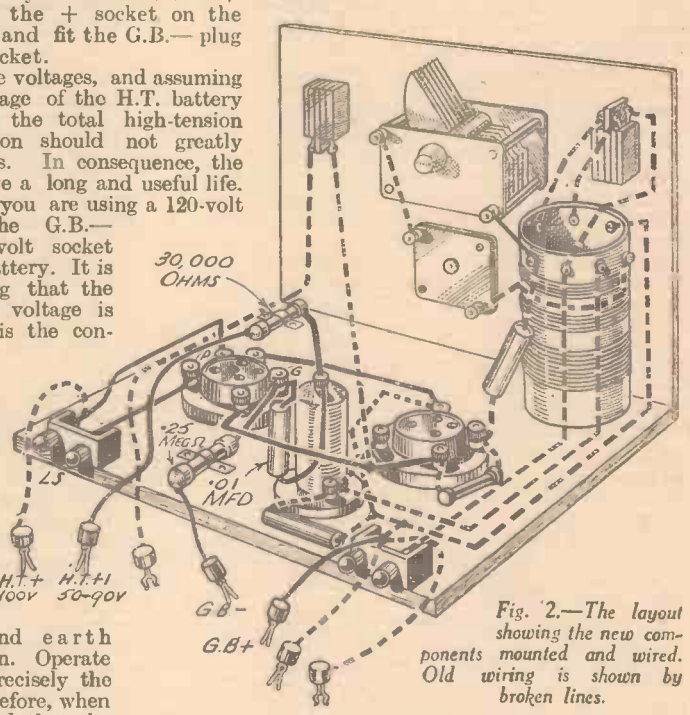


Fig. 2.—The layout showing the new components mounted and wired. Old wiring is shown by broken lines.

Strictly speaking, there is no need to switch off the set each time the H.T.+1 wander plug is removed, but it will be better to do so, if only in order to cultivate the good habit. This is because the procedure should certainly be followed when moving any of the other plugs.

And now what about finding the best grid-bias voltage? It is more than likely that the voltage used initially will be most suitable, but there is no harm in making sure. Move the G.B.— plug into sockets giving increased voltages, going up in 1½-volt steps. Remember—switch off every time before making an alteration. Also bear in mind what we stated above: that the highest G.B. voltage which can be used ensures the most economical running. There is a limit, of course, because if the voltage is made too high, reproduction will become "thin" and "tinny," and distortion will occur. If you are "on top" of a transmitter and want as much volume as you can get, a G.B. voltage of 3 might be best, but otherwise it is unlikely that it will be necessary to go below 4½ volts.

Practical Television

June 26th, 1937. Vol. 3. No. 56.

METAL RECTIFIERS FOR TELEVISION APPARATUS

IN view of the recent increase of interest in the subject of Television reception, and of the extent of the work which is being carried out in this connection by amateur constructors, we give below some of the many applications of metal rectifiers to Television circuits, together with the marked advantages which the metal rectifier shows in each case over the corresponding valve rectifier. This information has been compiled and submitted by the makers of the rectifiers, The Westinghouse Brake and Signal Company, Ltd.

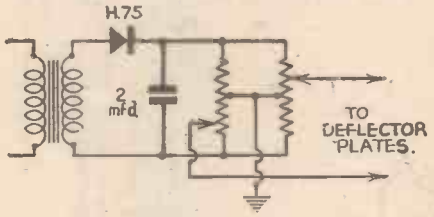


Fig. 1.—A half-wave circuit utilising the type H.75 rectifier.

H.T. Supply to Vision Receivers

The current consumption of the present design of vision receiver varies from about 200 volts at 40 milliamps. to 230 volts at 50 milliamps., and for these outputs we should recommend the use of rectifiers style HT.12 and HT.9 in the voltage-doubler circuit.

D.C. Output.	*Rectifier.*	*Voltage Doubling Condensers.*	*A.C. Input (approx.).*
200-v. 80 to 40 mA's	HT.12	4+4	140 volts, 120 mA.
230-v. 50 mA's	HT.9	4+4	180 volts, 170 mA.

The great advantage of this arrangement is that the use of the voltage-doubler circuit limits the output current of the rectifier, and accidental short circuits, which are particularly liable during experimental work, can do no damage to the rectifier or transformer.

H.T. Supply to Sound Receivers

H.T. consumption for the sound receiver is normally of the order of 250 volts at 50 milliamps., and for this output the Westinghouse Company suggests the use of the HT.9 rectifier used in the voltage-doubler circuit with two 4 mfd. condensers. The A.C. input for the above-mentioned output would be approximately 200 volts at 170mA's. This rectifier is, however, quite suitable for a maximum output of 300 volts at 60 milliamps., in which case the input must be increased to 200 mA's at 240 volts.

The advantages of these voltage-doubler circuits also apply here, and either of these rectifiers would be suitable for the average hard-valve time base.

H.T. Supply to Time Base Generator

The requirements of thyratron time-base circuits vary from about 900 volts at 14 mA's to 1,000 volts at 18 mA's. For the latter output two HT.9 rectifiers connected in series, and used in the voltage-doubler circuit, will be found excellent. The voltage-doubling condensers should each be 2 mfd., 750 volts working, and the A.C. input 460 volts.

The advantages of the voltage-doubler circuit are even more marked at this voltage, as the transformer can be wound for a very much lower voltage than if valve rectification were used, and this results in a smaller and cheaper transformer. The elimination of the high voltage secondary winding also has an important bearing on the question of safety from shock, and this is particularly important in home-constructed apparatus. A further advantage is great stability of output, since vibration and sudden draughts will not affect the D.C. voltage, and this results in freedom from drift, and reliable operation of the time base.

Supply to Picture Shift Circuit

An output of about 250 volts at 4 mA's is usually required for this purpose, and a very suitable rectifier is the H.75, which may be used in the half-wave circuit shown in Fig. 1. For this output, an input voltage of approximately 230 volts 8 mA

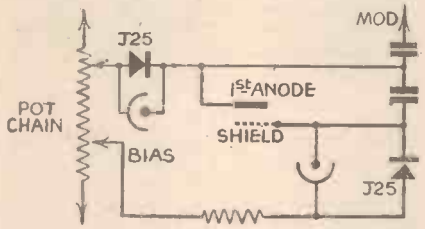


Fig. 2.—A patented circuit now employed in certain commercial receivers, built round the type J.25 rectifier.

R.M.S. will be required. The rectifier is, of course, quite small, and need take up very little space, since it can be supported by reasonable heavy wiring, or, if this is not possible, a small clip is quite sufficient. The rectifier is capable of a maximum output of 10 mA's.

H.T. Supply to Cathode-ray Tube

Tube requirements vary from 3,000 volts at 0.75 mA to 4,000 volts at 0.75 mA. "J" type rectifiers are most suitable for these outputs as shown below:—

D.C. Output.	*Rectifier.*	*Voltage Doubling Condensers.*	*A.C. Input (approx.).*
3,000-v. 0.75 mA	2 units J.176.	0.5+0.5 (2,000-v.)	1,200-1,300 volts.
4,000-v. 0.75 mA	4 units J.125.	0.5+0.5 (3,000-v.)	1,600-1,700 volts.

The advantages of cheaper transformer construction and greater safety from breakdown and shock are even more marked when dealing with the high voltages required for the tube anode supply. The automatic protection against damage by short circuits, mentioned below, also applies in this case, and, in addition, full wave rectification is obtained.

The "J" type rectifier units are capable of a maximum output of 2 milliampcres.

Double Modulation and Restoration of D.C. Component

The circuit shown in Fig. 2 is being widely used by manufacturers at the moment, and presents a particular application where the use of metal rectifiers shows a marked saving in space and increase of safety.

As the present tendency is to earth the tube anode, the use of diode rectifiers in the positions shown is dangerous and necessitates highly insulated heater windings. It will be seen that the above circuit provides double modulation and restores the D.C. component of the picture signal which is normally lost when V.F. amplification is used. This circuit forms the subject matter of Letters Patent applied for by a leading manufacturer, and this fact must be borne in mind.

SPOT SIZE AND MODULATION

AMONG the several desirable features which should, theoretically, be possessed by every cathode-ray tube which is to be used as a television picture reproducer, is the one which implies that the size of the scanning spot should remain constant and only alter in light intensity in accordance with the strength of the received video signal. Unless this is the case, or alternatively, unless any change of size is encompassed by fairly narrow known limits, there will be underlap and overlap in the lines tracing out the picture, and this will bring about a loss of detail or picture definition. If the action of intensity modulation is considered carefully it will be seen that without some form of compensation there is sure to be a variation in spot size taking place. The beam of electrons with their individual negative charges will tend to repel one another and without any focusing device, whether electro-magnetic or electrostatic, the beam will diverge as it emerges from the last orificed anode, and show itself as a spot of light on the screen some 3 or 4ins. in diameter. The focusing arrangements bring about a constricting or fasciculating action which overcomes the electron repulsion, causes the beam to converge and so become a small bright spot of light. According to the number of electrons in the beam, however, so the repulsive field among them will be a certain value, but changes in the number of electrons brought about by the signal intensity modulation will quite naturally alter the magnitude of the repulsive field. With increased brightness there are more electrons in the beam, a greater repulsion occurs and the spot size increases.

"THE DANGER OF TOBACCO"

John Abbot, the young actor who played the part of Claudius in the Old Vic production of "Hamlet," at Elsinore, plays a very different rôle in television on June 24th, when he will be seen in a monologue or, rather, a one-man play by Chekhov, "The Danger of Tobacco." In this serio-comic story Ivan Ivanovitch Nyukin takes the audience into his confidence while ostensibly he lectures to them on the evils of tobacco. Incidentally, he is puffing at a cigar while he speaks.

Televiews

A Holiday!

IT is learned that viewers during part of the summer season will be unable to have their television receiving sets in operation. For three weeks, from July 26th, the Alexandra Palace is to close down for a complete overhaul of the cameras, amplifiers, and radio transmitters. This will ensure that everything is working satisfactorily for the proposed Radiolympia television demonstrations, but it is a matter of great regret that there is not sufficient stand-by equipment to maintain continuity of service. This state of affairs must be remedied at the earliest possible moment.

A Difficulty

THE development of mechanical optical systems of television is still being undertaken with every promise of results which will be comparable with the more familiar electrical optical systems. One of the main difficulties at the moment, however, is on the question of synchronising, and it is already known that efforts are being made by the B.B.C. to meet the claims of mechanical picture reproducers. Whereas a cathode-ray tube scanner with its associated electrical equipment is adaptable quite readily to phase changes in the synchronising pulses, with mechanical receivers this is not quite so easy. With the use of a single source of synchronising pulses injected into the picture signal at the correct phase position, irrespective of the camera in use at any time, matters are quite in order, and no doubt this scheme will be operative very soon. No doubt readers will recall that in the earlier experimental high-definition television transmissions, separate synchronising pulse generators were used for each scanner, and it was necessary to phase the pulses correctly before the picture was faded up, otherwise it would be split horizontally. This is liable to produce a measure of hunting in a mechanical scanner, as low-definition enthusiasts know only too well.

Work in Australia

SINCE the bulk of Australia's population is segregated into the few main cities, the problems associated with a national television service are of a special nature. Developments are being undertaken, however, and already definite arrangements have been made with companies in England. In Brisbane itself is a research station which has graduated from the low-definition standards to one of 240 lines, and transmissions are carried out on a wavelength of 5 metres using low power. Already demonstrations have been given and pictures seen both by Government officials and the Press. Only films have been attempted so far, but the results have been most encouraging. Due to the large areas which have to be covered a suggestion has been put forward that short waves be employed, and a certain amount of picture detail sacrified to compensate for the lower-carrier frequency. It seems doubtful whether this will happen, however, but it is interesting to know that activities in Europe are being watched carefully so that the Australians can take full advantage of any outstanding developments that may materialise.

Charlie Kunz shows Reginald Dixon some of his new melodic effects on the grand Blackpool Wurlitzer Organ.

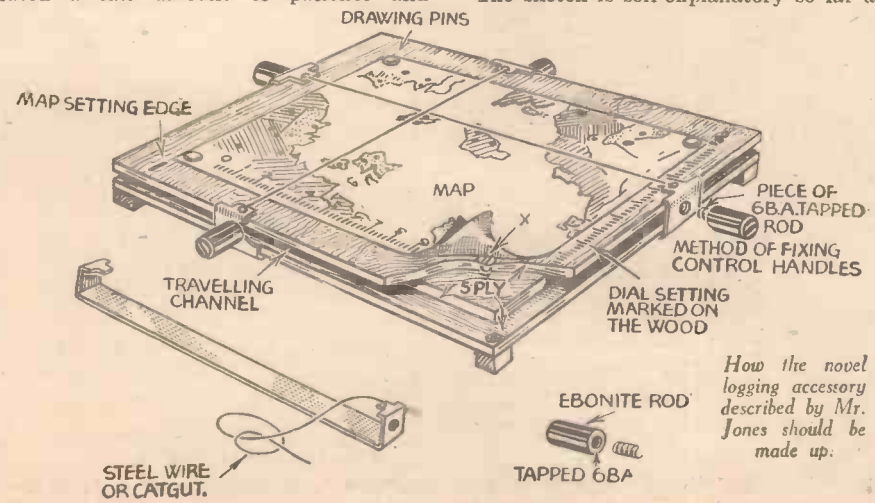
A USEFUL LOGGING ACCESSORY

I HAVE, during my experiments, inaugurated a system of rapid checking whilst logging stations, and although it has necessitated a fair amount of patience and calculation, it has been worth every moment of the time taken, not only in the smartness and accuracy in the resultant job, but in the interesting tests and notes which I have had to compile, together with the novel method of station allocation by sectionalised maps (of which there are now nine) covering a considerable number of stations.

The sketch is self-explanatory so far as the general construction is concerned, but a word about the map.

I procured a series of maps of states and countries, and cut these up into sections, one of which is shown in the drawing, the calibration being carried out by checking with the receiver on all wavebands and marking stations covered by various wavebands. For example, "Sheet 1" would constitute a bandspread of, say, 40 to 50 metres only, whilst Sheet 7 might cover 150 to 250 metres, etc.

The cursors are simply constructed out of brass strips, the dial-setting markings are general to all, whilst the frequency settings are noted and marked on the side of each map sheet, as shown, and referenced in a log-book. Four fixing screws ("X") secure the pieces of plywood and finally four small feet permit unobstructed operation of the intersecting cursors.—C. R. JONES (London, S.W.11).



How the novel logging accessory described by Mr. Jones should be made up.

On Your Wavelength

BY THERMION

The Television Exhibition

THE introduction of a Television Exhibition at the South Kensington Museum has given a hall-mark to the new science and should do a great deal to dispel any doubts which the public may have as to whether television is here. It is an excellent Exhibition enabling you to make comparisons. I was not impressed with one particular system of which not a great deal has been heard, but no doubt it will develop. At the moment, television receivers are being made by a number of well-known radio manufacturers, only five of whom can be considered in the running. Yes! Television is here. In fact, it is here, there, and everywhere. When I travel to the office, I see large notices outside radio stores drawing attention to the fact that they are the leading television experts for the district. When I wander into my local hostelry for a glass of sarsaparilla I am now entertained by a television receiver instead of by an awful wireless set badly installed. Local papers are filled with announcements of local pub proprietors who wish to inveigle you into their saloon bars to test the waters, while you look in and listen. We are living in a period of great scientific activity, and although we do not know it the new science is stealing a march on us. I forecast that within three years there will be an enormous boom in television, and I am hopeful that the home constructor will be the first in the field, as he was with radio.

A Different Starting-off Point

BUT unfortunately, the impoverished and struggling wireless manufacturer of 1922 who welcomed the home constructor and his custom, in fact relied upon it, is the opulent and hard-faced radio manufacturer of to-day. Having built his industry on the demands of the home constructor and obtained his technical education from the work of the home constructor, he now casts him adrift like an old boot and welcomes him no more! No longer does he welcome your letters containing suggestions for a new component or for the modification of an existing one. He does not want to hear from you at all; he wants to sell his components to the set manufacturer. So with television we start off from a different standpoint. The manufacturer has his radio experience upon which to base his methods. He wants to keep television out of the hands of the home constructor, and will move heaven and earth to do so. Unfortunately for him, a lot of water has to flow under London Bridge before television reaches the stage where it will command large sales. Able as are the technicians of our wireless firms (and most of these were originally amateurs), they know little of television and will depend upon the work of the amateur to perfect their product. The public may have a short memory, but constructors have a long one, and may not be so partial to the blandishments of the manufacturer as they were in the past. It is fortunate indeed that in the component industry there are still old-established firms left who are now enjoying the prosperity which they were denied at a time when mushroom firms battened themselves like barnacles on to the hull of the radio ship. They have been cleaned off and wiped up, of course, and we must see to it that these parasitic appendages who know nothing of the science upon which they grow exceeding fat are not allowed to fasten themselves on to the television industry.

Junk

LET us frankly admit that a large percentage of radio components were purely junk, not because the manufacturer wished to sell junk, but because he was without the knowledge necessary to design the right product. He was the victim of any charlatan who cared to come along and pose as a radio expert. The real testers of the product were the home constructors. They rectified the wireless trade, and they will rectify the television trade. The more people there are interested in a new science the better it is for that science. To endeavour to corner it purely for the purposes of exploitation will bring it tumbling about the ears of those who hope that it will inflate their bank balances. You will have noticed that very few firms have produced any components for television, and that is the reason. That situation will change shortly, however.

A Secret Paper on Electricity Distribution

THE so-called secret white paper circulated by the Ministry of Transport to the electricity undertakings was recently published under the title of "Electricity Distribution," and it purports to be an outline of the main provisions proposed for securing the reorganisation of distribution on the general lines recommended in the report of the Committee on electricity distribution. It is intended that the proposal shall later be embodied in a Bill. This memorandum is of interest to every user and maker of wireless sets. It proposes 30 distribution districts, and it would be the duty of the Electricity Commissioners to review the undertaking in each district and to prepare schemes for the consolidation of the undertakings into groups. Amalgamation of undertakings may be made compulsory. It suggests a reduction in the number of undertakings, an area of supply for each unit sufficiently large to ensure diversity of demand and scope for development, and the possession of adequate finance. The Commissioners require to be satisfied that,

among other things, each scheme will result in an eventual reduction of charges to consumers, and that no inconvenience as regards supply will be caused to consumers. The memorandum proposes that the undertakings must offer an approved two-part or other tariff for domestic and other supplies, to provide distribution mains within a prescribed period in built-up areas which are at present without cables, to submit and carry out approved schemes of extensions for undeveloped areas, to offer facilities for assisted wiring and for the hire or hire-purchase of electrical apparatus and to modify the right of undertakings to require a guaranteed gross revenue of 20 per cent. in relation to capital expenditure before giving you supplies.

At present the full effect of the Grid Scheme has not been felt, for there are still wide variations in voltage supply, whilst adjacent districts are supplied with both A.C. and D.C. It is time that the scheme was brought to fruition, for the prices over the country vary between ½d. a unit and 9d. a unit.

Disturbances of Radio Communication with the North Pole

I NOTICE that at a session of the special commission appointed by the Academy of Sciences of the U.S.S.R. to investigate the causes of interruptions of wireless communication with the expedition at the North Pole a letter was considered from Professor Molchanov, the director of the Geophysical Observatory of the U.S.S.R. Professor Molchanov said that interruptions in communications with polar regions were not unknown. During the Arctic flight of the Graf Zeppelin in 1931 communications were completely cut off with every station, even in polar regions, for several days at a time. Radio communications were also interrupted during Chkalov's flight in the Arctic in 1936. The study of the causes of these interruptions necessitates special research in the state of sunspots and magnetic elements, as well as the conditions of the ionosphere. While some research in these subjects has already been carried out, the Geophysical Observatory is now renewing these studies, and a special geophysical station is being set up in the Murmansk region for the purpose. As an immediate measure to effect improvement in wireless communications at the North Pole, he suggested that stations should work on different wavelengths. He was of the opinion that transmission and reception could be partially improved by the raising of aerials to a greater height on ice mounds. Professor Molchanov also recommended the raising of aerials on kites or, in calm weather, on captive radio balloons.

The suggestion sent by the Commission to Academician Otto Schmidt was to work on a long wavelength of 600 metres for short-distance communications, and in the event of atmospheric interference to transfer to short waves, 90-120 metres for distances up to 100 kilometres, and 70 metres for distances of 100 to 300 kilometres. For communications between the North Pole and Dickson Island a wavelength of 22-25 metres was recommended.

Pick-up Connection

MOST readers are acquainted with the method normally adopted for connecting a pick-up to a triode detector valve, that is by connecting one lead to the grid and the other to G.B.— or the H.T.— line. Difficulty is often experienced by constructors in deciding the correct method of using a pick-up in conjunction with double diode-triodes, however. This type of valve is generally resistance coupled to an output pentode, and therefore if connection is made to the grid circuit of the triode section of the valve, sufficient amplification will be obtained. In some receivers a volume control is connected in this grid circuit, and the pick-up leads can be connected to the end terminals of the control. If the control is connected in the grid circuit of the output valve, however, the pick-up leads should be connected to the ends of the grid leak of the triode section of the D.D.T. valve.

To A.C./D.C. Receivers

COMMERCIAL A.C./D.C. receivers are seldom fitted with pick-up sockets, but a pick-up can be satisfactorily used in conjunction with most A.C./D.C. sets. It is not advisable to connect the leads direct to grid of valve and H.T.— as in the case of A.C. receivers, however. If this method of connection were adopted a shock could be experienced from the pick-up. To avoid this, a condenser of approximately .01 mfd. should be connected in each of the pick-up leads, care being taken to provide a D.C. path from the grid of the valve to H.T.—. If a radiogram change-over switch is used and the valve grid-leak is not in circuit when on the gram position, a resistance of approximately .5 meg. should be joined between the pick-up terminal of the switch and H.T.—.

Using a Microphone

A QUERY was received from a reader quite recently concerning the addition of a microphone to his battery-operated amplifier. He was surprised to find that when anyone spoke into the microphone a howl developed in the speaker. This trouble is quite commonly experienced unless the microphone and speaker are screened from each other. The microphone should be kept in a screened compartment if the speaker is near, otherwise the microphone will pick up the announcer's voice direct, as well as from the speaker.

Post Office Cables

THE Post Office is engaged in an important telephone cable programme in Scotland, and a part of this programme entailed the laying of two cables from Glasgow, via Inveraray, across Loch Awe to Oban. Over a considerable portion of the route solid rock had to be blasted out to provide a trench for the cable. I think the most interesting part of the laying of these cables was perhaps the section comprising 800 yards laid across Loch Awe. The depth of the loch and the abruptness of the loch bed prevented ordinary methods being used.

This is what they did : 400 empty metal casks, each of 5 gallon size, were attached at two-yard intervals to float the cables into position. These casks had to be sunk with the cable and in order to control the rate at which they sank, each cask was drilled with a 3/16-inch hole below the water line. When the cables were in position, Post Office engineers in four motor-boats punctured the tops of the casks commencing from the centre of the loch. Careful timing and control of the work was necessary since the cables when laid had to conform with the contour of the bed of the loch. On this account surplus cable was provided on each bank and fed into the water as the cable sank in the centre. To co-ordinate the work the Post Office established an ultra-short-wave radio-telephone link between both banks of the loch at Port Sonachan and Kilchrenan.

These new cables will not only provide additional long-distance lines connecting Oban with the main trunk system, but will enable this system to be extended to the Highlands and Islands of West Scotland, including the Outer Hebrides, which will be in communication with Oban by wireless telephone.

More About the

"Parvo" Flyweight Midget Portable

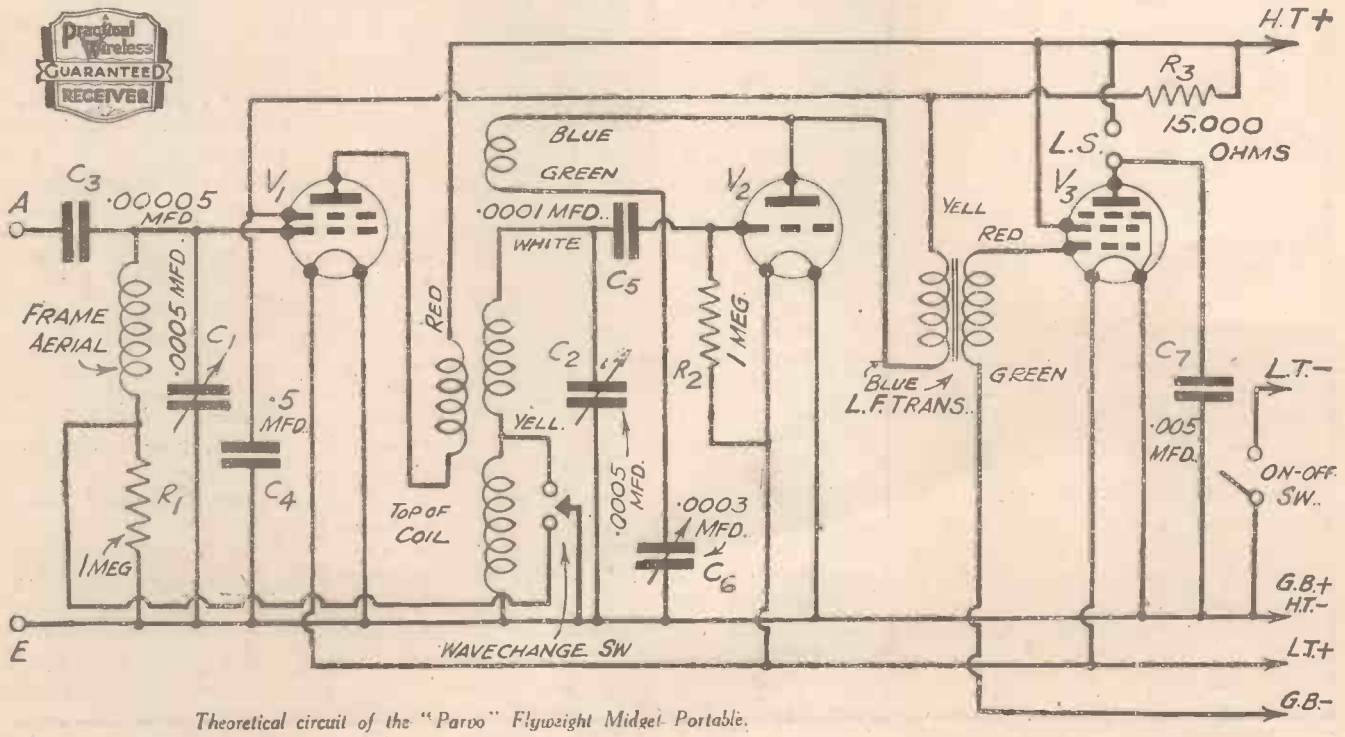
This Week We Give Details of the Cabinet and the Method of Operating this Ingenious Portable Receiver

WHEN the receiver is completed according to the details given last week, the next point will be to decide upon the type of containing case in which it shall be fitted. There is plenty of scope here for the individual constructor, although for those who do not desire to undertake this part of the work a ready-made cabinet may be obtained from Messrs. Peto-Scott. The simplest type of case will consist of a plain wooden box, preferably made from ply-wood to prevent warping. The rear side should be provided with hinges at the lower edge so that it may be lowered to replace the batteries or for test purposes, and the front may, if desired, be left open to expose the controls. This method will, however, leave the frame aerial winding exposed and liable to damage, and therefore a piece of suitable moulding may be placed round the front edge of the cabinet to cover this, whilst to present a neater appearance the speaker opening in the panel may be fretted instead of cutting out a plain circle as shown last week.

A better plan, and one which is incorporated in the Peto-Scott cabinet, is to have a sliding front provided with moulding at the upper edge to match the remaining front edges, and this permits the front to be slid upward to reveal the controls. An alternative plan, to avoid having to place the front on one side whilst the set is in use, is to adopt the form of construction which is utilised in the camera dark slide. The front should be cut right across, about three-quarters of an inch from the lower edge, and a length of linen affixed at the rear. The bottom edge should then be provided either with a thin strip of metal running right through the sides into which a thin slot has been cut for the purpose, or two fine pins may be driven through the front. Stops at the upper edge will prevent the pins from travelling beyond that point, and thus when the front is withdrawn to the stop position the lower strip will be held fast, and the upper portion will fall back upon the hinge formed by the linen. This is the idea illustrated in our cover illustration of this week's issue.

Here is the complete receiver ready for insertion in the cabinet.

There are, of course, many alternative arrangements which may be employed, but the outlines given above will enable anyone to design a cabinet to suit his particular



Theoretical circuit of the "Parvo" Flyweight Midget Portable.

Note how the tuning coil is mounted on the rear of the chassis.

needs. When all is ready the batteries should be placed on the rear chassis edge, and the various leads connected to the appropriate points. It will be noted that the H.T. battery incorporates a grid-biasing section, and the connection to the contact strips is probably simplest if crocodile clips are attached to the battery leads. For a more permanent contact the leads may be soldered, but care should be taken to use a really hot iron and avoid keeping it too long in contact with the battery, otherwise the internal connection may be loosened.

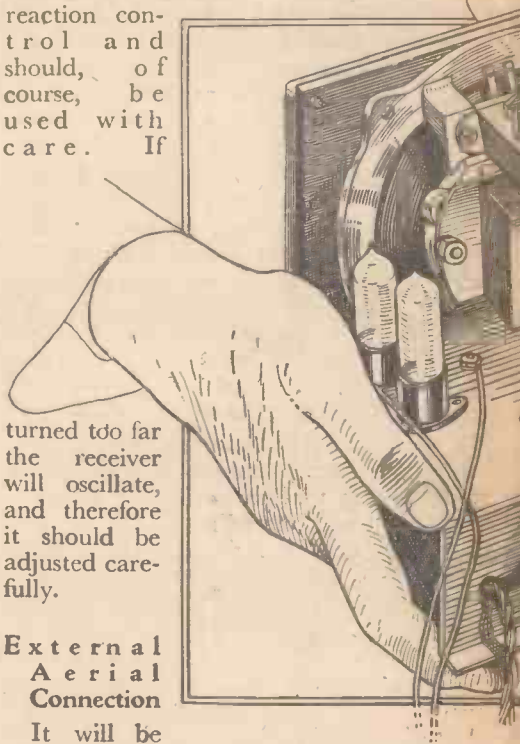
For connection to the accumulator it will also be necessary to use crocodile clips of the large type, or two spring contacts made from brass may be attached to a piece of paxolin and used for this purpose. In this connection it should be noted that many constructors may prefer to use the receiver with headphones only, and in that case a much larger accumulator may be employed and the standard type of terminal will then be available. Many more hours of service will be obtained from the receiver when a larger capacity accumulator is employed, but it must be left to the constructor to decide whether he requires loudspeaker reception or whether headphones will suffice.

Operating the Receiver

When the batteries are connected the receiver may be switched on, the push-pull switch on the right of the panel performing this function. The left-hand switch should also be pulled out in order to bring the normal or medium waveband into action, and the local station should be tuned in by turning condensers C1 and C2; that is, the two outside controls. They should be turned slowly together, keeping them as nearly as possible "in step." The right-hand condenser may be swung over a few degrees if necessary in order to make

quite certain that a position is found which coincides with that obtained on the other condenser, and when the local has been located, the two controls should be adjusted slowly for maximum response. The receiver should then be turned about in order to make use of the directional property of the frame aerial, and if no signals are located when the condensers have been turned through their full movement, this rotation of the receiver should be carried out and the controls again turned through the full movement. If, of course, you know in which direction the local station lies, then you can turn the receiver first to make certain that maximum volume will be obtained. The frame aerial should be in line with the station being received; that is, when standing on one side of the receiver and facing the station being received, the top edge of the frame winding should be viewed end on. If the local is very close at hand the volume may be too great and then the receiver should be turned slowly, so that the directional effect will act as a volume control.

When a station has been located the volume may be increased by turning the centre control in a clock-wise direction. This is the reaction control and should, of course, be used with care. If turned too far the receiver will oscillate, and therefore it should be adjusted carefully.



Our artist's impression of the receiver

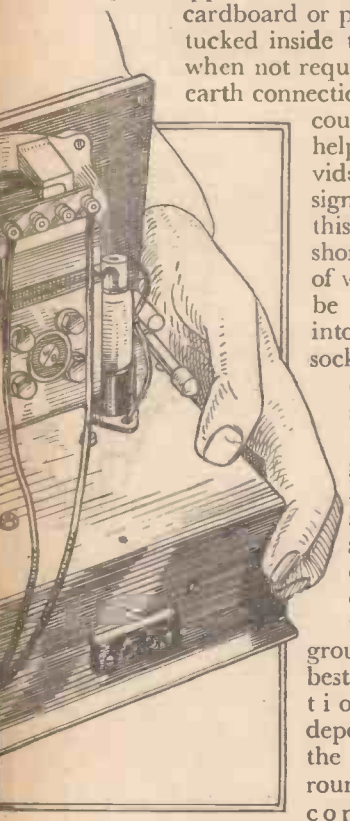
External Aerial Connection

It will be noted that a

LIST OF PARTS FOR "PARVO" F

One "Parvo" coil (B.T.S.), 3s. 9d.
60ft. 28 S.W.G. D.C.C. Wire (Peto-Scott), 1s. 3d.
Two .0005 mfd. Compax tuning condensers (C1 a
One .0003 mfd. Compax reaction condenser (C6)
Four fixed condensers (tubular type): .00005 (C7), .5 mfd. (C4) (T.C.C.), 5s. 0d.
Three fixed resistors, 1-watt type: two 1 megoh (Bulgin), 3s. 6d.
One L.F. transformer, type L.F.33 (Bulgin), 4s. 9d
One terminal socket strip (A.E.) (Belling-Lee), 9d
Three valveholders, midget type: two 4-pin, one 5
Two switches, type S.22 (Bulgin), 2s. 11d.
Three midget valves, XSG (V1), XD (V2), XY
One metal chassis, 6½in. x 4½in. x 2½ in., and pan
One pair headphones (B.T.S.), 7s. 6d.
One midget loudspeaker, type 37M (W.B.), 17s. 6
One H.T. battery (72 volts), type H1139 (Exide),
One 3 A.H. accumulator, type PRP3 (Exide), 7s.
One cabinet (Peto-Scott), 19s. 6d.

socket is provided on the rear of the chassis for the connection of an external aerial. This may conveniently be a length of thin flex, to the end of which a plug is attached. The plug should be inserted into the Aerial socket and the length of wire laid along the ground, thrown over a wooden fence, or otherwise extended. A length of about 20ft. will be found most suitable, and it may be kept wrapped round a strip of cardboard or paxolin and tucked inside the chassis when not required. An earth connection will, of course, also help to provide louder signals, and for this purpose a short length of wire should be inserted into the Earth socket and the other end stuck into the ground, laid in a shallow stream or otherwise connected to the ground. The best connection will depend upon the local surroundings and conditions which obtain when the set is being used. It should be remembered, however, that very dry ground or sand will not provide a very efficient connection, and a wet patch will be much more effective.

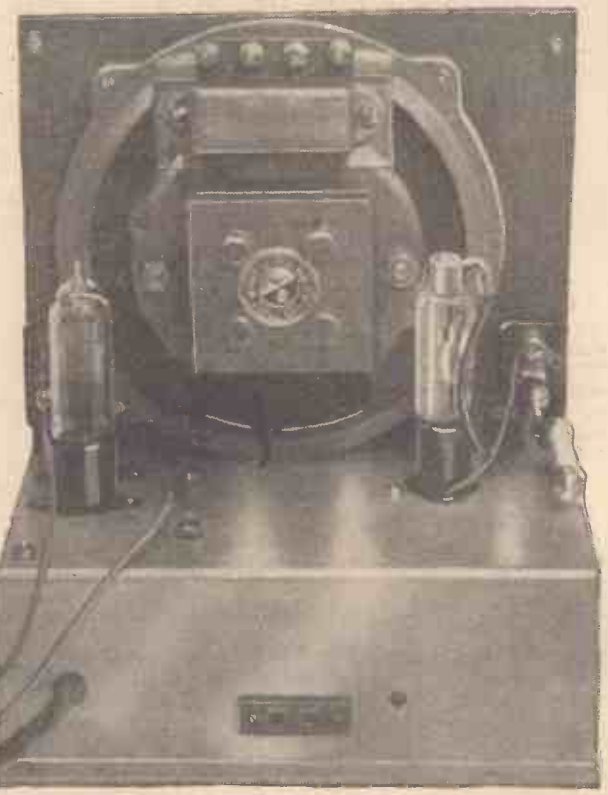


gives an indication of its size.

For long-wave reception, the left-hand switch should be pushed in, and the controls operated exactly in the same way as for medium-wave reception.

Higher Voltages

It is possible that some listeners may desire to use this receiver for general home use, in which case a larger H.T. battery could be employed in order to obtain greater volume. The problem of the cabinet would not then be so important, and the batteries could be placed externally, or a larger type of cabinet could be built. It will be noted from the circuit diagram on page 347 that no G.B. positive lead is fitted to the receiver owing to the fact that the specified H.T. battery incorporates a grid-biasing section and thus the G.B. positive and H.T. negative contact is common. To use a larger H.T. battery, therefore, a separate G.B. positive lead will have to be attached to the receiver and it should be connected to the bolt on the chassis near the loudspeaker to which the H.T.— lead is at present attached. The maximum H.T. voltage recommended by the makers for the valve in use is 100 and the grid bias for this voltage is 9 volts. Therefore a 9-volt G.B. battery should be obtained and the G.B.— plug inserted in the 9-volt socket, with the G.B. positive plug inserted into the socket marked with the positive (+) sign. Used under these home conditions with an outside aerial it may also be found desirable to substitute a pre-set or small variable series aerial condenser in place of C3, and this may be mounted on the cabinet near the aerial socket so that the maximum setting may be obtained under varying conditions.



There is ample space on the chassis for the H.T. and L.T. batteries.

LYWEIGHT MIDGET PORTABLE

nd C2) (Polar), 5s. 0d.
(Polar), 2s. 6d.
mfd. (C3), .0001 mfd. (C5), .005 mfd.
m (R1 and R2), one 15,000 ohms (R3)
-pin (Clix), 1s. 10d.
(V3) (Hivac), 41s. 6d.
el 6½ in. x 7¾in. (Peto-Scott), 7s. 6d.
d.
6s. 0d.
0d.

TRANSMITTING TOPICS

In this Article the Design, Operation and Adjustment of the Power Amplifier are Dealt With

By L. ORMOND SPARKS

THE power amplifier in a transmitting circuit—more usually referred to as the P.A.—is primarily designed to supply power to the aerial circuit by amplifying radio or high-frequency currents previously generated. In spite of the frequency it is called upon to handle, it can hardly be considered in the same light as an ordinary H.F. amplifier. In fact, it can be more accurately likened to an L.F. power amplifier, as the power involved necessitates the use of L.F. power or pentode valves, together with sufficient grid bias to produce the correct operating conditions. Many amateurs have some difficulty with the P.A. stage. They are unable to grasp its method of operation and/or obtain the utmost efficiency, and I am inclined to think that all their troubles are due to the lack of appreciation of what constitutes *correct operating conditions.*

A Comparison.

The quickest way to understand a P.A. stage is to use an ordinary L.F. or output stage as the basis for the investigations. It is well known that when a valve is used as an L.F. amplifier, one is concerned only with the straight portion of the characteristic curve of the valve concerned, i.e., the grid volts/anode current curve.

This can be appreciated more readily, and the whole operation of an L.F. amplifier summed up, by reference to the curve

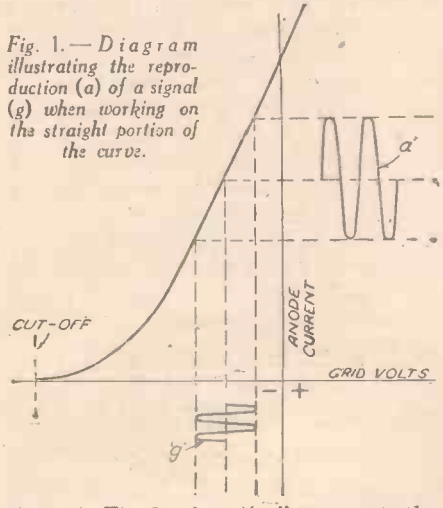


Fig. 1.—Diagram illustrating the reproduction (a) of a signal (g) when working on the straight portion of the curve.

shown in Fig. 1, where "g" represents the input and "a" the anode output. Providing the valve is operated on the straight portion, the anode output will be identical—though amplified—to the input, but if the input is such that it drives the grid too far along the negative line, then distortion of the output curve is bound to be produced. It is also possible, of course, for the input to drive the grid curve into the positive section; in which case grid current will be set up, distortion introduced, and the effect of the input reduced.

In case this is not too clear, it is only necessary to draw a fresh grid volts/anode current curve with "g" having greater amplitude. It will then be obvious that the operating portion will be brought down into the bend of the grid volts/anode current curve and/or too far over towards the positive bias or zero negative bias point.

In the first case the bottom of the output curve will be chopped off, while in the second, the grid will become positive and act as an anode, thus producing current (grid current) in the grid circuit, a most detrimental state of affairs in L.F. amplifiers. From this it will be seen that the operating portion of the curve is limited and the actual efficiency of the arrangement low. It is these defects or limitations which necessitate operating a P.A. under rather different, and what may seem unorthodox, conditions.

The Effects of Distortion

With the L.F. example, the distortion produced will result in the output consisting of the frequency of the input *plus* harmonics of the original frequency, and as it is possible for the average loudspeaker to reproduce the majority of these, the reproduction will not be a faithful magnification of the input. Supposing, however, that we are only concerned with one frequency and that it is possible, by using some simple arrangement in the anode circuit, to ignore any multiples or harmonics of that frequency then it appears that the efficiency and output of the amplifier might be increased. These are the conditions which apply to a P.A. stage. One can consider—for practical purposes—that the valve is called upon to handle one frequency only—at high frequency, of course—and that the tuned-anode circuit will select or accept the frequency of the input only and ignore all others.

This allowance in the operating limits means that the possibility of introducing distortion *need not be* considered or, in other words, the grid input can be increased irrespective of whether it drives the operating point on the grid volts/anode current curve down into the bottom bend. In fact, a P.A. stage is generally biased well past the "cut-off" point, as shown below.

Referring to Fig. 2, it will be seen that the grid drive and bias have been adjusted so that the operating portion swings down into the bottom bend. If the resultant anode curve is examined, it will be noted that it now represents a series of pulses, and it is these which are used to develop the power in the anode circuit.

The Effect of Bias

It will be remembered that when a parallel-tuned circuit is in resonance (i.e., exactly in tune) with an applied signal, it can be considered as a high-resistance load. If, then, a suitable coil and condenser combination is placed in the anode circuit of the P.A. valve, it is obvious that the pulsations will set up an oscillatory voltage across the circuit, and cause an oscillating current to flow therein, *when* the combination is tuned to the frequency of the input. Any harmonics which might be present will have negligible effect, as the circuit—usually referred to as the "tank" circuit—will be out of resonance so far as they are concerned, thus providing a low resistance or impedance which will not allow any appreciable power to be developed.

The efficiency of the arrangement is greatest when the pulses are high and narrow, and they can be made thus by increasing the bias applied, but it must be remembered that the drive must also be increased accordingly. It is the adjustment of the bias which makes the operation seem, at first sight, so unorthodox compared with its L.F. counterpart. It is quite usual to bias a P.A. stage to twice—and even more times—its "cut-off," providing, of course, that there is sufficient drive available to warrant such conditions.

There is one point which must not be overlooked. The increase in efficiency obtained by the above methods is *not* an increase in the sense of obtaining greater output for a given input. For example, additional power is required to drive the grid swing hard over under such conditions. Similarly, if the drive is increased still further—with the object of getting even greater output—the input curve will cut too far into the positive area; grid current will flow, representing a power loss, and the drive will be—so to speak—held back.

The most, if not the only efficient way of increasing the power of the output is to increase the anode high tension and, at the same time, increase bias and drive. There are, however, limitations, the chief of these being the power which the valve can dissipate. The power lost often being sufficient to raise the anodes to a red heat, while large H.F. currents can produce

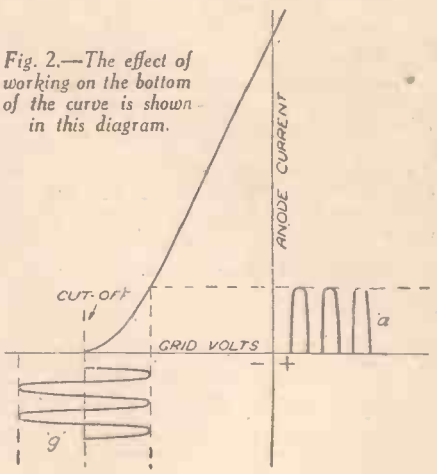


Fig. 2.—The effect of working on the bottom of the curve is shown in this diagram.

sufficient heat to damage the structure of the valve and set up numerous troubles.

A Problem of Wattage

The efficiency of suitable triodes, when operated under P.A. conditions, is in the region of a power ratio of 8 : 1, but much better figures can be obtained from circuits using pentodes, although the actual percentage efficiency will depend, to a great extent, on the frequency concerned. Many beginners are not too clear regarding anode dissipation rating as connected with watts input to the aerial. For example, one might be using a valve which, according to the makers' figures, has a safe anode dissipation of, say, 30 watts, yet the input to the aerial might be 70 watts.

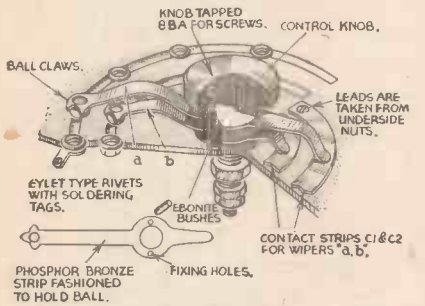
One is chiefly concerned with the anode efficiency of the stage, as I will endeavour to make clear next week.

A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — **READERS WRINKLES** — THE HALF-GUINEA PAGE

Interesting Switch Design

THE detailed drawing which is given below clearly shows an interesting double-pole rotary switch, embodying a rather novel method of maintaining a definite position indication and continual contact wiping. It gives a plan view of the mode of insulating the two wipers from the switch rotor, and parallel-wiping contacts, C1 and C2, permit under-panel

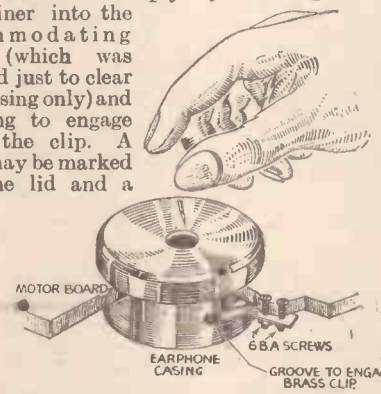


A self-locking switch which has numerous applications.

wiring. The contact arms A and B are constructed of phosphor-bronze sheet, and the eyelets were of the stationer's type, and the inclusion of solder tags resulted in neat wiring and prevented excessive solder in the interior of these rivets or eyelets. The grooves in which the ball bearings travel are, of course, optional, but tend to make a definite click on each position of the switch.—A. T. WARD (Edgware).

A Used-needle Container

A VERY neat used-needle container may be simply constructed from a disused earphone, and if incorporated in the manner shown in the sketch, the removal for emptying necessitates just a slight turn and pull disengaging the brass spring from the groove shown, leaving the cap to be unscrewed in the ordinary way. Replacement is simply by inserting the container into the accommodating hole (which was drilled just to clear the casing only) and turning to engage with the clip. A line may be marked on the lid and a corresponding line on the motor board to facilitate replacement and withdrawal—this is, of course, optional—whence a click will be heard on handling—without turning the container.—R. G. SMITH (Northampton).



Using an old earphone as a gramophone needle cup.

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., Tower House, 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 wrinkles.

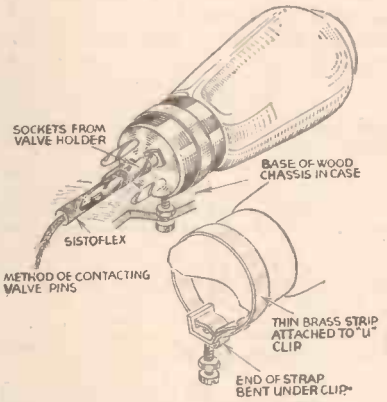
Tone Control Indicator

THE illustration below shows a rather novel tone control colour system which I have incorporated in my receiver. As will be seen, the principle of conveying light rays along a strip of glass is utilised, and arranged so that a number of glass microscope slides—(strips of glass) constitute the means of attaining a series of colour variations in "steps" by the intermediate functioning of a colour medium—in this case being in the form of a piece of coloured glass plate controlled by a strong thread and pulley system—and by adjusting to suit the total angle of rotation of the tone control, T.C., the variation in colour intensity is made to correspond to the tonal reproduction of the receiver.

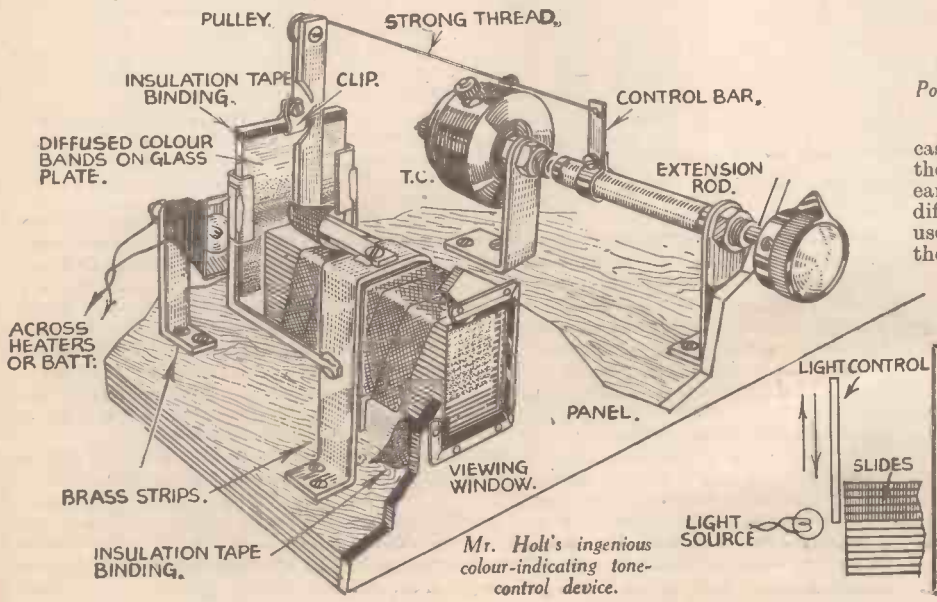
Another and more definite effect will, of course, be obtained in using a non-translucent medium, whence a decided light and dark stepping system will result.—P. A. HOLT (Lincoln).

Novel Valve Mounting

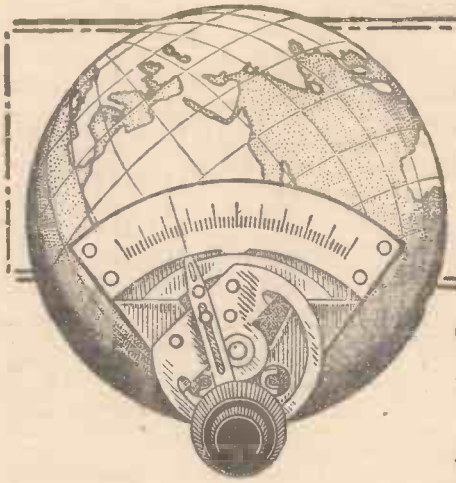
WHEN building a portable receiver to fit into a small leather attaché case, I found difficulty in fitting the valves, the case being too shallow. I therefore turned the valves on their sides, and utilising an earth clip, as illustrated, overcame the difficulty. The screw in the earth clip was used to fasten the whole job down, using the sockets from a valveholder. I saved more space, also illustrated, by connecting straight into the wiring.—A. HIGGINS (Bristol).



Portable design is simplified by adopting the form of valve mounting shown here.



Mr. Holt's ingenious colour-indicating tone-control device.



SHORT WAVE SECTION

COMPONENTS FOR THE SHORT-WAVER

Giving Useful Hints Concerning the Choice of Short-wave Components - - - - By IDRIS EVANS

WHEN building a short-wave receiver the components must be very carefully chosen if good reception is to be obtained. This does not mean, however, that all components used in broadcast-band receivers cannot be satisfactorily used in sets designed for reception below 100 metres. The L.F. amplifier components normally used in medium-long-wave sets are quite suitable for short-wave receivers, as the wave form in the low-frequency section of both receiver types is of a similar nature. In the H.F. section, however, the frequency is much higher in the short-wave receiver than in the medium-long-wave type and therefore greater precautions must be taken to avoid losses.

Valve-holders and Coil Formers

Valves with special high-insulation bases have now been designed for short-wave reception, but unless the valve-holder is also made from high-insulation material optimum results will not be obtained. The valve-holders used in the detector and H.F. stages should, therefore, be carefully chosen. The use of a low-insulation holder can cause loss of reaction on the lower wave-bands owing to excessive damping of the tuned circuit. It is obvious that there is no advantage in using a high-resistance grid leak in the detector stage if the insulation between the grid and filament sockets of the holder is low. Coil formers should also be carefully chosen, and although compressed cardboard is commonly used nowadays, constructors are advised to wind their coils on low-loss formers—bakelite and porcelain are suitable materials. Alternatively, commercial coils of reliable make should be used.

Tuning Condensers

The two most important points to watch when choosing the tuning condenser are the minimum capacity and the effectiveness of the contact between the moving vanes and the tag or terminal to which they are connected. If the minimum capacity of the condenser is high the minimum wavelength to which a coil can be tuned will be too high. For example, a coil designed to tune to a minimum of 17 metres may only tune down to 19 metres if the minimum capacity of the tuning condenser is high. One of the drawbacks of the old type short-wave receiver was noisy tuning, due to bad contact between the moving vanes and the terminal connected to them. This difficulty has now been overcome, however, and if the constructor buys a condenser of reliable make no trouble will be experienced from this source. Even standard condensers designed for medium and long-wave reception are generally found to be noise-free when used in short-wave receivers.

The maximum capacity of the tuning condenser is not quite so important as most constructors seem to imagine. In a receiver designed for reception between 15 and 100 metres a capacity of between .00015 mfd. and .00025 mfd. may be satisfactorily used. Many modern receivers use condensers having a maximum of .0005 mfd., but the constructor is not advised to use this high value if best results are desired. When a high capacity is used the wavelength range covered by one coil will be greater than with a low-capacity condenser in use, of course, and this is probably the reason why .0005 mfd. condensers are often used in commercial receivers. A wave-band of approximately 17 to 50 metres may be covered without coil changing if the tuning capacity is .0005 mfd., whereas with a maximum of .00015 mfd. the maximum wavelength to which the same coil could be tuned would be approximately 35 metres. When the capacity is over approximately .0003 mfd. the efficiency towards the top end of the tuning scale is low, however, and therefore the capacity limits mentioned above are recommended.

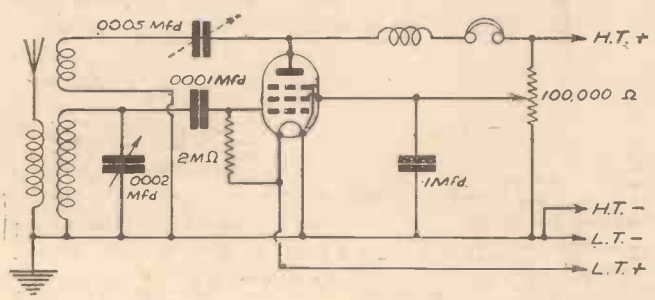


Fig. 1.—An efficient single-valve short-wave receiver may be built round an H.F. Pentode valve, controlling reaction with a screen-grid potentiometer.

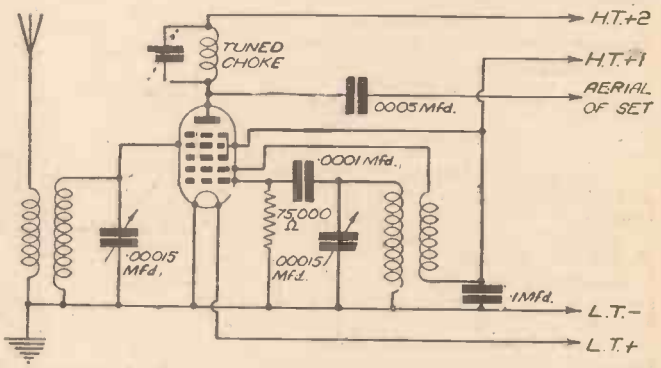


Fig. 2.—A single-valve superhet converter utilising a pentagrid as the frequency-changing valve.

Valves

Several valve types are suitable for use in short-wave receivers, but the beginner is advised to use triodes. A suitable triode used in a simple one-valve receiver can be relied upon to give satisfactory results—a valve having an impedance of approximately 10,000 ohms is generally found to be suitable. A one-valve unit using a triode can be used as an independent one-valve receiver, an adapter, or as a converter. When used as a superhet converter satisfactory results up to a wavelength of approximately 100 metres can be obtained.

An S.G. or an H.F. pentode valve can also be used in a one-valve unit—the diagram of a one valver using the latter type is shown in Fig. 1. It will be seen that reaction is controlled by means of a screen voltage potentiometer, the variable reaction condenser normally used in conjunction with a triode valve being replaced by a preset type—it is even permissible to use a fixed condenser provided that the value is carefully chosen.

If it is desired to tune above 100 metres it is advisable to use a triode-hexode or a pentagrid in the one-valve converter, (Fig. 2), but these valve types are not suitable for use if the unit is to be employed as an adapter or an independent one-valver.

Leaves from a Short-wave Log

Powerful Brazilian Broadcaster

THE 12 kilowatt PSE, Marapicu, station working on 20.09 m. (14.935 mc/s) is now used for the transmission of special programmes to Europe. It may be heard frequently towards G.M.T. 21.00 relaying a running commentary on some sporting or athletic event and usually concludes with a news bulletin in the German language. The call is: *Here PSE, the Brazilian propaganda station,* followed by details of wavelength and frequency.

Alterations in Bangkok Schedule

The regular Monday broadcast from HS8PJ, Bangkok (Siam), on 15.77 m. (19.02 mc/s), which hitherto has been given from G.M.T. 13.00-15.00, has now been suspended. It is replaced by a transmission on 32.09 m. (9.35 mc/s). The new schedule is G.M.T. 06.00-07.30, 12.30-15.00 every Thursday. The interval signal consists of three notes on ascending scale.

Nairobi's Summer Programme

As there appears to be some doubt regarding the VQ7LO transmissions, readers may care to make a note of the latest times advertised: Daily, except Sundays, G.M.T. 11.00-11.30; 16.45-19.45 (daily); 13.45-14.43 (Tuesdays and Thursdays only); and on Saturdays from 11.00-11.45 and from 16.15-19.15, and occasionally to 19.45.

A Far-flung Call

France has added a further unit to her system of Colonial short-wave broadcasting stations by the installation of a transmitter at Fort-de-France, in the island of Martinique. The station operates on 31.73 m. (9.454 mc/s) and transmits a daily programme between G.M.T. 16.00-17.00 and again from 22.15-23.00. It carries out frequent relays of the Paris-Colonial news bulletins.

Another Spaniard on the Ether

PCE1, Madrid, is the call of a new Spanish Republican station giving out daily war news bulletins at G.M.T. 22.45. The wavelength is 40.30 m. (7.445 mc/s). More interference in the amateur transmitters' band.

W2XAD Carries You Around U.S.A.

If you tune in W2XAD or W2XAF, Schenectady, respectively on 19.56 m. (15.33 mc/s) and 31.48 m. (9.53 mc/s), on any Monday, you may be given an opportunity of hearing one of their famous travelogues consisting of a talk on the wonders of some famous historical or geographical spot in the United States. The broadcast, given in French, English and Spanish, is transmitted in our language at G.M.T. 22.15.

Rocky Point's Most Powerful Transmitter

The new WEF high-power station situated at Rocky Point (New Jersey) has been designed to put over signals to Europe under all conditions of atmospherics and fading; its power is over 200 kilowatts. The channel used is 28.25 m. (10.62 mc/s). It has been freely reported that the morse transmissions received in Great Britain are from 750-1,000 times stronger than those transmitted from the U.S.A. on long waves at equal power.

ZTJ, Johannesburg

The regular schedule of this South African broadcasting station on 49.2 m. (6.1 mc/s) is as follows:

Weekdays: from G.M.T. 05.45-06.45 and 09.15-13.30; 16.00-21.55, except Saturdays when the broadcast is extended one hour. On Sunday ZTJ is on the air from G.M.T. 10.00-11.15, 14.00-18.00, and from 18.15-21.15.

Proposed Finnish S.W. Transmitter

In the near future the Helsinki (Finland) programmes are to be relayed on a short-wave channel in order to make them available to a greater number of overseas listeners. The Finnish authorities are considering the installation of a suitable station near Lahti, in the immediate neighbourhood of the long-wave transmitter.

Bandoeng's Midnight Transmissions

If you tune in to 29.24 m. (10.26 mc/s) at G.M.T. 23.00, you may hear the early morning broadcast from PMN, Bandoeng. At G.M.T. 23.20, you will pick up chimes striking 7.0 a.m. Broadcasts are not carried out on Sundays or holidays.

CT1AA Maintains Regular Schedule

In addition to its news bulletins, the programme schedule on 9.65 mc/s (31.09 m.) provides musical transmissions every Tuesday, Thursday, and Saturday between G.M.T. 21.00-23.00. Don't forget the cuckoo interval signal repeated three times.

RADIO FAULT TRACING—6

Further Details Concerning Ganging and Causes of Distortion, are Dealt With in this Article

CHECK the pointer setting of the receiver. This is an important matter as the ganging work can be rendered unnecessarily tricky if the pointer is not set properly relative to the rotor of the ganged condenser. Adjust the oscillator frequency to the chosen test value and turn the receiver tuning control to the dial reading appropriate to this frequency; also adjust the oscillator's attenuator control to give a suitable initial reading on the output meter.

The next move is to make the actual trimming adjustments. If the receiver employs reaction it is advisable to do the trimming with the reaction control advanced to a setting that the user would normally employ when searching for distant stations. The first trimmer to be adjusted should be that associated with the detector input circuit, and the other trimmers should be adjusted in turn, working back towards the aerial. Each trimmer should be adjusted to give a definite peak reading on the output meter. If, as progress is made, the meter reading starts to get high on the meter scale, cut down the oscillator output accordingly. Should the receiver jump into oscillation, reduce the reaction setting.

If it is found that one trimmer has to be adjusted to minimum or maximum without reaching a "peak setting" try adjusting the trimmer while the main tuning control of the receiver is varied slightly each way. If an optimum setting of the trimmer can be found with the main tuning control slightly altered, leave the latter at the new setting, and attend to the trimmer adjustments all over again. The point here is that the initial setting of the ganged condenser may have been slightly out, particularly if the dial is not very accurate, or if the pointer setting is not critical.

When every trimmer has been given a definite optimum adjustment the ganging should be in order for the waveband concerned. To make sure that all is well, however, the following checks should be made: verify that the receiver has not been lined up with a little too much capacity in all the trimmers, by setting the receiver tuning to the lowest wavelength of the band and resonating the test oscillator to the receiver. The oscillator should be at a frequency corresponding to this wavelength. Check up on the matching of coils and ganged condenser sections by testing the trimmer settings at a wavelength, say, about half-way up the waveband, but be careful that the trimmer adjustments are left at the optimum setting found at the higher test frequency.

A Possible Problem with the Superhet

If the other wavebands of the receiver involve separate trimmers each of these wavebands should be dealt with in the manner described. With most M.W./L.W. straight receivers, however, ganging on the M.W. band will be all that is necessary.

It will be noted in the foregoing that single peak indications on the output meter have been adjusted for, and it will be unusual if the adjustments are not satisfactory with a straight receiver of average type.

There are certain peculiarities in the case of ganging a superhet receiver. The I.F. stages must be attended to before any other sections of the receiver, and if the I.F. value is not known, the best thing to do is to apply an I.F. test signal from the testing oscillator and to tune the oscillator to give maximum response through the I.F. stages. Ignoring the possibility of the receiver adjustments having been tampered with, it is fairly reasonable to hope that all the I.F. circuits will not be so badly out of adjustment that the test oscillator frequency giving the maximum response will not at least be somewhere near the correct value.

Once the question of I.F. value is settled, the ganging of a superhet, although more involved than in the case of a straight receiver, is not to be regarded as complex. The only difficulty (and only in certain cases) may be that already touched upon, namely, that of getting the right shape of response curve.

Distortion

There are two different types of distortion. One is frequency distortion, which is produced by the receiver giving disproportionate amplification to different frequencies, *i.e.*, "cuts" high notes, exaggerates high notes, shows frequency resonances, etc. It must be understood that frequency distortion is to be expected of every receiver of average type, and that it is to be regarded as a fault only when the distortion is greater than normal. Incidentally, if frequency distortion is greater than normal a non-technical owner of a receiver does not usually say that the receiver is distorting. "The tone has become poor" is the complaint usually made.

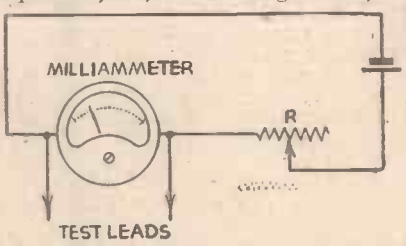


Fig. 1.—Method of using a milliammeter for low-resistance testing.

The other kind of distortion is amplitude distortion. With this type of distortion the modulation waveform of the signal is so badly treated by the receiver that alien frequencies are introduced and the sound emitted by the speaker thus contains components not present in the original. Very little amplitude distortion can be tolerated without the reproduction being considered definitely most unpleasant. Amplitude distortion will occur as a result of valve overloading; speakers, too, can become overloaded if too great an input is applied and will produce amplitude distortion. With some receivers overloading will occur if a local station is tuned in and the receiver worked at the fullest volume of output. It would not always be fair to the designer, however, to regard such a case as that of a fault.

The minimising of frequency distortion is very much wrapped up in the design of the receiver. The High-Frequency response, the proper matching of valve and anode load impedances, the correct choice of a large proportion of the fixed condenser values, and, of course, the design of the speaker, are all matters that have a bearing on audio-frequency response. Certain receivers will be found to contain tone correcting devices. The most familiar example is that of the compensating condenser, or condenser-resistance combination, shunted across the primary of the output transformer when a pentode output valve is in use in the output stage. Naturally, tone correction arrangements should be viewed with the eye of suspicion if frequency distortion is bad.

To deal generally with the procedure in tracing causes of distortion—if there is no particular clue immediately apparent—it will be advisable to check up on the valves and the valve operating voltages, as a first move. It is important to check up on the operating conditions of the valves as in some cases quite a small departure from normal will introduce distortion. The process of valve and valve voltage checking will amount to a check up on quite a large number of fault possibilities. With push-pull, class B or Q.P.P. output stages, a special watch should be kept for any signs of inequality in the two halves of the system. A milliammeter test in each output anode circuit in turn should be made if there is any doubt on the matter.

If the valves are in order and have been proved to be working under correct voltage conditions, and if the trouble is that of amplitude distortion it is high time to consider the speaker as the possible seat of the trouble. There may be a damaged cone (or cone suspension). With a moving-coil speaker there may be filings or other particles in the gap, speech-coil former off centre, or loose speech coil turns. Such faults as shorting turns in speaker or output transformer windings are to be mentioned, although these would probably call for investigation more on the score of weak reception. A similar remark applies to the possibility of a weak magnet with a P.M. speaker.

If a receiver incorporating A.V.C. shows evidence of excessive valve overloading although the valves are in order, there is every possibility that something has gone wrong with the A.V.C. system. All resistances, condensers, and connections associated with the A.V.C. network should be checked over.

The cause of excessive frequency distortion is not always easy to find. As regards a detector or L.F. stage it will be advisable to check all resistance and capacity values and the resistances of any transformer windings should also be closely checked.

More General Testing Notes

In an earlier article of this series mention was made of the importance of having means of carrying out low-resistance ohmmeter tests. There is a great difference between a low-resistance coil in normal condition and the same coil with a number of the turns shorting, yet the difference would not be appreciable on an ohmmeter test if the instrument were not designed for low-resistance measurements.

If any reader is experiencing difficulty where low-resistance tests are concerned, but possesses a low-resistance milliammeter, he can very easily make a device which will give comparative indications on low resistances.

In Fig. 1 a milliammeter is shown connected up to a D.C. voltage source through a variable resistance. The latter should be adjusted until the meter is giving full scale reading.

Suppose the milliammeter happens to be a 0-30 mA instrument with a resistance of 5 ohms. If a 5-ohm shunt were placed

(*Continued on next page*)

RADIO FAULT TRACING

(*Continued from facing page*)

across the meter the reading would fall back. As to the exact position where the needle will settle, this will be partly dependent upon the value of R and the voltage regulation of the supply, but it will be somewhere above the 15 mA scale reading. A 4-ohm shunt would give a lower reading; a 3-ohm shunt lower still, and so on.

Thus we have got an arrangement whereby different low resistances will give certain and different meter readings. Furthermore, with decreasing values of shunt resistance readable indications can be obtained down to a minimum value that may be regarded as surprising by those who have not used such a device before.

To use the arrangement as a testing device two extra leads should be taken from the milliammeter terminals and used as the test leads. For making comparative tests the device can be used as it stands; for actual resistance measurements calibration would, of course, be necessary. The lower the resistance of the meter the lower will be the minimum value of resistance that will give readable indication on the meter. The usual care to guard against meter damage should be exercised during the rigging up of the arrangement and the initial adjustments.

Poor Selectivity

The overall selectivity of a receiver is something upon which each of the H.F. tuned circuits has a bearing. Thus, when the selectivity of a receiver is below normal it is necessary to take an interest in any factor that affects the selectivity of each individual H.F. tuned circuit. The superhet receiver has certain selectivity peculiarities of its own, but these will be dealt with in the next article.

If selectivity is below normal a ganging check may be useful in some cases, not only because the actual trouble may be directly associated with ganging adjustments but also because the effect of some particular test readjustment may give a clue as to the particular circuit which contains the fault.

It is a fundamental fact that the selectivity of any given tuned H.F. circuit is lower the greater the effective H.F. resistance of the circuit. Very frequently the search for the cause of low selectivity will develop into a hunt for a fault that is putting up the H.F. resistance of a circuit. It is important to note that the H.F. resistance of a circuit can be increased either by an increase of resistance in series with the circuit, or by a reduction of resistance in shunt with the circuit. Thus it is necessary to take into account not only the series circuit itself but also all components which are connected, either actually or effectively, across the circuit.

The possibility of a valve being to blame must be allowed for and this, again, is one of the occasions when valve substitution may solve the problem.

If the valves are O.K. and it has come to a case of trying to track down the cause of excessive damping in some particular H.F. circuit the actual procedure will be greatly dependent upon the actual arrangements of the circuit and the accessibility of the various parts. If the circuit has M.W./L.W. switching (shorting out the L.W. winding on the medium range) and the selectivity is below normal only on the medium-wave range the switch contacts should be closely examined. Any excess resistance in the contact must inevitably have a bad effect upon the medium-wave performance.

(*To be continued*)

New McMichael Receiver

Twin Speaker Superhet De-luxe with Self-tilting Giant Dial

McMICHAEL RADIO LTD. announce the release of the new Model 137 twin speaker all-wave superhet de-luxe, the first of the 1938 McMichael programme. This incorporates many ingenious new features, foremost amongst them being the self-tilting giant dial with autographic indication. This dial is 10in. square, shows stations three times their usual size, and, as the cabinet lid is opened, tilts upwards automatically to the ideal viewing position whether the listener is sitting or standing. A Magic Eye is built into the dial itself, whilst the glass cover is fitted with a special autographic surface on which the exact position of short-wave stations can be marked as they are recorded.

The new McMichael receiver, showing the self-tilting dial lifted to provide easier tuning.

A special "free-wheel" tuning drive is incorporated whereby the change from low to high gear is made automatically after a few degrees movement of the knob. The dial is floodlit from above and an illuminated emblem on the cabinet front shows when the set is on and the lid closed. Incidentally, the lid can be closed without the slightest effect on the tuning even of short-wave stations.

The specification includes 8-stage band-pass all-wave superhet, available in separate models for A.C. or A.C./D.C. mains; six tuned circuits, full A.V.C., and multiple valves are used in each model. The wave ranges are 16.5-50 metres, 200-550 metres, and 850-2,000 metres (A.C. model).

There are four controls: tuning, wave-change, volume, and tone.

The output is rated at 3 watts A.C., 2 watts in the A.C./D.C. model.

The price is 16½ guineas for the A.C. model and 17 guineas for A.C./D.C.

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.

Bradford Short-wave Club

THE Bradford Short-wave Club has been arranging a winter syllabus, and there are a few vacant dates. Any offers of lectures and demonstrations to fill these would be appreciated.

By the time the winter session begins, the club transmitter will be working on artificial aerial. Meanwhile, local enthusiasts who are interested in the morse code are reminded of the class run by Mr. K. Abbott.

Meetings are held in the Bradford Moor Schools, Leeds Road, Bradford, on Friday evenings from 7.30 to 11 p.m. (Morse, 9 to 10 o'clock, and bring your own 'phones.)

A little correction has just come to hand with the publication of the Directory of Radio Clubs and Societies. In the list, Mr. Walker's call sign is given as 2BWR. It is in reality 2AWR, the mistake apparently having arisen through confusion with the club's call sign, which is 2BWC.—Hon. Sec., Mr. G. Walker, 33, Napier Road, Thornbury, Bradford.

Halifax Experimental Radio Society

THE above society has been through changing times during the past few weeks, the weekly meeting night having been changed from Thursday to Wednesday, and, due to the resignation of Mr. Crewe (chairman), a new chairman has been elected, to wit, Mr. J. A. Dixon, Ripponden, Yorks.

Members have been entertained for the past three meetings by: (1) Mr. Cobb (2ABC), talking on self-excited oscillators; (2) Mr. J. A. Dixon, on problems in the design of L. F. amplifiers; and (3) Mr. T. Murgatroyd, on his experiences on wavelengths below 10 metres.

Interested readers are asked to communicate with the secretary or come along to the next meeting where they will be sure of a hearty welcome.—Hon. Sec., J. B. Bedford, Oak House, Triangle, Yorks.

The Liverpool Short-wave Radio and Transmitting Club

THE above club now hold meetings each Monday and Thursday at 8.30 p.m. at their clubrooms at 11, Wavertree Road, Liverpool, 7. We now have a fully-licensed transmitting member and also a number of other members have either applied for A.A. licences, or already hold them. Work will soon be commenced on a club transmitter. Details of the club can be obtained from the Hon. Secretary, Mr. C. E. Cunliffe, 368, Stanley Road, Bootle, Liverpool, 20.

Chadwell Heath and District Radio Society

THE address of the above society is Chadwell Heath and District Radio Society, Ralphs Café, Tram Terminus, Chadwell Heath, Essex.

The yearly subscription is 2s. 6d. and 6d. per week, per attendance. G. amateurs are specially invited, also short-wave listeners.—Hon. Sec., Rowland C. E. Beardow, 2BZB, 3, Geneva Gardens, Chadwell Heath.

Leeds Radio Society

THE above society has been reorganised and is now at 34, Wellington Street, Leeds, 1.

The clubroom is open to members every day from 9 a.m. to 10.30 p.m., and each member has a key.

It is claimed that this is the only radio club in the country which is organised on these lines.

The subscriptions are £1 12s. 6d. yearly, paid either yearly, half-yearly, quarterly or monthly, the entrance fee is 1s. and 6d. is charged for door key.

The transmitting section has H. R. B. Gautby (G6GA) as leader, assisted by F. Tillotson (G6XT) and J. Murphy (G6MY).

The receiving section is divided into H.F. and L.F. sections, led by W. F. Wilson on H.F., and B. Stagg on L.F., assisted by G. Barnett.

The morse practice is led by R. Peck.

All communications to be addressed to the Hon. Sec., G. F. Webster, 14, Birfed Crescent, Leeds, 4.

TELEVISION EXHIBITION

ON Thursday, June 10th, we attended the ceremony at the Science Museum, South Kensington, when Lord Selsdon officially opened the Television section. Two separate halls are devoted to this part of the exhibition, the main hall being arranged to illustrate the progress and development of television, and the second hall is arranged to provide demonstrations of actual television transmissions. In this section commercial receivers manufactured by Baird, Cossor, Ferranti, G.E.C., H.M.V., Marconiphone, Murphy and Pye are to be seen, each in a separate section on somewhat similar lines to those adopted at Olympia last year. The entire room is darkened and the merits of the different receivers may be judged. It is particularly interesting to note the difference in colour tone adopted in the various cathode-ray tubes. A separate portion of this hall is screened off to provide a demonstration of the Scophony mechanical system, a large (5ft. by 4ft.) and a domestic receiver being provided.

Reception on the remaining receivers is carried out during the B.B.C. transmissions in the usual way, and when this is not available a special transmission is made from another part of the exhibition by means of film apparatus so that the receivers may be inspected by those who are unable to attend the exhibition during the hours of the television broadcast. The Scophony receiver picks up its own transmissions radiated from the Scophony laboratory at Campden Hill, a mile or so away, and this particular transmission is of the 240-line, 25 picture per second type, as distinct from the standard 405 lines interlaced scanning now adopted by the B.B.C.

We were unable to see this transmission at its best owing to local interference from diathermy apparatus in the same building, but we understand that special precautions are to be taken, including the use of a coaxial feeder from a special aerial on the roof, to avoid the difficulty in future. A special 64-page handbook is issued, and is obtainable for 6d., dealing with the progress of the science, and this, in conjunction with the various pieces of apparatus exhibited in the main hall, will enable everyone to understand how the modern receiver works, and the different models and sections which are on view are mostly working (some at slow speed) so that all the essential details may be clearly seen.

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

Willesden S.W. Club

SIR,—I desire to express my thanks for publishing my appeal for a short-wave club in Willesden. I am pleased to inform you that as a result of PRACTICAL AND AMATEUR WIRELESS's huge circulation, a short-wave club has now been formed, under the title of Willesden and District Short-wave Club. It was evident after only the first meeting that this district was badly in need of a radio club. There is still room for further members and anyone interested should communicate with me at 115, Willesden Lane, N.W.6.—S. A. REEVE (Hon. Sec.).

Scottish Broadcasting Stations

SIR,—Thank you for publishing my letter in your issue of May 1st, 1937, and for inviting the B.B.C. to reply to my criticisms.

I must express my surprise that I have seen no reply from the B.B.C. in your columns. The question of an efficient *National Service* in the north of Scotland really requires consideration.

While the provision of an efficient *Empire Service* on short waves is important, it seems strange to me that this Empire service should be perfected before that of the north of Scotland.

Admittedly the population here is scanty and perhaps in the opinion of the B.B.C. does not warrant the provision of another station, but after all is not the case of Scotland as urgent as that of parts of the Empire, which themselves have a service of their own?—A. H. MILLER (Strathpeffer).

Compensated Tone Control

SIR,—In his letter in the number of PRACTICAL AND AMATEUR WIRELESS for May 22nd, Mr. R. F. Hill has made one "questionable statement." He says that a "compensated" volume control prevents the tone of a voice appearing to change with the volume. By "compensated" I presume he means a control that preserves straight line characteristics. In this case the tone *will* change, as the response curve of the human ear varies at different volume levels (see "The Appraisement of Loud-speakers"—Part II, in the "G.E.C. Journal"), thus the sound must be reproduced at its original level. The remedy seems to be a large output (12 watts and over) and A.V.E. with a variable "tone" control for "P.A." occasions.—PETER G. REDGMENT (Brundall).

An Old Rule Modernised

SIR,—How many of the readers fight shy of technical terms? Well, I am sure most of us do, and the term mostly avoided is that which is called "Ohm's Law."

It is written thus: $E=IR$, $I=\frac{E}{R}$, $R=\frac{E}{I}$ to bring these algebraic equations to common figures, or should I say to a term used by the non-technical reader:—E=volts (E.M.F.); I=amps (current); R=ohms (resistance). If the above equations are repeated they will read thus: $\text{Volts} = \text{Amps} \times \text{Ohms}$, $\text{Amps} = \frac{\text{Volts}}{\text{Ohms}}$, $\text{Ohms} = \frac{\text{Volts}}{\text{Amps.}}$

Although this simplifies the equation, it can now be written much simpler as this: $\frac{\text{Volts}}{\text{Amps} \times \text{Ohms.}}$ Now if *one* of the terms is required, it is only necessary to place the finger on the term, e.g., if it is amps required, hide amps, leaving $\frac{\text{Volts}}{\text{Ohms}}$ and so on. The Ohm's Law mentioned here is all right for the electrical engineer, so to simplify it for the *radio* constructor it should read thus: $\frac{\text{Volts}}{\text{Milliamps} \times 1{,}000 \text{ of ohms.}}$

Perhaps other readers will be able to help to explain other technical terms useful to the radio constructor.—JOHN W. LEECH, (Llandudno).

A Log from Bath

SIR,—Other readers may be interested in my 20 metre log, May 18th-May 27th, the first, I believe, from this district:—LA1B, R6; VO1P, R5; SU1KG, R6; SU1RO, R7; SU1CH, R8; SU1RH, R4; SU5NK, R5; CT1JK, R4; CT1AY, R7; CT1BU, R5; CT2AB, R8; CE3DW, R7; SP1HH, R7; I1KL, R5; SV1KE, R6; HA8N, R5; HP1SS, R8; CY4BA, R8; ON4VC, R8; YI2BA, R6.

All the QRK's are the average for the period. The set was a 0-v-2 with a dipole resonating on 20 m., and pointing North and South. All listening is done between 8 p.m. and 11 p.m.

I would be glad to get in touch with another reader, age 17, residing in the North if possible.—R. ANDREWS, BLDLC 4070 (Southdown, Bath).

Back Number Required

SIR,—I would be very pleased if you would ask if any reader has an old copy of *Amateur Wireless* No. 612, March 3rd, 1934, describing Lucerne S.G. Ranger, which he could let me have.

I was informed it was out of print when I wrote for it and now this is the only means left whereby I can try to get hold of it.—ROBERT W. ARGUE (130, Parnell Street, Ballynoggin, Co. Dublin, Ireland).

CUT THIS OUT EACH WEEK

Do you know

—THAT cathode-ray tubes for television may be obtained to provide various coloured screens.
—THAT with two exceptions all the present commercial television receivers provide a black-and-white picture.
—THAT coupling can take place between the electrode assembly in a valve and other components having an external field.
—THAT losses are set up when a wire becomes corroded, or when any metal in an electrical circuit is coated with corrosive deposits.
—THAT silver-plating is employed on short-wave components to avoid the above trouble.
—THAT a directional microphone is advisable for band or concert work as it enables microphonic feed-back to be avoided.

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., Tower House, 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.

R. W. D. (N.W.11). The approximate cost would be 15s., although, of course, this will vary according to the make of component which you purchase. To this must be added the cost of the valve, batteries and 'phones.

J. E. W. (Beckermet). An adapter may be obtained direct from Messrs. A. F. Bulgin, Abbey Road, Barking, price 1s. 6d. We are unable to give connections for the coil, as these were not standardised, and you would have to write to the makers giving all details of the coil or alternatively sending it to them for inspection. A good local radio dealer might be able to trace out the connections for you.

R. T. W. (Holbrook). There can be dozens of reasons for the lack of volume: insufficient H.T.; inefficient aerial; defective components or valve; wrong connections; wrong circuit in use, and so on. As the volume is now poor we think it would be very unwise to attempt to use a self-contained aerial.

D. A. T. (Brentwood). We suggest you make the One-valver recently described by the Experimenters, and add the L.F. section to it as described in this issue. The additional parts could be obtained as you find sufficient cash for them.

L. E. T. (Surbiton). We cannot supply the diagram in question, but hope to give full particulars in a forthcoming issue.

J. H. (Clapham). The gauge is 22 D.C.C. and is quite suitable for the coil you intend to make. You could probably obtain the coil former locally, but in the event of any difficulty ordinary cardboard of the type sold as Postal Tube could be employed.

C. S. F. (Marlborough). There are two possible explanations—either the earth is defective, or the anode bypass condenser is too small. Try a pre-set condenser in place of the half of the reaction condenser now used, and adjust the pre-set until the desired results are obtained.

M. B. (Ormskirk). The first figure gives the number of H.F. stages, the letter "v" indicates a valve detector (to distinguish from a crystal detector), and the last figure indicates the number of L.F. stages.

S. E. (N.4). We regret that there is no amplifier of the type mentioned in our Blueprint service.

W. S. (S.E.11). We have no blueprints, but refer you to our issue dated February 29th, 1936.

J. J. S. (Walthamstow). We regret that we cannot insert your request and suggest you insert a small advertisement.

R. H. (Bow). There is obvious H.F. instability, but whether this is caused by some defective component or wiring, or interaction between certain leads, we cannot say. We can only suggest a careful stage-by-stage test with a good meter.

R. W. W. (Malta). We regret that we cannot solve your problem as we do not know how you are using the apparatus. We suggest you communicate with the makers, who may be able to suggest some fault in the unit.

W. P. (S.E.17). The transformer should be suitable, but your diagram does not give the total current delivered and thus we are unable to advise definitely.

C. R. (Angus). Full details of the coil have been given on several occasions in the Queries section of this paper. The last occasion was May 22nd.

Practical and Amateur Wireless
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., Tower House, Southampton Street, Strand, W.C.2.

PRACTICAL WIRELESS

	Date of Issue.	No. of Blueprint.
CRYSTAL SETS		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprint, 1s.		
All-wave Unipen (Pentode) ..	—	PW31A
Two-valve : Blueprint, 1s.		
Four-range Super Mag Two (D, Pen)	11.8.34	PW36B
The Signet Two	29.8.36	PW76
Three-valve : Blueprints, 1s. each.		
The Long-Range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow) ..	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-Mark Three (SG, D, Pow) ..	12.6.37	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	PM1
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 (HF Pen, D (Pen), Pen) ..	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen) ..	31.10.36	PW69
The "Colt" All-Wave Three (D 2 LF (RC & Trans))	5.12.36	PW72
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P) ..	1.5.37	PW4
Fury Four (2 SG, D, Pen) ..	8.5.37	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).. ..	—	PW31
Selectone A.C. Radiogram Two (D, Pow)..	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	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 (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
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) ..	5.6.37	PW40
F. J. Camm's 2-valve Superhet Two-valve	13.7.35	PW52
F. J. Camm's £4 Superhet ..	—	PW58
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valver)..	—	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
"Qualitone" Universal Four ..	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve : Blueprint, 1s.		
Midget Short-wave Two (D, Pen)	—	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
"Tele-Cent" S.W.3 (SG, D (SG), Pen)	30.1.37	PW74
PORTABLES.		
Three-valve : Blueprint, 1s.		
F. J. Camm's ELF Three-valve Portable (HF Pen. D, Pen) ..	16.5.36	PW65
Parvo Flyweight Midget Portable (SG., D, Pen)	19.6.37	PW77
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl. B)	15.5.37	PW12
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A
AMATEUR WIRELESS AMD 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	—	WM409
Three-valve : Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	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)	—	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, QP21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	*June* '35	WM398
Certainty Three (SG, D, Pen) ..	—	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
2HF Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2 HF, D, QP21)	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, 2LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, D, Pen)	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*April* '36	WM404
Five-valves : Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
New Class-B Five (2SG, D, LF, Class B)	*Nov.* '33	WM340
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) ..	—	WM394
Three-valve : Blueprints, 1s. each.		
Home-Lover's New All-electric Three (S.G, D, Trans) A.C. ..	—	AW383
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	AW430
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 (Super-het)	—	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.* '35	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
SHORT-WAVE SETS—Battery Operated.		
One-valve : Blueprints, 1s. each.		
S.W. One-valver converter (Price 6d.)—		AW329
S.W. One-valve for America ..	23.1.37	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 (H.F. 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-waver 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 : Blueprints, 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
Listeners' 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v.) for WM392 ..	*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/-)	—	WM408

QUERIES and ENQUIRIES

Making a Potential Divider

"I have constructed a fairly satisfactory mains unit, but find that I often need various voltages for experimental purposes. I have tried a number of variable resistances across the mains output but they prove noisy, and I think, therefore, of constructing a fixed wire-wound resistance, and making a number of tappings to give me a fair range of selection. Can you give me any details for making such a device."—A. M. (Kettering).

THE following scheme should prove satisfactory, although in the absence of complete details we cannot give you very definite figures. A length of 1in. diameter six-ribbed ebonite former should be obtained, with a length of 4in. Cut eight slots in the ribs each slot ⅛in. wide and with ⅛in. separating them. In these slots wind 1oz. of 40 gauge silk covered nickel chrome resistance wire, and take a tapping at the end of each winding. If the slots are about ⅛in. in depth, you will find that each may just be filled to accommodate the total amount of wire, and the tapping points should be taken out either to selector studs, or to short lengths of stiff wire driven into the former. In this case, a clip could be used for making contact and to facilitate changes from one point to another.

Obtaining Realism

"I have been experimenting with my quality set to improve the reproduction and have tried a number of novel schemes. I wonder if you know of any stunt or device which will enable me to obtain better results than are usually obtained with a normal broadcast receiver. I am not interested in expense, but should naturally like to experiment by making accessories or constructing apparatus which will be of assistance in my proposed new experiments."—D. R. (Brighton).

IT is difficult to make suggestions without a diagram of the circuit you are using, but probably the most useful idea which you have not yet adopted is to fit a good expansion circuit. There are various forms of this, and details of certain schemes have already been given in our pages. See our issue dated November 28th last. Added to this you could try the effect of two loudspeakers connected in different parts of the room or in different rooms in the house. This alone is often a very good idea for improving realism, as the slight echo effect produced by the delay or difference in time value of the two speakers gives a "body" to the music which must be heard to be appreciated. Some care is necessary in choosing suitable speakers and in placing them so that the delay is of the right value.

Varley A.V.C. Unit

"I would like to obtain the copy of 'Practical Wireless' in which some time ago you issued a circuit incorporating a Varley A.V.C. Unit in, I believe, a three-valve receiver. Could you give me details of this?"—R. G. G. (Oxford).

THE receiver in question was fully described in our issue dated November 4th, 1933. This was a three-valve circuit employing variable-mu S.G. H.F. stage, triode detector, and pentode output stage. No copies of the blueprint are available.

Prefect S.W. Three

"Could you please tell me the approximate cost of the Prefect receiver and also whether I can obtain a complete kit for it?"—V. B. (Doncaster).

THE cost of Kit A for the Prefect receiver is £2 15s. and Messrs. Peto-Scott can supply this kit. The set of three valves for this receiver costs 12s. 3d.

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.

A stamped addressed envelope must be enclosed for the reply. 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 separate department.

Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

Experimenters' Single-valve Set

"I am keen to make up the simple single-valve set described by the Experimenters, but am not clear regarding the coil winding. In the illustration of the coil it shows 30T. 30 gauge enamelled wire with two arrows, but in the text it says 25 turns for the two windings in question. Will you please let me know the correct number of turns?"—J. W. (Belfast).

WE are afraid your copy is badly printed, or you have not looked closely at the drawing. The diagram clearly shows 50 turns of 30 gauge enamelled, and, as mentioned in the text, this is made up from two separate windings each of 25 turns and the text and diagram therefore agree.

Record All-Wave Three

"In regard to the instructions for building the Record receiver we are told to loop and flatten the wires for attachment to the screws at the side of the ganged condenser. What screws are these and where do the wires go? Also we are told to attach a length of wire to the screws holding the screening cover in position. Do these wires go to earth? Where does the tuning dial screw, to the baseboard or the mounting block?"—H.C.W. (Bury).

THE screws referred to are those which hold the small paxolin insulating strip in position and consequently are connected to the fixed vanes in each section of the condenser. The proper connecting lugs are underneath the condenser and this method of making connection to the fixed vanes was recommended as it avoids soldering. If you can solder, you can connect the wires in question to the three soldering tags underneath the component. The wires attached to the screws holding in position the screening cover are connected to earth, as the condenser is mounted on a block of wood and is thus not in contact with the metallised surface of the baseboard, The small foot upon which the dial is mounted may be loosened by undoing the two screws in front, and the slots cut in this will enable it to be raised or lowered as desired. The foot is screwed to the baseboard and the dial then adjusted so that the spindle will pass through the bush, after which the two screws are tightened.

Adding a Pick-up

"I have a midget six-valve American receiver. Is it possible to introduce a pick-up into the circuit? If it is, I should be pleased to know how to do so."—R. T. (Fulham, S.W.).

THERE are, so far as we are aware, no suitable midget adapters for the valves used in the circuit, and, therefore, the usual procedure of connecting an adapter between the valve and its holder could not be followed. You will find it simplest to locate the detector valve in the receiver, and then solder or otherwise connect a wire to the grid terminal of that valve. A small two-socket strip should be mounted at some convenient point on the chassis or cabinet and the lead just mentioned should be connected to one of the sockets. The other socket must then be joined to earth, and the cathode lead to the detector valve (we assume that it is a mains set) must be broken and a suitable bias resistance and by-pass condenser connected between the cathode and earth. The grid leak must be joined direct to the cathode. If the receiver is of the "Universal" (A.C./D.C.) type some additional precautions may be necessary to ensure that the pick-up is not "live" due to one side of the chassis being in contact with one mains lead.

Fury Four

"Is there a blueprint available for the Fury Four—up-to-date, of course? I have the original. In the issue dated May 8th last you state one three-gang assembly BP.50. Does this mean three BP50's, or two BP30's and one BP51?"—G. J. T. (Bridgend).

THERE is no modernised blueprint available, but the additional instructions given in our issue dated May 8th last will enable you to carry out the necessary modifications to bring the receiver up-to-date. The BP50 coil is an aerial band-pass or tuned-grid coil with reaction, whilst the BP11 is an H.F. intervalve transformer with reaction. As you will see from the circuit diagram in the issue in question, the intervalve coils are of the parallel-fed tuned-anode type—not H.F. transformers—and, therefore, three BP50 coils are required as mentioned in the article.

The coupon on Cover iii must be attached to every query.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

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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 amplifications, neutralizations, superhet alignment, etc. The most comprehensive manual published, written by practical engineers, price 6d., post free, 7½d. including catalogue.

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44, HOLLOWAY HEAD, BIRMINGHAM 1

SHORT WAVE on a crystal set. Full building instruction and crystal 1/2 post paid.—Radiomail, Tanworth-in-Arden, Warwickshire.

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. **WARD**, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

REPAIRS to Moving Coil Speakers, Cones and Coils fitted or rewound. Fields altered. Prices Quoted including Eliminators, Loudspeakers Repaired, 4/-. L.F. and Speech Transformers, 4/- post free. Trade invited. Guaranteed. Satisfaction. Prompt Service. Estimates Free. L.S. Repair Service, 5, Balham Grove, London, S.W.12. Battersea 1321.

ALL lines previously advertised still available. RADIO CLEARANCE, 63, HIGH HOLBORN, W.C.1. Hol. 4631.

ALL goods previously advertised are standard lines, still available. Post card for list free. VAUXHALL UTILITIES, 163a, Strand, W.C.2. Over Denny's the Booksellers. Temple Bar 9338.

GRAMOPHONE attachments for Radio, electric motors, 30/-; pick-ups, 9/6; portable gramophones, 15/-; spring motors, 4/6, dozen, 36/-; pedestal Anexagram, £5; soundboxes, tone-arms, horns, cabinets, needles, gears, springs, Violins, and Accordions, accessories, cheapest. Trade supplied. Catalogue free. —Regentam, 120, Old Street, London, E.C.1.

BANKRUPT Bargains. List free. Over 50 new receivers, etc., in stock. Keen prices. Valves, Components.—Butlin, 6, Stanford Avenue, Brighton.

ALCO ELIMINATORS AND CHARGERS.—4 H.T. taps. 120v/150v. 20/30 m.a., 18s. With ¼ amp. charger, 25s. Charger alone, 7s. 6d., ½amp., 11s. Year's guarantee. Details free.—P. and D. Radio, 1, Goodinge Road, N.7.

BARGAIN.—Portadyne All-Mains, list 10 guineas—£5; also Portadyne Battery Portable, list £9 10s.—£4; carriage paid.—G. W. Supplies, 13, City Road, London, E.C.1.

VALVES

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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.

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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. **OCTOL** bases, 9d. each.

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