SPECIAL CHRISTMAS FEATURES

A NEWNES PUBLICATION

Edited by
F.J.CAMM

Vol. 15, No. 376.

Dec. 2nd, 1939.

PRACTICAL TELEVISION

Contents

A Pocket Portable
Home Recording
The Drawing-room Play
The Extension Speaker
Making Receiver Cabinets
Thermion’s Commentary
Practical Hints
Deciding Upon the Output Stage
Practical Television
Loose Connections
Readers’ Letters

Build The “Three-Two”!

THE OUTLINE OF WIRELESS By Ralph Stranger

This book teaches you everything you need to know about wireless. The entire theory and practice of reception is covered simply and clearly from A to Z. 832 pages with over 500 illustrations and diagrams.

10/6 NET From all booksellers, or by post 11½ from the publishers, GEORGE NEWNES, LTD., (Book Dept.), Tower House, Southampton Street, Strand, London, W.C.2.
An ideal Christmas present for that member of the family who actually likes the talks

Tastes differ... it would be a funny old world otherwise. Some there are who consider talks a waste of listening time and would have the speaker blaring forth swing all day.

But every family has at least one member who likes and appreciates the talks. For these there are Ericsson Supersensitive Headphones... perfect reproducers... establishing a perfect link between speaker and listener—setting them apart in a world of their own. Give that listener a pair of these perfect 'phones. And whisper—you should sneak them yourself now and again if you want to know what good fun distant listening on 'phones can mean.

Light and comfortable in wear—three resistances, one price, 17s. 6d.

At all good radiodealers. If you have any difficulty in procuring, write direct to—ERICSSON TELEPHONES, LTD., 22, Lincoln's Inn Fields, London, W.C.2.

SUPERSENSITIVE HEADPHONES

Just Published For Every Home. Only 1/6 net.

THE VERY FIRST ATLAS OF THE WAR

Eight Pages of Up-to-date War Maps and Everything You Want to Know About Armies, Navies and Air Forces.

NEWNES COMPREHENSIVE WAR ATLAS is produced in handy size for easy home reference and each of the up-to-the-minute maps it contains is printed in full colours. They include the Western Front, with the Maginot and Siegfried systems clearly shown, and all other countries involved in the conflict, together with countries whose frontiers adjoin or are close to those of the belligerents. This atlas has lots of advantages over the ordinary wall-map, which often covers only one sector of the War, requires a big space and the use of drawing-pins, which quickly disfigure wallpaper.

Get NEWNES COMPREHENSIVE WAR ATLAS—it will make the war so much more understandable to you and your family.

GET YOUR COPY TO-DAY

Hand this Form to your Bookseller, who will get you NEWNES COMPREHENSIVE WAR ATLAS for 1/6, thus saving postage. Alternatively, send the Form with Postal Order for 1/6 to the Publishers and the book will be sent direct to you by return.
Radio at Christmas

The radio normally fulfils its function as a provider of music and other entertainment during the year, but at Christmas-time it is generally called into use to give fuller play to its possibilities. Many amateurs carry out a little home broadcasting at this time of the year, although, for the remainder of the time, this aspect of radio is overlooked. The addition of a microphone may, however, lead to new lines of development, either for room-to-room communication or for other "telephonic" purposes. The old idea of enabling one to hear a baby in a distant room, without having to switch off the wireless to listen, is well known, but there are many other interesting applications which will appeal to the individual after reading the articles on home broadcasting in this issue. Gramophone reproduction is receiving more attention, but there are still many listeners who are content with the playing of discs with a simple pick-up added to the set. The use of concertina cleaners and other special circuits is not so popular as it should be, but those who have tried them can vouch for their effectiveness in improving record reproduction.

Chess by Radio

Two teams, Sydney and London, are now, recently played chess by communicating the moves over a radio link. Each team played in two groups of four, at different stations. The match ended in a tie at 4-4, persons having the white pieces being successful at all eight boards. This match will probably be the last for some time, as amateur stations have now been taken off the air.

Sets for the Navy

It has now been announced that following the suggestion for supplying the troops with radio apparatus for entertainment purposes, it has been decided to make similar presentations to the men of the Navy. The receivers will probably be of the all-wave type so that full use of the short-wave transmissions may be made.

Rumanian S. W. Station

Experimental broadcasts are being made by the new Rumanian short-wave station on the 40- and 20-metre bands, and also by the station at Kisenew. The power is given as 20 kW, and the wavelength as 212.6 metres.

Physical Jerks

As already announced, next Monday will be the conclusion of an experimental series of physical exercises, to be broadcast for ten minutes, starting at 7.35 a.m. each weekday. On Monday, Wednesday and Friday, a male instructor will direct the exercises for men, while Tuesday, Thursday and Saturday will be given over to women listeners with a woman instructor at the microphone. At the moment the exercises are designed for listeners under 40 years of age, though if the experiment proves popular it is possible that the over-forties will be catered for later on. The exercises will be specially designed for listeners with little space in their homes, and extra equipment will be necessary.

Phone Books in Broadcast

Telephone, books, numbering into the hundreds, each consisting of 500 pages, are used in indexing the name of the telephone subscriber who gets the lucky 'phone call during "Heidi's ' Pot o' Gold " programme each Tuesday evening over WLW and NBC.

In examining 'phone books' from all over the country, it was found that some have 12 pages and some have 1,200. So it was decided, in order to be completely fair, to bind all the books into volumes of 500 pages each.

Thus, when the selector chooses Book 47, it may mean that that volume will contain 'phone books of a half-dozen small towns. When it selects Book 108, it may contain only half the pages of the Cleveland telephone directory, while the other half is included in another volume bearing another number.

Frank J. Dredge, the woodworker of Andover, Mass., who was presented with $1,000 in prize money, received it after he was advised by Western Union that the money was waiting for him about five minutes after Ben Grauer talked to him on the 'phone during the program. "Heidi's " Pot o' Gold " is heard at 8.30 p.m., E.S.T., Tuesdays, over the NBC Red Network.

Burbleton Comes Back

If one wished to know what the English outside London was thinking and doing any time during the last two or three years, one could not have done better than pay a radio visit to Burbleton, that mythical North-country township whose local bigwigs discussed their affairs with such engaging frankness in pre-war North Region broadcasts. Burbleton had a very big following and many people were pleased to hear that it is coming back to the programmes. It makes its first wartime appearance on December 1st, and all the old well-known characters will be heard debating, in true Burbleton style, the problem of A.R.P. in their town. T. Thompson, the Lancashire author, is responsible for the script.
A Pocket Portable

Constructional Details of a Midget One-valver, which Will be Found Particularly Useful for A.R.P. Work

THe midget receiver about to be described was made in a cigar box measuring only 5in. by 9in. by 1in.; a box which holds twenty-five cigars is of suitable size. Although small, the receiver works well, bringing in the Home Service transmissions at good strength on the phones on a piece of wire 10ft. long as aerial. The set does not work on the long-wave band, as the coil was not wound for this.
The "Pocket Portable" actually has the necessary 2-volt accumulator of the jellyed type fitted in the cigar box, and the complete set will quite easily go into any coat pocket and so, with a pair of head-leaves a reasonable length of wire for connecting up; this is the grid winding. Leaving a space of 0.1in. from the start of the grid winding, and using the same gauge of wire, and winding in the same direction, wind on enough wire to fill a space of 0.1in., thus completing the reaction coil. A little shellac varnish painted over the windings helps them to firmly in place. For details of the coil see Fig. 1.

Assembling the Parts
To make the receiver, first drill two holes, one above the other, the diameter of a banana plug socket, in the left-hand side of the cigar box, about 5in. from the back, and mount two red sockets. To one connect one side of the 0.001 series aerial condenser. Now, having wound the coil, place it lengthways in the bottom left-hand corner of the box, as close to the back as possible, and solder the input wire of the grid coil to the other side of the 0.001 aerial condenser. Continue with this grid coil wire and solder to the other banana socket. Fasten the coil in place, and secure with a very small screw through the paxolin former to the bottom of the box. This can easily be accomplished by inserting the screw at an angle. Screw down at both ends, and it is as well to note that, owing to the thinness of the wood, all screws will protrude through and in consequence will need filing flat.

Next, take the valveholder and screw this as close as possible to the coil, allowing for the width of the glass bulb. The 0.005 mfd. tuning and reaction condensers are now fixed into place, on the front of the box, and knobs attached. Connect the grid of the valveholder to one side of the 0.003 grid condenser, and the other side of this condenser to the coil and condenser. Join a piece of fine wire from the moving vanes of the tuning condenser to the moving vanes of the reaction condenser, and allow sufficient length to reach to the right-hand side of the box, to be joined later to earth, the fixed vanes of the latter being now connected to the reaction winding of the coil. The other side of the reaction coil is joined to the plate or anode terminal of the valveholder. A fine wire, insulated with sleeving, now joins the same anode terminal to one side of the H.F. choke. Solder the other side of the choke to the terminal marked A (see Fig. 3) and to one side of the 0.001 fixed condenser, the terminal C being joined to the other side of this condenser, and by a piece of thin rubber-covered wire to the socket (red) next to the phone jack.

Now solder the grid-lead to the grid of the valveholder, joining the other side of the lead to one of the filament terminals, and by means of some thin rubber-covered wire connect it to the terminal marked B on the phone jack. The remaining jack terminal D has now a piece of rubber-covered wire soldered to it—about 5in.

Fig. 1.—Winding details and connections for the coil.

The .0005 mfd. tuning and reaction condensers are now fixed into place, on the front of the box, and knobs attached. Connect the grid of the valveholder to one side of the 0.003 grid condenser, and the other side of this condenser to the coil and condenser. Join a piece of fine wire from the moving vanes of the tuning condenser to the moving vanes of the reaction condenser, and allow sufficient length to reach to the right-hand side of the box, to be joined later to earth, the fixed vanes of the latter being now connected to the reaction winding of the coil. The other side of the reaction coil is joined to the plate or anode terminal of the valveholder. A fine wire, insulated with sleeving, now joins the same anode terminal to one side of the H.F. choke. Solder the other side of the choke to the terminal marked A (see Fig. 3) and to one side of the 0.001 fixed condenser, the terminal C being joined to the other side of this condenser, and by a piece of thin rubber-covered wire to the socket (red) next to the phone jack.

Now solder the grid-lead to the grid of the valveholder, joining the other side of the lead to one of the filament terminals, and by means of some thin rubber-covered wire connect it to the terminal marked B on the phone jack. The remaining jack terminal D has now a piece of rubber-covered wire soldered to it—about 5in.

Fig. 2 (Left)
Circuit diagram.

Fig. 3.—Wiring diagram of this compact little portable.

phones, one has a complete receiver which is easily carried about.

Winding the Coil
The coil is made on a paxolin former 3in. long by 1in. diameter. About the middle of this former, wind on a sufficient number of turns of 28 d.c.c. wire (loosely wound) to fill up 1in., not forgetting to

phones, one has a complete receiver which is easily carried about.

Winding the Coil
The coil is made on a paxolin former 3in. long by 1in. diameter. About the middle of this former, wind on a sufficient number of turns of 28 d.c.c. wire (loosely wound) to fill up 1in., not forgetting to
Home Recording

Further Notes on the Production of Gramophone Records and Play-back

In the absence of alternative broadcast programmes, many listeners are now turning to their gramophone section, and there is obviously an increasing interest both in the playing of records and in their production. In the latter connection it must be remembered that much can be done to improve the reproduction by the use of special circuits, such as the contrast expander, whilst in the recording of music there is a most interesting field of experiment. It is possible to make discs at home which are absolutely indistinguishable from the commercial product—in fact, some amateurs have claimed that they have obtained better reproduction from home-made discs. But if care is not exercised, both in the selection of materials and in the processing, the results are absolutely worthless. It is useless to expect to get a good record with the aid of a cheap old-fashioned pick-up, a worn-out steel needle, and an aluminium disc. Similarly, it is just as much a waste of time to obtain a most expensive tracking gear, high-quality cutting head and diamond cutter and to connect it to an inferior thre valve battery set with cheap intervalue transformers. But by striking a compromise between these extremes, it is amazing what can be done.

The Amplifier

First of all, the amplifier or radio unit which feeds the cutting head should be capable of reasonable quality and a comfortable output. There is essentially a background of noise from the record when played back and therefore the sound track should be sufficiently great to obscure that background. Furthermore, to accommodate peaks in the volume the output stage should be of adequate power-handling capacity. Generally speaking, not less than 2 watts should be considered in this connection, and 5 to 10 watts will be even better. If a microphone is being used for the recording process this should be of a good type having a quiet background—not the cheap and noisy carbon type. What is probably more important is that there should be no audible hum in the amplifier—a point which is of the greatest importance in A.C. operated amplifiers and equipment. Some reliable apparatus should be employed to guide the cutting-head across the disc, and whilst it is possible to link up a standard pick-up traversing a 12 inch commercial record, thereby making this carry the cutter, as shown in Fig. 1, it will probably be found with an aluminium disc that the cutter digging into the disc will exercise such friction that the needle in the standard disc will jump and spoil the track. Where expense is to be considered the Feigh mechanism described in our issue dated November 18th will be found quite satisfactory. If much recording is to be done and really high-quality results are aimed at, then an elaborate tracker such as the V.G. should be obtained. The motor and turntable should be of reliable design capable of exercising a really steady torque without vibration or speed variation. The commercial models of complete home-recording gear generally incorporate a very heavy steel turntable to provide a flywheel effect.

Cutting Head and Needle

A really good pick-up capable of handling the input from the amplifier should be used, or one of the special recording heads specially obtained. This should be mounted to track correctly, and in conjunction with it you can use a worn steel needle, a sapphire or a diamond cutter. The latter are expensive, but are definitely worth the money. If the steel needle is used it should be run through on an ordinary gramophone record first and then inserted in the cutting head so that the slightly worn surface offers its cutting edge to the disc. For this purpose a magnifying glass will have to be used when inserting the needle. The sapphire needle will cost from 7s. 6d. to 12s. 6d. Aluminium discs must be replayed by fibre or similar needles, as steel ones will only cut up the recorded track. On the other hand the special discs may be replayed with steel needles after processing, this latter usually consisting merely of wiping over the dust with some special fluid, one acting as a hardening medium and the other as a polish. They may, of course, be played back instantly after recording and without processing, but in that case a fibre or other "soft" needle should be employed.

Connecting the Cutting Head

The cutting head should be fed from a filter circuit in the output stage of the amplifier to avoid direct current flowing through it. Fig. 2 shows a circuit for a single output valve, whilst in a push-pull stage two fixed condensers as in Fig. 3 will offer sufficient protection whilst permitting the passage of the signal currents.

"Safeways" Adaptors

Many houses are not provided with readily accessible power points, or other places where the wireless set or other low-consumption electrical apparatus may be easily connected. Some listeners overcome this difficulty by fitting two-way adaptors to a standard lighting point, and in this connection a really good connector with some form of separate switching is no doubt the best way of overcoming the difficulty. In the Olix range of components will be found several adaptors of this type, some with self-contained switches and others with a form of extension switch which is cord or button operated. In its simplest form this adaptor consists of a straight-through connector with a branch, the former being controlled by the switch. Thus, if any electrical apparatus is connected to the branch it may be controlled from the normal wall switch, and a light fitted to the trunk connector, as it is called, may then be switched off, if not required, by means of the switch on the adaptor. This is a square-section push device in the small model, and it costs 1s. 10d. A similar model, but with both trunk and branch controlled by separate push-switches, cost 2s. 3d. To avoid the necessity of reaching up to the lamp-holder to switch off, these adaptors are available with a double cord, provided with aons, or a twisted flex with pear switch at the end. The first model has a cord 15in. long, and the price is 2s. 6d. A patent form of spring anchorage is used to prevent the cords from whipping and also holds them well clear of the adaptor so as to avoid fouling or damage to the lamp. The other model is known as the "Either-lite," and the switch action enables either connector to be switched on, either switched off, or both off. This model costs 5s. 3d., and the cord is 7ft. long. These particular adaptors should not be confused with the cheap models on the market, as they are all provided with screwed shake carriers at the trunk end, and thus a shade may be mounted round the lamp in the ordinary way, the adaptor being above it and more or less out of sight.
The Drawing-room Play

The Microphone and Pick-up are Always in Great Demand at Christmas, and they can be Utilised to the Full in a Home-produced Radio Play — By L. O. SPARKS

With the wide popularity of the microphone amongst constructors, and the natural desire of most owners to emulate the R.B.C. studio results, the opportunity afforded at Christmas to entertain one's friends with a real radio play is a chance too good to be missed. Fortunately, providing one has a good receiver or, better still, an L.F. amplifier having a reasonable output to amplify the microphone currents, the production of a play is not, as might appear at first sight, a costly matter. Unlike ordinary amateur theatrical affairs, microphone costumes, scenery or lighting effects are required, while, as regards a suitable cast for the actors, there is, invariably, plenty of volunteers most anxious to try their talent in front of a microphone.

To ensure the complete success of such a venture, it will be appreciated that one person must undertake the rôle of producer, whose job it is to see that everything goes according to plan or script and arrange the presentation of the play in the most striking and natural manner. This does not mean, however, that everything connected with the production must be governed by one man's ideas; there is the technical side of the matter, such as the amplifier, the number and placing of the microphones. Then there is the question of effects, while the selection of suitable music and its production can easily form another person's part. The timing of the individual parts and the mixing of the various microphones, if more than one is used, together with prompting, can easily form a very full-time occupation for, say, the producer during the actual performance.

Requirements

The first thing to secure is, of course, a suitable play, and the time devoted to this matter can go a very long way towards making or maring the splendid effort. One must remember, that a radio play depends entirely on words, music and effects. The various scenes have to be portrayed by sound alone; the atmosphere has to be created in the listeners' mind by a skilful blending of spoken words, sound effects and, possibly, music: therefore, too much consideration cannot be given to the material forming the foundation and structure of the play.

It is not advisable to commence operations by attempting something far beyond the capabilities of one's equipment. In other words, remember the apparatus available when discussing the selection of the play. As regards the play, it is possible that the producer or someone interested in the project can write one himself. On the other hand, it is often possible to utilise a section of a short story and adapt it to existing requirements. Finally, several very fine plays have been published in past Christmas issues of this journal; therefore, if your volumes are not complete, there is still time to order from our Back Number Department.

Effects

These have to be introduced to just the right extent. Too little will leave the production wanting in atmosphere, but too much will, like too much seasoning, completely spoil the dish. The right amount will depend on the producer's skill, plus, of course, the close co-operation of the effects men.

The sound of wind can usually be produced by keeping the mouth fairly close to the microphone and going through the process of whistling through the teeth, but don't let it develop into a full whistle. A little practice will soon enable all the various intensities of sound from a gentle breeze to a full-blown gale to be produced at will.

The swish and crash of the sea need not be more than two pieces of very fine sandpaper rubbed together, two or three handfuls of sand in a large tin or on a stiff sheet of brown paper. It will soon be found that various movements will create very natural effects.

The crackle or roar of flames can be produced by crushing paper plus the wind effect, quite close to the mike, while a matchbox or a piece of wood slowly crushed can sound very much like a most sickening smash.

The clatter of horses' hoofs needs a couple of empty coconut shells lightly beaten on a plain or cloth-covered board, according to the ground they are supposed to be covering. The noise of chains, footsteps, slots and the clash of arms must always be most carefully rehearsed, otherwise there is the great danger of them being reproduced in such proportions to the rest of the sound as to make them obviously unreal and even ludicrous.

Mikes and Amplifier

The technical man must be fully familiar with the capabilities and peculiarities of his equipment. All precautions must be taken to prevent any trace of feed-back which might cause microphone howl. For this reason alone, it is always best to have a separate room for the studio, thus leaving the audience in a room on their own with a suitable loudspeaker.

The L.F. side of the set or the amplifier should have an output of, say, two to three watts, although this will depend on the size of the room housing the audience and the number in attendance.

If more than one microphone is being used, a simple mixer of the type shown in Fig. 1 is absolutely essential, and change-over switches can be wired to bring others into circuit when and if desired.

For musical interludes, it is really best to use suitable passages of pre-selected records, using, of course, a good pick-up to reproduce them via the set or amplifier. When required, the P.U. can be brought into circuit in place of one of the microphones by quite simple switching as shown in Fig. 2, but if a separate set can be used for P.U. work only, the set that greatly improves matters and gives the operator wider scope.

The connections for the normal type of P.U. are given in Fig. 3, and it should be realised that far less amplification will be required for this component than the microphone.
THE "THREE-TWO" RECEIVER

When considering problems of economy in the building of a receiver, there are very few things which may be done, apart from the acquisition of components of low cost. Inferior parts, however, will result in inferior results, and therefore it is false economy to obtain such parts. There is a scheme, however, which has been introduced before in these pages, namely, the use of multi-valves in positions other than those for which they are intended. By adopting this scheme, economy may be effected, although owing to the slightly increased cost of such a valve the saving is not considerable. When, however, one considers the associated components which are saved, plus the saving in space and consequent use of a smaller chassis, and the L.T. current, there is at least some small advantage in such a scheme. The receiver to be described is a battery version of a mains set which was built for experimental use, but, unfortunately, the full advantages of the mains set cannot be obtained, and the mains set can only be built with American valves. In the original model a triode-pentode was used in the dual function of H.F. amplifier and detector, whilst a dual triode was used as first L.F. and output stage. The ordinary battery Class B will not, unfortunately, operate as the two-stage valve, and therefore it is necessary to use a single type of valve. This still permits us, however, to build a two-valve which acts exactly in the same manner as a normal three, providing H.F. detector and output-stage in a compact form. It is necessary here, however, to point out that the specified dual-valve must be used, as this has a completely separate pentode and triode section, whereas the majority, if not all remaining valves of this type, have the grid of the triode section joined to the pentode section.

The Circuit

Standard parts are otherwise used throughout the receiver, and a small chassis only 8in. by 6in. is simple to accommodate them. A Varley standard two-gang coil unit is employed which provides an H.F. transformer input, with a similar inter-valve section, plus reaction. A two-gang condenser with standard slow-motion drive is employed, and the remaining few parts are wired between various points beneath the chassis. To obtain maximum sensitivity under all conditions, a separate by-lead is provided for the screen voltage of the H.F. pentode, whilst for volume control purposes the L.F. input is controlled by a potentiometer. The triode section of the first valve is perfectly normal, and all other circuit details may be seen from the theoretical diagram below. It will be noted that the triode anode is fed from the maximum H.T. line by using a decoupling resistance. The values of decoupler and coupling resistance have been chosen to provide smooth reaction with stability and avoid the use of a further battery lead. To keep down the number of panel controls the on/off switch is mounted on the rear of the coil unit and is operated by the normal wave-change switch which is provided on this particular unit. Note that a special slotted dolly switch must be used for this purpose, the correct Bulgin type number is S.168.

The receiver is perfectly stable, and handles just like a standard three-valve.

Construcional Data

The chassis requires only two holes for the valveholders, plus two small strips on the rear panel for aerial and speaker. Clearance holes or slots may be cut out for the latter, whilst for the valveholders the holes must be 1 3/4in. for the 9-pin and 1in. for the 8-pin. Small holes for the connecting leads from the coils are needed, and these may be 3/16in. in diameter. Two component-mounting brackets are screwed on the underside of the chassis to accommodate the reaction condenser and volume control, and these brackets should be set just beyond the edge of the chassis so that the lock-nuts of the one-hole fixing bush will clear the panel which is used with the set. It will be noted, by the way, that the condenser has been mounted off centre on the chassis to enable the size of this to be kept to a minimum, and, therefore, when placing the chassis in a cabinet, or using a panel, this may be either centred to permit batteries or speaker to be placed at the side, or a larger panel may be used and the panel centred on this.

Adjusting the Receiver

The receiver must be ganged before maximum results are obtained, and for this purpose the condenser should be adjusted to the North Regional or Scottish Regional setting on the calibrated dial so that the
Homo Service transmission may be heard. At first the signals may not be received exactly at these settings and the tuning control should, therefore, be adjusted on either side of the point (according to the part of the country in which you live), until some signal is heard. Reaction should be advanced slightly during this process. As soon as the station is located the trimmer on the section of the condenser nearest to the panel should be adjusted whilst the tuning control is manipulated to keep the signal audible. In this way the tuning setting may be brought to read correctly the wavelength of the received station. Next, the trimmer on the remaining section should be adjusted and as volume increases the reaction control should be set back until reaction is absent. If then the volume is too great, the L.F. volume control should be adjusted. Keep signals as weak as possible, whilst making these preliminary adjustments, and when once set they will require no further touching. There is a wide range of cabinets from which to choose, and a receiver of this type will make a very neat and compact assembly for general use. It was not thought desirable to include long-waves, although there is no reason why, if short waves are particularly required, an three-band coil assembly could not be used, but the receiver has not been tried out with this particular arrangement.

**LIST OF COMPONENTS FOR THE “THREE-TWO” RECEIVER**

One "Bar Type" 5-gang condenser (Polar).
One micro-horizontal drive (Polar).
One 2-gang coil unit, type BP.114 (Varley).
One 1600 mf. Compex reaction condenser (Polar).
One screened standard H.F. choke, type H.F.9 (Bulgin).
One 4-point slotted dolly switch, type S.199 (Bulgin).
One 3,000 ohm 1-watt resistor (Dubilier).
One 6,000 ohm 1-watt resistor (Dubilier).
One 40,000 ohm 1-watt resistor (Dubilier).
One 2 megohm 1-watt resistor (Dubilier).
Two 2000 ohm fixed condensers, type 635 (Dubilier).
One 43 mf. fixed condenser, type 4602/S (Dubilier).
Three 1 mf. fixed condensers, type 4603/S (Dubilier).
One 1 megohm volume control, type VC.65 (Bulgin).
One 9-pin chassis type valveholder, type X.112 (Clix).
One 5-pin chassis type valveholder, type X.112 (Clix).
One two-socket strip, A.E. (Clix).
One two-socket strip, L.S. (Clix).
One two-core connector, type B.220 (Clix).
Two component-mounting brackets (Peto-Scott).
One Metaphase chassis, R.M. with 3-in. runners (Peto-Scott).
One TP.22 triode-quad valve (Mazda).
One Pen. 220 output pentode valve (Mazda).
Connections wire, insulated sleeving, screws, etc.
Christmas, 1939

FATALISTS will point the tragic finger at the last two digits of this year of grace—39, three threes? The first three figures added together make thirteen, and the last two and the first added together make thirteen. I am not a numerologist, and I do not think that numbers have the slightest effect on what we prefer to term luck, which is always of two sorts, good and bad. But there it is. In 1939 we are engaged in a war of major proportions. It is certain that we shall emerge victorious and, let us hope, soon. The year has witnessed the confiscation of amateur transmitting sets, but it has also seen the immense power for good as well as for propaganda which can be made of the broadcast word in time of war.

Wireless had not been introduced in the last war. I am, of course, speaking of wireless telephony, for field telephone sets were in use during the 1914-1918 war. It seems a profound tragedy that the motto of the B.B.C., "Nation Shall Speak Peace Unto Nation," has borne such poor fruit. It is no fault of theirs. Foreign countries have used the power of the ether to fan the flames of hate, and in war similar methods must be adopted finally by all. You must agree with me, however, that the British propaganda is clean, careful, and calculated. It is free from bias and hate. The limitation of programmatic variety is one of the inevitabilities of war. It does help to cheer us with a form of cheer absent in the last. This issue goes out to countries, save the belligerents, all over the world, and to many my message of cordial goodwill will reach them round about the 25th of December. Because of this, readers in this country will receive it some weeks ahead. I hope that they will not doubt its sincerity, because it must be uttered at a time divorced from the atmosphere of goodwill which steals over the world during the joybell period. I know that many will feel a sense of incongruity this Christmas, but it is not for us to debate these things. We are all experiencing hardships and difficulties, and journals and journalists are not an exception to the rule. I do, however, want to express to all readers wherever they may be sincere greetings for the merriest Christmas possible under the circumstances. Between now and the 25th a shower of Christmas cards will arrive from loyal readers the world over. In advance, I thank them in the spirit of reciprocity which makes Christmas what it is.

Lincoln Did Not Say It

MAJOR-GENERAL SIR ERNEST SWINTON was speaking over the wireless the other night on war matters. I was not in the least interested in his talk, but I pricked up my ears when I heard him quote that famous phrase: "You can fool some of the people all of the time, and all of the people some of the time; but you cannot fool all of the people all of the time."

The meagerous B.B.C. should have veted that part of Swinton's speech with a little more care, for Abraham Lincoln did not originate that phrase. It is true that he used it in a speech at Clifton, Illinois, on September 8th, 1858. Spofford denied that Lincoln invented it. There are some who think that P. T. Barnham did so. I deny that too, for Pliny and La Rochefoucauld made similar remarks years before. The earliest to use it as far as I have been able to trace in the form in which Lincoln quoted it is Josh Billings. Just as well to have these matters right.

Newspaper Scoops

THE word "News," they say, is compounded of the initial letters of the four points of the compass—North, East, West and South. In these days of small newspapers and restrictions, the lot of the reporter is particularly unhappy, for although in peace time the scoop still lives, in war-time there is no such thing—for the Ministry of Information sees to that.

It has become increasingly difficult in recent years for the quickest mind to keep ahead of the speed of communications. Radio has eliminated the last few moments of delay. But the real scoop is still a thrill, and in the splendid Christmas Number of the "Strand Magazine" you will find the story of the most notable newspaper scoops of recent years, specially written by that world-famous journalist, Douglas Reed, who wrote "Insanity Fair" and "Disgrace Abounding."

In spite of war-time conditions this fine issue of "The Strand" lives up to its great tradition. In common with all other magazines it must be ordered from newsagent or bookstall.

Letters to Foreign Countries

A TOPICAL reminder concerning the new regulations governing the dispatch of letters to foreign countries. Under present conditions no printed publications, postage or revenue stamps, plans or photos, maps or similar diagrams, may be sent to the following countries: Baltic States, Belgium, China, Denmark, Greece, Holland, Hungary, Italy, Japan, Luxembourg, Norway, Poland, Portugal, Roumania, Spain, Sweden, Switzerland, Siam, Turkey, U.S.S.R., Vatican City or Yugoslavia. These regulations do not apply to letters, but the sender's address must be written on the back of the envelope, and the words "Written in English" printed. Communications will be opened.

J. H. Thomas Resigns

MY personal regrets that genial J. H. Thomas has resigned his position as Managing Director of A. C. Cossor, Ltd. Mr. Thomas was Chairman of the Radio Manufacturers Association, but I learn that he has tendered his resignation and this will be considered at the R.M.A. Council Meeting on December 15th. Col. G. D. Ozanne, the Vice-Chairman, has also tendered his resignation. The new Managing Director of A. C. Cossor, Ltd., is Sir Louis Sterling, who was formerly Managing Director of E.M.I. He resigned on May 20th.
LOOSE CONNECTIONS

The Importance of Avoiding a Noisy Mainly Dependent Upon the Efficiency Background is of Connections

T
HE writer, a Service Engineer belonging to a company whose name is a household word, has recently been amusing himself by reading a number of books on service work published both here and in America, also many articles appearing in these countries, and gives below a number of faults which, although not uncommon, have been rarely, if ever, mentioned.

Stupid Mains Plugs
A common cause of spluttering in commercially-built receivers is such a stupid one that the engineer never bothers to mention it, and the amateur usually thinks of it last. This is the actual connection between the mains cord and the mains plug. The average mains plug is peculiarly unsuitable for this purpose, having the usual tubular hole in which the end of the flex is inserted, which in turn is intended to be gripped by a screw of absurd dimensions, which may, with luck, grip as many as half of the metal strands. This connection very often becomes loose due to one or more strands working out from under the screw, leaving the rest of the lump a sloppy fit. In the absence of an intelligently designed plug, the best remedy is to bind the strands together so that the screw can be made to grip them without them spreading unduly. Where the cover permits of it, it is a good idea to bare about five, take the strands through the hole, round the outside, and back through the hole again. Obviously the screw should not be tightened to the point where the flex is cut, but it should be tight enough to prevent any possibility of arcing, which sets up most disagreeable interference.

Plugs and Sockets
There is an increasing tendency for manufacturers to terminate the aerial and earth connections of the set with sockets, and to generously provide two particularly nasty little plugs intended for the earth and aerial leads. At least one manufacturer recommends 7/22 copper wire for the earth "which should continue unbroken to the actual receiver," but thoughtfully provides a plug in which only three strands will pass through the hole provided for that purpose. These plugs are in themselves satisfactory, but many of them have a common failing. The wire is intended to be held in place by the metal plug portion which is screwed up against it. Often when screwed tight home it will not properly grip a piece of wire of reasonable gauge, and while the wire is clean, all is well, but when the wire oxidizes, nasty scraping noises are heard in the speaker if the lead ways. Trouble of this nature is peculiarly awkward to find, as if the lead is taken and shaken from side to side at an angle that is at all acute, it may bring the wire into perfectly good contact. It should not be necessary to add that such manufacturers go to great trouble to lower H.F. resistance of their tuned circuit, and it is intolerable that resistance should be set up in the radial plug, which necessarily happens unless the plug grips the wire tight enough to prevent oxidation.

The Elusive Gas Pipe
Many listeners are obliged to use a water pipe "earth" which, at best, must have a fairly high resistance. Along this resistance there is a potential drop, consequently if any metal comes in contact with the pipe throughout its length, which is in turn connected to earth, it will cause some sort of noise to be set up in the loudspeaker. Many years ago a case was investigated where a set made the most alarming noises when a motor-bus went by. This was due to a water-pipe "earth" through which a gas pipe momentarily when the motor-bus caused it to vibrate. Such a trouble as this is not difficult to find, as the water-pipe is visible throughout its length, but, unfortunately, this is rarely the case. To a lesser extent the same trouble can apply where the water pipe touches some other earthed object at a point above (possibly several stories above) where the earth lead from the set is connected.

Ancient Wall Sockets
Wall sockets that have been left undisturbed for a term of years often make very bad connection with the supply wires, due to damp, etc. Any of the other troubles which can attack a wall plug not protected by a box at the back. Such a state of affairs often gives rise to a minute arc between the wire and terminal, which in turn can produce a most appalling racket in a sensitive wireless set of the superhet class. The remedy is obvious, and it is sufficient, therefore, to draw attention to it. It will be appreciated that an ordinary A.C. voltmeter is not likely to reveal the trouble, the obvious pointer being whether the set works satisfactorily when plugged into some other socket. The same trouble would, of course, appear with a broken wire, but this usually solves itself, as the broken ends of electrical light cable very soon move apart so that a complete break occurs.

A Screw Loose!
The reprehensible habit of neglecting to "earth" a mains set is getting more and more common. Admittedly in nine cases out of ten reception is not improved, but it is unquestionably desirable from the safety aspect. An earthed chasis brings quite a few lesser troubles in its wake; an example will serve to indicate them. Some chasises are fixed in their cabinets by four nuts and bolts. In due course the base of the cabinet warps, and a nut and bolt which were previously under tension become loose and rattle on the chassis. If the chassis is earthed, this does not matter in the slightest. If it is not earthed, it will still not matter in 99 cases out of 100, but in the odd case it will faithfully record its movements on the loudspeaker by a peculiar scraping noise, which can be imitated by screening the aerial lead gently with a piece of metal. The trouble, of course, occurs in those receivers which are inclined to be on the verge of instability when the earth is removed, and it is more likely to occur with sets one or two years old, rather than with those of this season, which, taking them all round, are extraordinarily stable.

Declining Selectivity
The selectivity of some receivers is liable to decline gently, until a point is reached where its owner wakes up to the fact that, whereas it used to be possible to get this station free from that station, it has become impossible. Go to the local dealer and he will tell you that it is valves, which is a wise diagnosis, as it is almost, but not quite certain, to be correct. Assuming that the set is not out of gang, all components are O.K., and there are no loose connections, the "not quite" element will be resistance in the actual switch contact. Recently a troublesome switch was carefully measured for its resistance, and revealed the astonishing figure of 882 ohms, rather more than 25 per cent. of the H.F. resistance of a good grid coil at 400 metres. The trouble was that the wiper blades which formed one half of the switch contact had become tired and had lost the springiness they enjoyed in their youth, and touched the rotor portion of the switch so gently that a piece of tissue paper could be slipped between them without being crumpled.
The Extension Speaker
Technical and Practical Aspects of Remote Listening Points

It has always seemed very probable that the great vogue at one time enjoyed by the portable and transportable radio set was due to the fact that these sets offered the advantage of "radio anywhere in the house."

That they have to some degree gone out of favour does not, we believe, indicate that this feature is no longer appreciated; rather, it is the natural result of the introduction of fixed-location sets possessed of desirable attributes absent from the earlier form of portable.

In short, it appears that radio users have sacrificed the special convenience of being able to take the programme in any part of the house in favour of the good points of the modern "stationary" set. That the former convenience can be regained with the aid of extension loudspeakers does not seem to be very widely realised by listeners.

Here we intend to deal with the technical and practical aspects of that question so that readers may discover how easily the matter may be arranged.

The first consideration must naturally be given to the question of how many rooms are to be served, and whether more than one point is likely to be in use at once. In the majority of cases it will most probably be decided that it will suffice to provide an extension of at the most two additional listening points, and that only one of these will be working at a time.

Much the same reason it is only necessary to acquire one extra loudspeaker, so that the business is both simple and inexpensive; the single loudspeaker can be moved to the room in which it is desired to listen— and the wiring itself is easily installed.

When two or more additional instruments are expected to be in use at any one time some consideration must be given to the question of power output, in general, this arrangement demands a set with a fairly large output of the order of 3 watts as a minimum unless the rooms concerned are quite small. For a single extra point in use at once, on the other hand, almost any receiver giving good volume on its own loudspeaker will suffice.

Volume Adjustment

A word of warning is appropriate here regarding the question of volume adjustment when a number of speakers is in use in rooms of different size. It will be found that if the level is set to suit the bigger rooms it will be quite unpleasantly high in any room, small one, rooms lower than about 10ft. square are extremely difficult to group in with others more than about fifty per cent. larger.

In all such cases it is necessary to find out by trial how much the volume can be lowered before it becomes inadequate for the biggest room concerned so that a reasonable compromise can be achieved.

In this connection we would offer the general advice that it is best not to be too ambitious in these matters. Rather than create difficulties of this sort for oneself it is better to decide to leave any very small room out of the scheme and concentrate upon those of roughly equal size. Naturally, the question does not arise in those cases where it is expected that only one extension point will be in use at a time; here it is merely necessary to learn by experience what volume level should be heard in the rooms containing the receiver to ensure satisfactory listening at the distant points.

The cost of the installation will obviously depend on a large extent upon the style and quality of the loudspeakers chosen. The cost of the wiring will normally be quite small, even if one does the thing in style with plug-and-jack connecting for the distant points.

Apropos the cost of the loudspeakers it may be remarked that a considerable part of the purchase price goes on the cabinet work, so that if a simple and unpretentious style of case is chosen the cost can be kept down without sacrifice of quality of reproduction.

Running the extension wiring is a comparatively simple task. Many readers will no doubt carry out the work themselves and our suggestion is that twin bell-wire of the cotton-covered and paraffin waxed type should be used.

Wiring the House

Insulated staples such as may be obtained from almost any electrician can be used for securing the leads in position; it is a good plan to drive each staple nearly but not quite home, then apply a steady pull to the free end of the wire and give the staple a final sharp tap with the hammer. In this way the leads are kept taut and neat.

Probably the best route for the leads will be found along the lower edge of the skirting board, as close to the floor as possible. If reasonable care is taken the result will not be at all unsightly, indeed, it will be almost invisible if one takes a small brush and touches up both lead and staples with paint to match the colour of the skirting board.

Wiring System

The system of wiring should be such as to place all the loudspeakers in parallel, the series system of connection is only suitable in certain special cases. Actually, neither method is ideal in theory unless special arrangements are made as to the output circuits of the receiver, but the practical falling-off in quality resulting from the inevitable slight degree of mismatching scarcely justifies the complication brought about by adopting the extra connecting transformers to feed the extension systems as a whole; individual matching of the separate speakers is sufficient.

A convenient method of connecting the loudspeakers to the various terminal points is very desirable unless one is prepared to fit each instrument as a permanency and allow it to work at all times. This is not wanted in most cases, so it becomes essential to provide some means of silencing the unwanted instruments.

If this takes the form of some sort of plug and socket connection scheme, any particular loudspeaker can be put out of action by the simple expedient of withdrawing the appropriate plug. At the same time, it is then made an easy matter to transfer the instrument from room to room as required and one can reduce the total number of reproducers needed.

Quite simple and inexpensive connectors will serve the purpose, the miniature type of two-pin plug available from electrical stores being as good as anything so far as actual efficiency is concerned. Those who are prepared to spend a few extra pence to obtain good appearance and perhaps greater reliability would do well to obtain details of the Bulgin system of wall jacks.

Assuming that some such arrangement of plug and socket connection is used, the extension line system can be kept permanently connected up to the output terminals of the receiver; plugging in a loudspeaker at any one of the distant points then brings the programme into the room concerned.

The alternative method is to connect the extra reproducers permanently to their respective extension points and use some form of switching system at the receiver to bring the required extension into circuit when needed.

The output arrangements of the receiver must be given some little consideration, especially if it is to be a permanent installation. Some form of output filter or transformer is the only positive protection, and it should always be provided.

(Continued on page 249)
The Trophy 8

Review of the Peto-Scott Communications Receiver

In this receiver we have a good illustration of the incorporation of all those features which are essential when reliable short-wave long-distance reception is desired. Apart from those factors which are common to the communications type of receiver (B.F.O., A.V.C., etc.), the makers have gone even to the extent of mixing the valves. The desirability of reducing valve noise and background noise needs no emphasis, and in this connection it has been found, as we have explained before in these pages, that the majority of such noise is introduced in the first, or signal H.F. stage. Special valves have, however, been introduced to reduce this noise factor, and a typical instance is the Mullard EP8. In the Trophy 8, therefore, the makers have included this particular valve, leaving the remaining stages fitted with American G type valves and the results are fully justified. The frequency-changer is a 6HT8G, with a 6X7G L.F. amplifier, a 647G 2nd detector, A.V.C. and L.F. amplifier and a 6P6 output pentode. The usual B.F.O. stage and separate R.F. oscillator are provided, and the mains section includes a full-wave rectifier. The entire receiver is built into a black-chrome finished cabinet, but the speaker has been omitted and is obtainable in a similar style of cabinet with chromium decoration.

Controls
There are ten "controls" on the cabinet front, four of these being switches and jacks subsidiary to the main functions of the receiver. Phones, for instance, may be used by plugging into the jack, thereby cutting out the speaker and including them in the output circuit, fed through a standard filter. The switches are a "send-receive" on/off switch, B.F.O. on/off and A.V.C. on/off, whilst the remaining controls cover tuning, band-switching, H.F. gain, L.F. gain, tone, and B.F.O. pitch control. There are five bands, covering from 7 to 650 metres and the band switch, and the tuning dial are calibrated in kilocycles and megacycles (43 meg. to 545 kc/s) continuous.

The receiver has been tested by us on various aerials and gave a very good account of itself under varying conditions. The efficiency of the R.F. stage is very marked in contrast with other receivers of similar design employing a standard valve. All of the controls function in a smooth and effective manner, the judicious use of the H.F. and L.F. gain controls acting effectively in controlling background noise and interference where the latter is experienced. A.V.C. works well and is fully effective under all normal fading conditions, although as is usual with this particular type of circuit, high-speed fading naturally results in a variation in the signal strength. Each waveband has a separate portion of the dial for calibration purposes, so that no difficulty is experienced in logging any desired station. The price of this receiver is £13 17s. 3d., whilst the speaker is 46s. 3d. extra. Hire-purchase terms are, of course, available at the usual Peto-Scott convenient rates.

The Trophy Six

In the review of this receiver in our issue dated November 28th the price was given as £4 guineas. Owing to increased costs of materials since the war, the price of this receiver has been increased. The present price is, therefore, £10 10s. 6d.

NTS. 3-valver

The illustration below shows an interesting chassis form of three-valve set which may be obtained for £3 1s. 6d., including valves. This tunes from 14 to 2,000 metres, in four bands, and is available also in a mains form at £3 10s. 6d. In this case, however, the range is slightly narrower, covering from 18 to 2,000 metres. For the medium and long-wave bands the coils are of the screened type, whilst the short-wave coil is situated beneath the chassis and is unscreened. The receiver is complete with self-contained switching and incorporates a full vision (clockwise) tuning dial with separate scales for each range. There are three main controls: tuning, reaction and combined on/off and volume control, with a central 4-position wave-band selector. The receiver is assembled on a metal chassis, finished in pale grey celluloid and a gang condenser is used for tuning. The medium and long-wave coils are separated, as may be seen from the illustration and there is no trace of interference or instability due to coupling between stray wiring, etc. There is a fuse bulb fitted, and the battery supply is in the form of a multi-cable, rendering the receiver ideal for installation in a small cabinet of the type containing a speaker in the upper section. In this case, also, the batteries may be housed behind the speaker. The receiver has been tested on various types of aerial and gives a very good account of itself, being both selective and very sensitive. On quite a small indoor aerial a very wide selection of stations was received, and the quality given by the output stage, even with 100 volts, was fully up to the normal standard of a battery receiver of this type. The battery cords are colour-coded and the valves provided are of the Hivic type. The suppliers are New Times Sales Co. Ltd., 26, (Pt. W.I.), Ludgate Hill, London, E.C.4.

Three-quarter front view of the N.T.S. 3-valver.

containig a speaker in the upper section. In this case, also, the batteries may be housed behind the speaker. The receiver has been tested on various types of aerial and gives a very good account of itself, being both selective and very sensitive. On quite a small indoor aerial a very wide selection of stations was received, and the quality given by the output stage, even with 100 volts, was fully up to the normal standard of a battery receiver of this type. The battery cords are colour-coded and the valves provided are of the Hivic type. The suppliers are New Times Sales Co. Ltd., 26, (Pt. W.I.), Ludgate Hill, London, E.C.4.

The main version of the N.T.S. 3-valver.

NTS. 3-valver
A Simple Capacity Bridge

A Simple Capacity Bridge

The accompanying diagrams show a

capacity bridge which can easily be

made up from spare parts. It consists of

a 10,000-ohm potentiometer placed across

an L.F. source, one terminal of a pair of

carphones is connected to the sliding contact.

THAT DODGE OF YOURS!

Every Reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1.0.0 for the best hint 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 WIRELESS," George News, Ltd., Tower House, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every motion sent in must be original. Mark envelopes "Practical Hints." DO NOT enclose Queries with your hint.

SPECIAL NOTICE

All hints must be accompanied by the

coupon cut from page 252.

restricting the passage of any others. This

can be done quite easily by the methods

suggested, and if care is taken in choosing

the optimum condenser capacity, the quality of reproduction will scarcely suffer at all.—F. F. (Mill Hill).

Marking Leads Passing Through

Chassis Grommets

I

It is often difficult to trace leads which

connect underside to top-side chassis wiring when two or more are passed via rubber grommets inserted in the inter-

vening chassis. By adopting a simple method of colour-coding and a suitable

well-known constructional toy, and some

ods and ends.

A steel rod is soldered to one end of a

length of brake cable as shown. At the

other end some insulating tape is wound

round to the diameter of the spindle of the

condenser or potentiometer.

From some thin brass two collars and a

tube are made as shown. The sketch

illustrates the method of fixing the brake
cable to the condenser or potentiometer

spindle. The steel rod passes through the

panel through a bush wheel which keeps the

rod in a horizontal position. In use the

control was found to be free from

noticeable backlash, and is perfectly stable.

—L. CALLOR (Hendon).

WIRELESS TRANSMISSION

FOR AMATEURS

Edited by F. J. CAMM

Explaining how to Learn the Morse Code: Applying for a Licence: Building and Operating a Transmitter. Illustrated by Many Practical Diagrams.

Price 2/6 or 2/9 by post

From George News, Ltd. (Book Dept.), Tower House, Southampton Street, Strand, W.C.2.
Deciding on the Output Stage

With the advent of tetrodes, and the wide variation of sensitivity required in the output stage, selection of the various available output systems has become increasingly complicated. The battery user may select a triode, a tetrode, a pentode, or he may use the quiescent output systems, namely, quiescent push-pull or class "B" output. Throughout the other hand, he may choose a triode, tetrode, pentode, bottom bend push-pull, usually referred to as class "C," or normally biased push-pull valves, usually referred to as class "A," or one of the fancy output arrangements (low-loading, etc.). Certain secondary complications arise, inasmuch as class "A" or class "C" push-pull could make use of triodes, tetrodes or pentodes. It is therefore highly desirable to clear up the output question and to indicate which type of output is appropriate for any set of conditions. It is desirable, but not essential, that the output stage should have high sensitivity. It is exceedingly important that this distortion be introduced, i.e., the output valve must amplify irrespective of frequency. It is equally important that the output arrangement should accommodate the desired volume level without distress, and unless it is convenient to arrange the output stage to accommodate the highest instantaneous peak voltage, it is essential that occasional overloading will not be unduly noticeable to the listener. This latter is unquestionably a compromise, but for the battery user there is no reasonable alternative. For convenience, each type of output is dealt with separately, commencing with those which are applicable to either mains or battery working.

Triode Output

Triode output has the unquestionable advantage of simplicity. It will work with anode load grossly unsuited to its needs with little noticeable distortion, and when overloaded on transients to the extent of 50 per cent., the resulting distortion is noticeable only to the chosen few. Its principal disadvantage is poor efficiency, the output delivered being only about 10-20 per cent. of the power consumption. This disadvantage is clearly evident when the triode is viewed by the battery user. Anode consumption of, say, 10 milliamperes will seldom more than a 130 millivolt output. Another disadvantage is lack of sensitivity, but this can, of course, be overcome by providing adequate gain in the preceding stages.

Pentodes

When the pentode was introduced some years ago it was greatly misunderstood, a disadvantage under which it labours even in these enlightened days. There are still many people who call any remove a triode and substitute a pentode and hope, with unmerited optimism, for good results. It is stated above that the triode is tolerant of an incorrect anode load; it is equally true to say that the pentode is very intolerant. So intolerant, in fact, that it practically precludes the use of a moving-iron speaker, while almost every moving-coil speaker needs to be shunted by a resistance and condenser in series in order to check the tendency for its impedance to at the higher frequencies. The great advantage of the pentode is its high efficiency, being of the order of 40 per cent., or more than double that of the triode valve. In the case of the higher impedances battery pentodes, colloquially known as "economy pentodes," it has the additional advantage of a remarkable sensitivity. In battery receivers where high sensitivity and reasonable output is required, it is an excellent choice where one or other of the quiescent systems cannot be used. Mains pentodes, however, are not necessarily more sensitive than mains triodes; in fact, in one well-known valve maker's range it is possible to find a pentode and a triode with approximately similar output, the triode having less sensitivity than the pentode. The pentode will usually be chosen in a mains set where large output is required, and the use of an adequate triode is restricted either by the H.T. current available or cost.

The Output Tetrode

The tetrode follows logically from the pentode, and differs from it only in that it has no suppressor grid. The absence of this electrode necessarily results in the anode being further away from all other electrodes, and possessing, therefore, less capacity to "earth." The difference between a pentode and tetrode of equivalent characteristics is simply the reduction in sensitivity when the latter valve is used be more sensitive than mains triodes; in fact, in one well-known valve maker's range it is possible to find a pentode and a triode with approximately similar output, the triode having less sensitivity than the pentode. The pentode will usually be chosen in a mains set where large output is required, and the use of an adequate triode is restricted either by the H.T. current available or cost.

The Output Tetrode

The tetrode follows logically from the pentode, and differs from it only in that it has no suppressor grid. The absence of this electrode necessarily results in the anode being further away from all other electrodes, and possessing, therefore, less capacity to "earth." The difference between a pentode and tetrode of equivalent characteristics is simply the reduction in sensitivity when the latter valve is used be more sensitive than mains triodes; in fact, in one well-known valve maker's range it is possible to find a pentode and a triode with approximately similar output, the triode having less sensitivity than the pentode. The pentode will usually be chosen in a mains set where large output is required, and the use of an adequate triode is restricted either by the H.T. current available or cost.

Battery—Class "B" Output

As already intimated above, the quiescent push-pull output stage possesses considerable advantages. One of the principal of these is that the small quiescent push-pull pentode that a most excellent local station receiver may be made of pushing a half wave comes under review. Since the application in battery and mains working differs, it will be necessary to deal with each class separately.

Battery

From the point of view of efficiency, i.e., speech output, against energy consumption, the class "B" valve is still unchallenged. With suitable precautions, a carefully chosen battery pentode is really good, but it has the serious disadvantage of poor sensitivity, as the average class "B" valve with driver requires several times the input of the equivalent push-pull pentode. Under average conditions, however, really good output may be more easily obtained with class "B" output than with a quiescent push-pull.

Pentode Quiescent Push-pull

As already intimated above, the quiescent push-pull output stage possesses considerable advantages. One of the principal of these is that the small quiescent push-pull pentode that a most excellent local station receiver may be made of pushing a half wave comes under review. Since the application in battery and mains working differs, it will be necessary to deal with each class separately.

Summing-up

After reading the above notes, the reader will almost certainly come to the immediate conclusion that there is a great deal of truth in the old saying "one cannot have one's cake and eat it." Economy, sensitivity and quality do not go hand-in-hand. For example, push-pull triodes give the best quality, and are therefore wasteful, whereas the more economical output arrangements do not give such good quality. The modern commercially built receiver often makes use of pentode or tetrode output, but the shortcomings of these valves are somewhat negated by the use of specially designed loudspeakers, and the control of the response curve by the careful design of preceding stages. The writer admits having been a little harsh in his criticism of the various output systems, but considers that by exaggerating the advantages of the different stages the reader will be more readily able to compare them and appreciate the advantages.

P. R.
Television as a War Weapon

As might be expected, it is the Americans who are forecasting that television is to be the most powerful weapon which this present war will bring quickly to a stage of perfection. Their imaginative minds have been given full play, with the result that, although a long way behind this country in actual service technique, inventors are filing patents for devices that are claimed to be of immense value both in attack and defense. It is always dangerous to prophesy, and no doubt many of the propositions savour rather of that apt expression "that the wish is father to the thought," but taking a broad technical view of the whole situation, it seems very likely that just as radio made its most spectacular progress in the last war, so television may be called upon to fulfil a similar function. A recent paragraph in these columns drew attention to the possibility of televising direct from aircraft to ground stations, and now it is claimed in America that designs have been registered for equipment, both receiving and transmitting, that is small and light enough to satisfy the limited space available in airplanes. Ordinary short-wave radio has proved of inestimable value for maintaining communications between general army headquarters and units in the front line, and it is now suggested that maps, operational plans, and other documents be sent via low-powered directional television transmitters from unit to unit, using a process of scrambled signalling in order to ensure secrecy. It is said that this would be preferable to any drawings, etc., being committed to paper as these might fall into enemy hands, whereas a radio vision signal which can be interpreted only by those who know the code would provide no damaging record, as it is only transitory.

Other Devices

A NOETHER television patent for which high hopes are claimed proposes to send a televised picture of an airport to a pilot who is lost in a fog, or who happens to be flying over a strange country. This proposal has been made many times before, but in this case the scheme is to make a small light, moving to scale across the televised picture, show the pilot the exact height and position of his machine in relation to the airfield. Even with a picture definition of 180 lines, it was proved some years ago by special transmissions from the Crystal Palace that a detailed map comes over with very remarkable clarity, especially when a reasonably sized cathode-ray tube is used in the receiver and direct viewing is employed.

Ray-sensitive Spectacles

A CHICAGO inventor has produced special spectacles which he claims are designed to be sensitive to the infra-red rays. By their use a pilot is said to be able to get clear vision through clouds and fog to the ground below, while night observation from the ground, when these glasses are worn, will enable airplane engines to be seen above, since it is also claimed that when heated they radiate infra-red rays. Yet another example of the ingenuity of the American inventors is furnished by the story that experiments are now being conducted with television torpedoes. These machines are said to be relatively cheap and simple to manufacture, and carry in addition to their quota of bombs, a television transmitter. This sends back pictures to the base station, and the course of the torpedo is adjusted according to the information obtained in this way, using radio remote control. The timing for the release of the bombs is undertaken as a result of the same information. The idea may not prove so fantastic as at first thought, for although these machines could be very vulnerable to anti-aircraft fire, or the work of fighter squadrons, they could be sent in mass flight formation to their objectives, and man power would be saved. Pilots take a long time to train to a high pitch of skill, and pilotless equipment is, therefore, a possibility to be reckoned with, especially as it is stated that the Zeiss Optical Works are co-operating in this work. In any case, American experts are studying the problem, and more may be heard at a later date.

Film Scanning

THE American engineers are continuing their researches towards finding the best form of film scanning unit. Attention is not confined to the actual form to be taken by the television camera, that is whether of the storage tube or image dissector type, or a combination of both with or without secondary emission multipliers, but attention is also being given to the best type of film projector which can be employed. Opinion is necessarily divided, but many experts now feel inclined to place their faith in the continuous projector, as opposed to the ordinary type which operates on the Maltese Cross principle. By coming to this decision they are reverting to the machine in use several years ago, and also following in the steps of the B.B.C., who effected certain important changes in their film equipment at the beginning of this year. With this type of projector the film is never jerked through the gate in a series of movements but moves forward continuously. This form of machine was used for television purposes several years ago in America, and the appearance can be gauged by referring to Fig. 1. At the rear is the arc lamp or projection lamp housing while to the left can be seen the film spool chambers; the lower one being the main feed chamber and the upper the "take up" box. In the centre of the main body is housed the heavy mirror combination which is motor driven, and upon whose careful alignment depends the principle of this "jerless" film projector.

Ingenious Operation

IT does not matter at what speed this machine is operated, the film pictures always give the effect of continuous movement, and the scheme will be understood better by referring to Fig. 2. Driven round on an inclined axis is a large drum near the periphery of which is mounted a series of flat mirrors. By means of two fixed mirrors and the drum mirrors, the beam of light from the lamp housing is deflected to its path deflected four times, and at the same time passes through the film negative as it moves continuously through the gate. Although the film is moving, the individual pictures of each frame are projected on to succeeding mirrors, and due to the mirror movement the frame picture emerging from...
Making Receiver Cabinets

Cabinet Construction is an Interesting "Sideline" as a Change from Set Building and Experimenting, and Provides an Excellent Means of Occupying Spare Time on "Black-Out" Evenings

By FRANK PRESTON

I do not propose to describe any one cabinet, because style and dimensions must be decided by the individual in accordance with requirements. Instead, general constructional details will be given. Experienced woodworkers might decide to make a fairly elaborate piece of furniture—but they will not require instructions. The average handyman is much better advised to tackle a comparatively simple piece of construction, bearing in mind that a well-made rectangular box looks, and is, immeasurably superior to an ornate and "showy" cabinet which is badly made and probably lacking in rigidity.

General Procedure

No matter what the shape, provided that it is a simple one, the general method of proceeding is the same. The first step is to make a rectangular frame consisting of the two upright sides, the top and the bottom. After that, a front panel can be fixed with nails or screws, and a back made which can easily be removed. As an alternative, it might in some instances be preferable to fix the back, leaving the front open so that a choice, with its own metal or plywood front panel, can be slid into position. It is desirable, in any event, to make either the back or front a fixture, because this will stiffen the assembly to a marked degree.

In the first place, a rough drawing should be made of the proposed cabinet, and this should be carefully and accurately dimensioned according to the set, speaker and possible batteries which it will have to accommodate. The four parts mentioned above will call for prior attention, and should be bought in one length. In estimating the length, bear in mind that the upright sides will probably overlap the bottom and top, and that not less than 2in. of waste should be allowed for saving and final trimming and smoothing.

Suitable Timber

The wood, which should be well seasoned, can be bought ready planed, for it is not worth while to spend time in planing rough timber. As to the choice of wood, one of the best for the amateur is Japanese oak; but it is softer than English oak, is easier to work and less liable to splitting. Another is satin walnut, but the easiest wood of all to work is canary or American whitewood. This will have to be stained to match existing furniture, since it is yellowish in its natural form.

Corner Joining

After the planned wood has been obtained it is necessary to decide on the form of jointing to be used at the corners, since upon this depends the method of setting out. A professional woodworker would tell you that one of the various forms of dovetailing given by far the strongest corner jointing. But this method of construction is beyond the ability of the average constructor, who will generally find it better to use either butt or corner-halving in butt jointing, the ends of two pieces of wood must be made perfectly square so that they will fit closely against the other two. It is standard practice to allow the uprights to "run through," as shown in Fig. 1. The board should be marked out with the lengths of the top, bottom and sides, but a full 3in. should be allowed between all pieces; this is for the saw kerf or groove. In the case of the uprights, allow an extra 3in. at each end; this will project when the case is first assembled, but the projections will be planed down flush with the outer surfaces.

Halved Joints

It would appear that butt jointing would be the easiest type to deal with, but that is not necessarily the case, since it is far more difficult than at first appears to square the ends of a board. It is, of course, absolutely important that the end should be square to both the face and the edge of the board. Because of this difficulty it is often better to use corner-halving, as shown in Fig. 2. In this case it is better to allow the top and bottom boards to "run through," whilst the uprights should be made a little shorter than the top height of the cabinet by the thickness of the timber. Also remember that the "tongue" of the top and bottom boards must overhang the surface of the sides by ¾in. to 1in. so that the sides can later be cleaned down.

Making the Rebates

The method of forming the rebates across the ends of the top and bottom members is to square lines round the ends of the boards, the lines being the thickness of the wood apart; and the outer one being at least ¾in. from the rough, sawn end. Then either gauge or rule a line across the end and a short distance down the two edges, half-way across the wood. Next hold the board in a vice and, with a flat-back saw, cut across the end with the saw at an angle to the wood, as shown in Fig. 3. Saw down to the shoulder line on the edge nearer to you, and then turn the wood round and repeat at the other edge. Finally, hold the wood vertical and run the saw across just to the depth of the shoulder line. In doing this, the saw kerf or groove should be just inside the waste part of the wood. The rebate is completed by sawing across the face of the wood, to remove the small strip.

Form all four corners in this way, taking care that the rebates at both ends each are on the same side! Then hold the two pairs of corresponding members together and make sure that they are identical; if not they must be trimmed. When they are right, drill a few small holes—for nails—through the tongues of the rebates.

Final Assembly

To assemble, lightly coat the ends of the uprights with thin, hot glue—one at a time. Hold an upright in the vice, press the adjoining piece closely against it and drive in the nails. Actually, it is best to use ½in. panel pins, which are thin, round nails with small heads. Carry out this assembly work as quickly as possible so that the frame can be made square before the glue sets. To make it square, check the two diagonals shown in Fig. 4, with a lath. When equal, the lath can be lightly nailed across one diagonal to keep the frame true.

Fig. 3.—When making a corner halving the cut down the grain should be made first.

Fig. 1 (Left).—How the boards are set out when butt joints are to be used.

Fig. 2 (Right).—How a corner halving joint is made.

Fig. 4.—Before putting the frame aside for the glue to set it should be made square.
New FAST FLYER!

... But for

ALL-WORLD NEWS
Short-Wave Radio Thrills
and B.B.C. Listening

TROPHY annihilates distance

Get a TROPHY NOW. ... Enjoy the thrills of all-world radio listening. ... TROPHY range is unlimited.... In the comfort of your own home, hear—on speaker or 'phones—the amazing variety of broadcasts on the air day and night. On any other set but a TROPHY it is impossible to hear them all. You've always wanted a TROPHY, get yours now, prices may rise.

TROPHY 6

The design and specification of this 6-valve A.C. communications receiver ensures for the user reliable reception of the world's transmitters. Wave-range 3.5 to 545 metres continuous, using switched coil unit. Electrical broad-sounding and other refinements, including switched A.V.C. and B.F.O., pitch control. Built-in moving-coil speaker and provision for alternate use of 'phones. For use with ordinary aerial or doublet type. Hoisted in pleasing cabinet measuring 10ins. x 10ins. x 9ins. deep. Fully tested and ready for immediate use on 200/250 A.C. 6/100 cycles supplied. Fully Guaranteed. Terms available.

Price £10 19 6

TROPHY 8

The super 6-valve A.C. model of the TROPHY range. Here is a receiver for comfortable listening to the world's War news—flashes and important bulletins always to be heard in English in addition to interesting topical discussions, entertaining programmes and usual B.B.C. transmissions. Wave-range 3 to 550 metres. Solo-control broad-sounding. R.F. on all bands. Switched Beat Frequency Oscillator and A.V.C. Designed for use with separate P.M. speaker (for pedestal output). Constructions for alternate use of phones. For single-wire or doublet aerial. Complete in Cabinet size 16ins. x 9ins. x 10ins. deep. Fully tested, for operation on 200/250 x. A.C. supplies. Guaranteed. Easy Terms available.

Price £13 17 3

TROPHY 3

This amazingly sensitive receiver—available in battery and A.C. versions—is unapproachable by any other radio in the same class on reception on 6.2 to 550 metres (continuous). Employing single plug-in self-locating coils. At low cost, the TROPHY 3 gives dependable reception from every corner of the earth. Speaker is built-in with provision for phones. Meters and hand calibrated scale. Complete in cabinet as illustrated and supplied with coils for 12 to 32 metres. Ready for use. Fully Guaranteed. Terms available.

A.C. MODEL Ready for immediate operation on A.C. 200/250. £6 18 9

BATTERY (Excluding batteries). Fully tested and ready to play. If required, 5 additional coils for complete coverage. 6.2 to 550 metres, £1 extra.

CALLERS. All TROPHY machines are 'phones. Allow 2 days for delivery on order for B.B.C. Broadcasting. If not in stock, telephone or send order now for PRESTIGE BADGE or TROPHY Radios.

PORT ORDERS. Immediate delivery on receipt of freight. Despatched by registered mail. Guarantee, satisfaction, or money back. Despatched within 3 working days. No extra charge. Always sending you only genuine TROY products. Price £7 8 6

2-Stage Pre-Amplifier

DOUBLE the performance of your present all-wave set by connecting this pre-amplifying unit. Gives increased range, sensitivity, volume and selectivity and extra and station discrimination. Radiant sounds, for most sets. Connects easily. Adapts to your set and plugs into A.C. Danes, 2-stage, triode, twin moving coil phones. Price £7 8 6

Avoid the rush and order YOUR TROPHY NOW.

PETO SCOTT Co., Ltd.,
77 (Pim) City Road, London, E.C.I. Tel. Cellodine 8873,
41, High Holborn, W.C.1. Tel. Holborn 3288
 ARMSTRONG

Regret to announce that on and after December 4th a compulsory increase in all prices of chassis contained in our current catalogue will be 5 per cent. Readers of "Practical Wireless" will appreciate this very small increase and does not represent fully the cost of raw materials and manufacturing costs.

In accordance with our policy of fair trading we have made no increase in the prices of our chassis during the first three months of the war.

MODEL SS10

It is better to support the corners, and this can be done by gluing and screwing, or nailing, triangular pieces as shown in Fig. 5. This wood should be rough, and is better in this form because the glue will then have a better grip. When all the glue has had time to set (about 24 hours for Scotch glue, or about 12 hours for some proprietary glues) all the nails can be punched down just below the surface by means of a nail or pin punch, as shown in Fig. 6. This is better than attempting to drive the nails right down with a hammer, which would mar the surface of the wood. The projecting ends can then be planed down with a fine file, or sanded on a Stanley plane and, if necessary, the wood can be cleaned off with fine glasspaper, working in the direction of the grain only. In planing, work toward the direction indicated by arrows in Fig. 2.

If desired, the cover holes can be filled in with plastic wood or putty coloured with a little of the stain to be used on the completed cabinet. Alternatively, a wax can be used after sanding, or the edges might be covered with prepared beading. The latter is not recommended, for it gives an "amateurish" finish.

MODEL AW38

The fixed back or front can be screwed over the whole edge of the frame, or to fillets screwed to the inside faces, as shown in Fig. 6.

Any preparatory stain can be used, but stain-varnish is not recommended if a really good finish is desired. Give one light coat, allow it to dry, lightly rub down with fine glasspaper and apply a second coat. A final finish can well be given with polishing wax; this is better than varnish or polish for the amateur and "comes up" better every time the cabinet is rubbed with a dry duster.

REPLEYS 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 out of general interest.

J. A. B. (Brecknock Criss). The box was described in your recent issue which is on cover on the market.

We cannot supply blueprints or other details.

J. R. F. (Bunts). A converter could be used, but probably your previous set did employ H.F. amplification and this may account for the converter not failing to function.

M. F. (Lancashire). Owing to changing prices we suggest you write to Messrs. Petro-Scott for a quotation.

ARMSTRONG MANUF. Co.

WARLERS ROAD, HOLLOWAY,

(London, N.7)

(Adjoining Holloway Arcade)
Get back that P-U-N-C-H in your Set!

With the D.C.

AVOMINOR

ELECTRICAL MEASURING INSTRUMENT

This precision built moving-coil D.C. instrument, with 13 ranges covering 0-120 m/A, 0-600 volts, and 0-3 megohms, provides adequate testing facilities for checking valve performance, batteries and power units, etc. It reduces trouble-tracking to its simplest terms. In case, with instruction booklet, leads, interchangeable testing prods and crocodile clips.

Write for full detailed literature and current prices.

THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO., LTD.

Stentorian Baby Cabinet £1 12 6

Christmas without Radio? Impossible thought! So what could be a more suitable gift than a "Stentorian" to bring the radio to an extra room? Your family will appreciate it—and you will too!

Fit a new

Stentorian

The perfect extra speaker for any set

WHITELEY ELECTRICAL RADIO CO., LTD., MANSFIELD, NOTTS.
A Well-equipped Den

SIR—I enclose a photograph of part of my den which may be of interest to readers. My set is a 5-valve superhet with A.V.C. and push-pull output (PX4s). There is also a 2-valve short-wave converter coupled to it, covering 9-160 metres, with 4-pin plug-in coils. All are home-constructed and work off A.C.230 mains. The speaker is Magnavox 66, and headphones for DX. Aerial is an inverted-L, 30ft. high, 40ft. long, screened by houses and pointing to South America. I also use a piezo-electric pick-up and electric motor.

I would like to exchange QSL cards with anybody at home or abroad, and any reader of this journal is welcome to come down and have a chat at above address.

RALPH ROONEYS, Wellington Avenue, Smithdown Road, Liverpool.

Home Recording: Public Address Work

SIR—Having read several letters in your past two or three issues on home recording, 1, too, would be interested in a few articles on this subject. May I also suggest an article or two on home broadcasting and general public-address work, including a few circuits of high-quality amplifiers. Wishing your excellent paper all the best and continued success in its new form. —W. W. RITCHIE (Bournemouth).

[An article on Home Broadcasting appears in the present issue, and articles on Public Address work were published in the issues for December 17th, 1938, and July 4th, 1938. These issues are obtainable from our Publishing Dept., price 4d. each, post paid.—Ed.]

A Multi-valve Short-waver for Overseas

SIR—Being a regular reader of your Practical Wireless since 1934, I do feel it my duty to drop you a line from time to time. I must, therefore, congratulate you on the new appearance of your paper, which is most attractive.

Whilst looking back on the old and new copies of PRAC TICAL WIRELESS, I have noticed the lack of a description of a 2-, 3-, or 4-valve short-wave receiver running from A.C. mains 240 volts, covering the bands of 7, 14 and 28 mcs, and I shall be glad if such a description can be given in the near future. Australian metal valves of the latest types will be the most suitable.

The set should be simple to build and operate with the minimum of controls, and for headphones reception; bandspread tuning will be essential.

I submit herewith my log of 14 and 28 mc/s stations received on my "Halli
crafter's Sky Champion," with the aid of a 3ft. double aerial which is only 10 metres above ground and situated north-west to south-east. I've logged these stations in the period of 1.10.39 till 1.11.39.

W8PUE, CE1AN, VG0VES, LUTBU, HHRG, W0NNR, W8QXT, YV1AQ, UXUZA, T07SH, X13, J5CW, YV4AF, H6I, YV4AA, VG0VAF, KAPKE, OQ6AB, W5HRD, W6USA, K1AIF, NYIAE, K5AM, KAILZ, ZE1JS.

Tocyclists! Your shield will not be lost sound and true, unless the strikers are tied with five wire at the corners. AND SOLDE RED. This makes a snug case and it's simple—WITH FLUXITE—but IMPORTANT.

A corner of Mr. Ralph Ragerman's Den.

I have to-day received verification of reception on this new frequency and included is a schedule which might be useful to other readers, so I give it here.

For the next few weeks Athlone will be operating on 16.82 metres from 13.30 to 15.30, and from 14.00 to 18.00 hrs. G.M.T. every day, and also transmissions will take place on the new wavelength of 31.27 metres at the following times: 17.30 to 23.30 and 22.00 to 23.00 hrs. G.M.T.—R. T. PARSONS (Brighton).

A Militiaman's Appreciation

SIR.—I am a militiaman, and have been in barracks since the beginning of the war. I have PRACTICAL WIRELESS sent to me from home each week, and it arrives on Saturday in time for the week-end. It seems to be about my only connection with the life I lived before the war. Although I am now unable to indulge in any practical work, I still find pleasure in reading of the experiments and work of others.

Of course, everywhere work on radio and television must be seriously hampered by the withdrawal of all transmission licences. We can only make the best of it, and look forward to the time when we may return to our life as it was before the war.
I would say that it amounts to a national duty to continue publication of such periodicals as Practical Wireless and also Practical Mechanic, both of which keep the "ham," wherever they may be, in touch with their hobbies although they are unable to gather together.

I trust that Practical Wireless will continue to appear for a good many years to come and I am sure that it will never lack readers as long as it continues to publish articles of universal appeal to radio amateurs as it does at present.—John B. Bore (Somewhere in England).

The A.R.P. One-valver

SIR,—Just a line to let you know that I have built myself the "A.R.P. One-valver," and that I am more than satisfied with it. In the evenings it takes me all over Europe, stations coming in loudly on headphones at every movement of the tuning dial. I want to thank you for putting such a good little set before your readers. In fact, it is the finest set I ever handled.

I am going one better, and starting on the "Rapid Two."—W. B. Stevens (Newcastle-on-Tyne).

Exchanging S.W.L. Cards

SIR,—I should be glad to exchange my S.W.L. card with any "ham" and A.R.P. Two-valver owner.

I include a few of my best "catches" on the 20 m. band. They include XE2FC, BC2A, 21B, 104CLIX, 2KLO, 2K104JF, 4K6JF, and 2K4KL.—Harry Rockell, 22, Dale Ave., London, 11, Preston, Lancs.

P R O B L E M S

PROBLEM No. 376

I R V I N G had a space plate transformer with two 4-volt 1-amp. windings on it, and he decided to use the space transformer to supply the heater of the new valve. To obtain the 6 volts necessary, he joined the two 4-volt windings in series and took a lead from the center tap of one winding, thereby obtaining 6 volts (4 + 2). The results did not come up to his hopes, although he expected there would have been an improvement in the performance of the set. What was wrong?

Three books will be awarded for the first three correct solutions offered. Entries should be addressed to The Editor, Practical Wireless, George Kenway, Ltd., Tower House, Southampton Street, Strand, London, W.C. 2. Envelopes must be marked Problem No. 376 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, December 4th, 1939.

Solution to Problem No. 375

W. R. Roberts connected the new transformer and he was satisfied with the diatron, but he found that he had mixed primary and secondary windings, connecting one primary and one secondary terminals in each circuit. This obviously prevented signals being obtained.

The following three readers successfully solved Problem No. 370 and have books which have accordingly been forwarded to them:

T. W. Welch, 60, Telford Road, Leiston, W. G. H. Robinson, Forre House, Glascot, Cumberubnd. L. R. Sellers, 56, Sheelwood Road, King's Lynn, Norfolk, 23.

NEWNES' TELEVISION AND SHORT-WAVE HANDBOOK

by post free of charge

Extension Coupler

"I am building a short-wave experimental receiver, but wish for a long extension cord to the tuning condenser. Unfortunately I wish to mount this on a sub-panel and find it difficult to line it up exactly so that the control will be in line. The usual extension rod, therefore, is rather tight and the slow-motion drive slips. Is it possible to get a long flexible coupler similar to the small discs with crossed arms as in the Edystone range?"

-N. T. (N.W.4)

There is an extension shaft flexible couplings in the Bulgin range, type E.H.12 or E.H.14. The former has a 1-in. length of rod between the two flexible discs, and the second has a 2½-in. rod. If these are not sufficiently long you will have to make your own by obtaining two of the standard flexible couplers and welding them to the end of a length of ebonite rod.

Choke Coupling

"I should be glad if you would let me know what is meant by choke coupling. I am familiar with normal transformer and R.C. coupling, but have not yet met this new arrangement. I do not remember seeing any set in your pages employing it."

-A. G. (Wealdstone)

The choke coupling is exactly the same as resistance-capacity coupling, the full term being, in fact, choke-capacity coupling. The difference is that in place of an inductance in the anode circuit, the load is effected by means of a good L.F. choke. The inductance should be high and the main advantage is that it provides a lower D.C. resistance and thus the valve may be permitted to receive more high-tension voltage. There was one form of choke coupling in which the grid leak was also replaced by a choke, and for this purpose the secondary winding of a burnt-out transformer may conveniently be used.

Aerial Insulation

"Is there any need to go to the expense of fitting the elaborate chain of insulators on an aerial? I am using just one insulator at each end and a friend has told me that if I put a good chain of insulators I shall get better foreign-station reception. Your advice in this connection will be appreciated."

-F. R. T. (Cambridge)

One good insulator may be better than a chain of inferior insulators badly arranged. If the quality of the small insulators is the same, the latter are interconnected.

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 or reception described in our pages, from articles appearing in our weekly general columns.

(1) Supply circuit diagrams of complete multi-valve receivers.

(2) Supply all alterations or modifications of receivers described in our columns.

(3) Supply all alterations or modifications to commercial receivers.

(4) Answer queries over the telephone.

(5) Grant interviews to anyone who answers them.

The coupon must be enclosed with queries as they are dealt with by a separate department.

电池充电

"When charging two accumulators of different rating, must the current rate be limited to the rate of the smallest accumulator, or is the fact of the two batteries being in series sufficient to act as a regulator?"

-N. D. F. (Setlker)

With the ordinary home-charging methods the current should be limited to that of the cell having the lowest charging rate. There are, however, several methods of charging, i.e., constant current, constant potential, etc. We assume that your two batteries are of the same voltage, and therefore you should connect them so that the current flowing does not exceed that recommended for the smaller model. An ammeter is therefore essential in this case.

Extension Speaker

"I have tried an extension speaker on my set but it is very weak. It also seems to cut down the volume on the set itself, when both speakers are in circuit. Is it necessary to cut off the bass speaker when using an extension?"

-S. E. (Weston-super-Mare)

In cases both speakers may be operated together, but the problem is to the volume thereby obtained will depend upon the circuit. In some cases an extension speaker has to be of high resistance, and in others of low resistance, and it is therefore essential to use the right type of speaker with your set. The maker's instructions should therefore be followed in this respect. We would imagine from your remarks that your set is designed for a high resistance speaker and you are using a low resistance model, thereby short-circuiting the output circuit. See the article in this issue on extension speakers.

The coupon on page 252 must be attached to every query.

---

A COMMUNICATIONS RECEIVER

A COMMUNICATIONS RECEIVER is the ultimate in listening.

A HALLICRAFTERS COMMUNICATIONS RECEIVER is not a wireless set in the usual sense of the term. It is a good deal more. It is a specialists precision instrument designed and built primarily for the exacting needs of the professional and amateur broadcasting technician. At this time, however, when first-hand news and views (as well as rare and refreshing entertainment programmes) from every part of the globe are essential for the accurate valuation of international developments, a communications receiver is of vital importance to every reader of "Practical Wireless." A Hallcrafters Communications Receiver is the ultimate in radio equipment; no other type of set is capable of providing short-wave reception with such a high degree of sensitivity, selectivity, and range. Ask for latest Catalogue of Communications Receivers.

Wide range of models and prices. Attractive carry case.

WEBB'S

LONDON

THE HOME OF THE SHORT-WAVE ENTHUSIAST

14 SOHO ST., OXFORD ST., W.1

(Open 9.30 a.m. to 6 p.m.)

Telephone: Gerrard 2069

Emergency Branch: 38 Victoria St., St. Albans.

Phone: 4924

Birmingham Depot: 41 Carrs Lane.

Phone: Mid 5669

SXR4

53.5 to 560 kc. (60 to 555 mc.);

Built-in Frequency Meter; Meter Time-base;

Built-in Noise Limiter; Variable Sensitivity;

Break-in Relay Operation; Crystal Filter;

Four Band Positions; Electrical Band Spread; \n
Wavetuner 110 to 250 volt A.C. Speaker;

£24.0.0

4.5 to 120 kc. (1.8 to 45 mc.);

The 'SKY BUDDY' Another fine model from the Hallcrafters range at the very moderate price of £11.10s. (Including speaker). Remarkable value.
D.C. ELIMINATORS
AND I.F. CHARGERS

EVEN in the best regulated offices, slips occur from time to time, and in these days with A.R.P. work and black-out regulations theoretically that we will
have a slip to get into our issue dated November 11th last in the article on Eliminators. Here, the method of calculat-
ing a part of the bleeder resistance value was incorrectly stated. Statically, the value of resistance given by the contrib-
utor was correct. Unfortunately, however, when such a bleeder resistance is in
use there will be a current load to the lower part of the total resistance, and this will lead to an incorrect value, if the method of calculation which was given is adopted. Therefore, the method of calculation should be as follows: First, settle upon an arbitrary current which may be "bled" from the total H.T. and this should be a
small fraction of the total current, say 10 per cent., as already explained. Resist-
ance R1 in the diagram published in the issue in question has to pass this initial current when connected to a working receiver and we require 60 volts at the first tapping and this resistance. Therefore, 60 volts at the initial current, which we take as 2mA will give a value of 30,000 ohms. The next resistance, R2, is calcu-
lated exactly as mentioned in the article, namely, the current of the valve which is fed from the 60-volt point, plus the bleeder resistance, gives a total current of 4mA in the example and as 20 volts have to be dropped across that resistance the value is 5,000 ohms as mentioned. Thus it will be seen that all the calculations in the example are quite correct, with the excep-
tion of the first section, R1.

PRACTICAL TELEVISION

(Continued from page 241)

the main projection lens at the top of the com-
ponent is stationary. The angula-
tion of the mirrors one to the other is set to allow this to take place, and the scheme of "picture change" is a familiar one, and forms the basis of several pieces of scientific equipment. The actual change from one frame to the other takes place by ensuring that the succeeding frame picture is correctly focused on to the following mirror at the exact instant the previous frame is about to disappear from view. By merging the changes in this way the optical expression given to the eye is one of discontinuous movement and is, therefore, ideally suited to use with a disc scanner (as seen in Fig. 1), a storage tube or image dissector tube. The number of frames per second is governed by the motor drive, and can be made to suit any transmission standard, while the synchronising signals may be injected just where required, for the whole scheme of scanning is really in-
dependent of the film motion provided by the
projector unit itself. Furthermore, a smooth change over from film to studio scenes and vice versa is possible without any special adaptations, as is the case with the intermittent projector.

The only important defect which has so far been noticed with this apparatus is the possibility of frame flicker, even when the frames per second are at least 50. This is caused by alternate frames of the film reflected from the drum being

H. J. Barton-Chapple, a member of our technical staff, and a regular contributor to these pages, has just been granted a
commission in the R.A.F. Volunteer Reserve.

Alan R. Barnett, for nearly ten years East Midlands representative for Ekco, has severed his connection with the company.

G. W. Godfrey has given up his position as general manager of the home television sales section of Baird Television, Ltd.

PERSONAL PARAGRAPHS

BULGIN RADIO COMPONENTS

FOR EVERY RADIO NEED

BULGIN Transformers—models for all needs. High amplification, nickel-
layer alloy cores, even response curves, high gain and con-
tinuous copper windings. Joints are welded—not soldered. The range covers all requirements.

NEON TEST PROD

A SMALL neon lamp of special design and manu-
facture is incorporated in the valve to detect the "live" main of a supply; whether a supply is A.C. or D.C., continuity exists; etc. List No. T.P.S. 17/6 EACH

WATTMETERS

TWO models (for 250V and 125V max.) provide a simple
means of ascer-
inating the power taken by mains apparatus. Fitted
with 2 pole 5-A
pins and sockets, accurate ±5 per
cent. In a highly
polished bakelite
case. List Nos. 17/6
U.M. 12, 14. EACH

MICROPHONES

TWO carbon mi-

Please send me the NEW 128 pp. Catalogue No. 162, showing full range of Bulgin Products, for
which I enclose Ad. stamps.

NAME

ADDRESS

P.W. 11.39

Advert. of A. F. Bulgin & Co., Ltd., Abbey Road, Barking, Essex. Tel. RP impression 3474 (3 lines),

Send NOW!
PRACTICAL WIRELESS

December 2nd, 1939

LATEST PATENT NEWS

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.1, either sheet by sheet or as issued on a subscription of 5s. per Group Volume or in bound volumes price 12s. each.

Abstracts Published

ADJUSTING WIRELESS APPARATUS.—C. E. K. Jarvis, 4, Prince Consort Road, H. G. Maclean, No. 500305.

In a remote-control device for a wireless receiver, wherein the tuning element is driven through a flexible shaft from a shaft 2 (Fig. 1) actuated by the tuning knob on the receiver, the shafts are carried on a scale wheel 4, driven by a gear wheel 3 on shaft 2 and visible through a transparent cover plate 4 in the panel 13. The scale wheel 4 is freely mounted on a stud 5 and for adjustment thereof relative to the tuning element, a preferably sprung cap 15 is removed from the cover plate, where, by means of a screwdriver or like tool, the wheel 4 may be moved axially in opposition to the spring 12 out of engagement with the wheel 3 and then rotated until the correct tuning position is indicated when the wheel 4 is released to mesh again with wheel 3.

NEW PATENTS

Three particulars of New Patents of interest to readers have been selected from the Official Journal of Patents and are published by permission of the Controller of H.M. Stationery Office, London, W.C.2, p. 1 (weekly subscription, £2 18s.)

Specifications Published


PRACTICAL MECHANICS HANDBOOK

By F. J. CAMM.

400 pages, 6/- or 6/6 by post from

GEORGE NEWNES, LTD.
Tower House, Soho Square, Strand, W.C.2.
December 2nd, 1939

LOUDSPEAKER CONVERSIONS

BAKER'S Triple Cone Conversions Will Immeasurably Improve Your Present Speaker. Enables you to bring your speakers right up to date and obtain really realistic reproduction at the cost of a few shillings. Rebate certificates from the Pioneer Manufacturers of Moving Coil Speakers since 1927.—Scribes Bellhart Radio, 72, Sussex Rd., South Croydon.

NEW LOUDSPEAKERS

3,000 SPEAKERS from 6/6 each. P.M. and energised 4½ in. to 14 in., including several Militar type—Binural type.—Radiogram Ternate, Croydon Avenue, Southend, L.I.

NEW CHASSIS

A BRISTOL Company have a number of chassis not in the current catalogue, for disposal. These chassis carry many original generous guarantees and represent outstanding bargains. An example of one or two models described hereunder.

A BRISTOL Model RP/PR/2, 9-valve All-wave Radiogram chassis covering 4 wave bands and automatic time-switch for 24-hour output, capable of handling 8 watts. £7 16s. 6d.

A BRISTOL 7 and 8 Stage Radiogram chassis, complete with Speakers, ready to switch on. £7 16s. 6d.

A BRISTOL have a number of other models at equally economical prices. Kindly send us your requirements.

A BRISTOL will send any chassis on 7 days’ approval.

ARMSTRONG COMPANY, Warlers Road, Holehey, S.2.

MORSE EQUIPMENT


COMMUNICATION RECEIVERS

FIRST selection in the country. Sole Agents for famous HALL&QUATTERS Receivers, ranging in price from 4/- 10d. to £15. 15s. 6d. Such demonstrations at our London showroom. 60 post free—Webb's Radio, 14, Sloane Street, London, W.1. 'Phone: Gerard 2909.

TECHNICAL LITERATURE


RADIO MAP AND GLOBE


FREE ADVICE BUREAU

COUPON

This coupon is available until December 20th, 1939, and must accompany all Queries and Bids.

PRACTICAL WIRELESS, 3/12/39
**PREMIER RADIO**
---
AS USUAL!

**SPECIAL PURCHASE**

**AIR WARREN** 5-valve Widget Receiver For A.G. Mailers.

- Complete self-contained in well-finished, polished Oak Cabinet,
- 12 x 9 x 9 in., tapped 200-250 volts, or 5000, 10 watts, 2 volts, 2 amps.

Suitable for re-written: a) 45/2, model 5/6, each Auto Transformers, 200-250 volts,
- 6 volts at 200 watts, 12 volts at 250 watts.

- For Overseas News.

- In stock.

- For replacements in G.E.C. models, 5/6 each.

- Filament Transformers, 200-250 volts, tapped 350-0-350 volts, 100 ma.,
- 4 volts 5 amp. 100 ma., 4 volts 5 amp.

- 12 volts, 250 ma., 6 volts 50 ma., 6 volts at 100 ma., 6 volts.

- Input 4 volts 4 amp., 4 volts 6 amp.

- All sizes up to 2 kw.

- G.E.T. Wave 90, 100, 150, 200, 500, 1000 watts.

- £1/6 each.

- BULGIN 20 ohms Wire-core wound - 1/3 each.

- Standard Push-back Wire. 16 x 71, .009, .008.

- CHASSIS Mounting Valve Holders, American 4-, 5-, 6- and 7pin. 64. each. Old, 64. each.

- Cable 35, English 36, each. 21st each.

- POLAR 83/4. Low resistance, 40. each. 39th.

- All sizes up to 1 kw.

- WEAREITE Malus Transformers. Made to strict electrical standards, wire end type, all windings ironless tapped, screened. Prices, 200-250 volts, 200-250 volts. 6/6 each.

- ALL POST ORDERS TO Jubilee Works, 167, Lowe Street, W.C.1.

- BRIALAY Wire-wound Volume Controls, with switch, 15/6.

- WEAREITE Chokes, screened - 1/6 each.

- PISLEY DRY ELECTROLICS CAN TYPE - 10 x 2, mfd. 500 volts working - 1/6 each.

- 12 x 16, 350 volts - 1/6 each.

- 12 x 8, 500 volts - 1/6 each.

- 12 x 3, 475 volts - 1/6 each.

- 8 x 6, 500 volts - 1/6 each.

- 12 x 2, 500 volts - 1/6 each.

- 8 x 8 x 8 mfd. 560 volts working - 1/6 each.

- 16 x 8 x 1 x 1 mfd. 500 volts working - 1/6 each.

- 12 x 6, 560 volts working - 1/6 each.

- 16 x 6, 450 volts working - 1/6 each.

- B.A. CARDBOARD ELECTROLICS, wire-end type, 500 volts working.

- 3 mfd., 500 volts working - 1/6 each.

- 3 mfd., 500 volts working - 1/6 each.

- 10 mfd., 500 volts working - 1/6 each.

- STANDARD TELEPHONE HEADPHONES, 500 volts working.

- 2000 ohms and 4000 ohms - 6/6 each.

- 6/6 pair each.

- 1000 ohms and 5000 ohms - 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.

- 6/6 each.
How PRACTICAL MECHANICS will brighten your CHRISTMAS

Connecting a pick-up permanently to a battery detector stage.

Special Contents Include:

BROADCASTING YOUR OWN PROGRAMMES
How to connect and use the Gramophone with any existing receiver, and suggestions for increasing the entertainment provided by Gramophone Records with various devices.

EASY MAGIC FOR CHRISTMAS
Mystifying tricks that need neither skill nor special apparatus.

SYNCHRONISING SOUND WITH A CINE
How gramophone records can be made for use in conjunction with cinematograph films.

COPYING WITHOUT A CAMERA
An ingenious idea for copying articles from books without damaging the book.

A MYSTERIOUS SUBSTANCE
Facts about Radium and its varied applications.

BUILDING A GLIDER

IN THE DECEMBER

PRACTICAL MECHANICS

The Magazine of Modern Marvels.

Order a copy from your Newsagent To-day! 6d.
A HETERODYNE FILTER

A NEWNES PUBLICATION

Edited by
F.J.CAMM
Vol. 15. No. 377.

Practical Wireless

and

PRACTICAL TELEVISION

Contents

DX on the Medium Waves

More About the Three-Two

An A.C. Trickle-charger

Practical Television

Thermion's Commentary

Choosing a Loudspeaker

Practical Hints

Experimental Heterodyne Filter

Auto Grid-bias Circuits

Readers' Letters

THE OUTLINE OF WIRELESS

By Ralph Stranger

This book teaches you everything you need to know about wireless. The entire theory and practice of reception is covered simply and clearly from A to Z. 832 pages with over 500 illustrations and diagrams.

10/6 NET From all booksellers, or by post 11/6 from the publishers, GEORGE NEWNES LTD., (Book Dept.), Tower House, Southampton Street, Strand, London, W.C.2.
Best Christmas Reading

FOR ALL THE FAMILY

Get these three bright bumper issues. They will be enjoyed by everyone, for each is full of good humour and the real Christmas Spirit!

TIT-BITS XMAS EXTRA, 6d.
Four complete stories, many entertaining articles, special contributions by Sandy Powell, Western Brothers, Puzzles, etc., and a Children's Section.

XMAS LONDON OPINION, 6d.
A Christmas tonic for everyone, in the popular pocket size. It keeps the flag of humour flying!

HUMORIST XMAS NUMBER, 6d.
Hundreds of Christmas laughs inside by the most popular humorous writers. Artists include Bert Thomas, Lees, Arthur Ferrier.

FOR THE KIDDIES — 2d. each
CHRISTMAS HOLIDAY COMIC
MONSTER XMAS COMIC
Packed with all the things boys and girls love to read at Christmas.

Order To-day! Make Christmas Gay!
ROUND THE WORLD OF WIRELESS

Short-wave Receivers

The design of short-wave apparatus lends itself better to the experimenter than that of long-wave equipment, and although circuits must, more or less, be standardised, there are many refinements which may be incorporated and which will provide scope for experiment. The ideal short-wave receiver is, of course, the communications type of superhet, but it is possible to build a simpler type of receiver and yet still retain many of the features of this special type of superhet. We have already described in these pages various special short-wave receivers, and in this issue we give yet another specialised design, including five valves. Reaction is, of course, the main stand-by of the "straight" receiver, and the more effective that this part of the circuit may be made, the better will be the results. Specialisation has, therefore, been paid to this part of the Short-Wave 5, and there are many other features in design which will appeal to the experimenter who requires something different from the ordinary straight three or similar type of set for battery operation on the short waves.

"People's Set" for Troops

The authorities have approached some of the larger radio firms with a view to obtaining a design of radio receiver for use by the troops. Something on the lines of the "People's Set" is indicated, providing simplicity of operation and reliable results.

Elizabeth Cowell as Broadcast Announcer

The B.B.C. announces that Elizabeth Cowell, the former television announcer, has returned to broadcasting, by arrangement with the Air Ministry, as a woman announcer in the Home Service programmes. She is to specialise in anniversary variety broadcasts.

Miss Cowell and the B.B.C. as a television announcer in May, 1936, and since then has faced the microphone and television camera on more than a thousand occasions, at Alexandra Palace, on the stage at St. George's Hall, at Radio-Lympia and in television outside broadcasts. She has also produced television programmes, specialising in presentations of ballet, which is one of her principal interests. Miss Cowell speaks French and German. Before she joined the B.B.C. she had had considerable experience in dress design and display.

Children's Hour Adventure Story

Elsabeth Kyle is well known as a writer for Children's Hour, particularly in the adaptations she has made of folk tales. Now she has made a thoroughly topical play which will be broadcast on December 9th. It opens with Robin and Jean travelling to Glasgow in a train during a black-out. In an old curiosity shop they meet a mysterious stranger and take part in an adventure concerning a parrot, a musical box and the model of a Chinese temple carved out of priceless jade. The play, which is called "The Key to No. 10," will be produced by Christine Orr.

"The Hammer of God"

The Hammer of God has been adapted for broadcasting and will be produced by W. Furniss Sound on December 16th.

It will be remembered that "The Blue Cross" and "The Man in the Passage" have already been broadcast. The adaptation of "The Hammer of God" has been made by Douglas Cleverdon, who adapted Chesterton's "Club of Queer Trades," a series which was broadcast in monthly instalments between January and June of this year.

"The Hammer of God," when the Lord of the Manor was found with—to use the doctor's expression—"his skull smashed to bits like an eggshell," the police found an easy and convincing explanation; but Father Brown proves that the explanation is too easy. That, in fact, it leaves a number of account several necessary facts. Richard Goodden will play the part of Father Brown, and V. C. Clinton Buddlely will be the Narrator.

"The Doll's House"

B.B.C. enthusiasts will be interested to learn that Barbara Burnham is to produce "The Doll's House" on December 8th, with members of the Repertory Company.
POINTING out that the average amateur nowadays thinks of DX reception only in terms of short waves, a very keen experimenter recently asked me for a circuit suitable for a sensitive receiver for medium-wave reception. At first the request struck me as being a surprisingly one, but after further consideration and after discussing it with other experimenters, I realised that there was a good deal in it.

My querist pointed out that he had been building long-distance sets for a number of years and reminded me of the "Selectone," which I described in Practical Wireless seven years ago. This was a Det-I.F.-Power type of receiver with a number of features which were unusual at the time. It gave good reception of American medium-wave stations, not only on my own aerial but in the hands of a large number of readers. A suggestion was therefore made that an up-to-date version of this set should prove very popular. But I had to disagree with this, despite the fact that at least one reader has received three or four "Yaaka" on it within the past few weeks.

"Straight" Circuit Not Suitable

Unfortunately, a set of this type, however well designed and made, is not sufficiently selective for present conditions. The very nature of the simple type of "straight" circuit makes it unsuitable for 1940 DX. By designing a "straight" set with at least two H.F. stages—and possibly a band-pass filter into the bargain—sufficiently sharp tuning might be obtained; but only at the expense of a certain delicacy of operation and initial trimming. And even if an exceptionally high degree of selectivity were combined with marked sensitivity, I should not favour a circuit of that type. The reason is that the requirements can be met in a simpler and less expensive manner by using the superhet. Regardless of the adverse reactions of many "old hands" to the superhet, there is no doubt that it does present the most convenient method of combining every feature that is most valuable for medium-wave DX work. When "sounding" and simply is the prime need, a very good argument can be made out in favour of the "straight," but for any other purpose the "straight" cannot easily be defended, however much fondness the pre-1930 experimenter has for it.

A Superhet

This leads us to a brief consideration of the kind of superhet circuit best suited to the needs of the M.W.-DX "fan." Personally, I doubt whether I should build a set for long-distance reception of the so-called broadcast bands only. Since a short-wave band can be added at practically no extra cost, and with as many sacrifice of efficiency on the 200 to 2,000-meter range, there does not seem to be any very good reason for not including it. Even if it is used only rarely, it does provide an interesting diversion.

A skeleton circuit is given on this page which shows the general arrangement which may be followed in building a receiver of the type in question. It should be made perfectly clear that the circuit is not complete in every detail, and that it is given rather for the guidance of the experimenter than as a circuit which would appeal to the average constructor. That is why no constructional details will be given, for it is assumed that anyone who proposed to make a receiver round it would have sufficient knowledge and experience to work out his own practical details. There are on the market various makes of coils that could be used, whilst the other components are of standard type. Most readers have their own favourites in the way of valves, and certain resistor values are essentially dependent upon the particular valves employed. The values are generally given in the literature available from the valve manufacturers.

Valve Sequence

It will be seen that there is a preliminary H.F. stage, followed by a pentagrid frequency-changer (there is no particular reason why a triode-pentode or triode-hexode should not be used if preferred), a single I.F. stage and an H.F. pentode second detector. An I.F. amplifier would be used in most cases, but this can be of any standard type. Since there are two tuned stages prior to the frequency-changer it is quite unnecessary to use a band-pass filter, especially since ample selectivity control can be provided in the first I.F. circuit. Experience generally shows that a preliminary H.F. amplifier is better than a second I.F. stage, since a certain minimum signal input to the frequency-changer is essential for efficient operation; this is an important point when DX is the first need.

A three-pan tuning condenser is required, and the type of this depends upon the oscillator coil employed. My preference nowadays, but it has at least two advantages for the purpose under consideration. In the first place it permits the second-detector to operate at maximum efficiency, and in the second it allows that valve to be used in an oscillating condition for the reception of C.W. transmissions. It might be argued that a heat-frequency oscillator would provide a better means of obtaining C.W. reception, but we are concerning ourselves not only with efficiency, but also with reasonable simplicity.

Of course, reaction control must have some slight effect on the tuning of the second I.F. transformer, but this is negligible at 465 kc/s provided that trimming is carried out only at the reaction condenser is set to a position just below the oscillation point. Additionally, the differential reaction condenser counteracts to a large extent the changes in circuit capacity brought about by reaction condenser adjustment.

(Continued on page 265)
THE "THREE-TWO" RECEIVER

Three-quarter front view of the "Three-Two" receiver

THE only details which were not given concerning this receiver last week were the drilling dimensions for the panel lay-out. As the receiver must be provided with a panel, or mounted in a cabinet, which will have to be drilled, we give on this page a dimensioned lay-out of the front of the receiver, from which the desired drilling may be accomplished. The holes for the various spindles should, of course, be merely clearance holes, so that the control knobs will cover them. So much for the actual construction. A simple three-valve combination of this kind, however, is remarkably amenable to circuit changes, and much can be done to "hot-up" such a circuit so that each stage gives its maximum performance. For instance, the screen-grid of the H.F. stage is provided with a fly-lead for insertion in the H.T. battery. The usual voltage for such a point is round about 80 volts. When, however, this is raised or lowered the H.F. stage acts in a different manner, and in some cases the stage may prove unstable if it is raised or lowered above a certain point. This, then, is the first point where experiment may be carried out to provide an efficient H.F. stage.

Instability

Initial experiments should be carried out with the lead inserted into the socket nearest the 80-volt mark, and it is preferable for this type of receiver to obtain one of the H.T. batteries which has a large number of intermediate voltage sockets. Some, of course, only have sockets at every 15 volts, whilst others are tapped at every 6 volts or so. When a signal has been received and the receiver is found to be operating properly, move this screen voltage lead up and down the battery and note the variation in performance. It will be found that there is a point where sensitivity is at maximum and the set is perfectly stable. No bias is applied to the valve, and, therefore, gain is at maximum with consequent risk of instability if the lay-out is badly carried out. When, however, the screen voltage has been properly set for the valve in use, the receiver will be perfectly stable and gain will be adequate. If it is desired then, to avoid the necessity of using the extra fly-lead, or a different type of H.T. battery is to be used, where the appropriate tapping point is not available, the screen may be fed from a potential-meter across the H.T. supply, the two parts of such a potential-meter being provided by two fixed resistors having values which will ensure the correct voltage being applied. Alternatively, a simple series resistance may be joined between the screen-grid and the H.T. line feeding the output valve, with a 1 mfd. fixed condenser between the screen-grid and earth. To ascertain the correct value of this resistance a milliammeter should be inserted between the fly-lead and the socket on the H.T. battery which has been found most suitable, and the current reading noted. The value of the resistance may then be calculated by subtracting the voltage which is being used from the total of the H.T. battery and dividing this by the current in milliamps. The answer will give the value of the resistance in thousands of ohms, and a 1-watt component will be ample for the position.

Detector Stage

In the detector section or detector stage of a similar circuit it is also possible to improve the performance of modification of certain component values. The grid leak is probably the most critical in this respect, changes in its value affecting not only the sensitivity of the stage, but also the smoothness and efficiency of the reaction circuit. Try values from 1 megohms (100,000 ohms) up to 5 megohms, and note the difference in sensitivity on a weak station, and also the way the reaction control affects the receiver. When some voltage reaction will go in with a "plop" long

LIST OF COMPONENTS FOR THE "THREE-TWO" RECEIVER.

One 'Bar Type' 2-gang condenser (Polar). One micro-horizontal drive (Polar).
One 2-gang coil unit, type BP114 (Varley).
One screened standard H.F. choke, type H.F.9 (Jablons). One 4-point socketed dolly switch, type S.139 (Reliance).
One 3,000 ohm 1-watt resistor (Dubilier). One 10,000 ohm 1-watt resistor (Dubilier).
One 45,000 ohm 1-watt resistor (Dubilier). One 250,000 ohm 1-watt resistor (Dubilier).
Two 2000 mfd. fixed condensers, type 655 (Dubilier).
One 25 mfd. fixed condenser, type 4602S (Dubilier).
Three 1 mfd. fixed condensers, type 4603/S (Dubilier).
One 1 megohm volume control, type 5/G/P (Reliance).
One 9-pin chassis type valveholder, type X.112 (Clix). One 9-pin chassis type valveholder, type X.112 (Clix).
One 800 mfd. 115 volt condenser (Peto-Scott).
One two-socket strip, A.B. (Clix). One two-socket strip, L.S. (Clix).
One tap-cup connector, type 9623 (Clix). Two component mounting brackets (Peto-Scott).
One Meterplug chassis, 8in. by 8in. with 3in. of selected components provided, type X.112 (Clix).
One TP.22 triode-valve socket (Marsa). One pen 220 output pentode valve (Marsa). Connecting wire, insulated sleeving, screws, etc.

Drilling dimensions for panel or cabinet front for this receiver.

(Continued on page 269)
The problem of recharging low-tension storage cells forms one of the little, but always present, dis-advantages associated with battery-operated apparatus. However careful one might be in keeping a check on the discharge rate and period of an accumulator, there comes a time when the supply unexpectedly becomes exhausted, and for some unknown reason this so often happens when it is least convenient. During normal times, this failure of the L.T. supply to a radio receiver could be sufficiently annoying, but during the present conditions, when one does not wish to lose some special broadcast item, the necessity of preventing such occurrences becomes vitally important. The same

carries must now, of course, be given to accumulators which are being so widely used for emergency lighting work, and for portable and stand-by A.R.F. shelter listen points.

It is not always convenient for constructors to make use of some of the well-organised charging services now so well established in most areas, while others who have A.C. mains available naturally feel that they would like their installation to be as independent as possible from outside assistance.

For the benefit of the latter, details are given below of L.T. chargers suitable for most domestic requirements.

Technical Considerations

When dealing with an alternating current supply, it becomes essential to provide some means of converting or rectifying the available current to that suitable for charging purposes, namely, reasonably pure direct current.

For this purpose, various types of rectifiers can be used, but so far as most requirements

are concerned, the choice can be restricted to two, the valve and the metal rectifier. For amateur purposes, the latter is, undoubtedly, the most simple and economical, therefore it is that type which will be dealt with in this article.

Three fundamental circuits recommended by the makers of the Westinghouse metal rectifier are shown in Fig. 1, where it will be seen that the essential requirements are mains transformer, a rectifier, and a limiting resistance.

The construction of the mains transformer will depend on the voltage of the mains supply and the type of rectifier employed, i.e., the L.T. charging output required, which, in turn, will be governed by the number of two-volt cells to be charged at any one operation.

The limiting resistance R, although a rather insignificant item, is very important as it is incorporated in the circuit as a safety-device.

The resistance of an accumulator is very low, and it must be appreciated that the current limiting factors of the charging circuit are the resistance of the cell and the difference between the applied voltage and that of the accumulator. Also, any fluctuations exist in the applied voltage, these will be capable of causing fluctuations of a much greater magnitude in the charging current. As each type of rectifier has definite current limitations, and, of course, the same applies to the secondary winding of the mains transformer, it will be realised from the above that unless means are provided to prevent or swamp such current fluctuations, serious harm might be caused to these components. In view of this, the resistance should never be omitted from the practical circuit.

Controlling the Output

When metal rectifiers are used which have an output suitable for the charging of more than one accumulator at a time, with the tapped secondary having to be provided and the two common forms of tapped secondary winding or a reliable variable resistance. The first method is recommended by us in preference to the latter.

There is an exception to this rule, however, and that is when a centre-tapped secondary winding is used which require a centre-tapped secondary winding, which is shown in Fig. 1.

Design

For ordinary radio requirements, quite a small charging current will be suitable, as it is usual to bring the charger into operation only a sufficient number of hours each day, or every other day according to individual demands, to replace, as it were, the current consumed by the receiver during its period of operation. This process is known as trickle-charging, and the required apparatus is less costly than that which would have a greater output and which, consequently, would take a little time to charge a given cell.

A small panel is advisable, to carry the mains on-off switch and the output terminals or sockets and, with the larger chargers, a suitable ammeter to enable a visual indication to be obtained of the output or charging current. The circuit shown in Fig. 2 (upper half) makes use of the Westinghouse metal rectifier type L.T.7, which is ideal for normal 2-volt cell trickle-charging. The mains transformer secondary is centre-tapped to give a plus 4 volts A.C., while the fixed resistance must have a value of 2.5 ohms. The charging rate is 0.5 amps. The arrangement in the lower half of Fig. 2 has a greater output and is suitable for charging from 1 to 3 two-volt cells at a current of 1 ampere. The rectifier is the type L.T.4. The limiting resistance must have a value of 1.75 ohms. With the tapped secondary for current control, the secondary A.C. voltages will be 7.5 volts, 9 volts and 11 volts for one, two or three 2-volt cells, respectively. If, however, a variable resistance is used as the control, the secondary voltage must be 11 volts and the following resistance values provided: 5.21 ohms, 3.35 ohms and 1.75 ohms for one, two or three 2-volt cells as before.
More Prohibition

The Postmaster-General has announced that he has issued an order prohibiting except under the authority of a post-office permit the acquisition or supply of wireless transmitters and certain other electrical apparatus which may be used as parts of such transmitters; the possession of wireless transmitters, and the use of wireless transmitters. This is to enable the Postmaster-General to exercise in the national interests more effective control than has hitherto been possible over wireless transmissions in and from this country. The acquisition and use of wireless transmitters are not affected where there is a licence still in force under the Wireless Telegraphy Acts authorising the use of it. It will be illegal to possess a wireless transmitter within these limits after December 14th. Applications for permits should be made to the Engineer-in-Chief, Radio Branch, General Post Office, Harroge, Yorkshire, and are on forms provided for the purpose. These may be obtained at any head post-office or from the Engineer-in-Chief.

No person may now sell, purchase, let, hire, supply, dispose of, acquire or distribute wireless transmitters, whether for telegraphy, telephony, or television, or for use as navigational beacons, or landing beacons, or otherwise, for the purpose of indicating position or direction or the remote control of machinery. Nor may they sell, purchase, let, hire, supply, dispose of, acquire or distribute high-frequency inductors, spark coils, quenched and rotary spark gaps, high-frequency equipment, being equipment which generates or uses high-frequency current at frequencies greater than 10,000 cycles per second, and having a maximum output exceeding 10 watts and including equipment intended for use in connection with furnaces and motors, or for use in apparatus capable of anode dissipation exceeding 10 watts is illegal. Similarly, piezo-electric quartz plates or piezo-electric tournaiene plates, cut to oscillate at any specified frequency, are banned.

The transmitters seems to be in a bad time.

Overseas Correspondent Wanted

A. RTHUR C. H. WALTERS, who is ele 2DMT and who resides at 18, North Street, Bedminster, Bristol, 3, wishes to communicate with one of the fans overseas., He cheerfully says that although an undertaking by trade, his outlook on life is not morbid. He is prepared to swap letters and may write occasionally as well as an occasional book or novel.

Another Myth

A CORRESPONDENT whose initials and address I refuse to disclose lest some of my fans in the district bear him limb from letter thinks that the best English is spoken in Dublin and Inverness and in that order! They do not speak correctly English in Dublin or Inverness. It is a doggerel ponsis, and the pronunciations cannot be found in any dictionary whether published in England, Ireland or Scotland.

By Thermion

I have often wondered why it is that a few educated people are not retained in some parts of the British Isles to teach them English pronunciation and grammar.

"Incognito—by Request!"

The pundits of the B.B.C. pictures, might in many cases, or at times, think of giving the announcers names, thinking, no doubt, delightful thrills will stir our nerves and bones. Once we are assured the broadcast is "By F. Algernon Jones."

Too long, they think, "neath bushel hid The name of the announcer Who joggles with the English tongue When called on to pronounce "her." Their patronymic all concealed In mystery, is wrong In future they must prefixed be To story, news and song.

Announcers dear, with all respect, your name's not our concern. We, as the listeners, do not think your cognomens to learn. Please tell the punds, straight from us And let them learn, dog tale 'ems. The only thing we need from you Is just—the coming item.

"The War Weekly"

The war continues to be baffling. Everyone is saying "There isn't anything happening." This is not true. There is a great deal happening at the front, on the high seas and in the air. Behind the brief announcements in the Press and a word or so on the radio there are unmentioning activities that are slowly shaping the ultimate issue of the war. What these activities are and what is being done by us and the enemy are explained every Friday in The War Weekly by a staff of experts.

The War Weekly is no ordinary war paper, but a brilliant pictured story of current events which will build itself up into a permanent record. Diagrammatic pictures, maps and photographs are a big feature of this paper, which gives "what the newspapers don't tell you."

Battisin Belfry

I AM sorry that you will not have the pleasure of the latest creations of Master Battisin Belfry, who has graced one of our December issues ever since the paper started. The fact is that Arthur Ashdown, who appears in the Monarch, is in South Africa, searching for gold and diamonds. He posted the manuscript and drawings to us, but Hitler, knowing the epoch-making inventions of Mr. Belfry, and realising that if we published them the war would be over, sent them to the bottom of the ocean in a ship specially chartered to convey the manuscript to us.

Readers on Active Service

I AM happy to comply with a request made that I include a regular column of readers' changes of address. Where these addresses relate to the Army, I am, of course, unable to publish them, but I can include the reader's name and district and offer to forward letters. Readers who wish to keep in touch with one another are offered the facilities of this column.

"Wandering Willie's Tale"

One of the finest short stories in literature, which could also be classed among the best ten yarns that we consider the most natural; is "Wandering Willie's Tale," which is none the worse for having been written by the roguish Sir Walter Scott. It has been adapted into dramatic form by the B.B.C. Talks Department, and it will be produced by John Gough on December 8th. The eerie adventures which Wandering Willie, the blind fielder, happened upon at the Castle of Redbrae makes a gripping tale in dramatic form. Scott's own dialogue has been used mainly throughout, and wherever new dialogue has had to be written, the narrative has been closely followed by the adapter, who has made a study of the dialogue of the time. Because in the original the story is told by Wandering Willie himself, this does away with the need for an alternating narrator, as the linking passages between the various scenes can be told by the central character.

PRACTICAL MECHANICS HANDBOOK

By F. J. CAMM.

400 pages, 6/6 or 6/6 by post from

GEORGE NEWNES, LTD.,
Tower House, Southampton Street, Strand, W.C.2.
A Virile Outlook

With television transmissions in this country a thing of the past, and apparently a hope for the very distant future, according to the dictates of war, the British public, quite naturally, are apt to overlook what is happening in those neutral countries who are free to apply their scientific knowledge in peaceful channels. The continent of America, however, has been quick to recognize the advantage of the situation in which they have been placed, and seem determined to overhaul the standards of the work already established in television. They have made it clear that while the dissemination of pictorial information and a variety of entertainment are the prime factors associated with their steadily growing home service, the future of television is bound up in many directions which even the most courageous scientist would hesitate to prognosticate. Recent events have proved conclusively to the American public that the nation must not think of television only in terms of home entertainment. Television in cinema was becoming an established fact in Britain, and installations in these places of popular entertainment was proceeding at a pace dependent only on the speed with which the television projection receivers could be built. Demonstrations of these large screen pictures in New York and London have convinced those who saw them that they are entirely free from flicker, and have a degree of definition governed only by the quality of the transmission itself. In other words, the electrical and optical characteristics of the electronic apparatus employed was fully capable of dealing adequately with any transmission which the equipment was called upon to handle. As a result of this aspect of television's development, events of national importance, whether they have a bearing on the political, commercial, or sporting life of the community, can be participated in at the instant they happen, although separated by miles from the place at which they occur. Mass entertainment in this form, as distinct from the fireside atmosphere provided by sets in the home, will always be part of the make-up of the average person's life, and by lifting big-screen television from the realm of conjecture to practical realisation television has destroyed the limitations of human vision, and by harnessing sound and vision together opened up a panorama of events which can be seen without any time delay which characterises a recorded version. In the United States, the whole industry realises that it is, at the moment, only on the threshold of a virgin field and looks forward to improvements in education as a result of big screen installations in schools, so that the specialist can address a class of students numbered in thousands, instead of being confined to the four walls of the classroom. It is in this field that television will find diverse applications in commercial communication, the telephone, navigation on land, sea and air, so as to still further reduce the risk of travel which at present is hidebound by nature's idiosyncrasies from the point of view of weather. These items alone are sufficient to convince the fertile brains of that country that television will provide material for an all-embracing industry. It will not be a case of subordinating old industries to the requirements of the new, but of necessity there must be a reassessment of values, and the establishment of a spirit of co-operation so that all may benefit. This is not a case of a scientific miracle occurring overnight, but rather the gradual culmination of a series of discoveries in the field of electronic engineering, all of which have played their part in assisting in the progress of what is technically termed 'the art of instantaneous producing at a distance a visible image of an actual, or recorded scene, by means of an electrical system of communication.'

Visual D.F. Working

The versatility of the cathode-ray tube is exemplified once more by its application to many forms of direction-finding schemes where it is desired to secure the correct bearing of a signal. Many difficulties have to be contended with, however, and any out-of-balance must be counteracted. One very promising method uses the usual pair of crossed frame aerials set at suitable distances to each other, and feeds the signals through to the two pairs of plates of an electrostatically operated cathode-ray tube. In the path from aerial to C.R. tube, however, is interposed two amplifiers and two pairs of reversing switches. These last named are for the purpose of compensation for any out-of-balance of the actual operating characteristics of the amplifiers. Normally a single narrow ellipse would give the correct information from the calibrated fluorescent screen, but by synchronously operating the reversing switches so that the frame aerial signals pass through each amplifier in turn, any difference in the working characteristics is portrayed by the existence of two narrow ellipses. By taking the mean angle between these two patterns the exact bearing is logged.

Compact Relay Transmitters

For both commercial and military purposes, efforts are being directed in many quarters to the perfection of equipment which will serve as efficient relay transmitters when working on very low wavelengths of the order of a few metres. This in many cases is being supplemented by the development of micro-wave apparatus using carrier frequencies well above 300 megacycles. These transmitters have to be very compact, readily transportable, and possess a low power consumption when employed for field purposes, in order to maintain satisfactory lines of communication between units which may be separated by distances up to 20 miles. A very important point in connection with this apparatus is that it adds materially to the secrecy of the information radiated, since the propagated beams are directional, and distinct from the more common forms of broad band signals. The actual designs vary in certain respects according to the particular purpose for which the relay of signals is required, but as a basis it is generally found that the main unit comprises a high stability master oscillator working at a frequency dependent on the prime carrier frequency. For example, in the case of a 120-megacycle relay transmitter the oscillator would probably work at 20 megacycles and be followed by a combined separator and low-stage gain amplifier. The third harmonic of the oscillator would be extracted after the separator, doubled to the final working frequency of 120 megacycles before being handled by the output stage. Depending on the form of intelligence it is required to relay from point to point, so the degree of modulation response would be adjusted. The aerial used with this form of equipment often comprises a broadside array with reflectors, and by careful design a sharp beam is secured which can give a power gain up to a figure of 26. As an actual example of the simple nature of the micro-wave relay apparatus of low power, reference can be made to the accompanying illustration. The aerial form of vertical antenna is mounted on the top of the tripod rod carried on the top of a rigid tripod. Part of the valve equipment is also accommodated on the rear of the tripod for mechanical support, with batteries under the tripod.
Choosing a Loudspeaker

When to Use Permanent Magnet or Mains Energised Speaker Unit, and How to Get the Best from Them.

There are two principal types of moving-coil loudspeaker, known as permanent magnet (P.M.), and energised. Actually, as most readers now know, both depend upon the use of a magnet, for it is within the field of this that the moving coil—attached to the cone—moves. The audio-current output from the receiver is fed into the speech coil, as it is called, and produces a fluctuating magnetic field round the coil. As the coil is close to a powerful magnet system, the fluctuating magnetic field acts on the fixed field, this causing the speech coil, and hence the cone, to vibrate.

That is a very sketchy outline indeed, but it should suffice to clarify the statements that will be made later. It should not be hard to appreciate that the effect on the speaker cone must be more pronounced if the audio currents passed through the speech coil are increased in intensity. That simply means that a greater receiver output provides increased signal strength—there is nothing obscure about that. A point that might not be quite so obvious is that the intensity of the steady magnetic field acting on the speech coil also has a considerable effect on the loudness of reproduction. This means that a greater output can be obtained from a given input to the speaker if the strength of the magnet is increased. Actually, it is not just the strength of the magnet that is important but the effect of the magnet on the speech coil. And the effect is proportional to the magnet strength and also to the distance between the magnet and the coil; the closer the two can be placed, the greater is the effect of the magnet on the coil.

Kinds of Magnet

A permanent magnet is a magnetised piece of alloy-steel, whereas an electro-magnet consists of a piece of soft iron, or special iron alloy, which does not itself "hold" or retain any magnetic properties, but which can be magnetised temporarily by passing an electric current through a length of wire coiled round it. See Figs. 1 and 2.

In practice, a fair amount of electrical energy is required to energise or magnetise an electro-magnet of the type used for a loudspeaker. An average minimum figure for a smallish speaker is 5 watts, but 7 to 10 watts is desirable. When the moving-coil speaker was first developed, it was generally accepted that an energised or electro-magnet speaker was more sensitive than one of the permanent magnet type, because the field strength could be made so much greater. This idea is still held by some, but it is rapidly becoming less and less true. The reason is that a considerable amount of research work has been carried out in connection with the production of highly efficient permanent magnets, with the result that it has been possible to make them in such a manner that a tremendously strong field strength can be obtained. Incidentally, the makers of the W.B. "Stentorian" speakers have been pioneers in this field, and are now making even public address and auditorium types of P.M. speaker.

It would not be true to say that the P.M. speaker is more efficient than an energised model of equally sound design, but it can be stated without fear of contradiction that the P.M. type can to-day be as good as the energised pattern. Consequently, the reader might ask why energised speakers are still employed in large numbers by both constructors and receiver manufacturers, and this brings us to the choice of the more suitable type for various purposes.

Energising Current

A source of electrical energy is, of course, required to operate an electro-magnet speaker, and that would appear to be a disadvantage. It is, when dealing with a battery set or even with a mains set fed by a power supply unit capable of giving just the correct voltages and currents for H.T. and L.T. But in many instances, the power unit can provide rather more power than is actually needed by the receiver. In that case, the surplus can well be employed to energise the speaker. Moreover, it can be used very economically, because the magnet winding—referred to as the field coil—can be used as a very effective H.T. smoothing choke. Thus, the normal smoothing choke is not required. That means a saving in the cost of components; additionally, an energised speaker can generally be made rather more cheaply than a P.M. speaker of similar power-handling capacity.

But there are several points which have to be considered before a final choice can be made. The first is concerning the...
CHOOING A LOUDSPEAKER
(Continued from previous page)

amount of energising power that can be spared. As mentioned above, a small moving-coil speaker needs at least 5 watts for energising; a larger speaker to handle an audio output of, say, 6 watts needs something like 10 watts minimum; whilst a public address speaker to deal with an audio output of 20 watts needs not less than 15 watts, and should have about 30 watts for maximum efficiency.

Some Practical Examples

Fig. 3 shows a skeleton circuit, where a 2,500 ohm energised speaker field is used for smoothing the H.T. supply in an A.C. receiver. It is assumed that the output

"Free" Bias
Another method of using a speaker field
for energising is shown in Fig. 6, where the winding is in series with the negative H.T. lead. The H.T. voltage required is nearly 400 at 100 mA, and the rectifier provides 500 volts at 100 mA. We could thus use a standard 1,250 ohm field coil, which would produce a voltage drop of slightly more than 120 volts when passing 100 mA (1/10 amp.). The voltage drop can, however, be used for biasing the output valve, by connecting the grid-return lead to the negative side of the winding, as shown. In the example taken the G.B. voltage was 120—works well. It is possible, in many cases it would be possible to choose a field winding more appropriate to the G.B. needed.

Even in our example, however, the correct value of bias could be obtained by connecting a 50,000 ohm potentiometer across the field, the grid voltage of the rectifier in the grid-return lead to the slider of this; the connections are shown in broken lines. It will be seen that an 8 mil. electrolytic by-pass condenser is used in conjunction with the bias-voltage supply system.

In the Heater Circuit

We will take just one more example of the use of an energised speaker. This is with a D.C. receiver having indirectly heated 16-volt valves, as indicated in Fig. 7. In this instance the field winding is used to drop the voltage applied to the heaters from the D.C. mains supply. As 170 volts has to be dropped, the current being 35 amp., a resistance of approximately 700 ohms is required. This is a standard field coil resistance in some makes of energised speaker, so it could be used very conveniently. If an increased voltage drop were needed, a small fixed or tapped resistance could be connected in series with the field winding. There is no great advantage in this method of using an energised speaker, but it is mentioned as a matter of interest.

From the points that have been raised it will be appreciated that both the types of speaker have certain advantages. Both have their adherents, and both have been brought to a high degree of efficiency. At the same time, it is quite evident that more care is needed in designing a set for use with an energised speaker. For this reason the P.M. pattern is specified for the majority of PRACTICAL WIRELESS receivers, and is most favoured by the constructor. Additionally, of course, it is more adaptable for use with a variety of different receivers.

PRACTICAL WIRELESS
SERVICE MANUAL

Edited by F. J. CAMM.

From all Booksellers £/ net, or by post 5/6 direct from the publishers, George Newnes, Ltd. (Book Dept.) Tower House, Southampton Street, Strand, London, W.C.2.

Fig. 6.—Diagram showing how "free" bias is obtained by inverting the field winding, in the negative H.T. line.

Fig. 7.—For D.C. sets only. Speaker field in the heater circuit. Few receivers could take the 38 watts indicated without over-heating, but the by-pass circuit could be modified to overcome this difficulty by using a field of lower resistance in series with a resistor.
An Aerial for an Air-raid Shelter

On constructing one of your A.R.P. sets for use in my Anderson type shelter, I was puzzled as to what type of aerial to use. I finally decided to use a short, vertical type aerial, which, besides being easily made, does not hinder any placing of earth on top of the shelter.

I took the barrel of a cycle pump and placed it as shown in the sketch. I then placed a 4ft. length of tin, iron rod inside the pump barrel and held it in position with wet sand. The iron rod was a portion of a child's dialsed cot. The lead-in was led through the small hole in the pump barrel, and both ends were sealed with sealing-wax. There is no loss to earth, as the pump barrel is celluloid covered.—KENNETH BROWN (Gorton, Manchester).

A Motor-driven Coil-winder.

Desiring an adaptable motor drive for coil winding and light bulb fitting, I decided to commission the electric motor fitted to the household sewing machine. The motor is so fitted to the sewing-machine that it is a simple matter to remove it without any way upsetting the mechanism.

It occurred to me that if I constructed some form of temporary chassis mount in which could be incorporated permanently a suitable belt drive, it would be a matter of a few moments to transfer the motor from chassis to sewing-machine or vice versa, as desired.

The accompanying illustration shows the procedure I adopted, using a strong oak mounting chassis.

One interesting feature of this arrangement area is in the methods by which I should mount the motor, since it will be seen that due to the channeled mounting arm method of fitment, brought about by the design of the sewing-machine, a similar principle had to be adopted, this proving in the long run to be both rigid and conveniently simple in use.

To take a certain amount of strain off the mounting strips, I fitted a wood block so that the arm could rest in a groove, as depicted.

The driving band is kept in tension by an after which forms part of the motor-assembly, and this band drives a home-made pulley, details of which are given in the inset. The only slight modification necessary as far as the sewing-machine is concerned, is the fitment of a suitable mains plug which would fit both the chassis and sewing-machine socket, the sockets on the chassis being series connected to a toggle switch of Bulgin pattern, with the mains supply cord connecting through a noise suppressor unit also of Bulgin pattern; this latter fitment is not shown in the illustration, but as with the loudspeaker switchboard below.

Loudspeaker Switchboard

As I wished to have two or three distant listening points, and also to have facilities for trying out and comparing different speakers, I fitted up a small switchboard on the lines indicated in the accompanying illustration. It will be seen that this is fed from the L.S. or extension speaker terminals on a receiver and then five separate speakers may be switched for use individually or collectively. By operating the switches when two or more speakers are joined rapid comparisons are possible for test purposes, or if the speakers are fed from a distant point individual rooms may be switched in and out as required. —W. CLOUGH (Bayton, nr. Woodbridge).

Join Newnes’ Practical Group!

PRACTICAL MOTORIST

The owner-driver’s journal which tells you how to repair, overhaul and obtain the best performance from your car.

3d.—Every Friday.

PRACTICAL MECHANICS

The only English journal of its type. It deals with every branch of Science, Mechanics, Invention, Model-making, Chemistry, Astronomy, Photography.

6d.—Every month.

THE CYCLIST

The leading weekly for every Cyclist, Clubman, Utility Cyclist or Chauvinist. Join "The Cyclist" Road Club and also take advantage of the FREE Insurance.

3d.—Every Wednesday.
An Experimental Heterodyne Filter

Constructional Details of a Useful Unit for the Short-wave Enthusiast

Short-wave communication receivers using a crystal filter have an exceedingly high degree of selectivity; nevertheless, when two stations are interfering each other with an audible beat note, reception of either becomes impossible from a readability point of view. For this reason a heterodyne filter has recently been introduced in America (now being manufactured commercially) that will attenuate a single audio-frequency only. Having carried out some experiments with this type of filter, plus some additional modifications, it is thought that this piece of apparatus should be of considerable use to short-wave listeners generally.

The many uses to which such a filter can be put will immediately be apparent. Apart from removing the heterodyne note from interfering stations, it can also be applied to a super-regenerative receiver to cancel the quench note, and will also attenuate the loud hiss in the super-sensitive band of frequencies. For short-wave listening generally, an interfering modulated C.W. station in the broadcast short-wave bands can be completely eliminated.

To those who are not already acquainted with this type of filter, a few words of explanation are necessary. First it must be pointed out that it does reject a single audio-frequency completely, and not merely attenuate a band of frequencies as in a normal high or low pass filter.

The circuit is derived from the type of bridge circuit used for audio-frequency measurement. This is shown in Fig. 1. An unknown audio frequency is applied to arms A and B, R2 and R3 are then adjusted until the note in the headphones is cancelled out; when a balance is established.

The unique frequency is then found from the formula: 

$$ f = \frac{2 \times R_2 \times R_3}{R \times R_C} $$

provided that R divided by R1 equals 2, that R2 and R3, and C and C1 are equal.

Working Filter Circuit

Turning to the working filter circuit of Fig. 2, it will be seen from the circuit values that the above conditions have been complied with. The frequency range over which the filter will work is mainly governed by the value of C and C1. The value shown covers the most useful band in the top part of the audio scale. The two variable resistances will, of course, be potentiometers, using the slider and one side only.

One method of connecting the filter to the output of a small receiver is shown in Fig. 3. A 1:1 transformer may be used in the anode circuit of the valve which feeds the input of the filter, the output being taken to a pair of headphones. This arrangement can be applied to a standard short-wave receiver or to a two-valve super-regenerative ultra-short-wave set. In the latter case R2 and R3 may be permanently set for eliminating the quench note.

The few components needed may be mounted direct on to the front panel of the receiver or, alternatively, on a small sub-panel, as form, it is advantageous to make use of a little more amplification when the filter is used.

It will be seen that both input and output of the circuit can be connected across transformers, and by using two transformers in this way the filter may be connected between two L.F. amplifying valves of a multi-stage receiver. This method may be regarded as a trifle clumsy, and will not be looked upon with favour by those who dislike audio transformers from the quality point of view.

Fig. 3. One way in which the filter may be connected to the output of a small receiver.

Accordingly, a circuit was tested out using R and R1 directly in the anode of a valve, as in Fig. 5. It will be seen that a microfarad condenser is inserted between R1 and the junction of R2 and C1. This condenser did not affect the working of the bridge in any way apart from requiring small readjustment from R2 and R3. Also R and R1 have values of 100,000 and 50,000 ohms respectively. This circuit arrangement should be used in the early stages of a multi-valve receiver.

Operating Notes

Regarding the operation of the filter it might be noted that R2 and R3 will be quite sharp in tuning out the unwanted heterodyne note. When a signal is tuned in on the receiver accompanied by a heterodyne, first R2 and then R3 should be rotated until (as will happen in each case) the heterodyne diminishes in strength. Finally both potentiometers must be adjusted until the heterodyne completely disappears. With the elimination of one audible frequency, some distortion must of course take place, though this is not so important on the short waves, and also distortion will be at a minimum where the filter is tuned to the top part of the scale, hence the values shown. Where it is desired to remove frequencies in the lower part of the range, larger condensers must be used at C and C1.

R2 and R3 may also be increased up to a value of 50,000 ohms, in which case a wider band of frequencies is covered.

Fig. 4. Wiring diagram for the four components needed for the heterodyne filter. The components are mounted on a small sub-panel.

Fig. 5. The filter used for intervalve coupling.
Auto Grid-bias Circuits

This Article Explains Why Certain Modifications are Introduced Into Simple Auto-bias Circuits in Order to Ensure Better Working, with Special Reference to Mains Apparatus

When an electric current passes through a resistance, a difference of potential, or voltage drop, is produced across the ends of this resistance, and this offers a simple way of providing negative grid bias to receiving valves without using a separate grid battery. The principle will be understood readily by reference to Fig. 1, which shows the essentials of the grid and anode circuits of a typical output valve, such as an indirectly-heated pentode. Certain components necessary for a practical auto-bias circuit have been purposely omitted for the sake of simplicity, but these are given later in the article.

Brief Explanation

Examining this diagram, it will be observed that the main circuit through which the anode current flows commences at the H.T. plus terminal, through the primary of the speaker transformer to the anode of the valve, through the valve to the cathode, and from the cathode back to the H.T. minus terminal via the resistance "R," usually called the bias resistance. The grid of the valve is connected to the H.T. minus line through the transformer secondary (in the case of a resistance-capacity coupled valve the grid would be connected to H.T. minus via the grid leak, so in both cases the grid is at the same potential as H.T. minus).

Assuming that the anode current of the output valve is 30 milliamperes, and that the bias resistance "R," is of 500 ohms, a simple application of Ohm’s Law shows that the voltage drop across "R" is 15 volts. A very small voltage drop occurs at the cathode terminal of the speaker transformer as the cathode has essentially infinite resistance as being the case with all TV and radio receivers. The actual plate current is 31.5 milliamperes, while the plate voltage is 225 volts. To prevent negative grid bias, an anode voltage of 240 volts must be used. Let us assume that the H.T. and cathode are at zero volts. The anode voltage of 240 volts will cause a current of 31.5 milliamperes to flow through the 500-ohm bias resistance, giving a voltage drop of 15 volts. As this voltage is negative, it must be applied to the grid, so that the grid is at -15 volts with respect to the cathode. Therefore, this circuit is capable of producing negative grid bias.

Several different ways in which the bias circuit can be arranged. The reasons are that the diagram shown in Fig. 1, is only fundamental, and needs a certain amount of modification to meet practical conditions, and that different types of valves need somewhat different types of circuit, although all are basically identical.

One Case

In describing these different circuits, we will deal first with indirectly-heated mains valves, since these are the most commonly used to-day. Fig. 2 shows the basic circuit of a typical receiver in which auto-bias is applied to four indirectly-heated valves—the screen-grid (or screened cathode) H.F. amplifier, detector, a low-frequency amplifying stage, and an output pentode. The complete circuit through the valve, i.e., the anode current circuit, is drawn in thick line, and the auxiliary components associated with the auto-bias arrangements are drawn in thinner lines. It will be noticed that the essential arrangement, i.e., the inclusion of a bias resistance between the cathode and H.T. minus line is common to each valve. The questions which naturally arise are: why will not the simple arrangement shown in Fig. 1 serve in practice? And, if any modification is necessary, should there be any difference in the circuits adopted for the different valves?

The answer to the first question is that all these additional refinements are required in order to prevent the bias arrangement from transferring from the anode circuit to the grid circuit any alternating fluctuations such as audio-frequency or high-frequency signals, hum voltages, and so on, which would undoubtedly result in re-amplified hum and either low-frequency or high-frequency oscillation. In other words, these additions are a form of decoupling to obviate back-coupling.

Feed-back

Consider first the current flowing in the bias resistance in Fig. 1. This will consist of a direct current equal to the mean anode current of the valve and bearing an audio-frequency modulation. Possibly there may be also a certain amount of hum ripple in the anode current—the "residual hum" of the receiver. Now, as the circuit applied to the grid will also be negligible. The reasons for adopting different methods of bias decoupling in different valves will be apparent from a study of the conditions under which different types of valves work. Considering first the high-frequency valve, it will be clear that the

Fig. 1

Diagram explaining the simple principle of automatic bias

Fig. 2

Skeleton circuit diagram showing various ways of biasing indirectly-heated valves.

Fig. 3

Diagram showing the bias scheme for a directly-heated valve.
AUTO GRID-BIAS CIRCUITS  
(Continued from previous page)

angle current fluctuations are of radio frequency, in the main and, in fact, entirely if ever been taken in the layout to the effect of hum and if the ordinary decoupling circuits are efficient. It will therefore be sufficient to by-pass the bias resistance with a comparatively small condenser which will have a sufficiently low impedance at radio frequencies. A very usual value for this condenser is 0.05 mfd., but a slightly smaller or slightly larger size would make very little difference. It is important that a condenser used in this position is of a type described by the makers as "non-inductive" because, as will readily be seen, any component possessing inductance offers a comparatively large impedance to alternating currents, and thus partially neutralizes the low reactive impedance of the condenser.

On the L.F. Side

For low-frequency valves, where alternating components of audio frequencies have to be dealt with, the size of the condenser in the grid decoupling circuit must be much greater. When auto-bias was first introduced condensers of 2 and 4 mfd. capacity were most generally available, and a condenser of 2 mfd. has a reactive impedance at 50 cycles of over 1,000 ohms, so that by using such, when used in parallel with a bias resistance in the region of 1,000 ohms is quite small. Modern low-frequency valves in this position would be to produce more or less serious attenuation of the bias output. As a result, it becomes the standard practice to use a modification of the decoupling system as shown at "B" in Fig. 2. Here a decoupling resistance of high value, say, 50,000 ohms or more, is interposed between the secondary of the L.F. transformer and the H.T. minus line, and the 2 mfd. condenser is connected not directly in parallel with the bias resistance but between the top end of the bias resistance and the lower end of the L.F. transformer secondary.

A moment's study of this arrangement will show that in effect the shunt circuit in parallel with the bias resistance consists of the condenser and decoupling resistance in series. Owing to the high impedance of this combination, only a small proportion of the total A.C. component of anode current will flow in the arm "re," thus avoiding serious bias attenuation, while with respect to the grid circuit, and c act exactly in the same way as the decoupling resistance and condenser so commonly included in the anode circuits of valves, or the smoothing choke and condenser in an H.T. unit, namely, that the condenser offers a much smaller impedance to the A.C. component than the resistance so used. A.C. voltage drop occurs mainly across the resistance, giving an almost perfectly smooth voltage at the grid of the valve.

To-day, the decoupling system just described is seldom necessary because manufacturers have now produced low-voltage electrolytic condensers of very high capacity and therefore of correspondingly low reactive impedance, and these may be connected simply in shunt to the bias resistance as indicated in the case of the output valve in Fig. 2. Capacitors of 12, 25, and even 30 or 60 mfd. are available, and these do away entirely with the need for complicated decoupling devices.

Now consider the case of directly heated output valves, which are still used to some extent in broadcast receivers and are, indeed, essential where really big outputs are required. In such valves the filament itself is the cathode, and is, moreover, fed with raw A.C. It is therefore not possible to take the bias resistance from one side of the filament to H.T. minus, as by so doing a considerable amount of A.C. hum would be introduced. What is done, therefore, is to connect the bias resistance between the mid-point or centre-tap of the filament transformer and the H.T. minus line as shown in Fig. 3, by-passing it in the usual way by a condenser of large capacity. If the transformer has been centre-tapped accurately no hum will be introduced, but it is a difficult matter to tap out at the exact electrical centre of a winding. If the accuracy of the centre tap is in doubt when hum is experienced, the usual plan is to connect a potentiometer of fairly low resistance across the filament winding and, disregarding the centre tap, connect the bias resistance to the slider of the potentiometer, which should then be adjusted so that hum is reduced to a minimum (Fig. 4).

It should be noted that this arrangement not only renders the filament of the output valve at a potential above H.T. minus equal to the bias of the output valve, but makes the hivers of any other valves fed from the same L.T. winding also positive with respect to H.T. minus by the same amount. Normally, this should make no difference to the working of the set, but in the case of a large output triode, where the bias voltage may be anything between 20 and 100 it will be safer to use an independent L.T. winding for the output valve and another for the indirectly-heated valves.

LIGHT MUSIC BROADCASTS

VARIOUS criticisms have appeared concerning the alleged disappearance of light orchestral music from the B.B.C. programmes. Actually listeners are hearing a high percentage of the light orchestras which were popular before the war. Under the Defence Regulations, however, the activities of the B.B.C. are curbed in certain degree and this does not apply to the engagement of light orchestras.

Already the studio programmes have included Monty and his Orchestra; Fred Hartley and Mr. Judd; with Brian Lawrence; and among those booked for early inclusion are Troise and his Mandoliers, with Percy Manche, the Richard Crean Orchestra; Falkman and his Andre Band, with Melba Magri; Wynnford Reynolds and his Orchestra; A. J. Powell and his Banjo Octet, Harry Davidson and his Orchestra; the Palladium Orchestra; Campbell and his Saloon Orchestra; and the Alphas.

Recent outside broadcasts have brought listeners performances by the Hotel Victoria Orchestra and the Lewisham Hippodrome Orchestra, and have taken them to the Chicago Coliseum to hear Harry Fowler and his Orchestra; to Kilburn for Alfred van Dam and his State Orchestra; to the Strings and Arrangements Society and his Orchestra have been heard; and to Carigdes for music by Geiger and his Orchestra. It is expected that the near future listeners will hear Tom Jenkins and his Band at the Grand Hotel, Eastbourne.

ON THE DRAWING-BOARD

When designing a new receiver, much preparatory work should be carried out on the drawing-board. Some indication of the extent of such work in the factory may be gained from the above illustration which shows the drawing-office at the Ecko works. About 200 blueprints are made out for each set which is designed.
There is one more feature of the circuit given with the coil values of explanation involving its use in the method of obtaining delayed A.V.C. When a double-diode is used for second detectors in the usual circuit of A.V.C. it can be obtained in a simple manner, but with a pentode detector some alteration in method is required. The WNX9Y5 is connected wire across the detector (in series with a fixed condenser, of course) provides the required rectified A.V.C. voltage, whilst a single voltage is taken from a tapped 4:1 volt battery separate from the normal G.B. battery. A potentiometer is also used for variable-mu voltage control. This system works well in practice and the delay voltage prevents the sensitivity of the circuit being affected by a sufficiently strong signal being handled for a sacrifice in sensitivity to be permissible.

Reasonable Cost
A set designed around this circuit need not be expensive if four coils are made of separate screened coils of the type intended for direct bolting to a metal chassis. Four-range coils can be bought for about 16s. 6d. each, whilst high-gain P.T. transformers with tertiary winding will cost about 6s. 6d. each. Thus, the total cost of coils will be under 45s. If 15s. is allowed for the threecage condenser, a similar amount for a dual-range slow-motion drive of the type with an accurately calibrated circular scale, and 10s. for a wave-change switch assembly, it will be seen that the total cost of the most important works out at about 4s. four guineas. A cheaper tuning device could be used, but it does not pay to "economy" unduly in buying this important component. Using average valves and 120 volts (maximum) H.T. the current consumption will be in the region of 7 mA, which is within the range of the type intended for H.T. battery. Even when a small power pentode is added to the set the current consumption can be kept down to under 12 mA, and this can be obtained economically from a so-called double-capacity dry battery of the standard type. At this the circuit will be left on H.T. consumption of the set, with L.P. amplifier, could be kept well below 10 mA.

In order to keep the members together in the mean- time the "Trojan" has been developed, and it has been discovered that many of the "brass-pounders" can also have a pretty dash! Several of the members are now O.E.M.B., wireless operators or signalers, and all branches of the services are represented.

In order to meet the wishes of several members during the coming Christmas-mornings we are now held every Sunday at 2 p.m., or in addition to the usual meetings, each half-hourly to the end of the week.

BRISTOL EXPERIMENTAL RADIO CLUB
Headquarters: 21, King's Corridor, Old Market Street, Bristol, 4.
Publicity Manager: D.F. James (WZDC), 60, Robertson Road, Knellville, Bristol, 1.
Meetings: Alternate Tuesdays, at 7.30 p.m.
Full meeting of the above club held on Tuesday, December 5th, was the last before the Christmas holidays. It is anticipated that meetings will be resumed on Tuesday, January 10th, 1940.
Most members have now settled down to radio experimenting under war conditions. Arrangements are being made to demonstrate several long-distance and short-waves, 10-watts, special opportunity BARGAIN 69/6

SPECIAL OFFER! Brand New Fully Guaranteed All-wave Battery 3 Brand New

Free VALVES! wave: 8 KIT

All-Mains

chassis £5.19.6

NEW TIMES SALES CO.,
56 (B&W), LUDGATE HILL, LONDON, E.C.5.

December 6th, 1939

PRACTICAL WIRELESS

RADIO CLUBS & SOCIETIES

DX ON MEDIUM WAVES

(Continued from page 254)

BATTERY S.G.3
With All Valves Tested 69/6

- Powerfu...
THE SHORT WAVE 5

Preliminary Circuit and Constructional Details of a New Short-wave Receiver — By W. R. HOBBS

The gain control, exceedingly smooth reaction is obtainable.

Before dealing with a typical operating sequence, it will familiarise the scheme if the component lay-out

is considered here in connection with the circuit details.

General Scheme

V1 is a screen-grid valve of the short-wave type, having the grid return brought out to the top cap, and is wired for a completely non-resonant untuned H.F. stage.

Now, although normally only a small percentage of stage gain can be anticipated at this point, there is a very appreciable degree of control afforded by using the screening grid of this valve for injection into the aperiodic winding of the following H.F. stage, this adjustment being made through the potentiometer R3.

Again, to conserve as far as possible the little gain provided by this untuned stage, the valve V1 is mounted in such a way that short wiring results, with, therefore, the removal of various causes for losses and interaction.

The horizontal mounting of the valve in this manner results in not only a conveniently short serial connection, but also isolates electrostatically the remainder of the connections from the detector stage. Thus we have the valve base mounted behind the intermediate aluminium screen and in the section utilised for the next H.F. stage, which employs a high-frequency condenser, and it is useful to note here that no interaction takes place between V1 and V2, primarily owing to the ample distance and the wiring lay-out.

The Detector Stage

V2 wiring is quite ordinary, but a screen-grid potentiometer is used so that, as will be explained later, a dual form of reaction control furnishing maximum sensitivity is obtainable by the combined adjustment of these two controls.

Ganging accurately with this type of circuit used principally for the short-wave bands, would at first be seen impractical in view of the possible causes for attenuation, instability, and the usual circuit losses, and the writer feels that it should be noted here that the consistency in the operation of the original model in this respect can be achieved mainly to the high precision and accuracy enjoyed in the design of the Edyston condensers, whilst, of course, bearing in mind the slight but appreciable advantage obtained by the balancing or fine band-spread condenser which it was deemed advisable to incorporate for the higher frequency bands.

This balancing condenser is provided solely to counteract any small stray capacities, whilst at the same time proving very desirable as a fine bandspread when used with the reduction drive as depicted.

The feed to the primary or aperiodic winding of the detector coil is taken directly from the anode of V2 through the medium of two ceramic condensers, one a fixed condenser of 110 mfffd., the other a 50-mfffd. trimmer type, these

This three-quarter rear view of the receiver shows the comprehensive screening which has been adopted.

It is most desirable and, in fact, necessary, when more serious DX work is intended, to incorporate in the design of the receiver, means for varying certain of the circuit constants at will, so that selectivity and sensitivity may be adjusted more closely relative to reaction and stage gain. In this design, the writer has endeavoured to provide for such considerations without excessively increasing the cost, at the same time providing a sequence of manual control which should be readily grasped after a little practice.

Apart from the extra expense which would be entailed in the housing of the set in an elaborate cabinet, and although a somewhat smaller or more compact component lay-out could have been adopted, this would only detract from the original purpose of an accessible chassis, the use of which could combine the pleasure of both listening and experimenting.

Studying the theoretical diagram given in Fig. 1, it will be seen that, basically, quite a conventional scheme is employed, the principal features being the use of screened grid injection in place of the more customary anode feed, and the advantage of variable-mu characteristics in the detector stage.

In this way, the correct setting of the screen-grid potentiometers will provide both exact operating conditions for the valves and a method of determining the most sensitive setting consistent with reaction and the type of signal being received whether this be 'phone or C.W.

On the higher frequency bands, that is, using the 9 to 14 and 12 to 26-metre coils, this form of "balancing" provides a stable means for getting the most sensitive state of reaction in the detector stage, whilst for the lower frequency bands, and with careful adjustment of the variable-mu condensers, it is hoped this reaction will be very appreciable.

Fig. 1.—Theoretical circuit diagram of the Short-Wave Five.

This three-quarter rear view of the receiver shows the comprehensive screening which has been adopted.
THE SHORT-WAVE FIVE

(Continued from previous page)

condensers, as will be noticed, being connected in parallel.

In this manner, a third of the capacity coupling to the coil is adjustable, so that the final adjustment can be made at certain frequencies if desired, although for average purposes after a little experiment, the fixed coupling can be determined and fixed for all bands.

In the interests of short wiring again, the detector coil is on the potential-meter supported on insulating pillars, but one exception to the rule is taken by the necessarily long screen-grid coil return lead. This lead, it will be seen, is screened and adequately earthed to the chassis, being kept as close to the chassis and as rigid as possible.

Tests on the full range of the receiver showed, however, that no instability will arise if a component layout is closely followed. The detector valve, V3, is located the other side of the detector tuning, and the V.L.F. adjustable condenser, and the variable-nu.1 volume control is fitted directly to the chassis intermediate screen in close enough proximity to the valve.

Smooth Reaction

Considering the reaction circuit for the moment, it will be seen that the potential-meter is very conveniently mounted near to the coo-holder, and quite a comfortable arrangement can be carried out, whether the receiver be in or out of a cabinet, whilst it would appear that both the reaction potential-meter and the L.F. volume control R11 were so mounted in the interests of comfortable adjustment, this is by no means so, since it will be noticed that the coupling between the detector and the first L.F. valve V4 is being specially carried out with a minimum of wiring in the employment of a Hivac PX280 S.W. valve, which employs a top-cap grid return.

Filter feed transformer coupling is used between the L.F. valves, this being interrupted by a 'phone jack so that with or without the loudspeaker in circuit, more critical tuning can be accomplished.

LIST OF COMPONENTS FOR THE SHORT-WAVE FIVE

RESISTORS

One 4,000 ohms 1 watt. Eire Resistor Co.

One 25,000 ohms 1 watt. Eire Resistor Co.

One 10,000 ohms 1 watt. Eire Resistor Co.

Two 40,000 ohms 1 watt. Eire Resistor Co.

One 50,000 ohms 1 watt. Eire Resistor Co.

One 2 nogenohm 1 watt. Eire Resistor Co.

Two 50,000 ohms (without switch), type M. Eire Resistor Co.

Two 50,000 ohms (without switch), type J. Eire Resistor Co.

CONDENSERS (Fixed and Pre-Set)

One 1000 mfd., type CMS. A. F. Bulgin and Co., Ltd.

Two 1000 mfd., type CMS. F. Bulgin and Co., Ltd.

Two 1000 mfd., type CMS. Bulgin, Ltd.

Two 1000 mfd., type CMS. A. F. Bulgin and Co., Ltd.

One 1000 mfd., type CMS. A. F. Bulgin and Co., Ltd.

One 1000 mfd., type CMS. F. Bulgin and Co., Ltd.

One 1000 mfd., type CMS. Bulgin, Ltd.

Two 1000 mfd., type CMS. A. F. Bulgin and Co., Ltd.

Four 1000 mfd., type CMS. A. F. Bulgin and Co., Ltd.

DETECTION

One type E.R.D. Radionics—G51N (Birmingham), Limited.

VALVE- AND COIL-HOLDERS

Three 4-pin, type 9Q5. Stratten and Co., Ltd.

One 6-pin, type 9Q6. Stratten and Co., Ltd.

One 5-pin, type X47. British Mechanical Productions, Ltd. (Birmingham).

One 4-pin, type X10. British Mechanical Productions, Ltd. (Birmingham).

One 4-pin, type X10. British Mechanical Productions, Ltd. (Birmingham).

One 5-pin, type X10. British Mechanical Productions, Ltd. (Birmingham).

CHOKES (F.F.)

Five type 1010 (E.S.). Stratten and Co., Ltd. (Birmingham)

CHOKES (L.F.)

One, type L.F.16. A. F. Bulgin and Co., Ltd.

TRANSFORMERS

One type F.A.2. A. F. Bulgin and Co., Ltd.

SWITCHES

One type 505T. A. F. Bulgin and Co., Ltd.

BRACKETS


CONDENSER CRADLE

One type 1114. Stratton and Co., Ltd.

KNOBS AND DIALS

One precision (slow-motion dial), type 1,085 (Chas.) Stratten and Co., Ltd.

One type K56. A. F. Bulgin and Co., Ltd.

One type 1036 (driving head with knob, dial and cursor). Stratten and Co., Ltd.

Two type 1036-1,100M. Instrument knobs.

One type 1036. Instrument knobs.

One black plastic knob, type K112. A. F. Bulgin and Co., Ltd.

One red plastic knob, type K92. A. F. Bulgin and Co., Ltd.

EXTENSION CONTROL OUTLETS

Three, type 1040. Stratten and Co., Ltd.

JACKS AND PLUGS

One type P171 (single-jack circuit). Messer.

One type P172 (closed-jack circuit). Messer.

One type P176; jack plugs. A. F. Bulgin and Co., Ltd.

COILS

Junc. of 6-pin, type 932. Stratten and Co., Ltd. (Birmingham).

One set of 4-pin. type 959. Stratten and Co., Ltd. (Birmingham).

INSULATING PILLARS

Two, type S.M. (Hinck). Radiomax—G51N (Birmingham), Ltd.

Two type 1029. Stratten and Co., Ltd.

Four, type 1029 (midget stand-off insulators). A. F. Bulgin and Co., Ltd.

PLUG AND SPADE TERMINALS

Six, type MPIA, engraved. H.T.—H.T. F.

Two type MP4, engraved. H.V.

Two type VR45, engraved, red and black.

VALVES

One type SEG320, S.W. Hivic, Ltd.

One type PX205, S.W. Hivic, Ltd.

One type VPV21, 4-pin. Hivic, Ltd.

One type HP213, 7-pin. Hivic, Ltd.

One type 2230, 3-pin. Hivic, Ltd.

PHONES

S. G. Brown, Ltd. Type A.

LOUDSPEAKER

W.B. Straternity Junior. (Birmingham), Limited.

CHASSIS

Complete chassis. Petro-Sweet Co., Ltd.

MISCELLANEOUS

Wood screws (round head, 2 in. to 1 in. in length).

Wiring: A.F.B. wire.

Screened fused, W.S.H. M.G. type, A. F. Bulgin and Co., Ltd.

Screwing: A. F. Bulgin and Co., Ltd.

Flex. A. F. Bulgin and Co., Ltd.

Flexible cable: type F.C. Radionics—G51N (Birmingham), Ltd.

PRACTICAL WIRELESS

267

ELECTRADIOX

CHARGERS. YOU MUST KEEP YOUR BATTERY PREPARED !

BATTERY CHARGING ON A.R.E. Petrol Electric Charger. This charger has

the following features: Suitable for any make of battery and any size. The

charging can be done at any place, with a minimum of time and labour.

The charger is portable. The battery is charged in any weather condition. It

will hold up under any conditions. The charger is very easy to use and

operates on petrol, natural gas, or oil. The batteries must be charged to

full capacity before use, and the charger will charge them in a very short time.


A.R.F. ACCUMULATORS. Suitable for 11.5 V. battery, 20 C.P. 1200, 2 A.

A Railway screwdriver is necessary to use this charger. It is a powerful charger

and is used in every railway station in the country. A.R.F. Accumulators, 15/-.

A.R.E. CHARGERS, with automatic switchgear, suitable for 11.5 V. battery,

20 C.P. 1200, 2 A. A Railway screwdriver is necessary to use this charger.

A Railway screwdriver is necessary to use this charger. It is a powerful charger

and is used in every railway station in the country. A.R.F. Accumulators, 15/-.

A.R.F. CHARGERS, with automatic switchgear, suitable for 11.5 V. battery,

20 C.P. 1200, 2 A. A Railway screwdriver is necessary to use this charger.

A Railway screwdriver is necessary to use this charger. It is a powerful charger

and is used in every railway station in the country. A.R.F. Accumulators, 15/-.

ELECTRADIOX RADIOS

216, Upper Thames Street, London, E.C.4

E. L. F. Philpots: Original wire,并在下拉菜单中选择 'CVISION PDFCompressor'.
Comment, Chat, and Criticism

About Gramophone Records

I pointed out in my recent article on Gramophone Records that after accepting the modern miracle of electrical recording, with all its perfection of detail and lifelike representation of a great work of music down to the smallest detail, as a matter of course and an ever recurring certainty, the most vital factor making for the perfect record was the reproduction of the recording artist’s personality. The ability to do this on a wax or composition disc, to such a degree of fidelity that, having once heard a powerful personality play a given work, we can at once recognize him as the maker of the record, is, to me, an absolutely essential achievement, something romantic and fascinating, as well as scientifically marvellous, in one’s ability to pick up a performance of a great composition by, say, Caruso, Paderewski or Kreisler, took it under your arm, and take it with you to play at a friend’s house, as I must imagine for one moment. You or I, with these men in our pockets as it were, playing them there, these and everywhere. And all for six shillings a time.

The B.B.C. announcers say, “There are a few records so I’ll play you a record of . . .” Christopher Stone gives recitals of gramophone records (as if probably gets as much for doing so as most of the flesh-and-blood artists). It’s all most extraordinary and, in some ways, all wrong. But, like port wine or oyster, we must either bottle it if we want to enjoy it, or else visit Portugal or the Black Sea and get the real thing.

Individuality

That this question of individuality is one that does not come fully alive to your mind until you have been to be borne out by the large numbers of recordings one can nowadays get of most of the famous compositions. In fact, it is frequently almost entirely a question of “who do we prefer to play such and such a work.” More than what work do we prefer. With most of the masterpieces we have a choice of five or six recordings, as well as with hundreds of pianoforte and violin solos and songs, which are arranged before us performed by innumerable artists. With songs it is not quite so remarkable as the various voices, as well as the innumerable types of accompaniments they can be set to, to make a large variety of recordings almost a commercially successful certainty. But to store half a dozen different pianists playing the same Chopin study, and half a dozen orchestras and conductors, the same Beethoven Symphony had to be ranked and proven wise.

Cortot

As I said in the same article, few artists have succeeded in imparting their own individual style on to the disc to an extent of degree as the great French pianist. There must be something very vital in his playing which records very easily, like the tones of the instrument itself. For, apart from the usual faithful reproduction of those tones, Cortot’s records are just like bottles of essence, preserving something vital and necessary. They kill two birds with one stone—they not only preserve a mechanically perfect production of a great piece of music, but they preserve a great performance of it as well. So many recordings succeed in the first of these accomplishments, but not so many in the latter.

Cortot’s recordings of the Schumann Concerto, the César Franck, Symphonic Variations, and innumerable Chopin pieces, have long been famous. Also of chamber music, notably Beethoven’s Archduke Trio, Bach’s Brandenburg in D and the Franck Piano Quintet. He is unquestionably the most beautiful Schumann player among all the pianists, and his distillation of romance into the music of that most incurable of romantics has made a perfect recording of the Scenes from Childhood. If you have not heard Cortot play “Traumer,” then secure a record of this gem at the first opportunity. He has also just recorded a wonderful and characteristic performance of Chopin’s second Concerto—this after a banquet from Chopin’s beautiful garden—which I recently heard on the Editor’s machine at his residence.

Toscanini

Another superb record I heard on the same occasion was the one and only Toscanini—this time in charge of the National Broadcasting Corporation of America’s Orchestra—in the one and only fifth symphony. This sounds somewhat in the nature of an alliance of two perfect souls, and so it is. Toscanini said Queen’s Hall out last summer, for seven concerts in three weeks, within forty-eight hours. And the balcony was ten shillings a time! On those records you can tuck the great little man under your arm and go with him wherever you will. He is there to the very life. A Beethoven Symphony under Toscanini’s baton is probably the greatest achievement in the executive world of music. He has long been recognised as a maestro with the laston, and one of the chief reasons is said by be cause he adheres more faithfully to the commands of the composer, as these are recorded on his scores in the form of directions for performance, than any other conductor. Toscanini says that he wants such and such a movement to be played at so many metronome beats to the bar, or such and such a melody to be phrased as he has marked it—then Toscanini says, in effect, “that’s good enough for me.”

Playing Speed

This question of speed enters into a large number of recordings. It seems to be the fashion to drag things a little out and to sentimentalise over them, especially, of course, when there is a melody, and more especially if a famous personality is on all-contrary. Firstly, it is not a good expression, surely one of the most misunderstood words in the language—and also it robs the work of its sparkle and vitality. There is nothing worse than to let music drag and hang fire. I noticed this the other day on hearing Kreisler’s own recordings of his beautiful “Caprice Viennais.” I had not heard him play it for some time, and the first thing that was born in on me was how many players, notably those who have arranged the work for various combinations of salon orchestra, have overdone it with excessive and unwanted sentiment, robbing it of all its Viennese gaiety and charm. Kreisler should know, surely.

PROGRAMME NOTES

Glasgow Orpheus Choir

So far as a choir can be regarded as the creation of one man, Glasgow Orpheus Choir is the product of its conductor, Sir Hugh Robertson. They will come to a B.B.C. studio on December 9th to give a concert of the music which they sing better than any other combination. The Orpheus Choir was built up by Sir Hugh Robertson from the Glasgow Toybbee House Choir, until their fame extended across the world. They have gone to the King and Queen, to the British Cabinet and at concerts varying in size between tiny Scots village halls to the largest halls of the composer, as these are recorded on his scores in the form of directions for performance, than any other conductor. Toscanini says that he wants such and such a movement to be played at so many metronome beats to the bar, or such and such a melody to be phrased as he has marked it—then Toscanini says, in effect, “that’s good enough for me.”

“TO THE PUBLIC DANGER”

There is added point in these days of so-called black-outs and higher road fatalities to this play which was written by Patrick Hamilton for broadcasting. “To the Public Danger” was broadcast in the early part of this year and has been brought up to date specially for the revival on December 7th. Listeners will recall that the play deals with the criminality of reckless motoring without regard for the safety of the lives of other people on the road.
Open to Discussion

Double-detector Circuits

SIR,—With reference to the letter from Mr. Long, in your issue dated November 25th, I beg to state that I have forwarded to your correspondent the information he requires on the subject of the crystal set.

All the double-detector circuits appear to have created an interest, it would be appreciated if a few readers who have built up either the double-crystal detector circuit or the valve double-detector would report the results they have obtained. I have not tried it on the short waves; I must do this through a reader directly.

By the way, the reaction to detector 2 in the published circuit should preferably be taken to date negative.—D'Arcy Ford (Exeter).

A Prizewinner's Thanks

SIR,—I thank you for the book, "Wireless Transmission for Amateurs," which you awarded me in connection with a prize award.

I have recently turned my attention to the transmitting side of wireless, but unfortunately, the present restrictions on the issue of licences, etc., have confined any study to theory, rather than practice. My prize becomes all the more useful for that reason.

I have "dabbled" in wireless for the last 10 years, and have taken Practical Wireless almost from the first issue. The greater amount of my wireless knowledge has been obtained from the varied interests in Practical Wireless, and from the careful perusal of your Wireless Constructor's Encyclopedia, which has been an invaluable help to me.—W.M. G.H. Robinson (Clacton).

The S.W. "Ranger"

SIR,—Many thanks for your foolproof 0-1 V Short-wave Ranger described in Practical Wireless issue of March 11th, 1939. For range and signal strength it's a great DXer, once the coil is set. I received DJA (Br.), TAP, Anchorage (R7), Addis-Ababa (R7F), Rome (R9), Buenos Aires (R6P), W9EO (R9-7) and WNB1 (R8); and many unidentified stations. I find the 31 m. (9.6 u.) band the liveliest present. I use headphones only for DX work.—F.W. McGregor (London, W.).

Exchange S.W.L. Cards

SIR,—I should like to exchange my card with any other S.W.L. I will also QSL 100 per cent. I should also like to correspond with any short-wave fan in U.S.A. or Canada.—D. Smallcross, I, Cornwall Lane, Hillingdon, Middlesex.

S.W. Logs : Correspondents Wanted

SIR,—I have been a regular reader of your excellent paper for several years, and should like to make a suggestion. During the time I have taken the paper I have seen very few of what I call "full" logs, that is the calling, exchanging, calling again, exactly, and stating the time the station was received, and also QSA + B or RST so that others may compare results with them. I should like to see published more logs something like that of R.I. Caiger in the issue for October 9th, 1939 (+ RST). I do not include a similar log of my own as I have been QRT for some weeks, and do not think readers would be interested in such "ancient" logs. I should like to get in touch with any SWL A or full ticket, "ham," in any part of the world (except British Isles) with the view to exchanging 7 mcs and 14 mcs logs, also logs of BC stations. I am particularly interested in correspondence with India, Azores, Canaries, Bermuda, West Indies, Pacific and South Sea Islands, East Indies, Singapore, Malaya and Maland, but don't let my choice discourage other correspondents elsewhere from writing. I shall answer every card I receive. I greatly enjoy the present form of PRACTICAL WIRELESS and wish it every success.—T.S. W. Bouwe (Deerness, Hookerling, East Dereham, Norfolk, England).

The Kestrel S.W. Four

SIR,—Thank you very much for your advice I asked for recently, concerning the Kestrel. The trouble was a simple one—a broken G.B. lead. Readers may be interested in the following log heard in (RS) the Receiver, November 10th to 19th. Aerial, 308, inverted L facing N-S. On 16, 20, 25 and 31 metre bands, WNB1, WGEA, WSLR, WPIT and WCA1. On 19 and 25 metre bands, LRU and XGOY heard faintly.

Aural Problems

PROBLEM No. 377

PETERS made up a three-valve battery set, and added a bias condenser, and with a three-stage coil and three-stage condenser. Instead of using a metal chassis as specified in the description of the receiver, he effected an economy by using a wooden chassis, joining the filament circuit to earth instead of to an earth box on the chassis. When he tried out the receiver he failed to obtain any results, although no shortcircuit appeared to function correctly and sounds of some kind could be heard in the speaker. What was wrong? Three books will be awarded for the first three correct submissions. Readers should be addressed to The Editor, PRACTICAL WIRELESS, 100, Charing Cross Road, London, W. It is essential that any S.W.L. who wishes to receive complete results must apply for them to The Editor. No. 257 in the top left-hand corner and must be posted to reach office by 12 noon on the first post day of any Monday, December 9th, 1939.

Solution to Problem No. 376

When Jardine connected the windings in series he should have made a test with an A.C. meter to ensure that the windings were not so connected that they were in phase. If this is not done the voltages will not be additive and in his case, the result obtained by passing the voltage is thus failing to provide 6 volts. The valve was, therefore, under-drive.

The following three readers successfully solved Problem No. 315 and lookers have accordingly been forwarded to them:—H. H. Kass, 10, Gray's Passage, Tunstall, Lanes; H. K. J. Jarvis, 3, Woodland View, High Trun, Nr. Stafford; J. R. Cooper, c/o 20, Salt Hill Way, Stoughton, Bucks.

The well-known Europeans, such as Zeewan, Rome and Daventry, come in fine, and I have also heard EAO and TAP and a station announcing itself as being Belgrade.

On November 12th the 20-metre amateur band seemed alive, but I was unable to identify anything on the speaker, and my "phones" are damaged I unfortunately had to let the receiver down. I think this is a very fine set, and when conditions are good the Amateurs come over very well indeed on the speaker. I shall endeavour to let you have a more comprehensive log at a later date.

Would the Kestrel tune down to about 10 metres satisfactorily, as I have heard that the amateur band on this wavelength is active?—E. Andrews (Brighton).

([Although not primarily designed for tuning down to 10 metres, it may well be worth while to try, if available coils are used.—Ed.]

Correspondents Wanted

SIR,—I wish to get in touch with any young reader who is interested in short wave—medium or long wave—radio, and would like to correspond with such an enthusiastic SWL. —Ronald J. Richardson (188, Kingsley Road, Hornsdown, Middls).

SIR,—I shall be glad to get in touch with any reader of this journal residing in this district who is interested in short-wave work.—Gordon Richardson (16, Elizabeth Street, Holmwood, Nr. Oldham).

([We were interested in the photograph of your den, but unfortunately it was not sufficiently clear for reproduction purposes.—Ed.]

THE "THREE-TWO" RECEIVER

(Continued from page 255)

before the signal has been built up to suitable strength, whilst with other values it may be found that reaction will not operate even with the reaction condenser at maximum. The value of the grid condenser may also be modified in conjunction with the grid leak, suitable values being found between .0001 and .0005 mfd. The anode by-pass condenser is also a fairly critical component, the component reacting sensitivity and reaction control are concerned, and values greater than .0002 mfd. should not generally be used. The usual effect of a large capacity in this position is to cut top notes and give rise to muffled reproduction, whilst the reaction of a condenser entirely will result in greatly-reduced sensitivity, and in most cases complete absence of reaction.

Aerial Sensitivity

One final point concerns the aerial input. There is no H.F. control on this receiver, and there is thus, under certain conditions, risk of distortion in the H.F. and detector stages due to too great an input voltage. In this case, of course, some form of limit must be imposed on the incoming signal, and this is most conveniently carried out by a series-reactor condenser EAO as P.T.A. mounted. Such a component may be any type of variable or semi-variable condenser having a maximum capacity of .0003 mfd. or .0005 mfd. It is merely joined between the aerial lead-in and the aerial socket on the receiver, and at first sight ganging slightly the normal way of using the condenser is merely to adjust it until the signal is reduced to the desired level. Slight re-tuning will generally enable the signal to be kept free from distortion.
### Practical Wireless Blueprint Service

<table>
<thead>
<tr>
<th>PRACTICAL WIRELESS</th>
<th>BLUETPRINT SERVICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Pages (in.</td>
<td>No. of Blueprints</td>
</tr>
<tr>
<td>Live. Blue.</td>
<td>1-50</td>
</tr>
<tr>
<td>CRYSTAL SETS</td>
<td></td>
</tr>
<tr>
<td>Blueprints, 6d. each.</td>
<td>PW78</td>
</tr>
<tr>
<td>&quot;AC&quot; 5-10, P. (D, Pen)</td>
<td>PW79</td>
</tr>
<tr>
<td>&quot;DC&quot; 5-10, P. (D, Pen)</td>
<td>PW80</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 10, P. (D, Pen)</td>
<td>PW81</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 15, P. (D, Pen)</td>
<td>PW82</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 20, P. (D, Pen)</td>
<td>PW83</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 30, P. (D, Pen)</td>
<td>PW84</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 50, P. (D, Pen)</td>
<td>PW85</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 75, P. (D, Pen)</td>
<td>PW86</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 100, P. (D, Pen)</td>
<td>PW87</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 150, P. (D, Pen)</td>
<td>PW88</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 200, P. (D, Pen)</td>
<td>PW89</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 300, P. (D, Pen)</td>
<td>PW90</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 500, P. (D, Pen)</td>
<td>PW91</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 750, P. (D, Pen)</td>
<td>PW92</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 1000, P. (D, Pen)</td>
<td>PW93</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 1500, P. (D, Pen)</td>
<td>PW94</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 2000, P. (D, Pen)</td>
<td>PW95</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 3000, P. (D, Pen)</td>
<td>PW96</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 5000, P. (D, Pen)</td>
<td>PW97</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 7500, P. (D, Pen)</td>
<td>PW98</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 10000, P. (D, Pen)</td>
<td>PW99</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 15000, P. (D, Pen)</td>
<td>PW100</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 20000, P. (D, Pen)</td>
<td>PW101</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 30000, P. (D, Pen)</td>
<td>PW102</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 50000, P. (D, Pen)</td>
<td>PW103</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 75000, P. (D, Pen)</td>
<td>PW104</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 100000, P. (D, Pen)</td>
<td>PW105</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 150000, P. (D, Pen)</td>
<td>PW106</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 200000, P. (D, Pen)</td>
<td>PW107</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 300000, P. (D, Pen)</td>
<td>PW108</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 500000, P. (D, Pen)</td>
<td>PW109</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 750000, P. (D, Pen)</td>
<td>PW110</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 1000000, P. (D, Pen)</td>
<td>PW111</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 1500000, P. (D, Pen)</td>
<td>PW112</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 2000000, P. (D, Pen)</td>
<td>PW113</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 3000000, P. (D, Pen)</td>
<td>PW114</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 5000000, P. (D, Pen)</td>
<td>PW115</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 7500000, P. (D, Pen)</td>
<td>PW116</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 10000000, P. (D, Pen)</td>
<td>PW117</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 15000000, P. (D, Pen)</td>
<td>PW118</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 20000000, P. (D, Pen)</td>
<td>PW119</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 30000000, P. (D, Pen)</td>
<td>PW120</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 50000000, P. (D, Pen)</td>
<td>PW121</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 75000000, P. (D, Pen)</td>
<td>PW122</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 100000000, P. (D, Pen)</td>
<td>PW123</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 150000000, P. (D, Pen)</td>
<td>PW124</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 200000000, P. (D, Pen)</td>
<td>PW125</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 300000000, P. (D, Pen)</td>
<td>PW126</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 500000000, P. (D, Pen)</td>
<td>PW127</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 750000000, P. (D, Pen)</td>
<td>PW128</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 1000000000, P. (D, Pen)</td>
<td>PW129</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 1500000000, P. (D, Pen)</td>
<td>PW130</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 2000000000, P. (D, Pen)</td>
<td>PW131</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 3000000000, P. (D, Pen)</td>
<td>PW132</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 5000000000, P. (D, Pen)</td>
<td>PW133</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 7500000000, P. (D, Pen)</td>
<td>PW134</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 10000000000, P. (D, Pen)</td>
<td>PW135</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 15000000000, P. (D, Pen)</td>
<td>PW136</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 20000000000, P. (D, Pen)</td>
<td>PW137</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 30000000000, P. (D, Pen)</td>
<td>PW138</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 50000000000, P. (D, Pen)</td>
<td>PW139</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 75000000000, P. (D, Pen)</td>
<td>PW140</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 100000000000, P. (D, Pen)</td>
<td>PW141</td>
</tr>
<tr>
<td>&quot;AC&quot;-&quot;DC&quot; 150000000000, P. (D, Pen)</td>
<td>PW142</td>
</tr>
</tbody>
</table>
Gramophone Motor Hum

"I have a radiogram which gives rather pronounced hum, and I attribute this to the motor. Do you advise earthing this, or is there any risk of a mains short-circuit from so doing?"—L. E. (N.W.7.)

A large number of electric gramophone motors are provided with an earthing terminal, and where the motor forms part of a complete gramophone unit the mounting base may be earthed with advantage—thereby earthing the motor. You may find, however, that the hum is not removed by this method of earthing as the windings in the motor, when joined to motors, may interlace with windings in the motor, thereby introducing hum, and the turntable itself may not act as a sufficient screen. In these cases probably the only effective scheme is to use a pick-up which is provided with a special hum-reducing coil.

Battery Superhet

"Could you let me know when you last published sectional details of a 3- or 4-volt battery superhet? If you have not done one, perhaps you could say if you intend publishing one in the near future?"—R. G. (Tunbridge).”

We have published both a 3-valve and a 4-valve superhet for battery operation. A blueprint of the 3-valve is still available, No. PW40, and the constructional details will be found in the issue dated 5.6.37. These are reprinted, as the original issue is out of print. The 4-valve is, unfortunately, out of print, but if you look under the book number you will find the constructional data for the 4-valve in our issue dated 16.11.35.

Coil-winding Machines

"Have you at any time published details of a machine suitable for transformer windings, or whether there is a book which gives details?"—A. T. L. (W.C.I.)

For simple transformer purposes you only need a neat bobbin made from paper or similar material, and this may be mounted on a spindle carried in an ordinary twist drill, the number of revolutions for one turn of the handle being found, and then it is not difficult to wind the desired number of turns. An effective coil-winding machine was, however, described in our issue dated 23.10.37, and you may wish to make up an instrument of this type, which will also be found valuable for making coils. This machine is provided with a turns counter and is quite simple to make up.

Sound Detector

"I wish to make up a sound detector to pick up the air-radiated warnings and amplify them inside the house. How can I do this? Is it possible to place a microphone outside the house and connect it to a loudspeaker inside?"—R. E. (New Eltham).

Speaker of traffic, etc. Therefore, we suggest that the microphone is placed at the small end of a fairly large horn assembly to provide the desired waterproof properties, and if this is directed into the air it may be that the waves will cut out much of the traffic noise. Secondly, some form of relay may be used so as to provide a loud sound consumption whilst in a "stand-by" condition. We regret that we have no suitable diagram or blueprint which we could supply in this particular case.

P.A. Amplifier

"I have a commercial 5-valve superhet and am trying to find a suitable amplifier to work with this in a hall about 70ft. by 35ft. by 25ft. high, for dancing, etc. Sometimes it would be used with a pick-up and very seldom with a microphone. It is an all-mains receiver. Have you a suitable design you can recommend?"—W. S. C. (Mr. Liverpool).

It is desirable in such a case that the amplifier be self-contained, as there would be insufficient H.T. available in the receiver to operate an amplifier capable of giving the desired output. We recommend the 12 watt or the 18 watt amplifiers which we have described for the former in our issue dated 30.10.37, and the latter in the issue dated 31.12.38. Less than 12 watt would no doubt prove unsatisfactory for dancing in a hall of the size mentioned.

Cabinet Rattle

"I am troubled with a peculiar form of distortion which nothing seems to cure. It takes the form of a kind of buzz on certain notes, and although I have recently examined the speaker and have tried various circuit ideas it is still there. I cannot notice the trouble on weak or strong signals. This trouble leads me to suspect the speaker, but as this is fairly new and has not been overloaded by any means, I am rather at a loss to account for the trouble. I wonder if you can help me?"

-M. C. I. (Hastings).

This trouble may not be in the set or speaker. A very common cause of such a buzz is found to be due to the cabinet design and manufacture. In some cases the air-chambers provided round the speaker will resonate at certain frequencies and the increased amplification so afforded might result in some noise being excited in the cabinet all round and you may find that there is a looseness in the plywood laminations which is causing the trouble. A cabinet pin driven through the cabinet at the meet and riveted over on the inside should prevent movement of the wood and so reduce or cut out the buzz.

REPLIES IN BRIEF

The following replies to queries are given in abridged form either because of limitations of space or our rules, or because the point raised is not of general interest.

A. D. (Liverpool). We do not know of any particular component known as "membrane" and regret that we cannot complete your circuit diagram as it is too schematic.

J. B. S. (Saxmundham). Write to H. P. R., Ltd., Higham Street, Tottenham Court Road, London, W.C.1. A single-stage test in the amplifier should be made.

W. W. (Accrington). We recommend our book "Transmission for Amateurs." We would remind you, however, that transmitting activities on unlicensed frequencies without a licence will not be condoned.


W. E. (Bexley). The item will return 60 upwards, according to type. Electrodial Haloid, wishes to say that it can supply.

M. Y. (Newcastle). Explanations and details are now entirely out of print. The circuit has been superseded by modern designs.

J. W. (Gloucester, W.S.1). We would suggest you communicate with a C.R. Society, or a club, to which you may be able to send your address. Their address is Century House, High Street, London, W.C.1.

J. E. T. (Reading). We think it would be very difficult to make a satisfactory composite of this type, and advise you to obtain a ready-made article.

R. A. (Longstowe). We cannot give connections without a type number, as the firm in question makes different types of oval from time to time.

E. E. R. (South Harrow). This valve in question should work quite satisfactorily.

C. H. (Leicester). This is merely a standard component, having primary and secondary windings. Any standard coil, even if it includes a reaction winding, may be used, ignoring the reaction section. You will find any of the coils in the book in question may be used, but a tuning condenser is essential in conjunction with any of them. The sides of the box are necessary for wavelength changing.

M. K. (Bryan, Wigan). So far as we can trace the coil is no longer on the market.

D. H. A. (Luton). I am quite confident there is nothing wrong with the meter, and the connections are perfectly standard. You are mistaken, of course, there being no parallel in addition to the parallel with the supply it measures voltage, and in series it indicates this. The trouble is in the wiring.

The coupon on page 272 must be attached to every query.
RECEIVERS, COMPONENTS AND ACCESSORIES

SOUTHERN RADIO'S Bargains

LL Articles Fully Guaranteed. Postage extra.

1. - Parcel of useful components, comprising 12 condensers, resistances, volume controls, coils, wire, transformers, etc., etc., delivered to your door.

2. - Parcel of useful components, comprising 12 condensers, resistances, volume controls, coils, wire, transformers, etc., etc., delivered to your door.

3. - Service men's component kit. Comprising 12 condensers, resistances, volume controls, coils, wire, transformers, etc., etc., delivered to your door.

4. - Ten 12-watt transistors, 6.3 volts, for $1.50.

5. - Twelve mainsbridge type condensers, 1-5/8 inches square.

6. - Twenty 2-meter range meters (rolls and millamps), 50 cents each.

7. - Morse coppers, 25 cents each.

8. - Buzzer, 1/2; crystal detectors, 2/3; crystal sets, 1/3.

9. - Onondiago loudspeaker units, 2/6.

10. - Westecor, Type WE, 2/0 each.

11. - Tool or instrument carrying cases extra.

SOUTHERN RADIO, 46, Lime Street, London, W.C. Gerrard 6606.

VAUXHALL—All goods previously advertised are available now. Free delivery on all orders. Re-see—Vauxhall Utilities, 102a, Strand, W.C. 2.

BANKRUPT BARGAINS. Brand new 10089 models, plated, colorless, 200 aluminum mirrors, £1 10s. 4d. per 40 cent below list prices; also Midget, portable, £1 10s. 4d. per 40 cent below list prices; also Midget, portable, £1 10s. 4d. per 40 cent below list prices.

LONDON RADIO SUPPLY COMPANY

Important TROPHY announcement

To all PRACTICAL WIRELESS readers who, for some reason or another, have not yet ordered their TROPHY—please turn to last week's issue of this journal and study the important TROPHY announcement. TROPHY Radios have been recommended more than any others for all-world listening and represent the best value obtainable. Order Now at present low prices. TROPHY models from £6 16s. 6d., Terms available.

PETO-SCOTT LTD., 78, Wigmore St., W.1.

FREE ADVISE BUREAU COUPON

This coupon is available until December 15th, 1939, and must accompany all Queries and Orders for PRACTICAL WIRELESS, 9/12/39.

PRACTICAL WIRELESS, December 9th, 1939

Notes from the Bench

Another Soldering Hint

When fine soldering work is being carried out, the quick application of solder is one of the most important essentials, but this cannot be done if the iron will only carry a very small layer of solder. A good "bin" of molten solder is essential, but this will not adhere to the iron if the temperature is wrong or if the iron is not clean. This latter point is one which concerns us at the moment, and a brush which may be new to many is that the desired cleanliness and requirements for making the iron carry the solder may be obtained by rubbing the hot iron on a block of sal-ammoniac, or dipping it quickly in one of the prepared soldering fluids. Some amateurs preserve this effect by repeatedly and securely tinning the solder in powder in small quantities so that the desired cleaning and timing is carried out at once operation.

Wooden Chassis

Owing to increased costs of metal, chassis may prove more economical when made from wood, but there is no need to use very heavy plywood for this purpose if certain parts are kept light in mind. The top, for instance, may not be thicker than 3/4 in. provided it carries certain flat components, such as coil units, whereby the amount of flat metal forming the base will act as a stiffener to add strength to the chassis. This must not be overdone, but additional supporting strips may be placed beneath heavy components should the top be found to sag due to excessive weight.

Pick-up Chatter

With many types of magnetic pick-up it is often possible to hear the reproduction of a record, during loud passages, through the excessive vibration of the armature, and as this can become very annoying, it is always advisable to take simple precautions to eliminate this as much as possible.

A stout lid should always be provided to cover the turntable and pick-up when they are in use, and to prevent it acting as a sound-box, the interior of the lid and its edges should be covered with thick felt.

MORSE EQUIPMENT


LOUDSPEAKER CONVERSATIONS

PARKS Triple Cone Conversions Will Immensely Improve Quality of Your Portable Speaker. Enables you to bring your speaker right up to the high standard of reproduction at a very small cost. Free descriptive leaflet from the Pioneer Makers of Moving coil Speakers since 1927. Write to Bell Labs Radio, 79, Henley Rd., South Croydon.

LOUDSPEAKER REPAIRS

1. LOUDSPEAKER repairs, British, American, etc., 20/- per service, moderate prices—S. Sheldrake, Sutherland Terrace, London, N.1.

2. LOUDSPEAKER AND REPAIRING SERVICE: 24-hour service. See below. —

REPAIRS to moving coil speakers a specialty.

New type assembled fittings coils and fields wound or altered. Mains transformers, chokes, filters and variable condensers for speaker transformers, Class "B" and "F" transformers and inductors. Prices on request at 4s. each, post free. Discount to extreme estimators. Guaranteed satisfaction.


NEW LOUDSPEAKERS

3 SPEAKERS from 6/6 each, P.M. and 3 SPEAKERS from 2/- each, P.M., including several 6/6-3/6-3/6-3/6-£1 switches. Write for details.

BALMмышл,Tommy Tewenby, Copenhill Street, London, N.1.
COMMUNICATION RECEIVERS


TECHNICAL INFORMATION


PUBLIC APPOINTMENTS

WIRELESS Technical Instructors required in Army units. Voluntary.

PAY to 3d. per day (7 days a week). Clothing and accommodations, if not already provided, at no cost. Officers and non-commissioned men allowed to come ashore at wholesome price. Unemployed cable operators, road and local postmen, operators, etc...

EMPLOYMENT Secured; photos issued to country customers.

L. SMITH and Co., Ltd., 259, Edgware Road, W.2. Tel. 837, 297, 298, 299.

TELEVISION AND RADIOGRAM CABINETS from 41 inches. Makers' own designs. Carr's Furnishing, W.C.2, 593-

PUBLIC APPOINTMENTS

WIRELESS Technical Instructors required in Army units. Voluntary.

PAYABLE to 3d. per day (7 days a week). Clothing and accommodations, if not already provided, at no cost. Officers and non-commissioned men allowed to come ashore at wholesome price. Unemployed cable operators, road and local postmen, operators, etc...

EMPLOYMENT Secured; photos issued to country customers.

L. SMITH and Co., Ltd., 259, Edgware Road, W.2. Tel. 837, 297, 298, 299.

TELEVISION AND RADIOGRAM CABINETS from 41 inches. Makers' own designs. Carr's Furnishing, W.C.2, 593-

PUBLIC APPOINTMENTS

WIRELESS Technical Instructors required in Army units. Voluntary.

PAYABLE to 3d. per day (7 days a week). Clothing and accommodations, if not already provided, at no cost. Officers and non-commissioned men allowed to come ashore at wholesome price. Unemployed cable operators, road and local postmen, operators, etc...

EMPLOYMENT Secured; photos issued to country customers.

L. SMITH and Co., Ltd., 259, Edgware Road, W.2. Tel. 837, 297, 298, 299.

TELEVISION AND RADIOGRAM CABINETS from 41 inches. Makers' own designs. Carr's Furnishing, W.C.2, 593-

PUBLIC APPOINTMENTS

WIRELESS Technical Instructors required in Army units. Voluntary.

PAYABLE to 3d. per day (7 days a week). Clothing and accommodations, if not already provided, at no cost. Officers and non-commissioned men allowed to come ashore at wholesome price. Unemployed cable operators, road and local postmen, operators, etc...

EMPLOYMENT Secured; photos issued to country customers.

L. SMITH and Co., Ltd., 259, Edgware Road, W.2. Tel. 837, 297, 298, 299.

TELEVISION AND RADIOGRAM CABINETS from 41 inches. Makers' own designs. Carr's Furnishing, W.C.2, 593-

PUBLIC APPOINTMENTS

WIRELESS Technical Instructors required in Army units. Voluntary.

PAYABLE to 3d. per day (7 days a week). Clothing and accommodations, if not already provided, at no cost. Officers and non-commissioned men allowed to come ashore at wholesome price. Unemployed cable operators, road and local postmen, operators, etc...

EMPLOYMENT Secured; photos issued to country customers.

L. SMITH and Co., Ltd., 259, Edgware Road, W.2. Tel. 837, 297, 298, 299.

TELEVISION AND RADIOGRAM CABINETS from 41 inches. Makers' own designs. Carr's Furnishing, W.C.2, 593-

PUBLIC APPOINTMENTS

WIRELESS Technical Instructors required in Army units. Voluntary.

PAYABLE to 3d. per day (7 days a week). Clothing and accommodations, if not already provided, at no cost. Officers and non-commissioned men allowed to come ashore at wholesome price. Unemployed cable operators, road and local postmen, operators, etc...

EMPLOYMENT Secured; photos issued to country customers.

L. SMITH and Co., Ltd., 259, Edgware Road, W.2. Tel. 837, 297, 298, 299.

TELEVISION AND RADIOGRAM CABINETS from 41 inches. Makers' own designs. Carr's Furnishing, W.C.2, 593-

PUBLIC APPOINTMENTS

WIRELESS Technical Instructors required in Army units. Voluntary.

PAYABLE to 3d. per day (7 days a week). Clothing and accommodations, if not already provided, at no cost. Officers and non-commissioned men allowed to come ashore at wholesome price. Unemployed cable operators, road and local postmen, operators, etc...

EMPLOYMENT Secured; photos issued to country customers.

L. SMITH and Co., Ltd., 259, Edgware Road, W.2. Tel. 837, 297, 298, 299.

TELEVISION AND RADIOGRAM CABINETS from 41 inches. Makers' own designs. Carr's Furnishing, W.C.2, 593-

PUBLIC APPOINTMENTS

WIRELESS Technical Instructors required in Army units. Voluntary.

PAYABLE to 3d. per day (7 days a week). Clothing and accommodations, if not already provided, at no cost. Officers and non-commissioned men allowed to come ashore at wholesome price. Unemployed cable operators, road and local postmen, operators, etc...

EMPLOYMENT Secured; photos issued to country customers.

L. SMITH and Co., Ltd., 259, Edgware Road, W.2. Tel. 837, 297, 298, 299.

TELEVISION AND RADIOGRAM CABINETS from 41 inches. Makers' own designs. Carr's Furnishing, W.C.2, 593-

PUBLIC APPOINTMENTS

WIRELESS Technical Instructors required in Army units. Voluntary.

PAYABLE to 3d. per day (7 days a week). Clothing and accommodations, if not already provided, at no cost. Officers and non-commissioned men allowed to come ashore at wholesome price. Unemployed cable operators, road and local postmen, operators, etc...

EMPLOYMENT Secured; photos issued to country customers.

L. SMITH and Co., Ltd., 259, Edgware Road, W.2. Tel. 837, 297, 298, 299.

TELEVISION AND RADIOGRAM CABINETS from 41 inches. Makers' own designs. Carr's Furnishing, W.C.2, 593-

PUBLIC APPOINTMENTS

WIRELESS Technical Instructors required in Army units. Voluntary.

PAYABLE to 3d. per day (7 days a week). Clothing and accommodations, if not already provided, at no cost. Officers and non-commissioned men allowed to come ashore at wholesome price. Unemployed cable operators, road and local postmen, operators, etc...

EMPLOYMENT Secured; photos issued to country customers.

L. SMITH and Co., Ltd., 259, Edgware Road, W.2. Tel. 837, 297, 298, 299.
Many useful hints for Experimenters.

- Technical information and valve operating data.
- Use of Tables of Pin connections.
- Comparative valve Tables.
- Many useful hints for Experimenters.
- 12 Pages of Circuit diagrams

In fact, everything you need to know about valve characteristics and working conditions.

In these times of emergency, valve replacements will be required in many receivers. The comparative table shown in the Osram Valve Guide will enable you to select the equivalent Osram Valves.

Write for your copy of the OSRAM VALVE GUIDE (sent post free) to the Osram Valve Technical Dept. of:

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2
in the efficiency of the working of "THE SHORT WAVE 5"

The builders can specify the very finest components . . . the finest valves possible may be incorporated . . . the most careful construction carried out to the last degree—but if the telephones are not Ericsson SUPERSENSITIVE then the set cannot be expected to function at its 100% efficiency. (So now you can understand why "Practical Wireless" specified them when making up this fine set.)

These are the 'phones that annihilate distance, that make DX listening a positive commonplace, are comfortable over long spells—and never let you down.

At all good radio-dealers. If you have any difficulties write direct to:

ERICSSON TELEPHONES, LTD.
22, Lincoln's Inn Fields, London, W.C.2. Tel: HOLborn 6936

SUPERSENSITIVE HEADPHONES

BATTLE TRAINING IN WORD AND PICTURE is intended in the main for leaders of the smaller formations, from the Section or Platoon upwards, and for those who hope to gain promotion to these commands. It deals authoritatively and interestingly with the problems that confront such leaders on peace and war manoeuvres.

One of the features is an account of the operations carried out between two imaginary warring states—Anglia and Humbria. Problems are set covering every situation, and solutions given.

LORD GORT Recommends it in his special foreword!

WITH MAPS DIAGRAMS PHOTOGRAPHY EXPLANATORY PICTURES and a FOREWORD by LORD GORT.

Order from your Newsagents To-day.
December 16th, 1939

PRACTICAL WIRELESS

EVERY WEDNESDAY
Vol. XV, No. 375 Dec. 16th, 1939

EDITED BY
E. J. CAMM

Staff:
W. J. DELANEY, FRANK PRESTON,
H. J. BARTON CHAPPLE, B.Sc.

ROUND THE WORLD OF WIRELESS

Receiver Overhauls

ALTHOUGH receiver faults are not ever-recurring, there are many occasions when a listener feels that results might be improved by an overhaul. Cycles, cars and other working apparatus have to be overhauled periodically, and most wireless receivers pay for a similar overhaul. At such times it may also pay to make modifications to a circuit which has been in use for some time, and without making drastic changes it may be possible to make appreciable improvement in the results with little expense and with a minimum of trouble. The question of straightforward overhaul or clean-up is more simple, but there are many points which have to be kept in your mind. An examination of terminal or screwed connections; soldered joints which may have worked loose; dust between moving parts and similar details are probably familiar to every listener, but in view of the many different points which can receive attention at such an overhaul we give in this issue two or three articles on the subject. After a perusal of these it may be found that you can substantially improve your receiver's performance, but remember always to be discriminative in the changes which you introduce.

A Stimulus to Sales

DEALERS throughout the country should find business greatly stimulated by the extensive advertising campaign which has just been inaugurated by The General Electric Co., Ltd., in connection with the marketing of two of its current receivers. This advertising campaign is scheduled to cover a period of several weeks, and the media is a comprehensive one, embracing London national newspapers and a large number of others circulating in all parts of England, Scotland and Wales, Northern Ireland and Eire.

This means that literally millions of people will have their attention directed to these 5-valve, 3-waveband, receivers, for the advertisements are of imposing dimensions and occupy prominent spaces, while they tell a convincing story in a concise and attractive way.

Light Music

OUTSIDE bands and light orchestras are being heard in increasing numbers in the broadcast programmes. In Christmas week, for instance, at least a dozen combinations which were well known to listeners before the war have been booked, and they include Harry Engleman's Quintet, Falkman and his Apache Band, Orchestre Raymond Frize, and his Mandolines, Mantovani, and his Tripe Orchestra, Ernesto and his Quintet, and Sydney Baynes and his Orchestra.

Many Regional musical combinations are also being engaged so that, within the limits of the single Home Service programme, every effort is being made to give lovers of light music a representative choice.

The Christmas Cuckoo

"THE Christmas Cuckoo" is a play which has been written by Elizabeth Keen-Smail. The story of the book by Frances Browne entitled "Granny's Wonderful Chair" will be broadcast on Christmas Day. It tells the story of two poor cobbler who once upon a time found a cuckoo asleep in a hollow tree trunk. When they were cutting their Yule log They were kind to the bird and in return for their hospitality it promised them gifts when they came back in spring—a leaf from the Golden Tree worth a great price and a leaf from the Merry Tree which keeps folk jolly all the year round. One which thought that these gifts would make everything go well for the brothers but it was not quite so simple as that. The play will tell about the luck that the leaves brought them.

"Macbeth, King of Scotland"

COPPREY TEARLE is to play the lead in a special production, "Macbeth, King of Scotland," on December 22nd. This is the first time that a drama production has been broadcast on this scale since the beginning of the war. Aranged by Barry Keefe, producer, and produced by Val Gielgud, this Shakespearean production is a special adaptation which deals in sequence with the scenes showing the deterioration of the character of Macbeth.

"The Magic Shirt"

HOW a misfortune can be turned into a positive advantage is shown by the brothers but never grows old, and J. D. Devenish uses it to advantage in a play called "The Magic Shirt," to be broadcast on December 21st. Lord Wallaby, an elderly statesman, is reaching the peak of his career, thanks to Lady Wallaby, who is described as "the artifice of Lord Wallaby's career," but a burglar and a chapter from "The Arabian Nights" bring a sudden and astonishing dilemma. This does not require police or publicity, and Lady Wallaby finds a problem which she cannot tackle.

The part of Lord Wallaby will be played by Bruce Winston, and that of his manservant, Bono, by Barry Keefe. "The Magic Shirt" will be produced by W. Farquharson Small.
If you ask the average listener what, in his opinion, constitutes the ideal receiver you will receive a different answer from practically every one. To some, a three-valver with an output of less than 1 watt surface whilst others will listen to nothing less than an 8-valver with push-pull output rated at 12 watts or more. It is thus obvious that in general principles there is no such thing as an ideal receiver, each listener having his own ideas as to what constitutes the ideal. There are, however, many features which can be found common to each one and it is possible to arrive at some conclusion as to the points which should be embodied in a general type of receiver. For instance, the majority of listeners must have provision for gramophone record reproduction in the receiver whilst a choice of stations must also be provided. The highest possible quality of sound, low cost, construction and upkeep are also essentials which everyone aims at.

There is, however, one point which is not often stressed and which has not, so far as I am aware, received attention from designers, although perhaps some individual listeners may have thought of the idea, or even included it in their own homemade apparatus. I refer to the separate performances of the radio and the gramophone side of a single set.

Quality First

In the majority of receivers the pick-up is connected into the detector or one of the L.F. grid circuits, the connection generally being made permanently and opened or broken by means of a simple radio-gram switch. For normal purposes this serves very well. But when a little thought is given to the matter it is obvious that radio and record require different treatment. Those readers who have made up the Contrast Expander which I described on May 6th last will have appreciated how much better gramophone records sound when they are played through such an amplifier. But unfortunately, this type of unit is not satisfactory with radio, owing mainly to the different characteristics of the signal. It will be remembered that a gramophone record is mechanically recorded—that is, in a "sound" sense. Although electrical equipment is used to convey the sounds to the disc there are limitations imposed on the method of recording the sound which make it necessary to reduce the contrast and also to limit the volume and amplitude balance is very incorrect. Again, those readers who built up either of the tone-controls mentioned above in the issue dated February 11th last will have experienced the effects which are obtainable when bass or treble or both are amplified or reduced. From this point of view, however, there is a snag to be avoided. If a radio set is properly designed as a straight-line radio-gram amplifier is included, there should be no need for a tone control. If, for preference, one prefers organ music, for instance, to be deep toned, there is no objection to a top-note cut-off control. If the cabinet or room in which the receiver is housed gives undue prominence to the lower frequencies, there is similarly no objection to a low-note cut-off to improve the effective brilliance of speech and music.

Tone Control

A tone control should, as its name implies, control the tone of reproduction, but in most cases the component which bears this name merely reduces the higher frequencies and thereby gives a more balanced effect to the output, although musically the factory when receiving distant stations, owing to background noises or heterodyne whistles. From this, therefore, one will assume that quality, as such, is only obtainable from a "local" station, and, therefore, a bass roll-off, properly designed for quality should have a minimum of H.F. amplification, sufficient to lead the detector stage satisfactorily, and a really good L.F. section.

Separate Gramophone Section

To enable the same set to be used for records, however, a separate amplifier would be desirable, preferably incorporating the contrast expander arrangement, and the switch for radio-gram. Switching should cut out entirely the radio section of such a set and bring in the circuit the special record amplifier. One or two commercial receivers have, in fact, attempted to incorporate such a device, but, as mentioned in the earlier paragraphs of this article, a complete home radio-gram set has not, so far as I remember, been built on such lines. Economy is undoubtedly the main feature of such a receiver, but by the use of special multi-section valves, initial expense could be kept down to a minimum, whilst upkeep should not be out of the ordinary, with suitable choice of valves. If the output section of the radio equipment were designed on a multi-valve principle, it should be added to the gramophone amplifier section and still further reduce expense, and a suggested scheme is indicated in Fig. 3. It will be seen that the change from radio to gram is made in the L.F. section, and the pick-up is permanently in circuit. By making use of multi-switches, such as the small Bulgin components, operated by a single rod, the H.T. to the separate sections, or the L.F. or both, could also be cut out as desired so that the total drain would be constant from the supply section. To obtain the desired high output and good quality such a receiver would have to be mains operated, and the A.V. mains user is in the best position in this respect owing to the high H.T. which he can obtain from a suitably designed mains unit.

NEWNES TELEVISION AND SHORT-WAVE HANDBOOK

8/- or 5/- by post from

GEORGE NEWNES, Ltd.

Modifying Old Receivers

Simple Modifications for Old Receivers Now Being Used as Stand-by Sets

By L. O. SPARKS

A PART from the vast number of constructors who are, by now, well-established readers of Practical Wireless, fresh recruits to this sphere of radio activity are rolling up in surprising numbers and the majority of them are old-timers returning, once again, to their hobby of several years ago.

This sudden interest on their part is due, according to the many letters received, to their desire to make a stand-by receiver or bring into service one of their earlier efforts which had been put on the shelf when they deserted the ranks, so to speak, and went over to a commercial product. Their skill and knowledge has, of course, become a little rusty, with the result that they were unsure how to carry out some of the desirable modifications necessary to bring the sets in question up to date. The general difficulties seem to be those mentioned below.

Fitting Modern Valves

With many of the older circuits, it is not always an easy matter to substitute modern valves for those originally specified, owing to the fact that the valve of to-day has a much higher efficiency than its earlier counterpart. There is, of course, also the question of the original valveholders being unsuitable for certain types of modern valves and this, in turn, may necessitate alterations to the layout of the components.

The chief danger, due to increased efficiency, lies in the H.F. and output stages. For example, a modern S.D. or H.F. pentode might introduce signs of instability, due to the characteristics of the H.F. coupling and the existing operating conditions governed by the circuit design, being unsuited for use with a valve of high gain. Similarly, if two stages of L.F. amplification are employed, trouble would, no doubt, be experienced if a modern steep-slope L.F. pentode were inserted in the output stage, especially if a power valve had been used in the first place.

Providing screened coils are incorporated in the circuit and that it is possible to adjust the screen and anode voltages of the H.F. valve, it is usually possible to overcome any initial troubles which a modern H.F. valve might introduce, but to avoid any unnecessary alteration to the layout, it is always advisable to select a valve having the same type of base. If one wishes to be on the safe side, the valve manufacturers will gladly suggest the nearest equivalent in their present-day products.

Variable-mu Control

The use of a variable-mu type of H.F. valve allows a very satisfactory form of volume-control to be obtained, and, at the same time, helps to remove any trace of distortion due to the reception of a very powerful local signal. The modifications for this refinement are quite simple, as Fig. 1 indicates.

The diagram at the left shows the normal circuit of a "straight" H.F. screened-grid valve, such as those used in the earlier sets. It will be noted that the aerial coil is connected between the grid and earth. With a variable-mu valve, it is necessary to apply a variable negative bias to the grid of the H.F. valve, and this is done in the manner shown by the circuit on the right of Fig. 1.

The earth end of the coil is disconnected from the earth line and taken to the moving arm of a potentiometer having a value of 50,000 ohms, and one side of a 0.1-mfd. fixed condenser, the other side of which is taken to earth. Across the potentiometer is connected a 9-volt grid-bias battery which has its positive socket also connected to the common negative earth line. This connection should be broken, either by means of a switch or by removing the plug, when the set is not in use, to prevent unnecessary drain on the G.B. battery.

Output Pentodes

The pentode was not so widely popular a few years ago as it is to-day, therefore power or super-power valves were invariably employed. These could handle, within reason, the input from two stages of L.F. amplification which so often formed an essential part of many designs. To-day, however, a modern pentode, with its high gain, will give greater output for a much smaller input, so when replacing the output valve of a receiver of a few years ago, it is necessary to remember this fact, otherwise severe distortion will be introduced. The question of matching the loudspeaker also enters into the question. If the original speaker is to hand, then it would not be advisable to use a pentode, as this would necessitate the use of a suitable output transformer to secure satisfactory matching between valve and speaker.

A modification worth while, with a circuit using two stages of L.F. amplification and a power valve and, of course, providing a modern speaker is to be used, is to dispense with one L.F. stage and insert a pentode in the output. Failing this, a simple volume-control should be inserted across the second L.F. stage so that the input to the output pentode can be controlled, thus preventing overloading.

If modern valves have to be fitted in a set with two L.F. stages coupled together by means of L.F. transformers, much better results will be obtained by replacing the second transformer with a resistance-capacity coupling as shown in Fig. 2, which also indicates how the volume can be controlled with such an arrangement. Another item which must not be overlooked when a modern pentode is used, is the tone or loud-correction in its anode circuit. This takes the form of a resistance, having a value of, say, 15,000 ohms, connected in series with a condenser of .01-mfd., and joined across the L.S. terminals or between the anode and earth.

Selectivity

Some of the older types of coils were designed to secure greatest sensitivity and, due to the conditions then existing, the question of selectivity did not receive a great deal of consideration. Apart from the addition of a stage of tuned H.F. amplification or the insertion of a 0.002-mfd. variable condenser in series with the aerial lead-in, there is very little that can be done. The most satisfactory course is to fit modern coils.

Fig. 1.—The diagram on the left shows an ordinary H.F. grid circuit while that on the right indicates connections for a variable-mu.

Fig. 2.—Converting a transformer-coupled stage to resistance-capacity coupling. By replacing the 1 MFD leak by a potentiometer of the same value and connecting the grid to its moving arm, an efficient volume control will be obtained.
Notes on Servicing

In this Article Some of the Snags in Radio Service Work are Briefly Explained

The Avo Test Meter, which has several separate ranges, easily selected by rotary switches.

Many of the more experienced service engineers having been called up, it is likely that greater responsibilities will fall on those of lesser experience. As most of these people no doubt realise, there are many snags and pitfalls in radio service work which may be encountered from day to day. An outline of some of these difficulties may, therefore, be of value to service engineers of short experience.

Locating Faults

We will commence with the case of the receiver which is known to be absolutely silent. It is unwise to switch on such a set with the supply connected without first making a rough test for an H.T. short-circuit, as additional components may be damaged by so doing. A quick resistance test between the heater socket of the rectifier valve and chassis, on a mains receiver, will show if such a fault exists. This precaution may save further damage to the mains transformer, L.S. field, rectifier valve, and other components if, for instance, a resistor or H.T. smoothing condenser has developed an internal short-circuit. When switching on a set for test, a danger sign to look for is a glowing auxiliary grid where the output valve is a pentode. Here is an almost invariable warning of a break in the anode supply to this valve, such as an open-circuited output transformer primary. The overheating could, of course, be avoided altogether on test, by making a continuity test between the H.T. supply and pentode anode, before switching on the set. Once a fault has been located, particularly in the event of burnt-out components, it is wise to search for a possible breakdown of some other component as a cause, or result of the trouble. An intelligent use of the voltmeter will give much useful information on the working condition of the receiver under test. It is, of course, essential to use a high-resistance voltmeter for tests where high series resistance is encountered in the circuit under test, otherwise the consumption of the meter may seriously affect the reading obtained. A case in point is the taking of voltage readings at the screening grid of an H.F. valve which receives its supply via a resistor of high value.

Anode Voltage

In certain cases an abnormally high voltage at the anode of the output valve, together with low current consumption, can be puzzling. The routine check of components usually associated with these symptoms may reveal no fault. An open-circuited smoothing condenser may be the culprit in such cases. It may cause audible oscillation which results in weak or "no sound." When replacing defective resistors, care should be taken to fit components of ample current-carrying capacity. Occasionally, it may be found that the makers of the receiver in question have cut things rather fine, and it may be advisable to replace with a resistor giving a greater factor of safety. This point should be looked for, particularly where an H.T. potentiometer network is used to feed the screening grids of H.F. valves. Any associated decoupling condensers should, of course, be checked for leakage when a resistor breaks down. It should be remembered that a high-resistance leak may not show when testing with the usual ohmmeter using a single cell. It is necessary in such cases to test at a higher voltage, say 200 volts or so. However, care must be taken not to apply a much larger voltage to the component under test than it is designed to work at. Noisy valve controls are common troubles, though there are pitfalls here for the inexperienced engineer. It is possible for noise and intermittent signals to be produced on turning the volume control while this component is in perfect working order. Where a coupling condenser is used between the volume control rotor and the grid of the L.F. or output valve, for instance, an intermittent contact in the condenser may cause noise or/and intermittent signals when the volume control is operated. It may be found possible to clear intermittent faults by disturbing valves or components. In many cases this will be an unwise procedure, as the fault may not reappear for a considerable period. If at all possible, some means should be found to localize the fault first. A signal generator will be of great assistance for this purpose. It can be used to inject signals stage by stage in a process of elimination. An output meter will give a better indication than the ear in locating such faults.

Faulty Soldered Joints

Dry or imperfect soldered joints can cause numerous troubles. It is possible for a joint, which appears to be O.K., when tested with an ohmmeter, to offer a high impedance to an H.T. A case in point was a fault which appeared in an A.C. Radiogram handled by the writer recently. The instrument was a new one, having been in operation only a few weeks when a fault occurred. The customer reported that signals would fade or suffer a sudden decrease or increase in volume at intervals. A number of service calls were made but the fault did not appear. The set was, therefore, brought into the workshop. A signal generator was connected to the aerial socket and an output meter to the L.S. sockets. The set ran perfectly for some days when the meter showed a decrease in output. The generator

(Continued on page 290.)
A Suggestion for Small Clubs

SECRETARIES of some of the smaller and more recently formed clubs tell me that they are finding difficulty in carrying on. Their members are being called to the colours, and new recruits do not come along in sufficient numbers to fill the gaps. They ask me what they should do. The answer is that they should endeavour to carry on. There are no rules which will apply to every case, for the number of members, the district, as well as the sphere of interest fostered, affect the problem. Clubs must, however, carry on. They owe that to those who have joined the colours. The latter will not feel particularly pleased if they return to civilian life and find that those they left behind were not able to defend their small portion of the home front. It is in some cases, however, I know that the difficulties are very real, and for this reason I make the suggestion that they should endeavour to get some of the larger clubs to absorb them. Some of the old clubs are, too, finding it difficult to keep membership up to strength, and they might be willing to take in some of the smaller clubs, of course with the proviso that when the war is over they will revert to a separate identity. It will be nearly impossible to get the members together again if they are allowed to disband, or if there is no organisation at home which will act as a link.

From an Active Server

BEARING on this matter is a letter from L. Frank, XG4NLL, who is now stationed at Cosham, Hants. He expresses pleasure that PRACTICAL WIRELESS is continuing to act as the link between constructors. He says it joins his past and his present life. The Liverpool and District Short-wave Club, of which he was hon. sec., started a promising career, but it has been closed for the duration of the war. He would be delighted to hear from readers, or from any of his club colleagues. Any letters sent to me will be forwarded.

Some John Hilton Nonsense

A FEW evenings ago John Hilton gave a talk in which he uttered some remarks which can only be defined as wrong. Here is one of them: "If you are asked to pay higher prices walk away and put your money in National War Savings." I do not know how he thinks that people who cannot pay for hire-purchase transactions are able to buy savings certificates. I suggest that B.B.C. speakers confine their remarks to subjects they know something about. I am yet to learn that Hilton's experience entitled him to speak on business matters, and I would further remind him that textbook economics may be useful playthings, but an ounce of practical experience of them is worth the whole lot of professorial tripe uttered in a didactic I-know-all-about-it-take-it-or-leave-it attitude. There are those in the radio trade who know far more about these matters than John Hilton. He should confine his remarks to subjects on which he is enabled to speak with authority. I also suggest to the B.B.C. that they should not permit speakers, however distinguished, to talk on subjects they obviously can know little about. It offends the ears of those who know as much as there is to know about the subject.

New P.O. Regulations

SOME drastic new regulations are now in force regarding the sale, purchase or even acquisition of various pieces of apparatus which are common to high-quality receiving apparatus, as well as standard transmitting equipment. The full details of the regulations, so far as they affect the dealer and listener, are given on another page in this issue, and one point which is probably of the greatest interest is that relating to valves having an anode dissipation of 10 watts or more. Such valves are commonly used in output stages of high-quality broadcast receivers and public-address equipment. The regulation also prohibits the use of remote-control apparatus such as might be used for the radio control of boats, aeroplanes or other working models. Great care is, therefore, necessary in considering the making of wireless apparatus now, and any experiments which you might wish to carry out should bear these new regulations in mind. Fuller details of the new regulations may be obtained from H.M. Stationery Office.

Torch Batteries

LEARN of a dealer in Dumfries-shire who is adopting the trick I have previously referred to of making torch batteries out of high-tension batteries. He breaks up a 6s. H.T. battery and offers to alter the customers' torches to take two of the cells by soldering on a tin extension. The customer, of course, pays the cost of the alteration. He sells these 3-volt conversions at 4d. and the 4½ Volt batteries at 6d. Thus, in this form he is able to make 13s. 4d. out of a high-tension battery. This is quite apart from the fact that high-tension batteries are unsuitable for a quarter to half an ampere discharge. Battery manufacturers can have the address of this person if they wish. His name has been sent on to me by Mr. W. M., of Dumfriesshire.

By Thermion
In discussing nationality in music a few weeks ago I drew attention to the various harmonic and rhythmic "colourings" and "effects" which go towards making the music of one nation so different from that of any other. The characteristic ornamentations that occur in all Spanish melodies, and the use of the melodic minor in such a lot of Russian music—all these things, I explained, had come down to us from the days of the troubadours, and the folk-singers of days gone by, and were now as much a part of musical language in their respective countries as were the various idioms and characteristics of their speech.

This week I would like to emphasize that this is something quite separate and apart from any particular composer's individuality. What really happens is this: A musical idiom gets evolved from the common stock of musical speech of a people in the same way that Yorkshire folk say, "Art cousin," and the younger generation says, "O.K., too!" Why do they say it? How did they ever get to talk with those accents, and to use those idioms? When did it cease to be common? Well, doubtless the philologists tell us in their massive tomes and treatises just as the mathematicians tell us where the Squarrels got their twists and turns from in their music. But all that concerns the musical man in the street is that they are there, and have been there for several hundreds of years, with the result that it is just as natural—indeed, it is practically impossible for the late-twentieth-century composer to write a melody to-day with that certain Spanish flavour in it as it is for the modern American to write a poem in English, or the modern German to write a poem in German.

A composer's idiom is his musical language, and an individual's idiom is his personal language in the way in which he dresses that up—the harmonic, rhythmic, contrapuntal devices he uses to clothe it in. A genius like Wagner or Beethoven has such infinite resources and such inexhaustible originality in these fields that his personality obliterates through every page he writes. We do not think of him so much as a German writer, as just "Wagner" or "Beethoven." Although a composer like de Falla is a splendid musician, and has written much beautiful and original music, the idiom that he has inherited from generations of musical forbears is so strong that it predominates over his own musical personality with the result that when we hear his music for the first time, and consequently in ignorance of its composer's name, we instinctively exclaim: "that's something Spanish." But when Wagner comes to us from afar it's "Here's Wagner," and never "They are playing something German." That is why we always think of Spanish, Hungarian, Russian music—as well as such weird noises as Chinese, or Scotch bagpipes—in terms of national, and of German, and much English and French music, by whom it was written.

Czech Music

Apropos of this subject, I have just come across a most interesting and illuminating comment from a source where one would least expect to find it. During the week-end, I happened to read No. 15 of the very interesting "Oxford Pamphlets on World Affairs"—"Czecho-Slovakia," by the Headmaster of Charterhouse, Mr. R. Birley. In the paragraph entitled "the revival of the Czechs" Mr. Birley says: "It was to be expected that Czech nationalism would find expression in an artistic revival. Naturally, it took time for a national literature to appear, and it must be remembered that until after the war of 1914-18 there was no call for translations of what was an unknown language. But there is one medium which is peculiarly suitable for the expression of an awakening national spirit, and it is one that needs no translation. It was through their music that the Czechs made themselves known to Europe, and in the works of their composers, especially Smetana and Dvorak, can be seen clearly the spirit of a nation.

The Czechs had belonged for centuries to an international culture, and these composers are clearly influential in style, and form, by the great musicians of their age. But the new Czech culture was inevitably bound up with the spirit of the common people, from whose racial consciousness it had sprung." And I must quote again from Mr. Birley's last sentence: "He [Smetana] has watched the rising Vltava and heard Smetana's Symphonic Poem to the river, where the songs of the people mingle with the surge of the tide, and they are genuine Czech things.

Mr. Birley emphasizes very graphically the power that music has for expressing a nationalistic feeling at the same time as it can paint a picture or tell a story. It is also a lucid and succinct confirmation of my remarks on the origins of nationalism in music. And this dual accomplishment is manifested in a work like Smetana's Vltava in a way that makes it an admirable example for illustrating this article. By the way, this work, and the even better-known opera to the opera, "The Bartered Bride," will be familiar to Promenade and other Symphony Concert listeners. In writing a work which merely consisted of fumid runs and arpeggios on the strings and the harp, which the most naive listener could tell was meant to describe water, plus these reminiscences of a shady bank and a spooning couple, Smetana might not have done any more than a hundred composers have done when writing of "The Thames on a Sunny Afternoon," or "Niagara's Rushing Cascade." But it is the employment of national harmonies and rhythms which tell us that, first of all, the piece is of Czech origin, and secondly, that it is a picture of a Czech river that we are looking at. Thirdly. Smetana's individual treatment of music's language tells us that it is Smetana who has written the work, and not Dvorak or Bartok. And, lastly, his statement that the picture is of the River Vltava, and not of any other Czech river, must be accepted as binding by the listener.

Critical Listening

If all these factors are considered, and their implications observed, whenever music is listened to, then there is absolutely no reason why either the meaning of the work should escape us, or that it should not interest us. But don't ever listen to even the most insignificant work without a set purpose. Ascertain the composer's intention as to what he set out to do. We owe it to him, and we owe it to ourselves.

And, after all, is it only that we do before we start to read the most trifling piece of writing, or before we look at the smallest work of art, and they are not? Things. So with the abstract language of music, added concentration and preliminary enquiry are necessary. And what a reward such an effort gives us! What thrills, what delights and what sensations are ours if we just take that little trouble before sitting down to listen.

A COMPLETE LIBRARY OF STANDARD WORKS

By F. J. OAMM.

PRACTICAL WIRELESS ENCYCLOPÆDIA 5/-, by post 5/6.
EVERYMAN'S WIRELESS BOOK 5/-, by post 5/6.
TELEVISION and SHORT-WAVE HANDBOOK 5/-, by post 5/6.
SIXTY TESTED WIRELESS CIRCUITS 2/6, by post 2/10.
WIRELESS COILS, CHOKES and TRANSFORMERS and HOW TO MAKE THEM 2/6, by post 2/10.
PRACTICAL WIRELESS SERVICE MANUAL 5/-, by post 5/6.
WORKSHOP CALCULATIONS, TABLES & FORMULÆ 3/6, by post, 3/10.
PRACTICAL MECHANICS HANDBOOK 6/-, by post 6/6.

All obtainable from or through Newsagents or from Geo. Newnes, Ltd., Tenter House, Southampton St., Strand, W.C.2.
Overhauling the Receiver
Some SeasonableHints on Checking Through the Receiver
and on Improving Selectivity  --  --  --  By FRANK PRESTON

EVEN with a receiver that is operating satisfactorily, it is a good plan to check through it and carry out at least a minor overhaul about once a year. And this is probably the best time of the year to do it, the set will be required to give of its best during Christmas, and most receivers are being used for a greater number of hours during the holiday season than any other time of the year.

It is not necessarily suggested that any extensive alterations be made—unless some appreciable slackness, remove the terminal nut and clean the contact face of this and also the looped end of wire. This can be done by scraping with a knife blade or by rubbing with very fine glasspaper; emery cloth is not very suitable, because the fine particles can, in some conditions, form a high-resistance leakage path.

If connections are soldered, look carefully for "dry" joints. These can be detected by the solder being in a dirty blob, instead of its having run smoothly, and also by pulling fairly hard on the wires. If the joint is too weak, in which case it might cause a high-resistance connection, thoroughly clean the parts, apply a trace of Fluxite and re-solder. Do not forget to see that all terminals are tight in the component to which they are attached. In some cases it will be necessary to disconnect and remove the component to tighten any loose terminals.

Self-contained Battery Sets

When checking through a battery set, the batteries for which are housed in the cabinet with the set, bear in mind that the fine spray given off by the accumulator when freshly charged has a tendency to corrode insulation and wires near it. Pay especial attention to coil windings and flexible leads. While carrying out the inspection see that all screens and screening cans are tight and having good earth contact. This applies especially to built-up screening boxes.

Fig. 1.—A simple method of connecting the aerial tuner to a band-pass filter.

Clean Tuning Condensers
Variable condensers should be cleaned, and to do this it is in some instances necessary to remove the cover plate. With older types in which the vanes are fairly widely spaced, or in a simple type of "straight" set, an excellent method is to run a pipe cleaner between the vanes. This will be still more effective if the cleaner is first dipped in carbon tetrachloride or one of the preparatory cleaning fluids normally intended for fabrics. "Open" the moving and fixed vanes and clean each set separately. Incidentally, the same cleaner dipped in carbon tetrachloride (about three pence a small bottleful from most chemists) is excellent for cleaning switch contacts, terminals, valve and coil pins or other rubbing contacts.

Test the Wiring
When wiring has been done by clamping the looped ends under terminal heads, run round those with a small pair of pliers and see that all are tight.

other hand, should any valve be suspected and there is no convenient means of making a test, most dealers will arrange for a new valve, or one known to be in good condition, to be tried as a replacement.

Adding Band-pass

While carrying out the examination it might be desired to improve the receiver, either by adding another amplifying stage or by modifying the tuning arrangements to obtain greater selectivity. Full details of both H.F. and L.F. amplifiers have been given in these pages before, and back numbers of the articles in question are in most cases still available if required. The question of selectivity would not appear to be of great importance now that there is only one B.B.C. "home" programme, but as many readers have discovered of late, interference with the two frequencies employed by the B.B.C. is not uncommon on some sets. When a single-circuit aerial tuner is in a Det.-L.F. receiver it might be desirable to change this for a band-pass filter. This can generally be done by replacing the existing single condenser by one of the two-gang type and fitting another coil identical with that already used. Sometimes a second single condenser can be attached to the present one by means of a coupler.

(Continued on page 390)
C.R. Tube Research

ALTHOUGH the need of cathode-ray tubes has been relegated to the background in so far as television is concerned, there is renewed activity in the laboratories for the production of tubes to meet special demands. Various kinds of detecting and measuring devices are now being developed, and although the immediate application is quite naturally for war purposes, it is anticipated that with the ultimate cessation of hostilities this same equipment will find its way into more peaceful channels. That being the case, it is quite natural that those firms who have for the past few years been primarily concerned with improvements in cathode-ray tube technique now find that their labours are by no means curtailed in the research section, but rather the reverse. Each laboratory dealing with questions of high vacuum physics is of a most interesting character and is called upon to solve a multitude of problems in which cathode-ray tubes play a pre-eminent part. The various forms of hard glass used for tube envelopes have to be tested and examined to ensure complete freedom from flaws, and in the case of high-vacuum tubes it is essential to watch for any tendency towards failure at the rounded edges, where considerable strain occurs. The laboratory must contain suitable pumping plant, high-voltage test equipment, and the accompanying illustration is therefore of interest, as it shows the corner of one cathode-ray tube research section engaged on experimental work. The extra high-voltage test apparatus is seen on the left just in front of the tank, while a tube which has already been subjected to its various forms of examination is standing on top.

The baking oven will be readily recognised and this is supported between vertical tubular runners, so that the cylindrical chamber can be raised and lowered easily against balance weights and so allow periodic observations to be undertaken. Below the bench supporting the oven is accommodated the high-vacuum pumps, which are kept running during the baking process, and when sealing off the tube. Liquid air, oxygen cylinders, electrostatic voltmeters, high-voltage condensers and a large assortment of chemical materials will always be found within the precincts of these laboratories, and most of these things can be recognised by readers in the photograph shown.

Single Sideband Working

THE Americans have now had several months' experience in the operation of their television service on a single sideband basis, and the consensus of opinion seems to be that it is working quite satisfactorily. This is a very important point, for it might have a marked bearing on future television developments in this country when the time comes for the whole situation to be reviewed. If the B.B.C. scheme is recalled, it will be remembered that the vision signals were radiated on a carrier wave frequency of 45 megacycles. The maximum modulation frequency for a 405 line, 5 by 4 format picture repeated 24 pictures per second was regarded as 2.5 megacycles, with the result that the vision signal extended from 42.5 to 47.5 megacycles. The sound channel was on 41.5 megacycles, however, so that it was safe to assume that between 41.5 and 47.5 megacycles no other signal could be radiated within the normal reception area without causing interference. With radio communication considerably extended for all forms of national purposes at the present time, the use of such a wide band for television purposes would be regarded as rather extravagant. If single sideband working had been adopted originally, however, the position would have been entirely different, and a distinct economy from the point of view of "ether space" would have been effected. Suitable filters at the transmitting end effectively suppress the unwanted sideband, and all the intelligence required is maintained in the signal which remains. When any extension of the service has to be considered, the problem of available frequency bands will necessarily become acute, and before home television sets are counted in their hundreds of thousands instead of in thousands, as was the case three months ago, it is reasonable to anticipate that very serious consideration will have to be given in the light of provincial requirements. It is certain, therefore, that the experience which has been gained on the other side to the sidebands. Following on this at the same time, the total sideband spread, and in consequence the interference with neighbouring channels, is reduced very considerably. Finally, there is no reduction in the aerial power, whereas with an interrupted continuous wave, such as would be used for Morse telegraphy transmission, the power is always half or less, depending on the waveform of the modulation. For broadcast television, Armstrong has been demonstrating in America in no uncertain manner that his scheme embraces all the advantages known previously to be available for wireless telegraphy. Whether this same argument will still hold for the ultra-high modulation frequency which is inseparable from modern high-definition television pictures has yet to be investigated.
Practical Hints

A Condenser Improvement

To prevent increasing the minimum capacity of one section of a ganged condenser in my receiver, I hit upon the idea of making up a rather novel movement which simply alters the physical setting of the body of the condenser but leaves the moving vanes stationary. In the accompanying sketches the details of the scheme are clearly outlined, and from these it will be seen that I have made good use of a rubber door-stop for the separate control.

This door-stop is rigidly fitted with a threaded 3-16in. diameter brass shaft which passes through a bush in the front panel and terminates in a 3in. diameter control knob.

This rubber "drive" presses firmly on the edge of a shaped brass operating arm, which is soldered to the brass clamping nut on the condenser bush. The small ebonite roller engages in a recess filed in the arm and located at the maximum setting of the condenser.

The diagram shows the method of assembly, the bush type fixing nut normally supplied with this particular type of condenser being the principal feature in the fitting. It will be apparent that the ultimate smoothness in the movement will depend entirely on the careful choice of thickness in the operating arm, washer, and bracket or panel mount.—G. F. Davis (St. Albans).

Insulated Coupling Brackets

Recently when mounting a variable condenser on a rather thin aluminium screen, it occurred to me that whilst the extension rod fitted between the condenser and the front panel afforded some degree of rigidity, the screen and front panel were not sufficiently earthed for a receiver which I expected to operate down to 11 metres.

Due to the particular design of chassis, and in view of the fact that the extension rods were, of course, insulated, the rather large screen would quite possibly introduce noises apart from the movement noises of the old types of variable condensers employed, I therefore devised a number of "coupling" brackets which could be used also for various other purposes apart from that intended.

Inductance Tapping

To make a tapping on a S.W. coil a crocodile clip is usually employed, but as this only grips half the wire a sound joint is not ensured. A remedy is shown in the accompanying sketches. By cutting a slot in the former about 1in. wide, as at A, a tapping can be made by a crocodile clip from the inside, which will then grip firmly.

If a more permanent and neater job is required, holes, as at B, can be drilled before winding, and tappings soldered on through the former.—K. A. Skone (Wrexham).

A Single Drive for Two Components

Recently I found it necessary to include two condenser drives in one, so I devised the following idea. A rod about 8in. long was fitted (as shown) underneath the chassis. A 2in. diameter wheel (A) was fitted and this contacted with a wheel (B) of 1in. diameter. This drove another wheel (C), which was fitted to the spindle of the reaction condenser. Mounted 1in. farther back was another wheel (D), which drove another smaller wheel fitted to the spindle of the volume control.

The components and wheels were mounted on brackets secured to the top of the chassis. To operate reaction, leave the control as shown in diagram, for volume, push in until A engages with D.—M. C. Campbell (Romford).

That Dodge of Yours!

Every Reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not put it on to us? We pay £1.00 for the best that submitted, and for every other item published on this page we will pay half-sixpences. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL WIRELESS," George Newsome, 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. Must envelopes "Practical Hints" DO NOT enclose Queries with your hints.

Special Notice

All hints must be accompanied by the coupon cut from page iii of cover.

Some of these I made insulated by using a bakelite strip in place of a conducting brass strip as used in the ordinary type illustrated. It will be seen that the insulated types can be used in instances where the moving vanes of the condenser are in direct contact.

Insulated coupling brackets for extension rods.

There is one other point concerning the use of these couplers, and this is with regard to dial and reduction drive fittings. I have found that with some reduction drives, if careful alignment is not effected, then at certain points in the movement, sluggishness prevents accurate tuning, so here again the couplers have proved useful for maintaining the alignment of the control with the condenser, irrespective of the extension rod when testing and carrying out modifications.—J. L. Stevens (Manchester).

Read "THE CYCLIST"

3d. Every Wednesday

A simple dodge for driving two components from a single spindle.
CHOKE filter output was decided on in this receiver for two reasons, a final precaution against H.F. leakage, and secondly, to interrupt more satisfactorily the output circuit when frequently using the 'phones.

Normally speaking, a straight circuit of this type, where H.F. and L.F. amplification is freely used, brings a compromise of a high noise to signal ratio, but—and this is in no mean way attributable to the performance of the Z220—the results have definitely passed expectations in this respect, and provided an accumulator of, say, 20 A.H. minimum is used, the apparent comparitively high drain of 1 amp. on the L.T. will not prove worth considering, whilst the total anode consumption is reasonably low, being in the neighbourhood of 20 mA.

A wooden chassis was decided upon during the design of this receiver, as it was anticipated that there would most likely be some difficulty in obtaining metal at a reasonable price, owing to the war, and, therefore, as little aluminium as is necessary was used.

ABOVE-CHASSIS WIRING DIAGRAM

To provide adequate screening, however, the H.F. sections only are mounted on a thin gauge aluminium sheet (20 S.W.G.), a similar gauge being used for the intermediate screen.

The front panel is of 18 S.W.G., and as this would prove too flexible if used in the more conventional way, owing to the rather large proportions, it is bent round the sides of the chassis.

The L.F. stages are treated almost as a separate amplifier, being, as will be seen, mounted directly on the wooden part of the chassis and well away from the rest of the H.F. stages.

On studying the wiring diagrams, it will be apparent that to facilitate wiring between the front panel and the screen, the front panel may be very simply removed after a trial assembly by just loosening the extension rod (grub screws and reduction drive), the dial timbers being left assembled excepting for the screened grid potentiometers, 'phone jack and switch.

Figs. 1, 4 and 5 give the constructional details for the chassis, screen, and panel, but it will be noticed that owing to the design of the chassis and the use of baseboard mounting components, a somewhat different form of diagram from the standard practice of this journal has been made, this illustrating only the essential centres and incidental measurements for the principal components, as it was anticipated that little difficulty is offered by the layout.

The 1 in. diameter drillings can be made with a woodworker's bit.

The Layout

Referring to Fig. 4, a few words on the layout and relationship of the components will, no doubt, help. The overall chassis measurements are quite clear, but the portion covered by the base plate is the aluminium sheet on which the H.F. components are mounted will be referred to during the article—may not be, and this is indicated by the letters "A", "B", "C", and "D". Although for clarity in the diagrams the screw holes for fixing this plate to the wooden chassis are not given as in the case of component fixing holes, it is...
FIVE

details and Full Operating Notes

BE "T-WAVE" FIVE

FIVE

BE "T-WAVE"

belece

will be apparent that to prevent this thin aluminium "riding" up at the corners after fitting the components, at least three fixing (wood) screws should be provided along each edge.

Another point which may not be clear is the method of mounting the horizontal valve VI, the centre line for which is depicted in this diagram. Actually the low-loss baseboard type valve-holder for this position is first of all fitted to a simple metal bracket of proportions which are not critical and which may fall in with the constructor's own requirements, but the method adopted by the writer is a simple aluminium bracket which in turn is reinforced with a block of wood, as is clearly defined in the wiring diagram given in Fig. 2.

The six-pin coil-holder is supported on thin insulating pillars, and it may be found preferable in the original design, to remove the existing pillar terminal stems, and fix directly to the coil-holder by substituting long 6 B.A. screws.

The 7-pin valve-holder for the H.P.215 valve (V2) is similarly supported on two midget insulating pillars, which in turn are secured to two home-made aluminium brackets screwed to the chassis.

There is, however, ample room for a modification to be made here if the constructor does not wish to go to this trouble, and this is in the use of a four-pin type pentode with another low-loss type valve-holder as used for V1 and the detector.

The intermediate screen should be fitted with fixing flanges towards the front panel, this resulting in the "cut-out" for the valve VI being located on the left of the chassis, and so the edge of the fixture will fall along the fixing line shown.

The cut-out in the centre of the screen is carried right through the fixing flanges, this method providing an easy means for determining the screen's relationship to the location of the ganged condenser cradle to prevent the flexible coupler fouling the edges of the cut-out.

This condenser cradle method of mounting is very clean, consisting simply of an Edizlystone condenser cradle of the three-gang pattern with the end ganging bracket removed, mounted on two large insulating stand-off pillars. Unfortunately, there is not space here to detail this more fully, but the assembly will prove quite straightforward when the components are to hand.

There is just one consideration to be made with regard to the front panel diagram, Fig. 1, and this should be made in conjunction with the under-chassis wiring diagram, Fig. 3.

To earth the front panel effectively—and this is most important—the fixing screws located in the side portions in the wiring diagram should not be of the wood-working type, as these pass through both panel and the side runners of the chassis, being finally secured with nuts.

(Continued overleaf)

UNDER-CHASSIS WIRING DIAGRAM

Components for this be found on page 292.

Three-quarter front view showing the separate screens.

Drilling details of the front panel.

PDF compression, OCR, web optimization using a watermarked evaluation copy of CVISION PDFCompressor
THE SHORT-WAVE FIVE
(Continued from previous page)

Wiring
Wiring should only be attempted when one is fully satisfied that the various controls are working without any trace of binding, a condition which could quite soon arise in badly aligning the reduction drives. While on this subject of the reduction drives, there is a point concerning the epicycle drive used for the bandsetter or balancing condenser C12. It will be seen, on referring to Fig. 2, that these lock-nuts are used on a 6 B.A. bolt in such a way that one secures the bolt to the panel, whilst the other two act as "distance" lock-nuts, clamping the small fixing lug of the drive very securely.

All pillar connections should be carried out by removing the terminal screws and soldering wires directly and neatly to the heads. Again, to take full advantage of the low-loss characteristics of the coil and valveholders used in the H.F. stages, soldering should be employed, not terminal connection. See that the electrolytic condensers have correct polarity as indicated in the wiring diagrams.

Testing the Receiver
Having satisfied oneself that wiring is correct, the serial, earth and speaker connections can be made, but the valves and coils remain until the ganged condenser moving vanes have been physically set to as close a ganging as the constructor finds possible, finally adjusting all dials to read correctly and the vernier in very careful adjustment of the tuning dial, as otherwise is not possible. Any errors in ganging will be automatically counteracted as tuning is carried out by adjusting the bandgreder or balancing condenser.

The screen-grid potentiometer for V1 (R3) should be set at the most sensitive point, which is determined by tuning-in roughly any reasonably weak station, but to commence operation a mid-scale setting will suffice.

The immediately important consideration is to get the detector stage steady and with only very slight degree of smooth reaction, this state of reaction being finally adjusted to maximum intensity of the signal gain through the first stages.

The screen-grid potentiometer in the reaction circuit will therefore have to be considered next, and this is R5. Approximately just over half-scale will serve to determine the state of reaction in relation to the gain-control and variable-nu control R14.

Now it will more than likely be that the reaction will be fierce, so the potentiometer R14 should be adjusted by increasing in an anti-clockwise direction, reducing screen voltage by turning the control R5 back (anti-clockwise).

Now adjust the potentiometer which governs the bias on the primary coil of the detector tuning coil, this is R4.

Finally, the combined adjustment of the reaction condenser with R5, followed by the combined re-adjustment of the two potentiometers R4 and R5 should bring the desired signal in at maximum gain.

The full sequence is not by any means as involved as would appear, and a little experiment will soon clarify the relationship of each control, making it possible for a different sequence to be adopted consistent with the essential principles outlined.

For C.W. signals it will be found possible to modulate the note without "wobbling" or any trace of drift, simply by re-adjustment of, say, R4. It is, however, important that the frequent re-adjustment of the variable-nu gain-control, in conjunction with the screen-grid injection control R3, be carried out to obtain the exceedingly smooth reaction which is possible with this receiver, with particularly stable adjustment on the higher frequency bands.

NEW SMALL PROJECTION TUBES

In the big screen electronic television equipment for cinemas, the manufacture and installation of which ended abruptly with the declaration of war, two forms of cathode-ray tube were employed. One used an opaque screen accommodated in a large glass vessel approximately 16ins. in diameter, so that the picture could be lens-projected directly from the front surface of the fluorescent screen on to the remote viewing screen, while the other was of a more conventional character, and allowed the picture built up on one side of the tube's screen to be projected right through the material, and binder, on to the separate viewing screen. The advantage of the former over the latter idea was the material increase in light due partly to the fact that no loss of brilliance was entailed by passing the picture through the granular structure of the fluorescent powder, and the material used to bind this to the 'inner glass wall of the tube. For this reason steps have been taken to produce smaller counterparts of the opaque screen-tube, and material success seems to have crowned the efforts of the engineers responsible for the work. The anode voltage employed is of the order of 20 to 25 kilovolts and to save employing an expensive projection lens, attention has been turned to making a lens structured screen of the reflecting type for viewing purposes. Neglecting for the moment the obvious advantages accruing for home viewing in those countries where a television service is still possible, these tubes and remote viewing screens can be used for a variety of scientific purposes, in lieu of the more conventional and lower operated tubes with which most readers are familiar. A compact assembly is possible, brilliance is of a high order, with the modulate trace of the moving spot within the screen area, and there is no doubt that their use will extend, especially if the mains supply voltage can be reduced to economical limits and to reduce the size and cost of auxiliary equipment.
PRACTICAL WIRELESS

ENCYCLOPAEDIA

By F. J. Gamm

6th Edition

5/- Net

Wireless Construction, Terms, and Definitions explained and illustrated in concise, clear language

From all Booksellers or by post 3/- G from George Newnes Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

PRACTICAL WIRELESS

December 16th, 1939

PRACTICAL WIRELESS

IMPORTANT P.O. RADIO REGULATIONS

It is now illegal to sell or even possess certain apparatus, under the Emergency Powers (Defence) Act, 1939

The Postmaster-General has issued three orders under the Emergency Powers (Defence) Act, 1939, the first and third of which came into effect on November 25th and the second on December 16th. One particular part of the regulations issued is of great interest to dealers and listeners and is as follows:

REGULATION OF USE OF WIRELESS TRANSMITTERS.

The Postmaster-General, in the exercise of the powers conferred on him by Regulation 8 of the Defence Regulations, 1939, hereby orders that on and after the 25th day of November, 1939, no person shall, except under a licence or permit granted by the Postmaster-General, use a wireless transmitter for communicating by wireless telegraphy, wireless telephony, or wireless television; or as a navigational beacon or landing beacon or otherwise for the purpose of indicating position or direction; or for the purpose of the remote control of machinery.

This order shall not apply in relation to any apparatus used in accordance with the terms of a licence in force under the Wireless Telegraphy Acts, 1904 to 1926, authorising the use of apparatus for transmission. All licences or permits should be made to the Engineer-in-Chief of the Post Office, stating full particulars of the apparatus, the purpose for which it is to be used, and the name, address and occupation of the person or company who wishes to use it.

Possession of Wireless Transmitters

The Postmaster-General, in the exercise of the powers conferred on him by Regulation 8 of the Defence Regulations, 1939, hereby orders that on and after the 16th day of December, 1939, no person shall, except under the authority of a written permit issued by the Postmaster-General for the purpose, have in his possession or under his control (1) any wireless transmitter which is designed to be used for communicating by wireless telegraphy, wireless telephony, or wireless television; or as a navigational beacon or landing beacon or otherwise for the purpose of indicating position or direction; or for the purpose of the remote control of machinery; (2) or wireless apparatus components capable of being assembled to form such a wireless transmitter; or (3) any wireless receiving apparatus which is designed to be used also as a wireless transmitter or which can be adopted for the purpose of being used as a wireless transmitter by the operation of a switch or by the changing of screwed or plug connections.

This order shall not apply in relation to any apparatus in respect of which there is in force a licence under the Wireless Telegraphy Acts, 1904 to 1926, authorising the use of the apparatus for transmission.

Applications for permits should be made to the Engineer-in-Chief of the Post Office, stating full particulars of the apparatus or article concerned, the purpose for which it is required, and the name, address and occupation of the person or company in whose possession or under whose control the apparatus or article is to be retained.

Control of Wireless Transmitters and Certain Other Electrical Apparatus

The Postmaster-General, in the exercise of the powers conferred on him by Regulation 55 of the Defence Regulations, 1939, hereby orders that on and after the 25th day of November, 1939, no person shall, except under the authority of a permit granted by the Postmaster-General for the purpose, sell, purchase, let, hire, supply, dispose of, acquire or distribute any of the undermentioned articles:

(a) Wireless transmitters which are designed to be used or are capable of being used for communicating by wireless telegraphy, wireless telephony, or wireless television; or as navigational beacons, or landing beacons, or otherwise for the purpose of indicating position or direction; or for the purpose of the remote control of machinery.

(b) The following articles intended for use as parts of wireless transmitters, namely, high frequency inductors, spark coils, channeled and rotary spark gaps.

(c) Any wireless receiving apparatus which is designed to be used also as a wireless transmitter, or which can be adapted for the purpose of being used as a wireless transmitter by the operation of a switch or by the changing of screwed or plug connections.

(d) Line carrier telegraph equipment or line carrier telephone equipment.

(e) High-frequency equipment (being equipment which generates or uses high-frequency current at frequencies greater than 10,000 cycles per second and having a maximum output exceeding 10 watts) including such equipment intended for use in connection with furnaces and medical apparatus.

(f) Electronic valves capable of an anode dissipation exceeding 10 watts.

(g) Piezo electrical quartz plates or piezo electric tourmaline plates cut to oscillate at an intended frequency.

Applications for permits should be made to the Engineer-in-Chief of the Post Office, on forms obtainable at any Head Post Office or from the Engineer-in-Chief, stating full particulars of the article concerned, the purpose for which it is required and the name, address and occupation of the person or company who wishes to obtain it and of the person or company from whom it would be obtained.

Yes, the headline means exactly what it says— we will send you this Wonder "Eddystone" All-World All-Wave Receiver, carriage paid to your address for you to subject it to 7-days Home Trial, and should you then find it net up to your fullest expectations you are at liberty to promptly return it—when we will cheerfully refund your money in FULL.

This is an exceptional offer—but we make it because we want YOU to see for yourself what words cannot fully convey—the outstanding capabilities of this set that makes everyone who see it do wish to obtain it. It is a Twelve-Valve Receiver that will give you intrinsically interesting World-wide reception —something EXTRA—news from all countries of World-wide events, official and unofficial impressions, American Amateurs, etc. It has 4-wave bands (13-33 metres, 31-85 metres, 200-555 metres and 800-2,100 metres), special chassis and coil unit construction, automatic volume control, special intercalate frequency stage, H.F. amplifier, "Magic Eye" for accurate tuning, separate oscillator valve to eliminate frequency drift, tune control, power pentode valve giving 5-watts undistorted output, 12 in. moving-coil loudspeaker, grammaphone pick-up and external speaker terminus. Truly magnificent Oak or Walnut Cabinet, for A.E. mains.

25 Gns.

This is a super set, filling for your requirements. Send the coupon below NOW for full descriptive literature.

POST THIS COUPON TO STRATTON & CO. LTD., EDDYSTONE WORKS, BROMSGROVE STREET, BIRMINGHAM.

Name..................................................
Address...........................................

This Wonder Eddystone All-Wave All-World Receiver Sent You ON 7 Days Trial.
PRACTICAL WIRELESS

December 16th, 1939

EDDYSTONE E.R.A.7 CHASSIS

The listener who is only familiar with the standard type of commercial receiver would probably be very surprised if he could inspect the special Eddystone 4-band chassis receiver, known as the E.R.A.7. In place of the usually bent or pressed metal chassis and thin screening boxes for coils, this receiver is built on a die-cast aluminium alloy chassis, and the various screening compartments are also of one-piece die-castings. Apart from this, massive screening is employed than 4 to 6 microvolts delivering a 50 milliwatt output. Background noise is low under all normal conditions, in spite of the high level of the gain of the receiver. The speaker which is supplied with the chassis is a 12-in. energised model, and the smoothing provided by the field immersed in the circuit to cut out all traces of hum. The controls are four in number, rotary on-off switch, wave band selector, tone control, and volume control. In addition to these there is, of course, the main tuning control and this incorporates a gear-driven slow-motion device of the automatic two-speed type, wherein rotation of the control in the opposite direction operates the slow-motion drive. The output stage is rated at 5 watts and the speaker handles the maximum output easily, and the response curve is remarkably flat.

The Tuning Scale

The scale is of novel design, being in the form of a cylinder 1 in. in diameter and 8 in. in length. The tuning indicator is mounted on a rack and pinion device operated from the waveband selector, and the pointer is in the form of a thin wire carried on a runner and driven by a fine cord. The separate scales for each band, which are from 13 to 33 metres, 31 to 85, 200 to 555, and 900 to 2,100, are marked in wavelengths and have station-name indications on every scale. The amateur bands are separately marked on the short-wave ranges and in addition carry a number of additional markings to simplify tuning of the amateurs.

The tuning indicator is mounted on a separate small unit which also carries two dial lights, and this unit has to be bolted to the cabinet or panel front. It is one of the best receivers which has so far been tested by us, excelling in range and quality of reproduction, even under most adverse conditions. Out of curiosity we tried the set with a very short indoor aerial in an all-steel building where normally results are very poor. Even so, however, we were able to hold an American broadcast signal during the middle of the day at entertain-
Simplified Multi-waveband Switching

A Circuit Incorporating a Coupling-coil Feed-back Arrangement for Short-wave Reception

In designing an all-wave receiver, an important problem to be solved is how to reduce the number of switching contacts to a minimum, it being obvious that the more contacts there are the greater is the chance of faults developing and the complexity of wiring increasing. The problem is usually not difficult, where the local oscillator circuit of a superheterodyne receiver is concerned, because of the necessity of maintaining the strength of oscillations constant throughout each waveband, and of providing suitable tracking circuits. The Telefunken Company has solved the problem in one way by using a Colpitts circuit on the longer wavebands and a coupling-coil feedback arrangement on the shorter waveband.

In Fig. 1 is shown only the oscillator circuit of the superhet receiver, which may be connected in any desired manner to the mixer stage. The resistance W4 and condenser C1 generate the grid-bias voltage, which matches itself automatically to the instantaneous oscillator amplitude. In order to obtain a sufficient voltage swing, it is necessary to increase the resistance W4 from the previously usual value of 50,000 ohms up to about 150,000 ohms. In order that the time constant of the combination W4, C1 should not be too great, and thus encourage relaxation oscillations in the S.W. range, the capacity C1 is reduced from about 100 mmfd. to 25 mmfd. The resistance W3 serves to guard against a rise of the oscillator voltage at the lower end of the S.W. range, when reduction of the grid A.C. voltage rises, due to voltage division between the grid-cathode capacity and the resistance W3.

Fig. 2 (left).—Parts of the circuit of Fig. 1, which are operative on S.W. reception.

Fig. 3 (right).—The part of the circuit which is operative on medium waves.

Short-wave Working

On short waves only, the switch S1 is closed, so that the lower end of the S.W. coil K is connected direct to earth. A further tracking condenser C4 may be introduced which is, however, not essential on S.W. reception, since the percentage frequency spread between oscillator and signal frequencies is very small, and adequate gauging is achieved even without this condenser.

Those parts of the circuit of Fig. 1 which are operative on S.W. reception are illustrated in Fig. 2, in which, however, the circuit elements W3, W4 and C1 are omitted for the sake of simplicity. It will be seen that an inductive feedback occurs between the feedback coil R4 and the grid circuit coil K. The circuit elements M, W, L and C2 of Fig. 1 are in parallel with the condenser C3 in the S.W. setting, and are, therefore, in effect inoperative and not shown in Fig. 2.

Medium-wave Reception

On medium-wave reception the switch S1 in Fig. 1 is open and S2 closed. That part of the circuit of Fig. 1 which is operative on medium-wave reception is shown in Fig. 3. In contradistinction to Fig. 2, the feedback is done here by means of a Colpitts circuit.

The S.W. feedback coil R4 acts effectively as a conductive connection on medium waves. Therefore, on medium waves, the long-wave additional coil L in Fig. 1 and the auxiliary tracking condenser C2 are effectively directly short-circuited by the switch S2. The parallel capacity C, which serves to increase the initial capacity on long waves, is in effect similarly in parallel with the capacity C3. By closing the switch S2, the danger of excitation on a short wave is also avoided at the same time, without the expense of a separate switch, since the S.W. mode H.F. current is by-passed via the switch S2 and the capacity C to the feedback coil R4. This would also be the case if the capacity C was increased, and hence the losses increased. The same resistance W1 serves the same purpose on long-wave reception.

Long-wave Working

When both the switches S1 and S2 in Fig. 1 are open, the circuit is ready for long-wave reception. As against medium-wave reception, not only the additional coil L, but also the condenser C2 comes into operation, the latter being provided to make the tracking capacity smaller than on medium-wave reception. The series circuit of C2 and C3 is then operative as tracking capacity. The condenser C3 is, however, only brought in to the feedback by means of capacitative voltage division, as otherwise the feedback would be too strong. In this way the circuit is further simplified, since a separate switch contact for switching over the upper end of W2 to the upper end of C2 becomes unnecessary.

The danger of excitation on a short wave can, if necessary, be eliminated by connecting the parallel capacity e not directly parallel to the coil L, but with its lower end to earth, as shown in Fig. 1. In the long-wave setting, not only does the feedback coil R4 operate as feedback for a short wave, but there is also the feedback voltage arising across the condenser C3, since if the capacity c were not connected as above the low-potential end of the coil K would be connected via the capacity b and the capacity c with the junction of C2 and C3 for a short wave. By means of the separate connection of the capacity c, however, the low-potential end of the coil K is for short waves connected via the capacity b and e to earth, avoiding C3. The capacity c (about 70 mmfd.) must be large compared with the self-capacity of C.

The connection of the capacity c has no effect on the oscillator generation of the long waves, since for the long waves the oscillating circuit is operative, consisting effectively of the capacity C with the parallel connected series circuit a, b and c, together with the coils K, M and L, and the tracking condensers C2 and C3. It may also be observed that the capacities a, b and c need not be adjustable as shown.
Open to Discussion

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).

Exchanging S.W.L. Cards: A Good S.W. Log

SIR—I would be very pleased to exchange my S.W.L. card with any other S.W.L. A. for fully licensed hams in the British Isles or overseas. I QSL 100 per cent.

I also append my log of the stations heard during the last month on a home-built four-valve receiver run off a mains eliminator, and used in conjunction with a horizontal end-on antenna 65ft. long and 30ft. high, directed S.E.

C.W. (5.6 m/c): W1PK1, FOKE.

C.W. (7 m/c): PY2HT, PY4BU, W1ASO, BEH, BVJ, TET, KC, KZT, RHE, KK, LIA, LIT, MAB, W2ESK, GBR, GCD, GS, KJH, UK, W3HNN, W1WYQ, W4SAR, W4TCD, NRT, RUL, RWA, QAS, QGW, SKM, WOC, NAX, PND.

Fone (14 m/c): EA7BA, K4FPC, PK1OG, PKSW, W4DZK, HCM, CW, XE7AI, KE9B, K4ESR, FPC, LZ1ID, Q50MI, PY2DY, HT, PT7VBJ, TA1AA, AR, FX, VO1Y, WUR, WR9W, PND, W77A7, K1XN, BLA.

Fone (25 m/c): W1NCD, JUI, LEU, LO, W2AOD, JLV, KYO, QF, W3CMO, LD, XSM, W4SAR, EJ, PPR, R/L, RUL, TOU, W9KBD, TOZ.

Also I have heard broadcast stations: W2NE, 25.65 metres, WGO, 25.35 metres, W5CN, 25.45 and 25.58 metres, WCXB on 25 metre band; XEWX, Mexico City, on 31.58 metres; TOWA, Guadalama City, on 30-98 metres; VLR, Melbourne, Australia, on 31.32 metres; and TAP, Ankara, Turkey, on 31.70 metres.

Every card that has been received lately have been VK2ME, VLB, WCA2, W2HNP, X6AJ, and VJSK.


SIR—I have been a reader of your excellent paper for about a year now and would like to exchange my S.W.L. card with anybody at home or abroad. All cards will get a prompt reply.—Douglas Nass, 41, Town Terrace, Leeds Road, Huddersfield, Yorkshire.

Correspondents Wanted

SIR—I would like to get in touch with any young reader of your journal aged about 14 or 15 who is willing to correspond with me at the address given below. I have been reading your paper for the last eighteen months, and have gained almost all my knowledge of wireless from it. J. A. Bladon, Middleton A, Christ's Hospital, Hurnham, Sussex.

SIR—I have been a reader of your excellent paper for some time now and I have gained practically all my radio knowledge from it. I am fifteen years old and I am very interested in learning the Morse code, and I wonder if any reader living in my district would be kind enough to teach me. I should also like a correspondent about my own age interested in short-wave work. In closing, may I wish every success to your fine paper.—G. D.

Shepherd's, 82, Brentwood Road, Tottenham, London, N.17.

From a Blind "Reader"

SIR—I feel I must write and tell you how much I appreciate the new PRACTICAL WIRELESS. I have been a reader for quite a long time, and have followed all the articles on short-wave radio. I have twenty-nine cards from sixteen different countries. I would like to mention that I am a blind listener and wish to exchange my S.W.L. card with any other S.W.L. in any part of the world. I will QSL 100 per cent. Also, I would like to correspond with this listener in any part of the world.—Thomas J. Horncox, 8, Moorbridge Cottages, Bestwood Colliery, Nottingham.

Countries

SIR—I am a regular reader of your splendid radio paper and am interested in short-wave radio, your equipment consists of two receivers, the Hallicrafter's Sky Chief, and a ten-valve Ferguson (13 to 20 metres). The serial is an inverted L, 601 long, 30ft. high, direction N. to S. with lead-in at the south end. I am a member of the B.L.D.L.C and the B.S.W.L and I hold the B.S.W.L's "H.A.C." certificate (S.W. broadcasting bands). I have qualified for the V.B.E. but have not yet applied. I listen on the S.W. broadcast louds and have heard seventy-seven countries, thirty-five being verified, QSLs amount to fifty. I think your paper is excellent, but I should like to see the returns of the "Leaves from a Short-Wave Log"—V. Smytheman (Birmingham).

Price Problems

Problem No. 378

Barclay has a space mains transformer whose two 4 volt 1 amp windings in addition to the H.T. winding. He wished to make up a set in which he needed 4 volt 2 amps for the heaters and desired to use the transformer by connecting the two 4 volt windings in parallel to obtain the desired high current of 4 volts. He did this but when he switched on the transformer, he could not make it work and he accordingly switched off. What was wrong? Three books will be awarded for the first three correct solutions opened. Entries must be addressed to The Editor, PRACTICAL WIRELESS, George Newsom, Ltd., Tower House, Southamp- ton Street, Strand, London, W.C.2. Envelopes must be marked "Problem No. 378", in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, December 18th, 1939.

Solution to Problem No. 377

Parker failed to note that the tuning condenser must be earthed to obtain a complete circuit from the moving vane of the condenser to the coil. A metal chassis permits this to be done, but on a wooden chassis, as there is no earth terminal on the average condenser, he overlooked this fact.

The following three readers successfully solved Problem No. 376, and books have accordingly been forwarded to them:

R. Bucklebridge, 12, Rosset Road, Radford, Coventry.
E. D. Gunn, 30, Suffolk Road, Ponders End, Enfield, Middlesex.
C. W. Smith, High Street, Stamford, Warwickshire.

Always Depend On

BULGIN Short-Wave Components

Specified for the "Short Wave Five" Audio Freq. Chokes

These clamped and stranded choke need no introduction; all have monometallic windings, and are unequalled for power efficiency, reliability, and value. Inductance accurate to ±1 per cent. Insulation ±1 K V, with 6in. leads and finished matt grey.


A.F. TRANSFORMER

This component has an average primary inductance of 50-80 H. and gives excellent and level quality reproduction.

With a generous nickel alloy core, and with low self-capacity for high amplification.

No. L. F. 12. 6/6 each.

SWITCHES

We have the largest range of switches in the industry, and this is a famous and original Mains Toggles type, single-pole 250a., 3A max. Suitable for sets, eliminators, etc. Polished nickel-plated finish. List No. S. 01. Price 1/6.

MOULDED JACK PLUG


Also Specified:

Condensers, Knobs and Dials, Bracket, Chokes, Screws, Wiring, Screened Flex, Slinking, accessories, etc.

If you have not yet had a reference copy of our complete catalogue No. 162, showing full range of components, please send at once, mentioning this paper.

Investigate the Bulgin Range


Open to Discussion
I. 

I read Smith: "Our old more-decorous.

"Oh no," replied she.

"It's meandered, it is."

With FLUXITE'S cute soldering set.

See that FLUXITE is always by you—in the house—workshop—work on—work swiftly and safely. Ideal for 30 years in government works and by leading engineers for broadcast equipment. Of terminators—on trains, etc. 6V., 12V and 24V.

Ask for the FLUXITE SMALL-SPACE SOLDERING SET—compact but substantial—complete with full instructions, 3/6. Write for Free Book on the art of "soft" soldering and ask for Leaftlet on CASE HARDENING, STEEL and TEMPERING TOOLS with FLUXITE.

TO CYCLISTS! Your wheels will not be ruined and unless the axle is tied with less wire at the coverings AND SOLDERED. This makes a smooth-running wheel. It's simple—"Case" with FLUXITE—but important.

THE FLUXITE GUN is always ready to put. FLUXITE on the soldering iron. If applied with little pressure places the right quantity on the right spot and one charging lasts for ages. Price 1/- or billed 2/6.

ALL MECHANICS WILL HAVE

FLUXITE IT SIMPLIFIES ALL SOLDERING

FLUXITE LTD., (Dept. W. F.) DRAGON WORKS, BERMONDSLEY STREET, S.E.I

"ENGINEERING OPPORTUNITIES" FREE!

This unique hand-made Shenandoah Pencil will reveal to you the best method of obtaining "坐在 YOUR OPPORTUNITY" FREE!

PROFESSOR McCARTHY, 62 YORK STREET, LONDON, S.W.1

A selection of the best and most interesting communications of the World's most brilliant minds.

REPLACEMENT TRANSFORMERS, 100 DRAWINGS, 276 PAGES, 300 Illustrations, 156, 16th, 17th, 18th, 19th, 20th Century, all recognized as the best in the World. A selection of the best and most interesting communications of the World's most brilliant minds.

"ENGINEERING OPPORTUNITIES" FREE!

This unique hand-made Shenandoah Pencil will reveal to you the best method of obtaining "坐在 YOUR OPPORTUNITY" FREE!

PROFESSOR McCARTHY, 62 YORK STREET, LONDON, S.W.1

A selection of the best and most interesting communications of the World's most brilliant minds. 100 DRAWINGS, 276 PAGES, 300 Illustrations, 156, 16th, 17th, 18th, 19th, 20th Century, all recognized as the best in the World. A selection of the best and most interesting communications of the World's most brilliant minds.

The Christmas Gift for Every Boy

ROUND THE WORLD IN INDUSTRY

By Gerald Collins

This stirring book describes how some of the most thrilling "jobs" in the world are carried out. Travel on the world's most exciting train. Go down under the sea with the divers and tunnelers and up in a plane which a test pilot is throwing about the sky! With many dramatic photographs.

5/-"-

Available from all bookdealers and direct for post 5/6. from the publishers, George Newnes, Ltd. (Books Dept.), Tower House, Holborn Viaduct, Strand, W.C.2

OVERHAULING THE RECEIVER

(Continued from page 279)

One method is shown diagrammatically in Fig. 1, where it will be seen that "top-capacity" hand-paste coupling is used, a .0001 mfd. differential condenser being employed for coupling purposes. By varying the capacity of the condenser the degree of selectivity can be modified to suit prevailing conditions. Although usual coil connections are made, these are dependent upon the particular type of coil in use.

Re-trimming

When there are two or more tuned circuits in the receiver, selectivity can be restored to maximum by retuning the trimmers should this prove necessary. In most cases, only very minute adjustments will be necessary unless a new valve has been fitted in an H.F., I.F. or detector holder, or unless the wiring has been altered since trimming was carried out initially.

If the receiver covers short waves, as well as medium and long waves, it might well be found that re-adjustment of the H.F. trimming coils can be achieved by improved reception. Great accuracy of trimming is essential on short waves, and the small changes of capacity which occur while the

such troubles as instability or even "no signs" may be found that instability occurs at one end of the wave band only, and much good time may be lost in looking for faults which do not exist outside the valve.

Variable Selectivity

When dealing with a superhet, it will generally be found best to set the aerial trimmers first, and then to deal with those for the primary and secondary of the first I.F. transformer, and finally the primary and secondary of the second I.F. in that order. Selectivity can often be improved to a fair extent by moving the primary and secondary windings about .111, further apart. After this has been done the trimming should receive attention. Sometimes it is better to move the windings still further apart and to provide a variable-selectivity control. One method is by putting a winding of about 30 turns of fine wire between the primary and secondary, and wiring a 5,000 ohm variable resistor across this. Another method is to connect a .0001 mfd. pre-set condenser between the "node" and "grid" terminals of the transformer (see Fig. 2). Selectivity can then be varied by adjusting the condenser; increasing capacity reduces selectivity. As a complete alternative to either of the above suggestions it might be thought worth while to replace the first, or both, I.F. transformer by a new one of the variable-selectivity type.

NOTES ON SERVICING

(Continued from page 276)

was connected stage by stage as the fault continued to appear at intervals. Tests were complicated by the fact that the fault at one time appeared to be in the second I.F. stage, and at other times in the output stage. It was suspected that two distinct faults existed, and this was found to be so. The fault in the output stage was caused by the valve making imperfect contact with its holder. Closing the sockets a little cured this trouble. The fault in the second I.F. stage, however, proved to be more troublesome. Individual tests of the components revealed no fault. Eventually, it was found that the fault could be produced at will by disturbing a condenser connected to one of the tags of the second I.F. transformer assembly. The condenser proved to be R1, so the coils and trimming condenser inside a screening can were examined. All appeared to be in order on making routine tests but the fault remained. A closer inspection of the assembly however revealed a clumsy joint between a stiff tag from the primary trimming condenser and a busbar to which the coils were connected. The tag was bent at an angle to the busbar where it should have been soldered to make a sound joint. In consequence a small space between these parts had been filled with solder. The joint was re-made and the trouble was cured. It would appear that the solder offered a varying impedance to H.F., although a resistance reading on a meter capable of registering as low as .05 ohms, gave a zero reading. The writer had previously experienced cases in which a high impedance to H.F. was offered by an apparently sound joint as shown by the ohmmeter.

Replacement Valves

In conclusion, a few words of warning of the pitfalls to avoid when fitting replacement valves. The characteristics of valves shown as equivalents on makers' lists may not conform exactly to those of the originals, and queer results may follow their use in certain cases. This may be so, particularly in the case of frequency-changer valves. The use of an equivalent here may result in
Neutralising. "I have been looking through some old books and in the course of reading found reference with circuit to a neutrodyne receiver. I am not very familiar with theoretical circuits and enclose the cutting and should be glad of some further details as to the value of the condenser marked NC and the valve."—L. G. R. Blackburn.

The type of circuit referred to was used for H.F. amplification in the days prior to the introduction of the screen-grid valve. When the anode circuit is tuned to the same frequency as the grid, they are out of phase due to feedback via the inter-electrode capacity of the valve. This prevents maximum amplification of the signal at the point of its passing due to feedback. By adjusting the condenser marked NC in the diagram between anode and grid, a similar capacity is replaced which will produce a similar effect on that of the valve and thus a very small component has to be used. Special condensers were made for this purpose and are still obtainable from Jackson Bros. The S.G. valve, however, overcomes this difficulty and in addition gives greater amplification and better stability.

Screened Leads. "I have built a set which unfortunately is not very efficient, and in trying to buck things up I have made a number of modifications. I have screened the H.F. section, with a partition round the entire section screened the anode lead and generally carried out the wiring in the best possible manner. I enclosed a sketch of the set and have included working voltages and all other data. I wonder if you could assist me in getting this set stable so that it would be useful."—F. W. S. (Chelmsford).

The circuit, in most respects, quite satisfactory, I think, you will find that the trouble is entirely due to the long resistance load running from the detector across the chassis to the reaction condenser. If you screen this lead and earth the screening, we think you will find that the set will be quite stable and will experience no further trouble with it.

Coupling Coils. "When making coils I am a little in the dark about the method of winding which is adopted in various makes. In some cases the wire is not separated over the length of the winding in simple form; in some the windings are on top of each other, and in yet other coils they are in coils. Is there any particular rule which has to be followed in this particular connection?"—H. F. (Leicester).

The aim in winding coils where there is a primary and secondary is to obtain maximum inductance between those windings with minimum capacity coupling. There are several ways of obtaining this desired end. If separate coils are wound and placed side by side (that is, end to end) there will be maximum inductive coupling between them (if they are wound with the correct sense) and minimum capacity. The same end may be obtained by winding the primary over the secondary, using some form of spacer and winding the primary at a slight angle.

Aerial Static Charge. "When I adjusted my series aerial condenser the other day I got a shock from it. I thought there may be some mains leakage from the set, but a careful inspection showed that there was not. I made a number of tests and finally found that when the aerial in question I did get a shock, and I have since been unable to obtain any. Can you explain this?"—W. C. (Beddington).

RULES

We wish to draw the reader's attention to the fact that due to the demands on our time, we are no longer able to answer questions or to deal with problems of this kind, in the space at our disposal. This applies also to answers of our previous columns. We regret that we cannot, for obvious reasons—

1. Supply circuit diagrams of complete multi-valve receivers.
2. Suggest modifications or modifications to receivers described in our correspondences.
3. Suggest alterations or modifications to condensers described in our correspondences.
4. Answer queries over the telephone.
5. Grateful for any advice or comments on the operation and performance of the equipment described, although we are not in a position to give any technical assistance.

Requests for illustrations must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL WIRELESS, Rotherham, S. Yorks. The Centre must be enclosed with every query.

THE effect was no doubt due to a static charge which had collected on the aerial side of the condenser in question. If a good-air-dielectric condenser is used this may accumulate quite a large charge during stormy weather, and it may often be seen to discharge with an impressive flash. A solid-dielectric condenser, generically leads to sufficient to prevent this trouble, however, and there is no need to worry about it except in very stormy weather, when it is desirable to short-circuit the condenser or fit a proper spark-gap in the aerial circuit.

Stepping Down Mains Voltage. "I have an American A.C.-D.C. set which is provided with a 110-volt input. My mains are A.C., but 220 volts, and I have been told that I can use the set if I put a transformer between the mains and the set. If this is so, could you tell me what type of transformer I need and where I can get one. If this is not the case, how can I work the set from these mains?"—M. V. (Long Eton).

A two-coil transformer is needed for this purpose. These are made now by several firms. They are wound to carry the necessary high mains current, and have a low-voltage winding, that is, to step down high voltage mains for low-voltage receivers, or for low-voltage mains with a standard high-voltage receiver to be used.

The coupon on page iii of cover must be attached to every query.

The range of ERIE Products includes:

- Volume Controls
- Tone Controls
- Volume Controls
- Volume Controls
- Receiver Units
- Condensers
- Silver Mica Condensers
- Gas Radio Transformers
- High Voltage Transformers

Send to day for full details.
**RECEIVERS, COMPONENTS AND ACCESSORIES**

**SOUTHERN RADIO'S BARGAINS**

**ALL GUARANTEED. POSTAGE EXTRA.**

- Parcel of Useful Components, comprising Condensers, Brastrads, Volume Controls, Wire, Circuits, etc. (Resellable), 40/- per parcel.
- Service Man's Component Kit. Electrolytic Condensers, Valve Holders etc. 10/- complete.
- Transistor Kit. Integrated Circuits, Transistors, Resistors, etc. 10/- complete.
- Valve Holders, Wire Wound Resistances, etc. 3/-. 5/-.
- The Kill. Small Trader's Parcel of Components. 150 Articles comprising all Types, Valve Condensers, Resistor, Resistors, Coils, Wire, etc. Value 85/-, 1/- the parcel.
- 400-Wire-end Resistors, assorted capacities, 25 of each size, 3/- per 100.
- 10 Volume Controls, 1/.

**TELSIX 3-Band Meters (Volts and Milliamps).**

Eddystone, Saloon, £2 2s. 6d. (including VAT). See our latest lists.

- **S.T.A.R.T.-BY** Crystal Set. Specified Co., Ltd. 2s. each, 20/- per parcel. Valued at 3s. 6d. 8/- per parcel.
- **5-000-WATT** Crystal Set. Specified Co., Ltd. 5s. each, 40/- per parcel. Valued at 10s. 6d. 35/- per parcel.
- **500-WATT** Crystal Set. Specified Co., Ltd. 75/- each, 50/- per parcel. Valued at £1 10s. 6d. 21/- per parcel. 

**VAUXHALL—All goods previously advertised are still available and now reduced to / per piece.**

- **VAUXHALL Utility, 135A, Sprite, £4 10s.**
- **S.T.A.R.T.-BY** Crystal Set. Specified Co., 3s. each, 20/- per parcel. Valued at 7s. 3d. 10/- per parcel.

**BANKRUPTCY BARGAINS.**

Dated 22nd March 1940. Makers' reduced prices, with guarantees, at less than cost price. All goods new and complete,

- Complete car radio. 8/-.
- Receiver and accessories, 7s. 6d. per set.
- Receiver and accessories, 8s. 3d. per set.
- Receiver and accessories, 10s. 6d. per set.

**BARGAINS.**

- **K.W. (Adjoining Stratton Rd.,) 7/6.**
- **33A, Strand, London, W.C.2.**
- **107, New Bond Street, London, W.1.**
- **50, Sloane Street, London, S.W.1.**
- **30, Palace Gate, London, S.W.1.**
- **21, Great Marlborough Street, London, W.1.**
- **22, Victoria Station Approach, Manchester, (opposite Victoria Station).**

**SHOPWORN CALCULATIONS, TABLES AND FORMULE**

By F. J. Gamm


**RECEIVERS, COMPONENTS AND ACCESSORIES**

**SOUTHERN RADIO'S BARGAINS**

**ALL GUARANTEED. POSTAGE EXTRA.**

- Parcel of Useful Components, comprising Condensers, Brastrads, Volume Controls, Wire, Circuits, etc. (Resellable), 40/- per parcel.
- Service Man's Component Kit. Electrolytic Condensers, Valve Holders etc. 10/- complete.
- Transistor Kit. Integrated Circuits, Transistors, Resistors, etc. 10/- complete.
- Valve Holders, Wire Wound Resistances, etc. 3/-. 5/-.

**TELSIX 3-Band Meters (Volts and Milliamps).**

Eddystone, Saloon, £2 2s. 6d. (including VAT). See our latest lists.

- **S.T.A.R.T.-BY** Crystal Set. Specified Co., Ltd. 2s. each, 20/- per parcel. Valued at 7s. 3d. 10/- per parcel.
- **5-000-WATT** Crystal Set. Specified Co., Ltd. 5s. each, 40/- per parcel. Valued at 10s. 6d. 35/- per parcel.
- **500-WATT** Crystal Set. Specified Co., Ltd. 75/- each, 50/- per parcel. Valued at £1 10s. 6d. 21/- per parcel. 

**VAUXHALL—All goods previously advertised are still available and now reduced to / per piece.**

- **VAUXHALL Utility, 135A, Sprite, £4 10s.**
- **S.T.A.R.T.-BY** Crystal Set. Specified Co., 3s. each, 20/- per parcel. Valued at 7s. 3d. 10/- per parcel.

**BANKRUPTCY BARGAINS.**

Dated 22nd March 1940. Makers' reduced prices, with guarantees, at less than cost price. All goods new and complete,

- Complete car radio. 8/-.
- Receiver and accessories, 7s. 6d. per set.
- Receiver and accessories, 8s. 3d. per set.
- Receiver and accessories, 10s. 6d. per set.

**BARGAINS.**

- **K.W. (Adjoining Stratton Rd.,) 7/6.**
- **33A, Strand, London, W.C.2.**
- **107, New Bond Street, London, S.W.1.**
- **50, Sloane Street, London, W.1.**
- **21, Great Marlborough Street, London, W.1.**
- **22, Victoria Station Approach, Manchester, (opposite Victoria Station).**

**SHOPWORN CALCULATIONS, TABLES AND FORMULE**

By F. J. Gamm


**RECEIVERS, COMPONENTS AND ACCESSORIES**

**SOUTHERN RADIO'S BARGAINS**

**ALL GUARANTEED. POSTAGE EXTRA.**

- Parcel of Useful Components, comprising Condensers, Brastrads, Volume Controls, Wire, Circuits, etc. (Resellable), 40/- per parcel.
- Service Man's Component Kit. Electrolytic Condensers, Valve Holders etc. 10/- complete.
- Transistor Kit. Integrated Circuits, Transistors, Resistors, etc. 10/- complete.
- Valve Holders, Wire Wound Resistances, etc. 3/-. 5/-.

**TELSIX 3-Band Meters (Volts and Milliamps).**

Eddystone, Saloon, £2 2s. 6d. (including VAT). See our latest lists.

- **S.T.A.R.T.-BY** Crystal Set. Specified Co., Ltd. 2s. each, 20/- per parcel. Valued at 7s. 3d. 10/- per parcel.
- **5-000-WATT** Crystal Set. Specified Co., Ltd. 5s. each, 40/- per parcel. Valued at 10s. 6d. 35/- per parcel.
- **500-WATT** Crystal Set. Specified Co., Ltd. 75/- each, 50/- per parcel. Valued at £1 10s. 6d. 21/- per parcel. 

**VAUXHALL—All goods previously advertised are still available and now reduced to / per piece.**

- **VAUXHALL Utility, 135A, Sprite, £4 10s.**
- **S.T.A.R.T.-BY** Crystal Set. Specified Co., 3s. each, 20/- per parcel. Valued at 7s. 3d. 10/- per parcel.

**BANKRUPTCY BARGAINS.**

Dated 22nd March 1940. Makers' reduced prices, with guarantees, at less than cost price. All goods new and complete,

- Complete car radio. 8/-.
- Receiver and accessories, 7s. 6d. per set.
- Receiver and accessories, 8s. 3d. per set.
- Receiver and accessories, 10s. 6d. per set.

**BARGAINS.**

- **K.W. (Adjoining Stratton Rd.,) 7/6.**
- **33A, Strand, London, W.C.2.**
- **107, New Bond Street, London, S.W.1.**
- **50, Sloane Street, London, W.1.**
- **21, Great Marlborough Street, London, W.1.**
- **22, Victoria Station Approach, Manchester, (opposite Victoria Station).**

**SHOPWORN CALCULATIONS, TABLES AND FORMULE**

By F. J. Gamm

PRACTICAL WIRELESS

PREMIER RADIO—AS USUAL!

SPECIAL PURCHASE!

"AIR WARDEN" 5-volt Midget Receiver for A.C. MAINS Transmitters. Completely pre-wired and contained in well-finished, polished Oak Cabinet, 2 x 9 x 17 inches. With built-in driving Coil speaker. Complete at Wholesale Price £6 6s. Od. Our Price £5.50. The Ideal Stand-by Set.

PREMIER SHORT-WAVE KITS for OVERSEAS NEWS

Incorporating the Premier 5-Band S.W. Coil, 11-86 Megacycles, Each Kit accommodates with all components, diagrams and 2-volt valves. Each Kit 1/8.

2 Valves Kit, 12/-

DE LUXE S.W. KITS

Complete to the last detail, including all Valves and coils, using the Exclusive 5-Band Premier S.W. Coil, with diagrams and lucid instructions for building and working. Each Kit is supplied with a steel Chassis and Panel and uses plug-in Coils to tune from 13 to 170 metres.

1 Valve Short-wave Receiver or Adapter Kit 2/-

2 Valve Short-wave Superhet Converter Kit 2/3/-

REPLACEMENT VALVES FOR ALL SETS

EUREKA MAINS VALVES 4 x A.C. Types, A.G.H.; A.C./A.C./C.G.A. 566. 10. £2 each.

EUREKA SHORT-WAVE Types, 6 x A.C. Types, A.G.H.; A.C./A.C./C.G.A. 566. 10. £3 each.

COMPONENTS FOR SALE

T.R.I.A.D. Made in these Coils are all type stock. Standard tubes, 5/6 each. Outlet tubes, 5/6 each, 3/0 each.

PREMIER BATTERY CHARGERS for A.C. Mains. Weightless Reception complete and ready for use. To charge 5 volts at 1 amp., 7/-; 6 volts at 1 amp., 12/6; 7 volts at 1 amp., 2/-.

MOVING COIL SPEAKERS complete with transformer. 10/6. 100. M.P.D. 15. 5/11. 4/11. 1/11.


PREMIER Short-wave Coils, alltrans-construction, with Trefoilmodulation 115 m.m., 190, 255, 400, 510, 1000 m.m.; 213, 1600 m.m.; 250, 211.

PREMIER SHORT-WAVE COILS, 4- and 6-coil types, 15-26, 41-49, 78-170 metres, 24 each, with circuit. Special set of S.W. Coils, 14-45, 4/11.

UNIVERSAL Metal Micro Carlor Dials, Direct and 100 ohm. Ratios, 4/2.

CARDBOARD ELECTROLYTIC CONDENSERS, Precision-made, all-trans-construction, with Trefoil modulation. 3.3 mfd. 6.3 volt, £1 10/- 8 mfd. 6.3 volt, 10/-5.

500 V., 3/6; 444 500 V., 2/6; 3.3 V., 1/6.

Orders 5/- and over send Post Free. Under 5/- phone odd day postage.

YOU MUST HAVE A PREMIER 1940 CATALOGUE

111 PAGES

PRICE 6d.

GET YOUR COPY TODAY!

PRACTICAL WIRELESS, 14/12/39

PREMIER RECEIVERS, COMPONENTS AND ACCESSORIES

RADIO CLEARANCE, LTD.

FILAMENT Transformer, input 230-250 volts, output 240-250 volts, 4 volts 4 amps, 4 volts 6 amps. Each MAINS Transformers, American windings, input 230-250 volts tapped, output 240-250 volts, 4 volts, 2 amps., 4 volts 3.5 amps., 6.5 volts, 2.5 amps., 8 volts, 1 amp. G.E.C. MAINS Transformers, American windings, 230-250 volts, output 50-60 m.a. 5 volts, 2 amps., 8 volts, 1.5 amps., 16 volts, 0.5 amps. Suitable for replacements in B.G.C. models, 5/6 each. American 4.5-5-6 volt 3.5 amps. 14/19. 9/6 each. 5 volt 6 amperes, 24 Mfd. C.Na Type Electrolytics, 450 volts working.

1/6 each

8.75 m. Can Wet Type Electrolytics, 450 volt working.

1/1 each

Preset Button Units with 5 press buttons, ready for wiring into set, with circuit... 6/11 each

WEARITE Set of two Iron-Coil Cables, Aerial and H.F. Trans., with diagram... 7/11

BULGIN 30 ohms Wire-wound pots 1/2 each

WEBRITE 110 k ohm, F. Transformers... 8/6 each

AMERICAN C.T.S. Volume Control, finest made, divided spindle, length 12 in., with switch 2000.. 50.00

WEARITE 110 volt, 5000 m. ohm. Less Switch, 50,000, 1,000, 500,000... 1/6 each

500 volt, 60,000 ohms, 1/6 each

WEARITE Chokes, screened 1/6 each

PLESSEY DRY ELECTROLYTICS CAN TYPE 12 x 6 mfd. 500 volts... 1/6 each

12 x 350 volts... 1/6 each

12 x 8 500 volts... 1/6 each

12 x 5 500 volts... 1/6 each

6 x 8 500 volts... 1/6 each

12 x 450 volts... 1/6 each

4 x 8 8 mfd. 500 volts working... 2/11 each

10 x 8 x 4 x 4 mfd. 500 volts working... 2/11 each

12 x 8 x 8 x 8 mfd. 500 volts working... 2/11 each

16 x 8 x 8 x 8 mfd. 500 volts working... 2/11 each

10 x 16 x 36 x 500 volts working... 2/11 each

B.1. CARDBOARD ELECTROLYTICS, wire-end type, 350 mfd. 500 volts working... 6/1 each

4-lead type, 2/11 each

8 mfd. Tubular Type, 500 volts working... 2/11 each

Bias Wire End Type... 2/6 each

Bias Wire Type... 4/6 each

B.2. CARDBOARD ELECTROLYTICS, wire-end type, 350 mfd. 500 volts working... 6/1 each

4-lead type, 2/11 each

8 mfd. Tubular Type, 500 volts working... 2/11 each

Bias Wire End Type... 2/6 each

Bias Wire Type... 4/6 each

S.T.C. Twist Switches 1/1/6 each

Battery Output Voltages, well-known make 4/6 each

Double Diode Transformer... 2/- each

RAITHMEN First-grade Valves, largest stock of all types in stock, including Glass Series, Glass Octal Valve Series, enamel Type Valves, Metal Sets, and Resistance tubes; at all most competitive prices; send for Valve lists.

Orders Must Include Suggested Postage to Cover. Hours of Business : 9 a.m.-9 p.m. Saturdays, 9 a.m.-6 p.m.

"COMPLETE ELECTRICAL ENGINEERING"

STUDY the information contained in this great new work and you will add considerably to your earning capacity in the electrical engineering world! COMPLETE ELECTRICAL ENGINEERING is offered to you at a price you can afford to pay. It is a complete library—a ready reference to the thousand and one applications of present-day electrical engineering. Its contents are absolutely comprehensive and deal with everything you can possibly want to know—from Electrical Power Supply to Talking Picture Equipment; from the Wiring of Modern Flats to Electrical Timing Instruments; from Emergency Storage-Battery Systems to Testing Electrical Machinery; from Lift Operation and Control to Garage Electrical Testing Equipment; from Time Switches and Time-Delay Devices to Electrical Welding Plant; from Refrigeration to Electric Meters and Cookers, etc.

It is impossible in this space to include details of the 160 Sections, but the special brochure which is yours for the asking—and without obligation to purchase—will show you that COMPLETE ELECTRICAL ENGINEERING is the very work you have been looking for. It can be yours within a few days!

A Few of the Many Testimonials Received

Valuable Information
"I cannot refrain from congratulating you... The valuable information is given in simple language, which achieves its aim far better than if it had been written in what I would call a high-brow fashion."—J. L. P. P. (Hull).

Meets Requirements
"COMPLETE ELECTRICAL ENGINEERING is just the book I have been looking for. I am pleased to say that it meets my requirements admirably."—C. B. (Colindale, N.W.9).

Electrical Education
"I have gained much pleasure and most valuable education from reading COMPLETE ELECTRICAL ENGINEERING. It has already repaid me its cost."—T. A. (Southport).

Most Helpful
"As a works engineer I have found COMPLETE ELECTRICAL ENGINEERING most helpful and interesting."—G. C. (Loughborough).
SIXTY TESTED WIRELESS CIRCUITS

By F. J. Camm

Circuits for Battery and Mains-Operated Receivers, Adaptors, Units, Portables, Short-Wave Receivers, All-Wave Receivers, Amplifiers, and a Room-to Room Communicator. Diagrams and instructions for assembling and wiring. Details of components and notes on operation.

2/6 NET

From all booksellers or by post, 2110, from the publishers, GEORGE NEWNES, LTD. (Book Dept.), Tower House, Southampton Street, Strand, London, W.C.2.
It would cost you many pounds, and take months of waiting, to obtain by your own efforts the contents of one single issue of P.T.O. You would need to subscribe to hundreds of newspapers and magazines published in every part of the world, and to purchase expensive books. You would need to be a translator of French, German, Spanish and other languages—and you would have to spend weeks in sitting the wheat from the chaff. P.T.O. selects each month the best articles that the world’s press and books have to offer. A skilled staff of translators and sub-editors is constantly at work with one object—to keep you well informed! That is why P.T.O. is exceptional value for 6d. monthly.

Some of the 38 Brilliant Contributions in the January issue:

STALIN’S REAL AIM
By Sir William Oudendyk
(From The Fortnightly, London)

MY MONKEY-GLAND TREATMENT: THE FACTS
By SERGE VORONOFF
(From Revue de Paris)

WHO IS MARSHAL VOROSHILOV?
By V. LENAT
(From Sevastopol, Riga)

HOW LONG WILL YOU LIVE?
By AMRAM SCHEINFELD
(From “You and Herdity,” published at 12/6)

PILOTLESS BOMBERS
By T. STANHOPE SPRIGG
(From Flying, London)

TWO MILLIONTHS OF AN INCH
By David O. Woodbury
The grinding of the mirror of the world’s largest telescope
(From This Week, New York)

ASK YOUR BOOKSELLER
to get you the book or books you require at the usual price, thus saving postage. Alternatively, send the form to the publishers, with postal order to cover postage, and the book or books will be sent direct to you.

Better Radio in 1940
with these Handbooks

(1) EVERYMAN’S WIRELESS BOOK
By F. J. CAMM

(2) WIRELESS COILS, CHOKES
AND TRANSFORMERS—
And How To Make Them
By F. J. CAMM

(3) MATHEMATICS OF WIRELESS
By RALPH STRANGER
Essential for the wireless amateur without knowledge of mathematics who desires to gain a fuller knowledge of his subject. Written by one who has the gift of explaining obscure subjects in a simple fashion. The book gives a simple introduction to Arithmetic, Algebra, Powers and Roots, Differential Calculus, Integral Calculus, Trigonometry, The Slide Rule, Logarithms, Efficiency Curves and Graphs in Wireless, Mathematics and Wave Lengths and Frequencies, and a number of problems involved in “wireless” calculations. 256 pages. Fully illustrated. 5/- net. (By post 5/6)

(4) DICTIONARY OF WIRELESS TERMS
By RALPH STRANGER
Mr. Ralph Stranger, who is a master of lucidity, has produced in his “Wireless Dictionary,” a valuable and fully-explained synopsis of technical terms that everybody can understand. Indispensable to every wireless enthusiast who reads technical books and journals. It is a comprehensive work of reference for those wishing to understand the more advanced and serious books on wireless, but who do not possess any technical knowledge. 160 pages, well illustrated. 216 net. (By post 2/10)

Re the Publisher, GEORGE NEWNES, L.D., TOWER HOUSE, SOUTHAMPTON STREET, LONDON, W.C.5. Please send me by return the book or books encircled below. I enclose Postal Order for the necessary amount.

If you hand this form to your bookseller please state the titles you require.

1. 2. 3. 4.

P.O. No. 16

Name

Address

Pocket Receivers

Many ingenious designs have been given from time to time for small receivers suitable for carrying in a pocket. In some cases these have been merely "designed", but the results have not been so poor that it has not been worth while building the set. In others, the portability has been good, but the shape has been inconvenient. We have tried out several designs which have been suggested, but there is a feeling that in practically all of them, the battery problem undoubtedly being the most difficult of solution. However, many readers are interested in this type of receiver we describe in this issue a small two-valve, using standard parts and a few battery valves, and this is built in a quite small cigar box. The batteries must, of course, be housed in a regular or separate case, as two pockets will be needed if the receiver is being built for carrying about. However, a good overcoat or trench coat will accommodate the two parts and with a length of wire slung across the body and a pair of headphones, signals may be heard whilst walking.

Radio Act Savings

A good endorsement for banks and an idea for entertainers generally is provided by the Novelty Acts, a quartet heard over WLW Monday to Friday at 8 a.m., E.S.T. The group decided two years ago that they were not going to quit radio brokewhen they do. They entered into a pact at that time to save $2.50 each week, and after the first year this was dumped to $5 and later was increased to $7.50.

If Tex Owens hadn’t come down with a case of acute appendicitis eight years ago, he might never have gone into radio. While entertaining a group of children in the same hospital, he decided that singing and playing a guitar was more satisfactory than coun-
puh, acting in carnivals and numerous of his other occupations, and was advised to host a try at radio. Since then he has attracted a nation-wide following. Now he’s started three mornings a week over WLW.

Old Scottish Airs

A orchestral concert which Ian Whyte will conduct on December 22nd includes not only the overture to “A Midsummer Night’s Dream,” by Mendelssohn, and Grieg’s “Holberg” suite in five movements, but also two traditional Scottish airs. One has been arranged by the conductor and is called “The Finger Lock,” the other is a Scherzo by Herbert Stephen on the “Wee Cooer o’ Fife,” a tune which is familiar to those who used to hear the Scottish Children’s Hour.
Constructors' Problems

In spite of the hundreds of letters which are dealt with each week by our Query Service department, it is surprising to note how they can be classified under amusing headings. A careful examination of the records compiled by this department reveal that there are certain problems common to most readers and that these, in turn, can be ranged in order of popularity with surprising regularity. As these details prove that certain facts or formulae are not such general knowledge as one would like to think, in view of the wide range of articles which have appeared in recent issues, some of the queries are given in this article, although, for reasons of space, it is obviously not possible to deal with all of them in one issue. It is hoped, by adopting this procedure, that many readers will find the solution to their problem and that they will save time and postage.

Speaker Matching

Note that the use of extension speakers has become quite common, and the fact that most commercial receivers are provided with sockets for the easy connection of an external speaker, many readers are asking for details concerning suitable ratios for output matching transformers to enable them to use an existing speaker or purchase one of the correct type.

The formula itself is quite simple, namely,

\[ N = \sqrt{\frac{Z_v}{Z_s}} \]

where \( N \) is the turns ratio of the transformer, \( R_v \) the optimum load resistance of the valve concerned, and \( Z_s \) the impedance or resistance of the speaker. The value \( R_v \) can be ascertained from the valve maker’s leaflet; similarly, the impedance of the speaker is usually quoted by its maker, so the unknown value \( N \) can be calculated with little difficulty.

If a speaker is not already provided with its own matching or output transformer, then the resistance of the speech coil or, in the case of the moving-iron models of a few years ago, that of the speaker bobbins will have to be taken.

Meter Shunt Resistances

The desire to convert an existing single scale reading meter into one of the multi-scale type is very common but, so the post bag reveals, the method of calculating the values of the required shunts, necessary with amm or milliamper meters, is not too well known. It is quite simple and not difficult to remember, whilst its application should not cause anyone any perplexity.

The resistance of the meter winding is,

\[ R_m = R_s \frac{N-1}{N} \]

where the resistance of the meter winding is that specified by its maker and \( N \) represents the number of times the full scale deflection is to be increased. For example, if the meter has a normal full scale reading of, say, 5 mA and is desired to fit shunts to allow it to read 50 mA at full scale, then \( N \) equals 10 and \( N-1 \) naturally becomes 9.

Stage Gain

When designing and constructing L.F. amplifiers, much trouble and dissatisfaction of unnecessary valves will be avoided. The Query Service figures show that these facts are now being more widely appreciated, therefore the formula is given below.

Stage Gain = \( R_1 \)

\[ R_1 = R_s + R_a \]

where \( R_1 \) is the anode load and \( R_s \) the impedance of the valve and \( \mu \) its amplification factor, the last two values being those given by the valve data sheet for the valve concerned. With L.F. transformers the ratio of the

winds must be taken into account, in addition to the amplification factor of the valve, and \( B_1 \) then becomes the dynamic resistance of the primary winding. With a resistance coupled L.F. stage, \( B_1 \) would, of course, represent the value of the anode resistance.

Standard Resistance Colour Code

Although these details have been published many times they are given in these pages once again, and we would suggest that they are copied out on a stout piece of cardboard and placed in a spot handy to the constructor’s bench, thus avoiding much waste of time during experimental work.

<table>
<thead>
<tr>
<th>Figure</th>
<th>Colour</th>
<th>Figure</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Black</td>
<td>5</td>
<td>Green</td>
</tr>
<tr>
<td>1</td>
<td>Brown</td>
<td>6</td>
<td>Blue</td>
</tr>
<tr>
<td>2</td>
<td>Red</td>
<td>7</td>
<td>Violet</td>
</tr>
<tr>
<td>3</td>
<td>Orange</td>
<td>8</td>
<td>Grey</td>
</tr>
<tr>
<td>4</td>
<td>Yellow</td>
<td>9</td>
<td>White</td>
</tr>
</tbody>
</table>

The chief thing to remember when applying this code is the following order of reading the colours, as it will be found that each resistance carries three indicating colours or markings. These are Body, Tip and Dot. The body will be a certain colour according to its value, but one end or tip of it might be marked with another colour while on the body will be found a dot of another colour. They must be read in the order given, and an example is given to make this quite clear.

A resistance has a resistance having a grey body with a black tip and a red dot would indicate 8, 0, 0 or, written correctly, 8,000.

Frame Aerials

The actual windings necessary for a frame aerial for use on the ordinary broadcast wavebands, i.e. medium and long waves, depends so much on the size of the frame, the spacing of the windings and other details, that it is not possible for the Query Service to calculate the exact number of turns required for each individual application, especially when very brief information is provided, as so often is the case, of the circuit under construction. To enable, therefore, the constructor to have a basis for the start of his experiments, it should be noted that for the medium waves, approximately 75 feet of wire will be required, while for the long wave section, 130 to 150 will be necessary. If the frame is of the type incorporating its own reaction winding, then 40 to 50 feet is suggested for this, but experiments must be made to determine the most satisfactory number of turns in each case.

The medium-wave section should be wound with, say, 24 S.W.G. enamelled or D.C.C. wire and its turns made approximately 4/8 of an inch apart. The long wave and reaction can be wound with much finer wire, for example 30 to 32 S.W.G. and the turns should be close together.

Wiring up a set in the Elega world. The chassis is already mounted in a "cradle" to protect the components against damage and to make them easily accessible for soldering.
Valve Economy

Novel Valve Arrangements Which May Be Tried in Order to Reduce the Total Number of Valves.

By W. J. DELANEY

We have already explained in these pages how various economies may be effected in general receiver design, and in one instance have indicated how a multi-electrode valve may be used in an unorthodox way in order to save initial valve expense and to reduce the size and number of components in a receiver. (See the "Three-Two" receiver in our issue dated Dec. 2nd last.) This idea wishes to go farther can strap two diodes for use as a rectifier or even use two of these particular valves in a straight circuit, making use of some diodes for A.V.C., some for rectification and others for quenching or other special purposes. However, the type of valve which is undoubtedly the most interesting from an experimental point of view is the A.C. double-triode. There are two types of this valve available of utilising a dual type of valve may, however, be applied in other directions and similar economies effected. In the article in question it was mentioned that tests had been conducted with a double-triode valve for L.F. and output stages, but these valves are not available in battery types. The standard Class B valve has characteristics such that it will not permit one section to be used as a straight output triode, although such section may be used as a triode. The reason is that the majority operate with no grid bias and thus their handling capacity is low. A low-gain two-stage amplifier could, however, be made up with such a valve, although it is probable that the resultant output would not exceed that given by a good L.F. valve. The total H.T. current would be less, although the L.T. current would be similar to the two valves each taking 1 amp compared with the 2.5 amp or more of the Class B valve.

Double Triodes

In the main types, however, there are several valve designs which lend themselves admirably to special uses, and the double-diode-triodes or double-diode pentodes need not be employed in superhet receivers. The use of the diodes for good-quality signals in a straight set should not be overlooked, and the experimenter who

Fig. 1.—The circuit of the Three-Two receiver using a triode-pentode.

Fig. 2.—Theoretical diagrams of the 6N7G and 6C8G valves and under-eaterholder view of pin connections.

Fig. 3.—Using a double-triode as L.F. and phase-changer with a push-pull circuit.

Push-pull

A very good instance of the effective use of the double-triode, single-cathode type, is in a quality L.F. amplifier wherein one section is employed for L.F. amplification, and the second as a phase inverter. The circuit is given in Fig. 3. It will be seen that the signal, either from a radio section or from a pick-up, are fed into one triode section, and the output is taken through the standard resistance-capacity circuit to one of a pair of output valves arranged for push-pull working. At the same time the signal is also fed to the second section of the double-triode, and the output from this section feeds the second of the push-pull valves. This arrangement has certain features which make it preferable to the more usual scheme of taking the output from cathode and anode of a single valve, and better balancing is possible. The advantage of this particular circuit is, of course, in the saving of space over two separate valves, the saving of one valve-holder and a slight economy in both H.T. and L.T. due to the particular valve characteristics.

Grid and anode of a triode valve may, of course, be stepped to permit the valve to function as a diode or rectifier, and this enables various circuits to be tried out.

(Continued on page 306)
PRACTICAL TELEVISION

December 23rd, 1939.

Vol. 4. No. 182.

An Optical Equivalent

PRINCIPLES which have been firmly established in the field of normal optics are freely borrowed and adapted to meet any special conditions which arise in electronic work. This is particularly the case with one of the ordinary types of cathode-ray tubes where it is found necessary to make the electron stream undergo focusing, refraction or reflection. An interesting application of this has just been made known, and has for its major feature the reduction of spherical aberration. In the usual form of cathode-ray tube the cathode and accelerating anode assembly are mounted at one end of the tube with its focus somewhere in the tube. In this special tube this assembly is located about the middle point of the glass envelope. The stream of electrons emitted from the cathode immediately comes under the influence of a positive field of force which accelerates the electrons towards a negatively-biased electrode positioned at one end of the tube. Before reaching this electrode, however, the stream must, of course, come under the influence of an equipotential surface which exists between the positive and negative fields. This surface sets the electrons in the same way as a mirror does to a beam of light, that is, reflects them back towards the remote end of the tube. The stream is then made to accelerate towards a fluorescent screen at the remote end by the action of a high potentialed additional electrode which brings about a strong focusing action, so that the impact of the stream on the fluorescent screen is evidenced by a sharp, clear-cut, tiny area of light. In addition to the reduction of spherical aberration the total length of the tube is cut down very materially, and this is a very important point for certain uses of the tube, particularly television. The tube housing is reduced in size, and yet normal forms of modulation and spot movement under the influence of a time-base generator can be undertaken.

Oscillographic Uses

THE cathode-ray tube is becoming an indispensable piece of equipment for the multidisciplinary oscillographic uses to which the device can be applied. No high-class servometer's equipment is really complete without an oscillograph, while in the laboratory its use has become as common as that of an ammeter and voltmeter. To study the behaviour of circuits and record the changes which occur when alterations are made is of importance to designers, and the accompanying illustration shows one corner of a research laboratory whose bench equipment lends support to these remarks. In many instances, experimental readings which must be recorded when accumulating experimental data, visual observation of wave-forms on the screen of the cathode-ray tube provides invaluable help in showing what is actually happening in that part of the apparatus to which the electrodes are connected. A recent paper, presented at the

The cathode-ray tube is indispensable in the modern laboratory, for it enables oscillographic records to be obtained in lieu of curves drawn after long mathematical computations.

Institution of Electrical Engineers, showed a new application of the cathode-ray tube for measurements in a network analyser. Under ordinary circumstances the calculations involved in the operation and design of modern electrical distribution systems very often present such intricate mathematical equations that their solution by ordinary analytical means becomes practically impossible. As an alternative, therefore, a miniature network, comprising generators, reactors, resistors and other circuit components, is set up to have an equivalent electrical characteristic to the distribution system undergoing investigation. It is here that the cathode-ray tube becomes of such importance, for the nature of the current and voltage distributions can be observed, their phase relationships checked, magnitudes can be measured, and, furthermore, there is the additional advantage that severe overload conditions can be handled without damage to the equipment. Transient phenomena in networks is becoming of increasing importance, and the photographic methods are used in conjunction with the cathode-ray traces on the fluorescent screen, proper records can be made in a manner which only hours of laborious calculations and drawing would reveal to those undertaking the investigations.

Shelf Life

Many home constructors of television send-in receivers, as well as purchasers of complete sets, are wondering if their equipment will in any way deteriorate as a result of the enforced shelf life brought about by the cessation of television transmissions little care and attention devoted now to the whole installation will repay the owner, and save the cost of a service call when transmissions are resumed at some later date. The cathode-ray tube of the set will benefit if it is given a short run of between 10 and 20 minutes each day, so that it is probable that the television brightness control is being kept at normal level, or if D.C. is present, advanced a little further to move the set into the normal living room scanning field on the tube face is plainly visible. Do not let dust get inside the glass envelope, and if the set is examined periodically as advised, then it will in no way suffer during its enforced retirement from household entertainment activities.

from Alexandra Palace. As readers know apparatus which lies idle for any period of time must inevitably accumulate dust, and with the self-imposed restrictions of lighting and heating it is probable that the whole set is accommodated in a room which is seldom used. If this be the case, it is better to move the set into another room where heat is available, and so remove any possibility of damage arising from temperature changes. If the television receiver is combined with an all-wave radio which does daily service for listening-in, then all is well, for the local heating from the valves and power pack will ensure that the set's interior in no way suffers. An occasional removal of the back, and the careful use of the suction nozzle of a vacuum cleaner by the radio expert of the household is a wise precaution, and with the very high winds which seem to abound at this time of the year it is as well not to neglect the aerial system. As many installations are a dipole with or without reflector, supported as high as possible above the roof top by a mast, it is a good idea to examine carefully the support fixtures to ensure that they are successfully withstanding the ravages brought about by inclement weather. If there is any movement of the mast in a lateral direction within its bracket support, this will cause damage to the pole and should be remedied by wedging straight away. Also, see that the feeder cable is free from defect and not swaying in the wind or fracture will result. Any exposed soldered joints should be cleaned and taged up.
The End of the Year

I AM necessarily writing this ahead of Christmas, but the message will reach you round about Christmas Eve if we can rely upon the railways to do their stuff and deliver promptly. I mention this point because some readers are complaining that nowadays they are not able to obtain copies with the same meticulous promptitude as hitherto. There are a number of reasons for this. There are restricted train services and restricted collection and delivery services, due to the blackout. We ask for the indulgence of our readers in these difficult times, and if the one and only weekly wireless journal fails to arrive on the Wednesday morning, readers must not presume that we have shut up shop and departed for some unknown destination in the country. The editorial offices of the journal have not been evacuated to the country. Here we are, right in the danger zone defying Hitler to do his worst. I refuse to evacuate my office, unless at some future time a bomb mutilates my sanctum. Even this, however, will not prevent us, like Burgomaster Max in the last war, from publishing our journal.

Anyway, festive greetings and all that.

The Club Dinners

FOR my sins it is part of my job to visit the annual forfomgering of clubs around the festive board, for even your energetic Editor has not yet discovered any means of being in two places at the same time. I am, therefore, his unworthy deputy, and one of the hosts which I have to propose, or to which I have to respond, includes the visitors and the Press—gentlemen of the Press, if you please. I do not know why journalists should be referred to as gentlemen, for the definition of a gentleman is one who does not work for his living, or one who would not willingly hurt the feelings of another.

The former definition certainly does not apply to me, and I gather from my correspondence that the latter does not either. But, still, here we are at the end of another milestone in the history of the world, and I do want for the nonce to drop the role of splenetic critic, and to extend the hand of comradeship to all my readers. Most of them understand my gibes, and accept them in the spirit of friendly badinage. Some, however, get quite hot under the collar, and add to the gaiety of my life by scrawling a bitter letter to me disagreeing with my views on this, that or the other. There is substance here for a New Year's resolution on the part of these readers. However, it is pleasant to hear the flattering things which are said at club dinners about the Press. It is realised that it is the Press which keeps the movement together. An industry or a hobby gets the press it deserves, and it is the wireless constructor who has made the wireless press what it is—the first reader to send me a rude answer to this is sacked!

The Past Year

This, indeed, has been a momentous year, one of alarms and excursions, finally culminating in the declaration of war towards the end of Radiolympia. The cloud of doubt ruined the best show of the lot, and caused it to close down before it had run the usual course of its life. The radio trade has had a bad time, although there are signs, judging from the re-introduction of hire purchase, that it is reviving. Amateur wireless transmitters have had their licences cancelled and their transmitting sets confiscated. The Baird Company has suffered a knock-out blow, for the television transmissions have ceased for the duration of the war. Journals, too, have had their difficulties, but we are encouraged by the continued interest shown in radio construction, as evinced by our net sales, to continue. This, in spite of rising costs and the inevitable problems which a war brings to journals of this character. We are on the threshold of a new year. We can but hope that another Radio Show will take place in 1940, which means that the war will be over soon.

Midget Receivers

I HAVE received the following interesting letter from A. C., of Rossendale, Lancs:

"From time to time various concerns have produced portable receivers of reasonably small dimensions—one or two sets were really in the 'pocket' class—but for some reason really little attention has been paid to the design of a midget battery receiver.

"In the United States, of course, there is a great business in the sale of A.C.-D.C. midget sets at about 30s. to 45s., and it is difficult to understand why our British manufacturers have never been able to cater for the low-price market.

"I suggest that there is a real need for a pocket portable at present, when so many thousands of people are taking part in some form of National Service. Broadcast programmes are popular with both British and French troops. As one report from Paris states:"

"Music has not been, as in 1914, the first victim of the war. The opening roar of the cannon scattered the startled muses. To-day, music goes with the soldiers to the battlefield. Thanks to the radio, the artistic life of a nation is no longer stifled by the crash of arms. Above the military trains, the convoys of supply, the transmission of the wave trains is uninterrupted. They travel, invisible in the air, to ensure the intellectual replenishment of the peoples.

"The receiving sets can carry to the very edge of the battlefield the comforting, cheering voices of artists who formerly could only occasionally reach the units behind the lines. . . . Just as one sends the soldiers at the front packages filled with good things, so art in its most familiar form gives our defenders a moment's diversion."

"These gifts will certainly be most welcome, but even the smallest commercial portable provides loudspeaker reception and is too big to be taken everywhere.

"Is it impossible to design a low-priced pocket receiver, strong enough to withstand normal use, operating from dry batteries for H.T. and L.T., and providing reception on small headphones?"
HERE are few spheres of life into which music, in some form or other, does not enter. Nor is there a function or a celebration in which it does not have its allotted place. Whether it be a King's coronation or the Maypole dance, the gathering in of the harvest, or the celebration of marriage nuptials; each and all call on music to play an important role. So with Christmas approaching, it may not be unseasonable if we consider the part it plays in the great annual festivity in the life and faith.

It would be impossible to talk about Christmas music without introducing a reference to its great twin event, Easter, as it would be to write about winter without mentioning summer. Not by way of critical comparison, but simply because it seems inevitable that we should. We all know that Christmas is a festival of rejoicing, whilst Easter is one of mourning. Consequently, the music for the two occasions is naturally of a vastly different character. But that is not the half of it. I think that much more than meets the eye. The religious nature and significance of the two rites govern the character of the music used in each. What is the first thing that strikes us about their music, when looked at in retrospect, as it were, and quite without prejudice or favour? Simply this, which is of profound significance. Christmas is a festival of rejoicing. It is the great carrying of the yoke. It has the widest possible ramifications from turkey to crackers, and mistletoe to mince pie. Everything is spontaneous, natural and free and we do as we darned well please. And we do it because we want to do it, unlike Easter, when we do things rather more because we've got to do them. The festival is completely informal and spontaneous/in spite of certain preparations and formalities, much more so than Easter. The result of all this on the musical side of the celebrations is inevitable.

The Christmas is consequently stamped with an informality and a spontaneity which are wholly lacking at Easter. Not only does the religious side of the ceremony lack the formal great masterpieces that Bach and Handel gave to the spring occasion, but the very joyousness of the season sets the whole people music making as part of their merrymaking. Which leads me to the core and root of all Christmas music—the Carol.

Carols

What would Christmas be without the carols? No matter how atrocious the vocal effort and regardless of the venality of some of the youngurchins who make sport of the occasion, and are quite oblivious of the true meaning of their chants, what would Christmas be without those "Noyles" and "Whilborne Shepherds' Watch," glibbed and croaked through the letter box? What if we were not summoned from our beds by the memories of the innumerable knok? Not quite the same, surely. Celebrants in hotels or restaurants must surely miss a vital part of the season through missing these young ritualists, who have been a part of the English winter mythology for ages out of reckoning.

Carols (the word Carol is derived from the French generic name Noel) have had a long and chequered history. They first came into use in the church service when Latin ceased to be the language universally understood and spoken—presumably at the time of the rise of our modern national dialect. St. Francis of Assisi is said to have designed the first examples to stimulate greater enthusiasm in church services than the long Latin sequences would generate.

Classification

Rickett divides English carols into groups according to their subject matter. The earliest dealt with the Nativity, the Incarnation and the Annunciation. Then came the Shepherd and the Epiphany groups followed by those of Christmastide, Visitation and Rosary. Although most of the best carols have come from the Continent, there are many English songs by Byrd, Gibbons, Lawes, and other masters of Elizabethan and Stuart English music. The "First Nowell" is only a portion of a long harangue, and its constant repetition gets very monotonous. "God Rest You Merry, Gentlemen." is a splendid tune, which used to vary with political "moods" in the eighteenth century. "Remember O Thou Man" (1811) is also a very good one. A very early one is "The Bear's Head in Hand Have I" (1821), and it is sung every Christmas in front of Queen's College, Oxford.

A large number of folk-song carols are based on mystery plays and pageants, notably the "Cherry Tree" carols, the "Carol and the Crake," "Joseph was an Old Man," "Dives and Lazarus," and "Three Ships," etc. English carols have suffered strange vicissitudes. They began as popular songs of great beauty, and up to the time of the Reformation—a time of Catholic piety such as we see to-day in any Roman Catholic country—the Virgin and Child was the favourite theme. Henry the Eighth's arbitrary rule in the sixteenth century and lasting effects on the temper of the country, caused a loss of joy and spontaneity to them—they became didactic. The Puritans also discouraged them altogether, whilst the Restoration had little effect. But they came back to some favour about 1700 and were more or less stabilised as a hymn for church performance—this being the final test of their quality. "While Shepherds Watched" would be typical of the form which they permanently assumed from then onwards. Perhaps the most beautiful carols are to be found in the lullaby and cradle song categories, the palm going to those originally written in Germany, owing to the facility of their harmonies and the beauty of their language. There are many collections and an extensive bibliography. Much research has evidently been given to the subject.

Amateur Talent

Carols, however, are surely at their best when, to a Christmas card set of frost, the music from the local minstrel collects in bands or choirs and goes out on its joyful ways singing, with sincerity and skill, for the benefit of deserving charity and to the pleasure of those inside and around their fire. A knock on the door nearly gets politely answered and the request for charity generously responded to, but a glass of port and a mince pie are not infrequently the carolers' reward. Also, we seldom get this notice in London, nowadays. It is many years since I can remember seeing it—fourteen miles from Charing Cross. I hope the custom has survived in the country—we can ill spare to shed more of these pages of Old England's story. But what chances would there songsters have on our modern arterial roads, and in the crowded areas of suburbia? Tip and the run is the order of the day there, and unaviodably so, I'm afraid.

King's College, Cambridge, have provided us in recent years with by far the best carol singing, and it has been among the best radio items on Christmas Day for many seasons. I cannot say if we are to enjoy these famous choristers again this year—probably not. But keep a look out for their next programme for them, and if you haven't heard them before, do join them. If you have, then I know you'll be switching on.

PROGRAMME NOTES

Strausses Galore

C Y WARRACK has chosen some of the music he most loves for the concert which he will conduct on December 23rd. Moreover, it has all been composed by members of the Strauss family. It begins with the overture, "Fanny Elsler the Dancer," by Johann Strauss (son) and followed by Old Viennese Dances, by Oscar Strauss; the Group, "Where once lads on bands or choirs and goes out on its joyful ways singing, the Gipsy Queen," by Emil Straus; the popular old tune, "Old China," by Johann Strauss (father); and the best known of all, "The Blue Danube" Waltz, by Johann Strauss (son).

Dream Come True

This story gave uncomfortable feelings to the people who heard it: Mrs. Rudolph Pribord, wife of the WLM staff artist, woke up one morning recently in tears, after a dream that her brother, a German citizen, had been drafted into the army at home and wounded in action. Early this week she received a letter from Germany. It said that her brother had been drafted for army service and several days after hostilities began was wounded.
A 2½-watt Battery-operated Amplifier

Owing to Previous Copies Being Now Sold Out, the Following Details are Reprinted by Request

WING to amplifiers being so often associated with high-power outputs, it has become common to think of them as being essentially mains operated; therefore, in view of this and the number of requests received for a battery-operated outfit, the unit mentioned above has been designed. To the many readers who have made such requests and who may require something different from that given below, we would draw their attention to the latest edition of "Sixty Tested Wireless Circuits," wherein will be found much valuable information, together with complete circuits, concerning amplifiers and their design.

The first consideration with any battery-operated apparatus is current consumption. The second, at least so far as amplifiers are concerned, is the output obtainable. Bearing in mind the fact that these two requirements are very closely related to each other, and that dry H.T. batteries are likely to be the source of nodal current supply, limits to suit both factors had to be selected, and it soon becomes apparent that it is absurd to think of 4.5 watts output, as so many constructors would desire.

If one can eliminate the question of dry H.T. batteries by, say, using large-capacity H.T. accumulators or, for example, a Milos Unit, then the output can be raised considerably, but even so, one cannot soar to the large outputs obtainable from some of the mains-operated "power" amplifiers.

So many pick-up enthusiasts appear to have the impression that unless an amplifier can deliver, say, 5 watts of undistorted output, it is not worth considering for record reproduction. Well, I suppose it is a matter of personal taste, but bearing in mind that one is usually concerned with using the equipment in a room of average size, I would suggest that such power is out of all proportion.

From the reproduction point of view, by which I mean judging purely, I maintain that an output system capable of handling 2 watts is more pleasing, when it is fully loaded, than a 5 or 8 watts outfit with the volume turned to the same output.

However, whatever the pros and cons of the case may be, it is always wise to remember that the ear is not too critical as regards intensity of sound when considered from the point of view of watts. For example, it would take a very experienced ear to differentiate between 3 and 5 watts output; therefore, I have selected a happy medium, remembering other limitations, and decided on an output of 2 ½ watts.

The Circuit

The valve sequence is one L.L.2, which has an amplification factor of 30, feeding into two pentodes, P.P.225's, arranged in quiescent push-pull, the coupling being provided by a Varley Q.P.P. transformer type D.P.36 which is parallel fed to allow the utmost inductance to be obtained from the primary winding to ensure a good bass response.

The normal output of one P.P.225 with 135 volts on the anode and auxiliary grid, and with its grid biased 12 volts negative, is 1,000 milliwatts, or 1 watt; therefore, with two in the above output circuit, it is safe to estimate that at least 2 watts will be obtained, provided the anode and bias voltages are correctly adjusted.

The current consumption of the L.L.2, with 135 volts on its anode, is approximately 3 m.A., whereas each P.P.225, under normal working conditions, will draw as much as 18 m.A. in the anode circuit, and 2 m.A. in the auxiliary-grid circuit. These figures at first sight seem rather drastic for battery operation, but one must not overlook the fact that with Q.P.P. output the two P.P.225's are so heavily biased that their standing current becomes very low and large current surges only take place during the handling of powerful passages in the input signal.

It is impossible to go into the whys and wherefores of Q.P.P. operation in this article, but it will suffice to say that the whole secret of satisfactory output and distortion-free reproduction is the correct adjustment of the grid bias with relation to the actual anode potentials.

The output from a normal pick-up will provide adequate input for the output valves as the L.L.2 has a fairly high magnification factor, while the coupling transformer has a ratio of 4:1. So far as microphones are concerned, a lot depends on the type and their actual efficiency, and with a high sensitivity model a satisfactory output will be obtained; but with others having a lower output, such as high quality transverse current and moving-coil types, it will be advisable to provide a simple "head" amplifier in the form of, say, a good straight H.F. pentode resistance-capacity coupled to the L.L.2.

Two variable controls are provided to allow two inputs to be controlled and "mixed" before being fed into the grid circuit of the L.L.2, thus allowing two pick-ups or one pick-up and a "mike" to be used, according to individual requirements. This item is always very handy as it increases the use of the amplifier considerably, apart from giving the operator greater scope so far as results or effects are concerned.

The third control R3 is a combined

(Continued overleaf)

Fig. 1.—Theoretical circuit of the 2½-watt battery amplifier.

Fig. 2.—Panel layout and drilling diagram.

TONE CONTROL AND ON/OFF SW.
A 2-J WATT BATTERY OPERATED AMPLIFIER
(Continued from previous page)

potentiometer and switch, the potentiometer section being used as a tone control, while the switch is wired to operate all batteries. It will be noted that the tone control is really a low-note booster or high-note cut off, but the values have been selected to provide a most satisfactory variation in the tonal response, and it will be found very useful for the elimination of recorded surface or record wear. It must be appreciated, when considering this arrangement, that the natural characteristics of the amplifier are on the high side, so any additional form of high-note booster is not required; in fact, it would be detrimental.

Layout

It will be seen from the illustrations that a small simple chassis has been used to hold all components, as this allows a clear top deck to be obtained and facilitates wiring. It will be quite an easy matter to build a compact cabinet round the chassis or, if a more professional appearance is required, to make a cover to fit into the top of the chassis out of stout perforated zinc.

The transformer is placed so that the grid leads to the two output valves are short and direct, the resistance Rg being included to prevent, in conjunction with the two fixed condensers, Cs between each anode and the negative line, parasitic oscillations which are sometimes generated in symmetrical push-pull circuits.

The anode circuit of the L.L.2 is decoupled by means of a resistance and a condenser to eliminate any possible instability through battery coupling, but the anodes of the P.P.225's receive their H.T. via the output transformer. No output transformer is included in the amplifier as the majority of modern moving coil speakers are fitted with a multi-ratio transformer which usually allows satisfactory matching to be secured.

Particular attention must be given to the connecting wires associated with the two input controls. As these potentiometers are in direct contact with the input grid, it is essential to cover all connecting wires with metallised brading.

"FOR SERVICE READERS."

READERS who have relations or friends in H.M. Forces will be thanked if they draw attention to our famous contemporary "TIT-BITS" and its slogan, "For Service Readers." This page, conducted by "Nobby," who is the Service-man's Champion, is already famous. Nobby's offer of expert help is extended to A.R.P. workers and all engaged upon Service for the State. "Apart from this feature "TIT-BITS"," readers will find the brightest of all home weekend's and is the ideal paper to send "him" in the next parcel.

TELEVISION IN AMERICA

Those nations free from the rigours of war and able to maintain their television services, that is to say, the U.S.A. and Italy primarily, have apparently been studying very carefully the nature of the productions which fortunate viewers within range of the Alexandra Palace signals were able to enjoy in pre-war days. From information which has become available from various sources it has appeared very clear that the authorities charged with providing entertainment through the medium of television, and this applies particularly to America, have begun to realise that it is far better to make a really honest use of the conventions which the restrictions of television make apparent, than to make fruitless attempts to disguise those limitations by a rather lavish copy of what occurs in either the film studio or on the stage. The producers who are tackling this important problem have come to the very sensible conclusion that it is preferable to exploit fully their own analytical selection of the visual clues which the new medium is undoubtedly placing at their disposal. It has always been recognised in the entertainment world that the films have the special advantage of post-editing, but there is no reason why this factor cannot be offset by paying very careful attention to individual lighting for each item of the production in conjunction with correct continuity movement. A clear lead is established over any film record by the vitality of the television transmission, for there is the knowledge that the event is happening while being watched, and if it should occur some months previously in the form of haphazard scenes which the editor has restored to a story, with the events in chronological order. In America it has already become apparent that the probationary period of programme production is likely to be a short one, and although large talent resources will be required this has become an incentive and not a deterrent.
A Pick-up Lifting Device

The action of removing and replacing a pick-up on a gramophone record has always struck me as being bad for the tracing, and as I frequently experiment in practising this very function, I decided that in the interests of my records I would construct some form of lifting device which would provide a further advantage in protecting a piece head which I use. After weighing the pros and cons of various schemes, I hit upon the idea of using a camera release and ratchet mechanism along the lines indicated in the sketches.

This camera shutter release is very positive in action, and by adjusting the relationship of the ratchet teeth to the push of the release pin, I very seldom have to make any adjustments. The diagrammatical representation shows the essentials of the completed assembly. The inset illustration clearly defines the function of the hinged record lifting strip.

—G. J. GRIMMS (Leicester).

Turntable Illumination

Apropos the article in a recent issue of P. W. regarding turntable lighting, I thought that the following idea used by me for the past few weeks would be of interest to other readers.

I had by me an old shaving-stick case, made of a composition similar to bakelite, of which the cap screwed into the body.

I cut a hole in the cap large enough to take a miniature batten holder, as supplied by a popular store, and then drilled the flange of this cap, and also drilled corresponding holes in the base of the batten holder, this allowing small bolts to be inserted and screwed up lightly to hold the assembly rigid.

Next, I cut a window in the body of the case in such a position as to allow light from the miniature bulb (15 watts) to project.

When completed, I gave the whole assembly a coat of brown bakelite enamel, and when this had dried hard I wired the lamp to a small press switch for inclusion on the motor board of my radiogram—W. CRUCCCH (West Wickham).

A Calibrated Scribuing Tool

As I do a good deal of home constructional work, I thought it would be well worth my while if I made a calibrated scribuing tool having inch and fractional markings. As a steel rule offered considerable difficulties, so far as drilling was concerned, I decided to go to a little trouble in carefully scoring a brass strip down to 1/16 of an inch.

After slightly shaping one end after marking and stamping the scale—the scoring being carried over one edge, as will be noticed in the accompanying drawing—I then drilled a small hole into which would finally be sweated the brass fluted needle holder. To observe the necessary degree of accuracy, I made sure that the centre of the hole corresponded to the exact centre of the zero inch mark.

Two 18 gauge brass guides, one screwed to the wooden handle, the other free to move up and down the scale and handle, were soon made, and the finished job proved interesting to make and practical in use.—R. C. WENDRUP (Hanworth).

Bandspread Adjustment

The problem of finding exact settings for a band-set condenser, which, to be fully effective, should be varied in steps, was overcome by me in the following manner. I took a standard small-capacity condenser and mounted this on the chassis—not on the panel. An old three-inch tuning dial of bakelite was then cut as shown in the accompanying illustration. If desired, of course, a disc could be cut from sheet bakelite about 1/8 thick to the desired size. A small spring stop device was next cut as shown in the separate illustration, and this was screwed to the chassis on the under side so that it engaged in the notches cut in the edge of the disc. The position of the condenser and the size of the disc are chosen so that a small section of the disc will protrude through a slot cut in the front panel. This portion of the disc is then engraved, and enables the condenser to be adjusted by the thumb and exact settings repeated.—T. HELST (Romford).

A simple bandspread adjusting dodege.
The design of pocket-receivers can cover many novel features, but generally speaking the true pocket set is only possible when Midget valves and special parts are employed. Even so, the accommodation of suitable batteries then brings the total dimensions rather beyond anything but a large coat pocket or similar receptacle. If, however, the batteries can be separately accommodated then quite reasonable pocket sets may be made up, even using standard parts. We recently described a one-valve built into a cigar box, and in an endeavour to see just what could be done with this type of box we carried out one or two experiments, and an interesting two-valve which was included in these is illustrated on our cover and described in this article. Standard parts were to be used and a selection of standard cigar boxes was obtained. These varied considerably in shape, but a very useful size was that used for 25s., and this measured 5 in. by 3.5 in. by 1 in. deep. This just enabled two valves to be accommodated comfortably in standard baseboard-mounting valve holders at each end of the box, with sufficient room between them to take a small transformer and the two variable condensers.

The question of a coil was solved by using the Bulgin Midget coil, and this was bolted to the top of the box—the relative positions of these parts all being indicated in the cover illustration.

Battery Problems
This, therefore, only leaves the problem of the batteries, and one easy way of overcoming this is to have a similar box in which may be placed a small jelly-type accumulator for L.T. with three or four G.B. batteries connected in series for H.T.

If the receiver is just required as a novelty, then standard batteries could be used in the ordinary way. Leads for the batteries are brought out from the case through a suitable hole, and two-socket strips are mounted on each side for aerial and earth and for 'phones. The cigar-box wood is generally of cedar, and although very thin is easy to cut, and when cleaned down will take a very good polish or may be left in its natural state. The labels are generally well fixed, but a damp cloth pressed on them will enable them to be cleaned off without warping the wood. Do not use too much water, and do not use coarse sandpaper to clean down as this will scratch the soft wood and spoil the surface. Be careful not to damage the cloth lining, as this is also attached with glue and will not stand up to misuse. When cleaned, drill the two holes in the front (which is actually the bottom of the box in question), using a twist drill to avoid tearing the wood. At the sides drill accommodating holes for the socket strips and then attach valve holders, coil, transformer, and socket strips with short bolts. The wood is too thin to permit of satisfactory screening, if desired valve holders may be wired up—from the filament point of view, before attachment, although it is possible to get at the various terminals if the position which we adopted is followed. This is shown in the illustration below. Wiring may be carried out with insulated solid wire, or ordinary flex, and is quite a simple matter.

Wavechange Switching
To avoid the fitting of a wavechange switch, the continued operation of which might result in splitting the thin wood of the box, we adopted a crocodile-clip method of wavechanging. A short length of wire is attached to the earth connection on the coil and the clip is attached to the earthed terminal of the tuning condenser when long waves are being received. This is merely to keep the clip from dragging loose and perhaps introducing a short circuit or other trouble. When medium waves are being received, the clip is attached to connection point No. 2 on the coil. The numbers, incidentally, will be found stamped into the coil-former close to the small eyeplets. If the small-coloured leads on the coil are not long enough, or you desire to preserve uniformity in the wiring, you can unsolder them and attach separate leads. The fixed condensers and grid-leak are joined to the appropriate terminals and the normal wire ends may be used. This is the suggestion we make use of standard mica condensers with terminals, short leads may be attached to them.

The battery leads should, of course, be long enough to reach to the battery box, or position in which the batteries are to be kept. An on-off switch has been omitted for the same reason as the wavechange switch, and the set is switched off merely by disconnecting the L.T. negative lead from the accumulator. Alternatively, a suitable switch may be mounted on a small strip of chonite, with a strip of metal attached to one terminal of the switch and drilled to accommodate the terminal on the accumulator. The lead is then attached to the remaining switch terminal and thus on-off switching may be carried out in the usual way.

If you are interested in making a more comprehensive job of the receiver then automatic bias may be provided by including a suitable resistance with by-pass condenser in the H.T. negative lead in the usual way. This will entail the fitting of an anchoring screw so that the lead may be attached and the secondary of the transformer connected to the H.T. negative lead. Any type of aerial may be used, depending upon the results desired. If selectivity is an important point in your locality, use a small aerial. This may be a length of flex in the form of a throw-out aerial, about 20 ft. being adequate. If a full-size outdoor aerial is connected to the set then selectivity will naturally be rather poor and a series-serial (Continued on page 312)
Loudspeaker Improvements

How to Obtain Increased Volume and Better Reproduction by Using a Wall-mounted Baffle.

Constructional Details are Given in This Article

By FRANK PRESTON

A s most readers are fully aware, speaker reproduction can generally be improved by transferring the listening unit from the comparatively small receiver cabinet to a good-sized baffle board. It is not as widely known that by this same means it is possible to obtain a greater useful volume of reproduction from a given input. In very many instances an improvement in the speaker mounting will give results as good as those to be obtained by adding an additional amplifying valve.

The Baffle Board

The blocks of wood used for mounting can be made from planed timber measuring about 2in. by 1in., by about 4in. long. They are best made from a single length because this simplifies the work of making the baffle. To mark out for this measure in. (or the thickness of the wood) from the corner at each end and draw a line down one face as also shown in Fig. 2. The corner can then be planed off. Bore a couple of 3-in. holes in each of the four pieces and countersink these for the screw heads. By holding the blocks in place against the wall the positions of the screw heads can be transferred by pushing screws through the holes or by means of a bradawl.

At the eight points marked the wall should be drilled to receive Rawlplugs of the correct size for 1½ to 2in. screws. As an alternative, they can be made in the wall by means of a wall drill or narrow cold chisel; wedges about 3in. long by 1in., thick at their wider end can then be made and driven into the wall. The wedges should be only slightly tapered.

During the past few years it has, unfortunately, become customary to build the speaker into the set, instead of using it as a separate unit. This might be a convenience but it is not conducive to high efficiency. One of the best speaker arrangements consists of a large shallow, open box, standing on end, with the speaker unit mounted in the centre of the front; this should be heavily and rigidly built to ensure complete absence of vibration. An objection to this form of construction is that the speaker becomes cumbersome. Another is that in many cases it is not possible—because of its size and weight—to place it in the most satisfactory position in the room.

Large Baffle Area

A better method, which is generally applicable, is to use a large baffle, which is mounted in a corner of the room between the two walls. The baffle board should consist of stout plywood and should be mounted in its centre at a height of about 4ft. It has sometimes been suggested that the speaker baffle of this type may be suspended with cords from the picture rail. This is seldom good practice unless the complete assembly is very heavy and rigid and, preferably, built as an enclosed box of triangular section. My preference is for a baffle board about 3ft. 6in. square firmly fixed to the walls.

One sound method of mounting is by screwing four wooden blocks to the walls, and screwing the baffle to these. The blocks should be shaped and arranged as shown in Fig. 1, where it will be seen that they are not of rectangular section but have one edge bevelled so that it makes an angle of 45 degrees with the wall. The simplest method of finding the correct position of the blocks is to bevel the two upright edges of the baffle, as shown in Fig. 2, and then holding the baffle in the corner and at the correct height so that its position can lightly be marked on the wall with a pencil.

Fig. 1.—How the baffle may be arranged in the corner of the room.

Fig. 2.—The edges of both the baffle board and the mounting blocks are bevelled as shown here.

To fit the baffle board it is necessary only to bore a hole about 3in. from each corner and in the centre of each edge, countersink the holes and mount with screws about 1in. long. A better appearance can be obtained by using so-called fancy screws, the heads of which are drilled and tapped to receive a short parallel-sided screw with a decorative head.

The Baffle Board

In choosing the wood for the baffle it is obvious that the plywood should be faced with a wood which matches the furniture in the room—often oak or mahogany. If this is not possible use first-class alder plywood, which can be well rubbed down and later stained and polished. For a baffle up to 3ft. square, ¾ min. (about 8in.) plywood is suitable, but for larger sizes it is better to employ seven- or nine-ply, which is between 8in. and 9in. in thickness. In the first place, the baffle should be planed perfectly square, and then the two upright edges may be bevelled. After that, the fret or hole should be made in the centre. Actually, it is better and easier to make a simple hole rather than to do any fretting. Since the speaker unit will probably be mounted on a small and separate board, the hole can be of any shape, but either circular or square will usually be preferred. This is easily cut out after finding the centre by drawing two diagonals.

Decoration

Whether the hole is to be round or circular it will be cut out with a keyhole or saw, as shown in Fig. 3. A 1½in. hole should be made inside the marked-out line in the case of a circle, or four such holes should be made just within the corners for a rectangular hole. After sawing, the edge

(Continued on next page)
LOUDSPEAKER IMPROVEMENTS

PRACTICAL WIRELESS

December 23rd, 1939

Remote Control for Television Cameras

CONSIDERATIONS of space often make it difficult to accommodate a large television camera and an operator at a point from which a scene has to be viewed. This difficulty can be overcome by arranging for the camera to move under the control of a view-finder observing the scene from a more convenient point at which an operator can be stationed.

The accompanying illustration, Fig. 1, shows an arrangement of this kind. It will be seen that the two mutually perpendicular motions of the camera 1 mounted in the gimbals framework 2 are conveyed to a remote view-finder 3 by means of flexible cables or shafts 4 and 5. At the view-finder the flexible shafts control the positions of the two independent cross wires 6, 7, which are within the field of view through the eyepiece 8, their point of intersection indicating the centre of the field of view of the camera. Alternatively, the flexible shafts may control the direction of the whole view-finder in which a rectangular framework would indicate the field of view for the lens being used.

A View-finder Improvement

An improvement upon the view-finder is shown in Fig. 2 in which the cross wires are accommodated in a subsidiary optical system 1 and superimposed upon the scene visible through the aperture 2 by means of a half-silvered mirror 3. The advantage of this arrangement is that a lens 4 may be included so that both cross wires and object would appear in focus simultaneously.

Although cross wires have been shown, it is preferable that illuminated slots with a black background should be used in practice, so that the auxiliary optical system will not reduce the contrast of the scene being viewed. Further, as an alternative to two intersecting lines, a gimballed mechanism may be devised which is controlled by the flexible shafts, and which carries a flag (such as a circle of wire) covering the centre of the scene being transmitted.

In the reverse arrangement, handles would be attached to the ends of the flexible shafts at the view-finder, and their manipulation would control both movement of the camera and position of cross wires.

It is obvious that instead of the flexible shafts, alternative methods of comminuting the movement of the camera may be employed. These methods include Bowden wire mechanisms or an electrical follower arrangement.

PRACTICAL WIRELESS

ENCYCLOPAEDIA

By F. J. GAMM

( Editor of "Practical Wireless")


Wireless Construction, Terms, and Definitions explained and illustrated in concise, clear, language.

From all Booksellers, or by post 6/- from George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.
Impressions on the Wax

A REVIEW OF THE LATEST GRAMOPHONE RECORDS

Parlophone

PATRIOTIC songs, old and new, are being issued by Parlophone on 78s. One of the more recent is "Loose Lips Sink Ships," by Victor Silvester, who has been heard on the wireless. "The Yanks Are Coming," too, is on 78s, sung by the British Grenadiers. "Footprints of Time," sung by Roland Farrow, is also on 78s.

Take Your Choice

HARRY ROY and his orchestra have made three new records this month. "You Can't Hurry Love," "Out of the Rag Bag," and "That Aint No Grand March." These records are typical of the Roy Roy style.

Variety

Leslie A. Hutchinson ("Hutch") sings a popular song of the moment. "I'm Right Here," by Parlophone, is the latest in the variety field.

Decca

FEATURING DECCA, the famous label with its wide variety of artists, has produced another excellent record. "The Night before Christmas," sung by Adele Basden, is a favorite with children and adults alike.

ELECTRADIAX

Our Parcels of Experimenters' Oddments at 5/- Post Free are a Bargain.

Disc Recording for Motorists.

Our disc recording for motorists is now available. It is a 78-rpm disc with half-hour lasting, and is designed for use in cars. The disc has a special holder that fits into the car, and is easy to use. It is available in a variety of styles and colors, and is sure to please any motorist.

Crystal Set. No need to worry about static. The Crystal Set, made by Decca, is a perfect solution. It is simple to use and can be enjoyed by all ages.

Non-Trembler. For those who prefer a non-trembler effect, Decca offers the Non-Trembler set. It provides a steady, clear sound and is ideal for those who need a calm, relaxing experience.

Remote Control. For a more advanced setup, the Remote Control set by Decca is available. It allows you to control your music from anywhere in the room, making it perfect for parties or gatherings.

Polaroid Cameraphones. Decca also offers the Polaroid Cameraphones, which take photos and record audio simultaneously. It's perfect for capturing memories and sharing them instantly.

Decca's wide range of products ensures there's something for everyone. Visit your local Decca store today to see the full selection and find the perfect product for you.
LATEST PATENT NEWS

Abstracts Published.


A diode and indicator point, particularly for a radio receiver, comprises a source of radiant energy, emitting a high proportion of waves towards the violet end of the spectrum, for illuminating the diode or the pointer either of which are coated with luminescent material, for example, a composition having a radiant content or a phosphorescent paint. Thus, the whole diode may be coated with phosphorescent paint and then coated, for example, blackened, to leave luminescent scale indicia exposed, or a glass scale to be illuminated from behind may be formed by coating the back thereof with black material except at the scale indicia and then coating the whole back surface with phosphorescent paint. A glow discharge tube with a luminescent blue gas is preferably used as the source of radiant energy.

INDICATING DIALS AND SCALES; ILLUMINATING.—Hauzermann Vereinigte Fabriken für Chemiker Geyser und Metallwaren Ges. No. 507556.

An edge-illuminated scale for watches, clocks, measuring apparatus, tuning scales for wireless apparatus, etc., is lit from one edge only and comprises a front transparent plate, bearing the matter to be illuminated, spaced approximately \( \frac{1}{2} \) mm. from a dark background plate to which it is secured peripherally by a raised edge or border. When thus applied to a tuning scale for a wireless receiver, a front transparent plate A of glass, mica or synthetic material (accompanied by illustration) has the scale indicia, D, E, printed on its front or rear surface and is secured to the back-plate B of glass, metal, synthetic material, etc., by a raised border C, for example, of Chatterton's compound. The back-plate of glass, is rendered opaque or translucent except along strips F lying behind the wave-hands S and E through which a luminous tuning spot or pointer moving behind the rear plate may be seen. The several wave-band scales E and F of station names D may be differentially coloured.

NEW PATENTS

These particulars of New Patents of interest to radio are selected from the Official Journal of Patents and are published by permission of the Controller of H.M. Stationery Office. The full Patents can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. weekly (annual subscription 12s. 16d.).


Specifications Published.


51486.—Philco Radio and Television Corporation.—Wireless receiving circuits.

51490.—Telefunken Ges. Für Drahtlose Telegraphie.—Aerial systems.

51499.—General Electric Co., Ltd., and Hunter, S. G.—Driving means for the tuning-indicators of wireless receivers.

51491.—Baird Television, Ltd., and Nuttall, T. C.—Television and like systems.

51493.—Electrical and Musical Industries, Ltd., and Percival, W. S.—Reduction of interference in electric signal transmission systems. (Addition to 467263.)

51499.—Fersch Akt. Ges.—Television transmitting-apparatus.

51454.—Baird Television, Ltd., and Nuttall, T. C.—Television and like systems.

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at the uniform price of 1s. each.

A COMPLETE LIBRARY OF STANDARD WORKS.

By F. J. CAMM.

PRACTICAL WIRELESS ENCYCLOPEDIA 6/-, by post 6/.

EVERYMAN'S WIRELESS BOOK 5/-, by post 5/.

TELEVISION AND SHORT-WAVE HANDBOOK 5/-, by post 5/.

SIXTY TESTED WIRELESS CIRCUITS 2/6, by post 2/10.

WIRELESS COILS, CHOKES and TRANSFORMERS and HOW TO MAKE THEM 2/6, by post 2/10.

PRACTICAL WIRELESS SERVICE MANUAL 5/-, by post 5/.

WORKSHOP CALCULATIONS, TABLES & FORMULÆ 3/6, by post 3/6.

PRACTICAL MECHANICS HANDBOOK 6/-, by post 6/.

All obtainable from or through Newsagents or from Geo. Newnes, Ltd., Tower House, Southampton St., Strand, W.C.2.

VALVE ECONOMY (Continued from page 295)

No doubt various circuits will suggest themselves to the experimenter, but one idea which has been proved effective is to use the valve as an amplifier and rectifier, and to insert a contrast expander circuit to take the place of two separate valves. Here the double-cathode type is most suitable, and, in fact, is essential for stability and correct working. The signal is fed into the first triode section which is treated as a separate valve, having the usual bias resistor in the cathode lead. The second section has grid and anode strapped to enable it to act as a rectifier and the load resistance is then included in the cathode of this particular section. The output is then applied to a variable-mu valve to which the input is also fed, and thus the desired combination for effective contrast expansion is obtained. The arrangement is shown, in skeleton form, in Fig. 4, exact values of components depending upon the particular valves which are employed.

Two-channel Mixer

One final circuit will suffice to show how these dual valves may be usefully employed. For home-broadcast performances, or even for small public-address equipment, it is desirable to employ an input mixing circuit so that two pick-ups or a pick-up or microphone may be used. In the usual way this is accomplished by connecting a volume control across each component and feeding the grid of a single valve. A more effective circuit is shown in Fig. 5, however, and in this the dual-triode is again employed. It will be seen that the output from one instrument is taken to one of the grids and the output from the other instrument to the second grid, the resultant output component present at the two anodes then being fed to the output coupling condenser through the usual load resistances and decouplers. With the type 6N7 valve the voltage gain from each grid is approximately 9, and thus it will be seen that this is a very effective circuit to employ on the input side as compared with the more usual single triode arrangement.

There are certain characteristics present in some of the dual-triode valves which render them very suitable for use as single triodes, for which purpose the two grids and the two anodes are strapped together. For instance, in a powerful amplifier it may be desired to employ a Class AB output stage for which really good drive is required. Such an input could be obtained from a 6N7 valve and could equally be connected to, but connected as a single triode. In that case the bias resistor would be of normal rating and the valve would be regarded as a straightforward low-impedance triode.
This receiver has proved extremely popular, but all copies of the original issue are now out of print. The details are, therefore, reprinted. The receiver is shown in its simplest form, and the blueprint which is available for it shows only the bare necessities. In this condition, however, the receiver may be relied upon to furnish a most comprehensive log and under all normal conditions some really good DX work may be accomplished with it. After it has been in use for some time, however, it will be found that various little improvements may be added, and these are described in this article, so that those who wish to build the set in a more advanced form may do so.

The circuit selected is the simplest reacting detector arrangement, rather than a special circuit utilizing an S.G. or H.F. pentode valve. Although home-made coils may be used, a standard 6-pin plug-in coil is specified, but the constructor may build for himself a set of such coils taking for his data the details given in our issue dated July 24th, 1937, or which will be found in our hand-book, "Coles, Chokes and Transformers."

It should be noted that a 4-pin coil is not recommended, although it can be used. The reason is that the aerial has a marked effect upon the performance of the receiver, and a 6-pin coil permits

**BLUEPRINT P.W. 88**

As not a necessity it will be found very useful in assisting in the removal of hand capacity effects. If desired, a wooden or ebonite panel may be employed and a thin sheet of metal or foil fitted behind the panel and connected to earth. It is preferable to cut holes in this so that it does not come into contact with any of the panel components, and then to connect a separate earth lead to it.

The Circuit

**Fig. 2.—Diagram showing the bandspreading condenser is joined to the main tuning condenser.**

Reaction is obtained by means of a standard reaction condenser and winding on the coil, and a capacity of 0.002 mfd. or 0.003 mfd. should be employed. In most cases the larger value will be found of most use. A normal tubular or micro fixed condenser is connected in the grid circuit with a fixed grid-leak of 3 megohms, but again, this value may be modified and up to 8 megohms employed. The choke is most important and although it is possible to make a very efficient component at home it is recommended that a really reliable commercial choke be obtained. This will avoid difficulties due to "dead spots," erratic reception, etc.

A simple baseboard form of construction is used, as there are only a few components and a chassis is not called for. A good quality coil-holder should be used, and although a metal panel connections should preferably be soldered. The tuning condenser specified has a maximum capacity of 0.0016 mfd., but if desired you may use temporarily a 0.005 mfd. standardcondenser with a 0.003 mfd. fixed condenser in series with it. A 0.0025 mfd. condenser may, of course, be used, but will give rather more difficult tuning due to the wider wave-range covered with that capacity. A set of coils may be bought or made and with these the receiver may be used to cover all wavelengths from 9 to 10 metres up to 2,000. It is not advisable to try to use a set of this type to tune below 10 metres, and therefore, if it is desired to listen on wavelengths below 10 metres an ultra-short-wave set should be made up.

**Fig. 1.—Theoretical circuit diagram of the simple one-valve.**

Refrainments

The receiver is operated by means of a 66-volt battery and the voltage should be adjusted to give a smooth reaction control. By way of refrainments the first improvements would be the fitting of a bandspreading condenser. This should consist of a small variable condenser having a maximum capacity of about 20 mfd., and it may be mounted on the panel quite close to the tuning condenser. It is wired in parallel with the condenser, that is, the fixed and the moving vanes of each condenser are connected together, as shown in Fig. 2. When this addition is made tuning will be very much simpler.

The main tuning condenser is simply advanced about one degree at a time, and at each setting the smaller condenser is turning throughout its range, thus spreading out the waveband which each adjustment of the main condenser covers. Good slow-motion dial will be found of the utmost value in a set of this nature, as they enable the small letters of the alphabet to be seen. The movement of the condenser is made and many stations which would otherwise be missed will thereby be heard.

**Fig. 3.—How a 4-pin tuning coil may be used.**

(Continued on next page)
SHORT-WAVE SECTION
(Continued from previous page)
will be especially noticeable where two or more stations are found very close together on the main tuning condenser. A simple method of this, and the band spreading condenser will enable quite a large movement to be made with the dial to separate these stations and overlap will be avoided.

Coil Ranges
In the Eddystone range there are 9 coils of the 6-pin type which may be used, and to enable the constructor to obtain some idea of the ranges covered the following are the type numbers and the bands which are covered with a 00016 mfd. condenser:

<table>
<thead>
<tr>
<th>Type</th>
<th>MFD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>6BB</td>
<td>9-14</td>
<td>6P</td>
</tr>
<tr>
<td>6LB</td>
<td>12-26</td>
<td>60</td>
</tr>
<tr>
<td>6Y</td>
<td>22-47</td>
<td>60R-1,000</td>
</tr>
<tr>
<td>6R</td>
<td>41-94</td>
<td>60Y-1,000</td>
</tr>
<tr>
<td>6W</td>
<td>76-170</td>
<td></td>
</tr>
</tbody>
</table>

If a 00025 mfd. condenser is used, or if the 0005 condenser scheme is adopted, the tuning range will be slightly greater than the above figures, and this will obviously be accompanied by the tuning difficulty already mentioned. It is desirable in a short-wave set to provide as small a tuning band-width as possible, so that difficulties in tuning due to the close proximity of different stations are removed. Another important point regarding tuning

concerns the minimum wavelength to which each coil may be tuned. This is dependent upon the minimum capacity of the tuning condenser and an inferior condenser will obviously tune to a higher minimum wavelength.

WIRING DIAGRAM OF THE SIMPLE ONE-VALVER

LIST OF COMPONENTS

<table>
<thead>
<tr>
<th>Component</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>One 00016 mfd. tuning condenser (type 922)</td>
<td>.00016</td>
</tr>
<tr>
<td>One 0005 mfd. reaction condenser (Polak)</td>
<td>.0005</td>
</tr>
<tr>
<td>One 6-pin coil-holder (type 069)</td>
<td>.069</td>
</tr>
<tr>
<td>One 5-pin valveholder (B.T.S.)</td>
<td>.0005</td>
</tr>
<tr>
<td>One H.F. choke (type 1010)</td>
<td>.0005</td>
</tr>
<tr>
<td>One 00025 mfd. fixed condenser (tubular type)</td>
<td>.00025</td>
</tr>
<tr>
<td>One J-400 micro-ammeter (Dubilier)</td>
<td>.0400</td>
</tr>
<tr>
<td>One omegatron switch (Balzini)</td>
<td>.00016</td>
</tr>
<tr>
<td>Four terminals (Clips)</td>
<td>.00016</td>
</tr>
<tr>
<td>One wooden baseboard 8in. by 7in.</td>
<td>.00016</td>
</tr>
<tr>
<td>One connecting wire (see text) 8in.</td>
<td>.00016</td>
</tr>
<tr>
<td>Flex, connecting wire, screws</td>
<td>.00016</td>
</tr>
</tbody>
</table>

NEWS FROM THE TRADE

Varley Dry Accumulators

We recently reviewed a new type of dry accumulator produced by Varley and we are now informed that this special unit is available in a wide range of sizes. These embrace various capacities from 24 A.H. to 40 A.H. types and the smallest model is suitable for use in a torch, the actual cell measuring 2½in. in height and 1½in. in diameter. This particular cell costs 2s. 6d. and it weighs 3½ ozs. Full details of the complete range may be obtained from Messrs. Varley Dry Accumulators, Ltd., at By-Pas Road, Barking.

Taylor Electrical Instruments, Ltd.

We are informed that Taylor Electrical Instruments will continue to produce their full range of instruments during the war, and that any of this equipment in position of most models is quite satisfactory, and other types are at present in production, and delivery will be available shortly. At the moment no price increases have been announced. Additional new factory space has been taken at Slough for the express purpose of manufacturing a large and comprehensive range of precision moving-coil meters, full details of which will be released when they become available.

BOOKS RECEIVED

Modern Armaments. By Professor A. M. Low. Published by The Scientific Book Club, 274 pages. Price 2s. 6d. to members.

Everyone interested in armaments will find a mine of information on the subject in this new book by Professor A. M. Low, who is an acknowledged authority on all types of modern armaments. The subject matter is dealt with in a simple and popular manner, and is readily understandable to the ordinary reader. The book is divided into seventeen chapters covering, amongst other subjects, Explosives; Small Arms; Artillery; Chemical Warfare; Warships; Mines and Torpedoes; Tanks; In the Air and Parachutes. Amongst a host of other details the reader is told about the secret of manufacture of big guns; how machine guns and other automatic guns and rifles work; all about explosives and ammunition; how gases and incendiary bombs are made; the development and manufacture of tanks and armoured cars; all about battleships and aircraft carriers the mass production of aeroplanes; and how that wonderful apparatus, the predictor, works. There are also interesting chapters on the adaptation of weapons to peace-time use, such as the employment of gas for destroying rats and other vermin.

This book which is illustrated with several fine photographic reproductions, can be recommended to all well-informed persons who are anxious to keep up to date with the latest scientific developments in connection with armaments, and to learn how some of the modern instruments of warfare may be turned to good use in peaceful occupations.

Practical Electrician's Pocket Book

The forty-second edition of this handy book has just been published and a new section of particular importance has been included on "Life and Their Maintenance." Dr. A. F. M. Fleming, Director of Research, Metropolitan-Vickers Electric, and past president of the I.E.E., contributes a brilliant technical summary of the Industry's progress during the year. In his preface, the Editor mentions that the "Pocket Book" widened its appeal during the Great War and suggests that it will again prove of yet greater value under present conditions.
PRACTICAL WIRELESS

December 23rd, 1939

Open to Discussion

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

The "Simplest Short-waver"

Sir,—After about three years of short-wave listening I am writing to let you know how pleased I am that I built the one-valve receiver, the "Simplest Short-waver." It certainly is a fine receiver, and I can recommend it to anyone wishing to begin short-wave listening with a small outlay. I certainly was pleased to receive VS08Q's "phone" with: an 0·v·1 version of it, and a long wire aerial. In stating this I must point out that it is difficult to receive here owing to the direction of the aerial.

To encourage other listeners who wish to build a low-priced receiver from junk, I am enclosing a list of 14 mercury cell batteries here on an 0·v·1; receiver built, with the exception of the coil former, entirely of B.C. parts with balelite insulation, and retaining most of the features of the "Simplest Short-waver." The aerial in use is 23·5 ft. in height.

All continents have been received, and all stations are heard on "phone."

They include: VK4-X, VS7FA, ZC3EO, VR3ET, VE3F, VS4B, VO3NO, VE3W, W1, W3, W4, W7FBO, W8, W9, HH3, VP6MR, VP6L, VP7NS, CQ1E, W1TB, VE3K, PVX, PVY, PV7, YV1, YV5, CE5AT, SU1, SU3JR, CN1AF, CN8, VO4Q, VO2HC, ZS2X, ZS6W, PT4A, FA9, FA8. Rare European includes G2ZAB, YR5IC and P8, SV1(3), S8P(2), LY(2), ES6D, OK1SV, OH2OI and XB1A.

I also commend your correspondent in Palestine on hearing PY on 7 mc's "phone."

I am hoping your fine paper will continue to keep the spirit of amateur radio alive throughout the war.—R. Taylor (Birmingham).

A DX Log from Purley

Sir,—I append my DX log of stations heard during the last week. I hope that it may interest other readers.

10 metre amateur band: W1, 2, 3, 4, 5, 6 (13 W6's heard in ten minutes one evening).

11 metres: W2XJ1, W2XXQ (New York); W6XPD (St. Louis), W8XNU (Cincinnati), W9XLI (Superior) and W9XXA (Washington).

13 metres: W3RA, WCBX, WPLT.

16 metres: W5A, W5KB, W5PL, W5RUM (ex-W5XAR), TJWA, J3A.

20 metre amateur band: W1, 2, 3, 4, 5, 8, 9, 3ZI(2), K9DAM.

21 metres: SUZ.

22 metres: WD4T, W5B, W5RO, W5UJ.

Solution to Problem No. 376

The idea which Barclay had in mind was quite correct but it is essential to have both windings in the same plane. When connected one way round the windings will form a closed circuit and there will heat up rapidly. This was what had happened to Barclay's transformer.

The following three readers successfully solved Problem No. 277 and have accordingly been forwarded to them: M. W. Evans, Park Place, Bexley, Kent; H. V. Price, 190, Meadow Lane, Longbourn, Leicestershire; J. D. Horrell, 5J, Jasmine Terrace, Aberdeen.

Religious Broadcast Services

Sir,—I wish to express my thanks to Thuram for his remarks in the issue of PRACTICAL WIRELESS of November 18th, when he states that: "Just about the time when I am able to listen-in each evening there is usually some musical or a religious service." The number of the services on week-days is increasing, and it would seem that this religious work is being delegated by the clergy to the B.B.C. If there is such a demand for sermons and hymn singing, why do not the clergy open their churches on week-days, and give those enthusiasts a chance of queuing up for admission? A well-known local paper told us recently that these additional week-day services were for the benefit of the aged and infirm, but confirming that they take place as late as 10.30 p.m., it is probable that such people would be resting.—A. Dunollly (Newcastle-on-Tyne).

Stability

The ideal receiver should be absolutely stable on all wavebands, and this end can only be obtained by effective screening, rigid leads and proper wiring. It is seldom possible to build a receiver of high screening standards free from short waves in such a manner that when tuned to a very distant station an earthen plate may be inserted at any part of the receiver without affecting tuning in the slightest. This end can be obtained, however, if the above points are attended to, and "bells" leads, such as those to the top caps of valves, are anchored or passed through rigid screening tubing.

Directional Aerials

When using directional aerials for selective distant reception, a compass or similar direction indicator is a valuable addition to enable the exact direction in which the aerial is pointing to be determined. If such an indicator, in conjunction with a world map, is employed, it will be found that some interference from the point of view of the "bending" of radio signals due to some peculiar ground contours in the vicinity. Obviously such experiments are of great advantage on the higher frequencies.

I would also like to bring to the notice of readers of PRACTICAL WIRELESS that my friend, Ken Graves, 296, Hollins Road, Oldham, and I are running a QSL Exchange Service, and any readers who are interested, and will write to either of us, will be given a hearty welcome. This Service is to keep the "Ham Fams Burning" until post-war conditions are with us again. In conclusion, I would like to say I greatly appreciate your paper, so "carry on, PRACTICAL WIRELESS."—Frank Clements, 11, Lysted Avenue, Great Lever, Bolton.
BLUEPRINT SERVICE

PRACTICAL WIRELESS

No. of

CRYSTAL SETS

Blueprints, 6d. each...

1921

Universal Hall-Mark (HF Pen, D, Pull-Full)

A.C. All-Wave Corson Four

SUPERHERTS

P.W.74

P.W.81

P.W.31

P.W.20

P.W.53

P.W.73

Two-valve (Blueprint, 1s. each...)

1915

E.C. D.C. Superhet (Three-valve)

Universal 15 Superhet (Three-valve)

Three-valve (Blueprints, 1s. each...)

1924

Superhet (Three-valve)

P.W.57

Made Sets (Blueprints, 1s. each...)

1921

P.W.31

P.W.20

Three-valve (Blueprints, 1s. each...)

1920

Simplex S.O.W. (HF Pen, D, Pull-Full)

HF Pen, D, Pull-Full

Three-valve (Blueprints, 1s. each...)

1920

P.W.57

AE.-All-Wave Corson Four

1)0.

The Tutor Three

Three-valve (Blueprints, 1s. each...)

1920

P.W.31

P.W.20

Four-valve, 5s. each...

1920

P.W.43

P.W.45

F. J. Camm's 2-valve Superhet

New Class D "F "D.E.F." (A.C. Short-wave Converter)

CONCRETE WIRELESS

Mains Operated...

Two-valve (Blueprints, 1s. each...)

1921

F. J. Camm's All-Wave Silver Souvenir Three (HF Pen, D, Pull-Full)

A.C. D.C. Superhet (Three-valve)

Three-valve (Blueprints, 1s. each...)

1915

P.W.36

E.C. D.C. Superhet (Three-valve)

F. J. Camm's "Rapide" Valve-waver (4-valve)

Four-valve (Blueprints, 1s. each...)

1920

P.W.31

P.W.20

F. J. Camm's 4-valve Superhet

P.W.43

P.W.45

F. J. Camm's 2-valve Superhet

New Class D "F "D.E.F." (A.C. Short-wave Converter)

Mains Operated...

Two-valve (Blueprints, 1s. each...)

1921

F. J. Camm's "Rapide" Valve-waver (4-valve)

Four-valve (Blueprints, 1s. each...)

1920

P.W.36

E.C. D.C. Superhet (Three-valve)

F. J. Camm's 4-valve Superhet (Three-valve)

Three-valve (Blueprints, 1s. each...)

1915

P.W.36

E.C. D.C. Superhet (Three-valve)

P.W.43

P.W.45

F. J. Camm's 2-valve Superhet

New Class D "F "D.E.F." (A.C. Short-wave Converter)

Mains Operated...

Two-valve (Blueprints, 1s. each...)

1921

F. J. Camm's "Rapide" Valve-waver (4-valve)

Four-valve (Blueprints, 1s. each...)

1920

P.W.36

E.C. D.C. Superhet (Three-valve)

F. J. Camm's 4-valve Superhet (Three-valve)

Three-valve (Blueprints, 1s. each...)

1915

P.W.36

E.C. D.C. Superhet (Three-valve)

P.W.43

P.W.45

F. J. Camm's 2-valve Superhet

New Class D "F "D.E.F." (A.C. Short-wave Converter)

Mains Operated...

Two-valve (Blueprints, 1s. each...)

1921

F. J. Camm's "Rapide" Valve-waver (4-valve)

Four-valve (Blueprints, 1s. each...)

1920

P.W.36

E.C. D.C. Superhet (Three-valve)

F. J. Camm's 4-valve Superhet (Three-valve)

Three-valve (Blueprints, 1s. each...)

1915

P.W.36

E.C. D.C. Superhet (Three-valve)

P.W.43

P.W.45

F. J. Camm's 2-valve Superhet

New Class D "F "D.E.F." (A.C. Short-wave Converter)
Operating Mains Sets

"We are unfortunately not on the mains, but have our own electric-lighting set consisting of a petrol engine driving a dynamo which charges about 25 cells from which we get 50 volts. Is there any way in which this could be made use of for using mains apparatus as I have often wished to make up my mind to buy the Air Harrow-Hill which has so far been unable to do so."—P. H. (Harrow-on-the-Hill).

PROBABLY the simplest and most effective way of doing this would be to obtain one of the vibratory rectifiers designed to operate from 6 or 12 volts D.C. and with a suitable transformer, would deliver 250 volts at sufficient current to operate a reasonable mains receiver, if you should get one. The rectifier and transformer may be obtained from Messrs. Bulgin.

Aerial Position

"I have read an article on aerials and am desirous of knowing whether my aerial, of which I enclose a diagram, would be suitable for short-wave reception as in the article it mentions about screening. The house is well clear of other buildings and except for possible roof screening is ideally situated."—R. D. (S.B.E.).

The effective height of the aerial is the height above the nearest earthed body. As your aerial runs parallel with the roof and is supported on 8ft. poles, then the effective height is only 8ft. This is especially so as the roof immediately below the aerial is lead sheeting. However, as with many radio problems, theory and practice may not run hand in hand, and the results obtained with your aerial may be much better than those you would obtain if you used the same aerial on the 8ft. poles down in the garden. We would suggest however, that a single wire, rather than a double wire system, would be preferable, especially if your wires are not widely spaced.

Choke Coupling

"I noted a recent reply by you regarding choke capacity coupling, but in looking up some old circuits I have found a scheme which does not appear to agree with your remarks and should like to know whether you can explain the idea. It appears that the extensive circuit includes a resistance, but the anode is then joined to a condenser which is fed to a centre-tap on a choke and I am not clear how this particular arrangement works."—L. E. (Bath).

The circuit may have been drawn in the wrong direction. If you will check the phase of operation, you will find the choke is no doubt a standard L.F. transformer with primary and secondary joined in series. The condenser is fed to the junction and thus we have an auto-transformer coupling, the exact ratio of the transformer depending upon the relationship between primary and secondary and the method of joining the two windings, i.e., in phase or out of phase. Thus the circuit in question is merely a parallel-fed auto-transformer arrangement.

Bias By-pass Condenser

"Is the value of the by-pass condenser across the bias resistance included in a cathode circuit critical? I have seen 250 mfd. used in some circuits and 25 or even 50 mfd. in other circuits, and I am building a set and wish to know the correct type of condenser."—F. C. V. (Birmingham, 9).

The capacity will govern the degree of voltage regulation, which is to say, while simple types of circuit a 2 mfd. may be suitable the higher capacities are preferable. If, however, small valves and inadequate H.T. are employed, the condenser must be worth over 200 volts and while to go to the trouble of using the larger capacity as the low-noise reproduction will be poor in any case.

Heater Leads

"I am making up an A.C. receiver and am rather anxious regarding the wire to be used for wiring up the heaters. In some receivers which I have looked at I find that solid wire is used, whilst in others flex has been employed. Does it matter what type of wire is used, provided that the current-carrying capacity is ample for the heater circuit?"—H. R. A. (Teddington).

The type of heater wire that it is more easily bent to follow the run of wiring. If solid wire is employed, for a given current rating it will be heavier than the stranded or flexible wire, and therefore more awkward to twist and bend. Furthermore, the flex must be bared at the points where it makes contact with the various valvesholders in the wiring and this means that there are two junctions at each valve heater pin. This may lead to difficulties as there will be an undue thickness of wire at that point. By using solid wire of suitable diameter it may be soldered to a valve pin, insulated sleeving slipped over ready cut to a suitable length, and thus the only one joint has to be made and this is generally simpler for the amateur.

Three-range Coils

"I wish to build up an all-wave receiver as published some time ago in your paper. I am told, however, that the coils are not made now and I should like advice if you can recommend a substitute."—B. D. (N.W.9).

The coils in question have been withdrawn and there are no exact replicas now available. However, in the Bulgin range you will find some all-wave coils which you may prefer to use, or alternatively you can build up an all-wave unit with the small individual coils which Bulgin are now marketing. Theory suggests to be arranged at right-angles to each other and with suitable switching.

REPLIES IN BRIEF

The following replies to queries are given in abbreviated form either because of non-compulsory use of your folds, or because of the general interest.

M. H. (Barnet). In view of the various types of circuit which can be made up, it is not possible to give a specific reply to your question but an all-wave type may be constructed as follows:

H. E. J. (Thornton Heath). Selectivity is found to be less when a single aerial is used. A more acceptable movement could be effected by including an ordinary small variable condenser in the line. For example, with a 9th, reaction, however, tends to indicate that there may be some mistake in your coil-wrapping.

G. B. (W. 3). We regret that we cannot insert your request, and suggest you take a small advertisement for the purpose.

H. E. N. (Eastbourne). Without a type number, it is not possible for us to give connections to your tube, as we have made new copies of the type described.

W. B. (Worthing). We regret that we cannot give connections from the details given in your letter.

C. T. (Liverpool, 15). We regret that we cannot supply a blueprint of the type mentioned.

E. B. (Enniscorthy). As this is a commercial model, we can only suggest you communicate with the makers.

J. B. (Barnet). The condenser may be poor, but there may be no need to alter the coil. If, however, reactions do not prove effective add about 10 to 20 turns to the reaction winding.

C. H. (Wellington). We are sorry that we cannot identify the apparatus and thus are unable to give you any help.

E. W. W. (Gimingham). The aerial would probably be no better than a single wire system for short wave work.

R. R. (Honesbury College). The resistors cost 3d. each.

A. F. (Fishamchurch). A defective valve could give rise to the symptoms mentioned. Have you the valve changed?

F. B. (Smithwick). We have no details of the coils or circuits mentioned and the paper in which these were originally described is not now on the market.

A. J. S. (Chichester). We regret that we are unable to send a list of stations, and a complete list of all available tuned circuits is not now in our files.

A. T. W. (Badenoch). We regret that we have not described a portable of the type mentioned. We have no details of particular local conditions and therefore cannot give a guarantee as to reception on a set of the type mentioned in your home.

O. P. A. (Dissay, E.). There are two or three different ways of curving out the idea. The idea here is that a wire winding of the idea utilizes a wire beneath carpeting, etc., and a small pick-up frame is included in the usual knapsack.

The coupon on page iii of cover must be attached to every query.
THE POCKET TWO
(Continued from page 302)
condenser is then desirable to enable certain stations to be separated. The addition of the load will in some cases improve signal strength, but in many cases will not prove essential. Remember, however, that sometimes some devices be removed if an earth connection is used, whilst in other cases the earth lead will result in improved signal strength. A list of the parts is given below.

LIST OF COMPONENTS
Two Variable Condensers, 0.005 mf, type C-V19 (Bulgin).
One Midget 'C' type C-40 (Bulgin).
One Midget L.F. Transformer, type L.F.58 (Bulgin).
Two Valveholders, type V-H19 (Bulgin).
Two Resistors, 0.5 ohm, 3 watt (Duco).
One 0.002 mf Micro Condenser (Dufillier).
One 0.05 mf Tubular Condenser (Duco).
One 150 ohm 1 watt Resistor.
One Crocodile Clip, Connecting Wire, Flex, etc.
One 210 Ohm, one 220 H.P. Valve (Cosser).

PRACTICAL WIRELESS
Classified Advertisements

RECEIVERS, COMPONENTS AND ACCESSORIES

COLUMBIA RADIO'S BARGAINS
ALL GUARANTEED POSTAGE EXTRA

1—Parrot of Universal Components, complete Condenser, Resistances, Valve Controls, Wire, Cables, etc. 1 line, $2.50; 5 per cent.
15—Parrot of Universal Components, Valve Controls, Condensers, Resistances, Tubular, Wire, Glass, Glass, Glass, Wire, etc. 125 articles contained in strong carrying case, 9" x 2" x 1", the kit.
2—Small Trader's Parcel of Components. 150 pieces, various types of capacitors, Valves Holders, Resistances, Connectors, Cables, Wire, etc. 1 line, 75c; 21, the parcel.

3—100 Wire-end Resistors, assorted capacities 1 and 2 watts, 5¢ per 100.

4—Valve Controls, etc. 1 line, 5c.

5-18 Rangefinders (Volts and Milliamperes), 4", Diamond Loud-speaker Units, 5", Crystal Lens, 5", Wondertube Types W-2, 2", Tetrasonic Midget Iron Core Cuts, 4", Step-up Transformers, 10-50 Volt, 7", Midget Electrolytic Condenser, 500 volts, 1/2", Crystal Detectors, 2", Crystal, 6", Resistors 5V, resistors.

6—20" or Instrument Carrying Cases, extra.

7—Government Stock; Wood 9" x 2", size, 5 c.

8—Special Offers, Portable Tour Radio, 15v., 2½" per 100; 25v. and 35v. 17½ per 100.

CARETHERM 100, 40, Li'l Lieve Street, W.C. G errard 6602.

VAUXHALL—All goods previously advertised are still available; send now for latest price list, etc.—Vauxhall Villas, 126, Stree, W.C. 2.

BANKRUPT BARGAINS. Brand new 1929 models, specially reduced, many in excellent condition, at prices only 40 per cent. Below listed prices; also, Midgets, fighters, radio, sound 140, spares, for sale. Brand Bargains, Dept. P.W., 2013, Duffield Road, Arson, Bletchley, Buckingham.
PRACTICAL WIRELESS

RECEIVERS, COMPONENTS AND ACCESSORIES

EPROM EX CINEMA PUBLIC ADDRESS MOVING-COIL SPEAKERS. 16w. con. 20w. speech coil, 6-watt field. 27$ each.

WESTINGHOUSE 16-SPEAKER, 765 RECTIFIERS. 200 volts, 100 ma. m.p.o. output (new), 760$ each.

WESTON (242) STANDARD TRIMMERS. 1 mfd. range 0 to 5 mfd. 20-50 volts, 50-250 volts.

FILLIOD MOVING-COIL 0 to 3 Amp. TESTING SET. Includes d.c. ammeter, 0 to 15 amp. and a.c. milliammeter.

G.E.C. 100 volt, H.P. D.C. MOTORS, 1,700 r.p.m. In good condition, double-ended spindle, 126$ each.

PHILIPS MAINS TRANSFORMERS. Input. 200-240 volts output. 200 volts 200 ma. also 2 1/2 l. winds, $29.

STEEL CABINETS. Series B, for transmitting or power amplifier racks. Size: 40 x 24 x 16in., 126$ each.

ELECTRIC LIGHT CIRCLE METERS, for sib-lighting, garage, etc. 200-250 volts, 50 volt. supply. 10, or 20 amps. 6-Q each post.

G.E.C. A.C. AND D.C. MOTORS, 1 h.p. 25 volts, 3 phase, but suitable for re-winding to local supply mains voltage (double-ended shaft). 26$ each.

WESTON (241) AND E. TUNER (295) SF DIAL MOVING-COIL MILLIAMMETERS, as new, 0 to 5 ma. and 0 to 50 ma. $25 each. 25-30 volts.

METERS, EXO. ELECTRIC, automatic exchange, condition as new, small size, suitable for home or office use, price (boxed). 25$ each.

ELECTRICITY CONDENSERS. 8 mfd., 350 v., 400 v., 600 v., 1000 v. 25$ each.

Mains Transformers (Auto. wind). 12 month's guarantee, 100/100 to 200/200 volts. 25-30 mfd., 500-750 volts. 26$ each.

HIGH VOLTAGE TRANSFORMERS for Televisions. Output. 10,000 volts, 1 ma. 255-5 volts. 250,000 volts secondary, enclosed in petroluem jerry can. Each post. 25$ each. 15 volt, 0.125 mfd. 5, post. 66$.

T.T. MOVING-COIL MODEM, 0 to 50 ma. and 500 ma. 25$ each.

EX-O.P.D. GLASS TOP RELAYS. Type B. £9 each post.


PREMIER BATTERY CHARGERS for A.C. MAINE. White, 100 watts, high voltage, for radio and ready for use. To charge 2 tubes at 4 amp. 11/2 each.

PREMIER SHORT-WAVE CARDS. All types, 250 ma. 26$ each.

MACKIE MOTOR GENERATOR, 220 volts 2.35 amps. 150$ each.

MEXICAN MOTOR GENERATOR, 220 volts 2.35 amps. 150$ each.

STANDARD TELEPHONE MAINS TRANSFORMERS, input 250/250 volts, output 250/250 volts 300 ma. 3 amp. 5 volt windings and a 50 volt winding, 126$ each.

STANDARD TELEPHONE CONDENSERS, 1 mfd. 400 volt W.G., 44 each, or for 1/- 13 mfd. 400 volt W.G., 64 each. 1 mfd. 1,000 volt test, 57 each.

STANDARD TELEPHONE WIND DYNAMO. 100 volts 4,750 r.p.m. 126$ each.

OXYGEN-ACETYLENE WELDING SET. 125$ each.

MACKIE MOTOR GENERATOR, 220 volts 2.35 amps. 150$ each.

MACKIE MOTOR GENERATOR, 220 volts 2.35 amps. 150$ each.

EUROPEAN RANGES VALVES, all types, A.E.C., ROT, B.B.C., C.S.I., C.G.P., E.N.G., etc. 50 cents each.

E.R.L. A.C. AND D.C. TRANSFORMERS. Input. 100/100 to 200/200 volts, output. 250/250 volts 300 ma. 2 amp. 110 volt output.

E.R.L. Diode Transformers, 7-1/2 volts, 110 volt output. 25$ each.

E.R.L. Diode Transformers, 5-1/2 volts, 110 volt output. 25$ each.

E.R.L. Diode Transformers, 6-1/2 volts, 110 volt output. 25$ each.

E.R.L. Diode Transformers, 5 volts, 110 volt output. 25$ each.


PREMIER SHORT-WAVE CARDS. All types, 250 ma. 26$ each.

MACKIE MOTOR GENERATOR, 220 volts 2.35 amps. 150$ each.

MACKIE MOTOR GENERATOR, 220 volts 2.35 amps. 150$ each.

STANDARD TELEPHONE HEADPHONES, resistance 5,000 ohms and 4,000 ohms. 4/1 each.

SMITH'S FANG TUNING CONDENSERS. 1000 volts, 2.5 mfd. each.

TUBELESS Condensers, as new, 500 volts, 5 mfd. each.

TUBELESS Condensers, as new, 500 volts, 5 mfd. each.

TUBELESS Condensers, as new, 500 volts, 5 mfd. each.

TUBELESS Condensers, as new, 500 volts, 5 mfd. each.

TUBELESS Condensers, as new, 500 volts, 5 mfd. each.

TUBELESS Condensers, as new, 500 volts, 5 mfd. each.

TUBELESS Condensers, as new, 500 volts, 5 mfd. each.

TUBELESS Condensers, as new, 500 volts, 5 mfd. each.

TUBELESS Condensers, as new, 500 volts, 5 mfd. each.
This is the week when you will be buying Christmas magazines, so be sure to get these three bright bumper issues. They will be enjoyed by everyone, for each is full of good humour and the real Christmas spirit.

- **TIT-BITS XMAS EXTRA, 6d.**
  Complete stories, many entertaining articles, special contributions by Sandy Powell, Western Brothers, Puzzles, etc., and a Children's Section.

- **XMAS LONDON OPINION, 6d.**
  A Christmas tonic for everyone, in the popular pocket size. It keeps the flag of humour flying!

- **HUMORIST XMAS NUMBER, 6d.**
  Hundreds of Christmas laughs inside by the most popular humorous writers. Artists include Bert Thomas, Lees, Arthur Ferrier.

- **FOR THE KIDDIES — 2d. each**
  **CHRISTMAS HOLIDAY COMIC**
  **MISCH XMAS COMIC**
  Packed with all the things boys and girls love to read at Christmas.

- **A HAPPY THOUGHT!**
  Why not give an evacuated child a Christmas surprise—send stamps or P.O. 6d. to Post Sales Dept. (Children), George Newnes Ltd, Tower House, Southampton Street, Strand, London, W.C.2, together with the child's name and address, and we will send immediately the children's comics mentioned above, with a special free Christmas card bearing your name.

ORDER FROM YOUR NEWSAGENT TO-DAY!
AN ALL-WAVE H.F. UNIT—See page 315

A NEWNES PUBLICATION

Edited by F.J. CAMM

Vol. 15. No. 380.

EVERY WEDNESDAY

Dec. 30th, 1939.

Contents

An All-wave H.F. Unit

The War and Music

Loudspeaker Design

Thermion’s Commentary

Practical Hints

Tone Control by Negative Feedback

Reaction Distortion

Practical Television

Transformers—H.F., L.F. and Mains

Readers’ Letters

THE OUTLINE OF WIRELESS  By Ralph Stranger

This book teaches you everything you need to know about wireless. The entire theory and practice of reception is covered simply and clearly from A to Z. 832 pages with over 500 illustrations and diagrams.

10/6 NET From all booksellers, or by post 11/ from the publishers. GEORGE NEWNES, LTD. (Book Dept.), Tower House, Southampton Street, Strand, London, W.C.2.
A New Book for Everyone in War-time.

FIRST AID for THE HOUSEHOLDER

By H. A. CLEGG, M.B., M.R.C.P.
and I. HARVEY FLACK, M.B., Ch.B.

ALMOST as many accidents occur in the home as in the busy streets—so statistics prove! That is why everyone should possess an elementary knowledge of First Aid. In these war days it is essential. Could you act quickly and efficiently, and perhaps be the means of saving a life? Any day the emergency might arise that would find you helpless, despairing—when every moment before the doctor arrives is of vital importance. Study this simple book and be prepared!

Fully illustrated with explanatory diagrams, and with strong linen binding, it costs only 1½ d.

ONLY 1/6 NET

To the Publisher, GEORGE NEWNES, LTD., (Book Dept.), Tower House, Southampton Street, London, W.C.2.

Please send me by return FIRST AID FOR THE HOUSEHOLDER, for which I enclose Postal Order for 1½ d.

P.O. No._________________________

NAME________________________________________

ADDRESS__________________________

P.W. 30.12.39

George Newnes, Ltd.
Home-made Test Equipment

We have often described items of interest for the constructor who is anxious to make up test equipment for various purposes. Unfortunately, many such items have to be calibrated against some standard and this often renders such items useless owing to the fact that suitable standards may not be easily available for the calibration process. Outside of such items, however, there are many which may be calibrated by ready-made parts, and when completed they form a valuable addition to the home workshop or even the service man's bench. In this issue, for instance, we describe a resistance-capacity bridge, in which standard parts are fitted to the dial has, of course, to be marked off or calibrated according to the components which are used in the instrument, but when completed it forms a ready and accurate instrument for the measurement of components which may be suspected or which are being tested for use in a receiver. With instruments such as these it is worth while remembering that the normal tolerances which the manufacturer allows will have to be taken into account, or special components obtained which have a guaranteed accuracy. Usually there is an additional charge for such components, but this is considered worth while by those who are making an instrument upon which they intend to place great reliability.

Radio Sermon Hits Home

A SERMON broadcast from WLW by the Rev. E. Howard Cadle, of Indianapolis, was recently credited to the surrender and alleged confession of Floyd Waters of Newport, Kentucky, to charges of participating in a hold-up last June. He gave himself up to Indianapolis police. The hold-up occurred at Beverly Hills Country Club in Kentucky, located across the Ohio River from Cincinnati. Tearfully Waters declared that he wished to "pay my debt to society." The message which Waters heard was broadcast from WLW on Sunday, November 15th, and prompted him to see the Rev. Mr. Cadle in Indianapolis and confess. Waters was reported to have heard the sermon in Dayton, Ohio. His wife is employed at Wright Field army airport located there. Waters, aged 37, and a former boxer, was one of five men wanted in the hold-up, Newport, Ky., officials said. Three others, Gus Fiech, Sam Schwaetzer and Warren McHugh, are now in custody at Newport, while a fifth, Marvin Peset, is still at large.

Whodunnit?

DICKSON CARR has written a detective thriller for production by John Chestle on December 27th, under the title of "Whodunnit?" The play is to be produced in three episodes. In the first, a man is accused of murder through the eyes of a witness, in the second instalment a suspect will be put on trial, and in the third instalment the crime will be reconstructed as it actually took place.

C'est Magnifique!

The sub-title, "A Collection of War-time Absurdities," is given to the programme called "C'est Magnifique," compiled by John McGlynn and M. H. Allen, which is to be broadcast on December 30th. The programme is designed to show some of the more ridiculous aspects of the war, and is a tribute to the geniality of the servicemen. The second instalment will be broadcast Thursday evening. The programme will be broadcast by 4.15 S.B.S. Be sure to tune in or record the programme if you wish to hear it. The programme will be broadcast on Thursday afternoon. The programme will be broadcast on Thursday afternoon.
WHILST conditions have slightly improved—since the declaration of war—they could not possibly have gone beyond the zero mark reached in the first few weeks of the conflict—it cannot yet be said that the performance and broadcasting of good music is in a satisfactory condition. Bad music, yes—als. But as I make it my job to write wholly about good music, my remarks must be confined to those parts of the wireless programmes provided by the symphony orchestras and the artists who co-operate with them. Whilst I wrote about the Promenade Concert programmes, it was my intention to review future wireless programmes, and to help readers to select the few occasions that they devoted to listening-in. I'm afraid this is no longer possible, as I do not get as much information as heretofore. Whichever conditions will so improve in the near future as to permit of their resumption I cannot yet say. In the meantime a short analysis of existing circumstances, with some suggestions for improvement, may be of interest.

Slump in Good Music

I will take what I consider to be the most important aspect of the present situation first. The slump in the performance of good music is most probably furnishing the chief cause of the lamentable decline in study that is recorded from all parts and all classes. It is also reflected in the remarkable decrease in the sales of music which the big publishers are forced to record. It is the most natural thing in the world for a student who was expecting, or at least working to take a place in the musical world during the next year or two, to abandon his studies for the duration. He saw that there was little or no chance of his talents being engaged owing to the lack of demand in the concert world, and his only prospect is to be compelled to continue his studies, with their attendant expenses, at Hitler's pleasure. There is also the war's immediate aftereffects in the form —a very unpredictable period. It is no wonder then, even if private circumstances don't compel him to call a halt, he should voluntarily do so, and to resume where and when conditions are more propitious. The air raid scare has been a big factor, too, in cancellation of study, more especially with children. But I don't think the economic factor has yet entered into it at the first degree. But the absence of so much good music, and the inferior quality of the performance of much that we do hear in broadcast, is bound to affect the study, and the consequent replenishment of the market, which is as important to the sale of music as it is to anything else. Music needs a shop window and advertising, just the same as any other commercial article. And this has always been provided in the form of the symphony concert, the opera, and the recital. It is very important for the future of the profession that they be restored, both as to quantity as well as quality, as soon as possible.

Lack of Broadcast Programmes

Another reason for the decline is the broadcasting of only a single programme. But this concerns only the quantity of music given us at the present time. The quality of it is really much more important, whilst the decrease in the size of the R.B.C.'s main symphony orchestra might be explained and defended from different angles not visible to the average listener; it is difficult for anyone of average intelligence to understand why the Bournemouth Borough Council should find it necessary to reduce its famous orchestra of over seventy players to a beggarly eighteen. No wonder their popular name is now missing from the Radio Times. It makes the performance of symphonic music absolutely impossible, and even of lighter genres very impossible. And the story has to be repeated all round the country, though seldom to such a drastic degree. The Bournemouth people have for a long time been a splendid body of musicians, and the privileged accompanists of a long line of renowned soloists, which makes this sad decline in their fortunes greatly to be deplored.

Erroneous Theories

Those of us who remember the last war cannot recall any such catastrophic avalanche of music as is now happening. Why has it happened this time? So far as the public performance of music is concerned, with the attendant concentration of large numbers of people in buildings and their dispersion afterwards, the air raid bogy must be held responsible. What is it not responsible for? The prophets of war have a lot to answer for. We all know that anything may yet happen. But there is now no doubt whatever that the forecasts that "Mr. Knowall" and "Mr. Wisdom" have been making for years past are once more foiled by the absurdity of the theory that what happened to Spain, Abyssinia and China would happen to London on the outbreak of war—all war being alike to them. Just in the same way that a shower of rain will wet the roof of London houses like it does in Madrid, Addis Ababa and Pekin. What a thousand pities. The people cannot be wholly blamed, because the belief entered all classes and was tenaciously clung to by high and low alike. But its baseless influence and results can now be seen in the virtual extinction of the entertainment world, which presents a spectacle comparable to that of a dying man being kept alive by means of artificial respiration. None of these deplorable consequences need have resulted, had a rational and calm view of the matter been accepted by side by side with the obvious precautions which both parties to the arms race now alike declare. But in saying, in effect: "Friends, Romans, countrymen; aerial warfare is possible, although it is improbable for such and such reasons. Although you might be bombed whilst listening to a concert or watching a cinema, we think it extremely improbable. We only mention it so as to disarm the enemy because it is our duty to look after you, and in the pursuit of that duty we are placing at your disposal such and such measures of a precautionary character. But go about as usual, enjoy yourselves, and keep a sharp look out." They said, in spirit and meaning: "Good people and imminent victims; war has begun, and we are working for a time. But in our supposition that, to-night, you will all be blown up sky-high. Consequently, we should demand it in a great extenuation of our responsibilities if we allowed you to assemble in any place of entertainment, public houses excepted. Nor must you mind not being able to see where you are going, catching the wrong train, or being knocked down in the black-out and perhaps killed. What does it matter, we are all going to be killed anyway. YOUR cheerfulness, YOUR courage, YOUR fortitude will bring us VICTORY." The results are for everyone to see.

A Few Good Concerts

There are a few good concerts on, notably the Philharmonia under Sir Thomas Beecham. But they are at awkward hours, which doubtless prevents many from attending them who would otherwise have done so; and few of them are broadcast. The B.B.C. with its reduced forces are giving their famous series of symphony concerts in the Coliseum Hall, Bristol. But only half the programmes is now put on the air. In listening to orchestral music over the wireless it is easy to tell where the reduction in effectiveness takes place—in the brass and wood-wind. I suppose these departments are almost impossible to recruit from the mass of musicians who practice nowadays. Were the diminution in the strings there would be little or no trouble. There are some good women flautists and oboists, but I have no idea how many are available for regular orchestral work. It was, of course, the last war which saw the first appearance of a woman in a symphony orchestra—the then Queen's Hall Orchestra, under Sir Henry Wood.
An All-wave H.F. Unit

A Simple Unit which Will Improve the Range and Selectivity of "Straight" Receivers

By L. O. SPARKS

Receivers of the detector and L.F. type are still quite extensively used, and their degree of popularity is, no doubt, due to the fact that if they are well designed, they are capable of giving very satisfactory results. Their general capabilities are, however, limited, as every user discovers sooner or later, and the purpose of this article is to show how a simple unit can be made which will give an over-all increase in efficiency and likewise eliminate the major limitations.

With an aerial feeding straight into a detector stage, it is not possible to obtain, in all areas, a degree of selectivity sufficient to null out the undesired waves received will be entirely free from interference caused by other transmissions. Similarly, the sensitivity of a detector cannot be increased beyond certain limits and, when these are reached, the addition of further stages of L.F. amplification will not compensate the inability of the detector to pull in a very weak signal.

Fortunately, both of these defects can be overcome to a very great extent by the same remedy, and that is by the introduction of a stage of tuned high-frequency amplification.

While many constructors appreciate these defects already, they have refrained from adding the H.F. stage because they did not wish to rebuild or enlarge their existing receiver. These quite sound reasons have been borne in mind when constructing the unit described below, and it will be seen that there is not the slightest need to modify the receiver in any way, as the H.F. stage is made up as a separate item so that it can be placed alongside practically any receiver of the "straight" type, whether designed for short or normal broadcast wavelengths.

The Circuit

The theoretical circuit is shown in Fig. 1. This in itself calls for little explanation, but for the benefit of those not too familiar with H.F. amplification, a few words might not be amiss.

The aerial circuit utilizes a coil of the plug-in type, such as those used for short-wave reception, thus allowing the tuning band which the unit will cover to range over the short, medium and long waves according to the coil used. With the specified tuning condenser, a .0005 mfd. it will be necessary to use the B.T.S. "One Shot Inductors," as these are designed to tune over all the wavebands concerned with a condenser of that value. Although the primary winding of the coil is used as a coupling coil for the aerial, a small variable condenser is provided in series with the aerial connection to provide an additional means of getting the highest possible degree of selectivity on all wave-bands.

The valve recommended is the Cosmos 210VPT, of the four-pin type, and as this has variable-rf characteristics, it enables a very fine form of pre-detector volume control to be secured by the simple procedure of varying the bias applied to the grid via the tuning coil. A potential at the anode of the H.F. valve through a small fixed condenser. The purpose of this condenser is to pass on the signal to the second tuned circuit connected to the grid of the detector, without allowing the passage of any of the high tension which has to be applied to the anode of the H.F. valve via the H.F. choke and the resistance of 10,000 ohms. If an all-wave H.F. choke is to hand, the resistance can be omitted, as it is only included to take care of the higher frequencies of the short waves if these are to be received, and if an ordinary H.F. choke is used. The tuned-grid coupling is the method used in this unit, but in place of the second coil shown in Fig. 2, use is made of the aerial coil in the receiver to which the unit is connected, therefore the only components required for the additional H.F. stage are those shown in the wiring plan.

The output from the unit is taken from the free end of the fixed coupling condenser, as shown in Fig. 1, and fed into the receiver via the normal aerial terminal, the aerial proper being joined to the aerial terminal on the H.F. unit.

Construction

As the circuit is so simple, and as so few parts are required, there is no necessity to use chassis construction, so a five-ply base-board 8in. x 6in. was used. All the components shown thereon are in position as soon as the board has been finished off, and the wiring commenced.

The panel 8in. x 6in. can be cut from a piece of three-ply, oak-faced, and after the holes for the aerial series condenser, the detector and the fuse, the chassis back plate and the tuning spindle have been drilled as indicated on the panel plan, the surface can be smoothed, stained and polished to suit individual tastes. Once the panel is screwed to the baseboard, the remainder of the wiring can be completed and the unit made ready for test.

Flexible leads must be fixed for the battery supplies to the anode and screening grid of the H.F. valve, namely, 120 volts and 60 to 70 volts, respectively. The

(Continued on next page)
AN ALL-WAVE H.F. UNIT.  
(Continued from previous page)

filament will require two more leads, which can be connected to the accumulator supplying the receiver, while two more will also have to be fitted for the positive and negative sockets of a 9-volt G.B. battery.

Regarding the battery supplies, there is one point which must be watched, although it is hardly likely to crop up in the majority of modern receivers. It is essential that the H.T. and L.T. negatives of the batteries feeding the receiver are common with the earth connection.

Operation

With the appropriate coil in the H.F. unit, connect the output socket to the aerial terminal of the receiver, after removing the aerial from that point and connecting it to the aerial terminal on the unit. The earth connection can remain on the set in the ordinary way.

When all battery leads have been connected and the set switched on, tune the receiver to the known setting of a station and then tune the H.F. unit, setting the H.F. volume-control at maximum and the reaction at minimum. Now experiment with the last two controls until the best result is obtained. It will be noted that reaction will be more smooth, and it will not be necessary to use so much of it for a given result, compared with the original circuit.

WIRING DIAGRAM

From the above diagram the layout and all wiring can be obtained, while on the left the panel dimensions are shown.

Five Ways of Electron Emission

T he recent intensified development of all forms of electronic devices has brought to the fore the fact that there are five practical ways in which electrons can be produced, or released from conductors, by supplying them with sufficient energy to break through the surface of the conductor. Many readers may only be familiar with two or three of these, so in view of the present-day importance of electronic engineering in all its various aspects, it will be interesting to recapitulate the five popular methods. In the first place, the action of a thermionic valve depends on the emission of electrons from the cathode, and this is brought about by heating this electrode either directly or indirectly, by the passage of a current of electricity. The cathode of the valve is made from a substance which has the property of releasing electrons through the agency of heat, and their subsequent action under the influence of other electrodes inside the glass bulb is familiar to every reader of PRACTICAL WIRELESS. Next comes the emission of electrons from such surfaces as caesium, rubidium, potassium, etc., as a result of their being brought under the influence of light. This conversion process is the method by which every photovoltaic cell is made to function, and depending on the chemical nature of the substance used for the cathode, the cell will have a definite colour response to the light which activates it. Then we have the cold emission of electrons which occurs under certain specified conditions when the surface of a metal is subjected to the presence of a very intense electric field of force. The fourth method depends for its action upon the ionisation of gases. That is to say, an electron impacting or colliding with a molecule of gas causes it to release a further free electron which in turn will perform a similar function, so that the effect is cumulative. It is this principle which is employed so effectively in gas-filled photo-electric cells in order to increase the output current for normal working purposes. The final, and in many respects perhaps the most important, scheme for releasing electrons is that known as secondary emission, whereby the impact on a conductor of an electron travelling at a very high velocity dislodges one or more electrons from the surface of that conductor. According to the method used for preparing the secondary emissive surface, and the nature of the substance employed (caesium appears to be the most generally used at the moment), so the number of secondary electrons released by the impact of a primary electron will vary from one to ten.

PATENTS AND TRADE MARKS

Any of our readers requiring information and advice respecting Patents, Trade Marks or Designs, should apply to Messrs. Rawson and Co., Patent Agents, of Bank Chambers, 29, Southampton Buildings, London, W.C.2, who will give free advice to readers mentioning this paper.
Loudspeaker Design

Some Interesting and Valuable Data Regarding the Design of Loudspeakers for Domestic Use

A GREAT deal of interest has been aroused by articles recently published in these pages regarding loudspeaker design. It is obvious that the problem is one which has the greatest attraction for the average listener, and in view of this, the following details, which are a reprint of part of a paper allocated for reading before the Institution of Electrical Engineers, will undoubtedly prove of value to those who are studying this section of the modern radio receiver. The paper is by W. West, B.A., and D. McMillan, B.Sc. After dealing with the various principles which are introduced into design and into the general features which are necessary in order to obtain high quality reproduction, the authors go on to say that advantage was taken of the great skill and experience which has been acquired by manufacturers, in order that a cheap and efficient product could become available, without necessary difficulty for laying down expensive additional plant. Departures from usual construction have, therefore, been made only where experiment indicated that sufficiently improved quality of performance would result therefrom, and where the modifications involved appeared to be feasible from the constructional point of view.

In this article are summarised the influences, affecting quality of performance, of the various parts which make up a moving coil loudspeaker, as they have been confirmed or revealed by the experiments. No modifications have been made which affect appreciably the sensitivity, except that any elimination of pronounced resonances tends to reduce the sensation of loudness of transmitted sounds. The discussion is concentrated on frequency distortion, since no evidence has been found that the usual distortions of well-designed modern loudspeakers exert any considerable adverse influence on the quality, at volume levels suitable for an ordinary living-room.

Magnet

No unexpected features of the effects of the performance of the magnet have been sought or encountered. Most of the experiments were made using a permanent magnet of about 170 cm^{3} volume, generating about 6,000 lines per cm^{2} in an air-gap of 1.075 in. external and 0.98in. internal diameter and 0.25in. deep.

Coil and Coil-former

No substantia evidence was found that commercial methods of construction of coil and coil-former impose any limitation on the performance of the loudspeaker. Additional stiffness of the coil former was not found to make any appreciable change in the frequency characteristic.

Simple auxiliary precautions towards ensuring freedom of movement of the coil in the air-gap are: (1) taking out the leads to the coil at opposite ends of a diameter, to ensure symmetry of the mechanical load due to the leads; and (2) taking out the leads at the same winding level, i.e., an even number of layers. This eliminates any resultant current in the coil, in the direction of the axis, which could set up forces tending to twist the coil.

Centring Devices

Both centring devices, commonly known as the "spider" and the "surround," add to the moving system a very small mass and a stiffness which may be, but need not be, appreciable. It is common practice so to adjust the combined stiffness that the main resonance of the moving system lies at the lower extremity of the frequency range which it is desired to transmit. At lower frequencies the efficiency of the loudspeaker must necessarily fall off rapidly, especially when an open casing is used.

For the design of a loudspeaker to be used in an enclosed casing, it is desirable that the contribution of the centring devices to the total stiffness should be negligible. The limitation of the frequency range at low frequencies is then determined by the size of the casing.

The stiffness due to the surround can be quite small with the cloth surrounds that are sometimes used. An alternative construction which introduces still less stiffness and mass, is available by replacing the usual type of surround by an air-gap between the diaphragm and the frame, bridged at a limited number of points (say three, spaced equally round the diaphragm) by strips of tape which support the diaphragm. Each strap is fixed at one end to the diaphragm and at the other end to the frame, with a distance of, say, 0.2in. separating the fixing points. With this construction the rim of the diaphragm should be made sufficiently rigid, e.g., by forming a circumferential corrugation near the edge. The influence of the air-gap between the edge of the diaphragm and the frame is not appreciable for widths of the air-gap up to at least 1in.

With a rather small enclosed case, limiting at about 100 c/sec, many types of external spider in current use introduce a stiffness which is not very appreciable. With a larger case, however, limiting at 40 or 60 c/sec, a spider of reduced stiffness, e.g., of thinner material, is required.

Under the influences of the forces vibrating between the spider and diaphragm, it is found that at certain frequencies, in a mode of vibration, having a natural frequency other than the impressed frequency, this gives rise to audible false tones from the loudspeaker at the particular frequencies concerned. The effect appears to be more marked when there is tension in the spider.

Framework

This part should not affect the performance of the loudspeaker, but with some commercial constructions it has been found that the apertures in the framework are insufficient to provide complete freedom of movement of the air behind the diaphragm. In such cases it appears that the resonator formed by the air cavity between the diaphragm and the frame in conjunction with the apertures in the frame acts as an anti-resonator on one or other range of sound by the diaphragm. This can reduce the efficiency of the loudspeaker somewhat over the range of frequencies, say 100 to 2,000 c/sec., where there is generally some difficulty in maintaining the efficiency of radiation of sound by the diaphragm.

In the design which results from these investigations the effect has been eliminated by limiting the part of the framework between the inner plate (of the magnet) and the outer rim to four strips, each 2in. wide.

Casing

For various reasons the investigations have been concentrated mainly upon loudspeakers with an enclosed case. The influence of the size of the case on the response at low frequencies was very marked. The compromise between size of loudspeaker and limitation of response at low frequencies is one of the factors which is being dealt with in devising a construction of the case which is adequate for soundproofing and at the same time economical in space and cost.

Two main principles for soundproofing are generally recognised; one is the use of massive non-porous walls, preferably of a

(Continued on page 332)
Recording the Signals

Quite naturally, all the important television developments that are taking place in this country, in so far as they apply to war purposes, are being kept secret. The only suggestions of how this special science is likely to be used in schemes of attack and defence emanate from those countries who are as yet not actively involved in the present international situation. In this connection it is learned that the intermediate-film method of transmission and reception is finding special applications, because it has the double function of furnishing the requisite television signal at the moment it is required, apart from the few seconds delay between the enactment of any scene and its ultimate conversion into modulated electromagnetic waves, and in addition provides a valuable record on the celluloid film for subsequent examination when such a need arises. The intricacies of this scheme are all centred on the photographic side, and a reference to Fig. 1 will show one form taken by the equipment for this purpose. The camera—one of the intermittent type—is seated on the bellows, and above this is the compartment housing the new film sprocket. Three leashes on a slide car are provided to enable the proper form of focusing to be undertaken irrespective of the scene to be recorded and transmitted, while the panning handle to the left enables the operator to encompass the whole field of view. After photographing the scene on the film the latter passes through a sound-recording head so that any sound may be photographed on the appropriate track provided. Cog-wheel drives then feed the film through developing, washing, fixing and final washing tanks, guides ensuring that it passes along several dipping into the appropriate chemical fluid. The mechanism for this is clearly seen in the rectangular container which runs from left to right under the camera bellows. The finished film negative in its dry or wet state, as the case may be, is then passed through the television camera in the ordinary way for conversion to a television signal and the film is stored for future reference purposes. This type of equipment has been improved so enormously that the whole apparatus can now be accommodated in a very small compass so that it is readily portable and may, therefore, be set up on sites or in machines in a way which a few years ago was thought impossible. It has been stated in various sources that the compactness is such that a modern airplane can be fitted out with a television camera and the intermediate-film method of transmission in due course because of the good pictures derived from a film record.

The essentials, in unit form, of a cathode-ray tube intermediate-film recording equipment.

Several Forms

Irrespective of the source of the radiated signals, whether in the air or on the ground, the next point that arises is what will happen at the point of reception. Here, again, one is confronted with a dual aspect, and the solution will depend entirely upon the purpose for which the transmitted television signals have been provided. Assuming that some form of military or naval activity is made apparent by this television signal, it is of great advantage to be able to refer at any time to what has happened, this being additional to any observations undertaken at the instant the signals are received. Several schemes may be used for this purpose, but the most promising is one which again resorts to the intermediate-film method of working, developments on which have been undertaken both in this country and abroad. The most promising scheme uses a cathode-ray tube working in conjunction with a constant-speed drive camera. Details of this apparatus are shown in Fig. 2, where separate units are laid out on a bench as distinct from being housed in rack form. The incoming television signals are received and in the normal manner by an efficient dipole-aerial array and passed to the television receiver. The output of the set is fed to the cathode-ray tube shown mounted horizontally in a frame support in Fig. 2. In ordinary circumstances, a complete picture would be traced out on the screen within the available scanning field of the tube, but with this particular arrangement such a course is unnecessary. The section of the time-base generator providing the frame scan motion is omitted, with the result that each individual line of scenery is traced consecutively over the thin strip of fluorescent running horizontally across the centre of the screen. In front of this is placed a constant-speed drive camera topped by a film-spool chamber, and this film is fed over sprocket-drive drums (seen inside the camera, since one face has been removed for inspection). The line trace is focused on to the celluloid film, and since the speed with which the film moves across the back of the lens is such that it corresponds to the picture-frame speed, the picture lines are recorded one after the other and displaced from each other by a line width. The film fed into the bottom take-up chamber is, therefore, a true record of the radiated television picture which can be subsequently developed, fixed and dried, and passed through a standard 35-mm. film projector for observation purposes at any time it is required. Here, again, the apparatus, which in Fig. 2 is shown laid out on a bench, has been improved to such a degree that it can be assembled into a very compact and neat unit so that it can be employed in quite out-of-the-way places.
ON YOUR WAVELENGTH

Is English Irish, Scottish or Welsh?

I'VE ad a letter from Oireland which as you might naow is one of ye brrrriyous spous of the British Oils. It is a little bit of haven which as the song siz, fell from out the skoi, and got cracked in the process. Irishmen deny that it is a little bit of 'ell, and I agree.

The preceding paragraph is another way of letting you know that I have had a letter from an Orishman who thinks that the best English comes from Ireland! Notice the refined English of my second sentence. Why, the Irish did not know our language till we taught it to them, and they have not learned it yet. Now it is the turn of the Scots and the Welsh. And a Happy New Year to all of you!

The New Encyclopaedia

I SEE that the seventh edition of the old "Wireless Constructors' Encyclopaedia" makes its appearance under the new title of the "Practical Wireless Encyclopaedia." As I have remarked before, it is a remarkable work. At 6s. it represents value unobtainable elsewhere for a guinea. Over 200,000 copies of it have been sold and it circulates in every country in the world. The seventh edition has been fully revised and contains a large amount of new matter and many new definitions. It is attractively bound in dark-blue cloth with gold lettering.

Our New Year's Set

I UNDERSTAND that the brains are at work devising the 1940 Boom Receiver. I have been unable to get into the Editor's sanctum because of the slide rules and the rules of calculation. If you have a particular hunch as to features the new set should contain, drop the Editor, not me, a line and let him know. The new design is expected to be released to the public some time in March.

Requests for Old Sets

SOME of our readers now in France want to know if readers at home have any old battery sets in working order which they would like to give to them. I have carefully filed these requests, and if you have any battery set for which you have no further use I should be glad to act as a distributor. Please mark your envelopes "Sets for France."

Other readers are asking for copies of periodicals, and here again I shall be glad to forward any which are sent to me.

Power Grid Detection

A READER asks me to define the advantages of this particular form of detection. The essential features are a large standing anode current with a hasty signal applied to the valve so as to produce a drop in current of about 15 per cent. Owing to this large anode current, it is necessary to use a valve with an impedance of between 10,000 and 25,000 ohms, and it is also impracticable to use the majority of L.F. transformers owing to saturation troubles. This means that either resistance-capacity coupling or a parallel fed transformer must be used, and it is quite obvious that a large current through a resistance to match an impedance of the order stated will result in a very heavy voltage drop.

Owing to the convenience of A.C. mains it is possible to use between 400 and 500 volts for H.T., and the drop through a suitable anode resistance still permits the valve to receive its maximum H.T. voltage. An alternative method is to use an ironed choke with a very high inductance value. Small values are chosen for the grid leak and condenser, usually about 0000 mfd. and 25 megohm. The detector circuit is standard except for these latter values.

Musical Frequencies

A NOOTHER reader wishes to know the usual musical frequencies. They are as follows as relating to the piano: A 26, B 30, C 34, D 36, E 40, F 42, G 48, A 53, B 60, C 64, D 72, E 80, F 85, G 96, A 106, B 120, C 128, D 144, E 160, F 170, G 192, A 213, B 240, C 256, D 288, E 320, F 341, G 384, A 426, B 480, C 512, D 576, E 640, F 682, G 768, A 853, B 960, C 1024, D 1152, E 1280, F 1365, G 1536, A 1766, B 1920, C 2048, D 2304, E 2560, F 2730, G 3072, A 3473, B 3840, C 4096.

Jelly Electrolyte

THE battery and accumulator shortage finds its reflection in the large number of letters I am receiving relating to accumulators and batteries. Requests for the formula for the jelly electrolyte used in unspillable accumulators have reached me by the score. I give it now in the hope that it will stave off a further number.

Prepare jelly electrolyte by adding sodium silicate to the acid (never add acid to silicate) in the proportion of 1 to 3, and immediately pour the mixture into the cell until the usual acid level is reached. Take care not to overfill the cell as this is difficult to rectify once jellification has taken place. If some slight shrinking of the electrolyte occurs, thus exposing the top of the plates, it should be made good by preparing and adding a little more of the mixture.

After filling, the cell should be inverted for six to eight hours to allow any free acid to drain off. It is advisable to give the cell a freshening charge before putting it into service. Pour off any free acid. If the jelly acid hardens add three or four spoonfuls of distilled water before every recharge.

Carrying On

THANKS to the hundreds of readers who have written expressing their gratitude that the proprietors of this journal intend to carry on. This is the only wireless weekly, and in spite of increasing costs, particularly on the paper side, readers will note that we have not increased the price of the journal. All readers for their part can help us by placing an order for the regular delivery of this journal. It helps the newsagents, and it helps us, for it prevents us printing more copies than are actually required in these days of paper shortage.
Tone Control by Negative Feedback

How the Negative Feedback Feature May Be Made Use Of to Control the Tone of Reproduction

THE idea of effecting tone control in a low-frequency amplifier by means of an adjustable negative feedback for the higher audio frequencies is already well known. These arrangements, however, have the disadvantage that the feedback is not effective for the middle and lower audio frequencies, so that reduction of amplitude distortion does not take place for these frequencies. In this unit, all the components of greatest amplitude which are most likely to be distorted.

Variable Grid Bias

In order to avoid an undesirably large variation of the grid bias, the resistance $R$ may be selected much smaller than the sum of $R_1$ and $R_2$. If such ratio of dimension cannot be obtained for reasons of a sufficient control range an additional current, for instance from the screen grid potential divider of the pre-stage valve, may be sent through $R_3$, in the case of small resistances $R_1$ and $R_2$ which current increases the potential drop at this resistance so that the grid bias is less influenced by the control at $R$.

The sliding contact $S$ and the right-hand end of the resistance $R$ are connected with each other by a parallel circuit $LC$ tuned to about 800-1,000 cycles, i.e., the medium frequency of the frequency band to be transmitted. This parallel circuit is permeable for the very low frequencies (from zero to about 200 cycles) and for very high frequencies (from about 2,000-10,000 cycles) compared with the resistance $R$ whereas it offers a comparatively high resistance for the medium frequencies (from about 200 to 2,000 cycles). When the sliding contact $S$ is at the point $b$, the filter circuit is out of action, and the counter coupling is at its maximum, uniformly for all frequencies. This gives an amplification curve which corresponds with the curve marked $b$ in Fig. 2, in which the amplification $V$ is drawn in relation to the frequency $f$. When, however, the sliding contact is at the point $a$ this results in an amplification curve such as shown by $a$. In this curve the amplification for the very high and very low frequencies has only increased very little, because as before, almost the entire output A.C. potential is present at the ohmic resistance connected in the cathode lead. The medium frequencies, however, are subject to a considerable potential drop at the parallel connection $R_1C_1$, so that the counter coupling becomes considerably less, and the amplification therefore considerably higher. The amplification is almost of such value as would be obtained if no counter coupling was present, and which is marked in Fig. 2 by a dotted line.

The circuit shown in Fig. 1, which applies the control curve according to Fig. 2, is particularly suitable for such receiving sets in which no completely effective automatic feedback can be provided, and in which the tone-control has to be used at the same time as amplification control, by hand to compensate different intensities of reception of different transmitters. In this arrangement the local transmitter is reproduced with comparatively small amplification, less distortion factor, and even amplification for all frequencies, whereas a remote transmitter is reproduced with more amplification.

![Fig. 1.—A two-stage amplifier with negative feedback.](image1)

![Fig. 2.—Curve showing effects of adjustment of resistance $R$ in Fig. 1.](image2)

![Fig. 3.—A modification of the scheme in Fig. 1.](image3)

![Fig. 4.—Results obtained by the circuit of Fig. 3.](image4)

This disadvantage can be overcome in a manner which will now be described.

Fig. 1 shows the circuit diagram of a two-stage resistance-coupled low-frequency amplifier of a receiver. The oscillations to be amplified are supplied to the control grid of the valve $V_1$, and are fed after amplification from the output of the output amplifier valve $V_2$ through the output transformer $T$ to the loudspeaker $L$. The potential at the loudspeaker is connected at the same time to the series connection of a blocking condenser $C_1$ and three ohmic resistances $R_1$, $R_2$, and $R_3$. The resistance $R$ is designed as an adjustable potential divider the sliding contact $S$ of which is connected to the cathode of the valve $V_1$. As the lower end of the resistance $R_1$ is connected with the earthed return lead, the part of the resistance $R$ between the left-hand end $a$ and the sliding contact $S$, and also the resistances $R_2$ and $R_3$ are in the cathode lead of the valve $V_2$. Therefore, an output coupling of the output A.C. potential to the cathode of the input valve is caused, as only the resistance $R_3$ which is mainly dimensioned for the supply of the medium grid bias of the valve $V_1$ is bridged by capacity.

(AContinued on page 312)
A Soldering Dodge

In a recent paragraph in "Notes from the Test Bench," mention was made of the difficulty of getting a large blob of solder on the iron. I overcame the difficulty by taking the spout of an old oil-can, and fitting a handle on it, as shown in the sketch. By placing the heated iron against the tip of the spout, which had been previously filled with solder, a large blob of solder falls on the place required.—D. B. Mack (Airdrie).

Heat-treatment for Components

On constructing several receivers, I have found that they would not function properly owing to the fact that there was no reaction. This I found to be caused by the damp atmosphere affecting the coils, so I devised the following simple method of treating the coils. First, I obtained a large biscuit tin, soldered in a shelf of zinc, and mounted a pair of lamps as shown in the sketch. The lamps used were 60-watt type. When current is applied the lamps become hot, thus heating the coils till all the dampness is extracted, taking about one hour. The coils should then be shellacked.—W. Flower (Lincoln).

An Insulation Stripping Tool

Many constructors find difficulty in removing the rubber insulation from single or multi-strand wire. The usual method adopted is to cut and scrape off the covering with a pen-knife, but this often leads to trouble, due to the wire being partly cut through. A pair of tinman's shears, costing sixpence, will, when converted as shown, enable the constructor to strip the insulation without harming the copper strands.

A useful dedge when trimming I.F. transformer.

On each blade, about one inch from the rivet, file a notch, using a three-cornered file. These two notches should be of such a depth so that, when the cutters are closed, the apex of each notch just covers the other. Both must be carefully bevelled to leave sharp cutting edges. In the side of one handle, about two inches from the rivet, drill a hole and tap 4BA. A two-inch length of 4BA screwed rod, which can have a terminal head locked on one end, is screwed into the hole.

To use the cutters, adjust the screw so that the notches in the blades are open sufficient to clear the diameter of the wire. Place the insulation in the notches and close the cutters. Hold the wire firmly with the left hand, and give the cutters a quarter of a turn round to make certain that the insulation has been cut through. Pulling the cutters sideways will bring the insulation off and leave the wire unharmed.

Finally, if much wiring is to be done with the same gauge wire, a lock-nut can be run on the screw at A to prevent movement.—Alec Davie (Edmonton, N.).

THAT DODGE OF YOURS!

Every Reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay 41-10-0 for the best hint 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 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 "Practical Hints." DO NOT enclose Queries with your hints.

SPECIAL NOTICE

All hints must be accompanied by the coupon cut from page iii of cover.

Adapting a pair of tin-snips for insulation stripping.

WORKSHOP CALCULATIONS, TABLES AND FORMULAE

By F. J. CAMM

2½% to post 3½%, from George Newnes, Ltd., Tower House, Southampton St., London, W.C. 2.
A

N instrument which will measure capacity and resistance values accurately, and with little trouble, is essential to the keen experimenter, and the bridge meter fulfils these conditions exactly.

The bridge meter is a modification of the well-known Wheatstone resistance network for determining the value of an unknown resistance when compared with certain known values of resistance, and as no current is passed through the indicator or indicating device at the point of correct value, this method is very accurate in use. The Wheatstone network is illustrated in Fig. 1 and r1 and r2 is the variable resistance, and X the unknown. It is the known resistance, which must be very accurate in value.

The bridge about to be described is based on this circuit, and is adapted to read capacity values as well as resistance values, as above mentioned. It is quite easy to construct and is not expensive.

Description and Circuit

The principle has already been described, and this bridge measures capacity values between 0.0001 mfd. and 10 mfd. The resistance range covers from 1 ohm to 10 megalohms. Either a low-frequency oscillator (similar to that given recently in this journal) or a signal from the mains (obtained from the secondary of a bell transformer) is necessary to give the signal for operating the instrument. The best-frequency oscillator is the better instrument to use as, due to the higher frequencies which are available for measuring small capacities, a better indication is given. A small-capacity condenser has a high reactance, and therefore a higher frequency will be more easily passed. The main frequency of 50 cycles would mean that on small-capacity condensers only a very weak indication current would flow.

Headphones are used in conjunction with the L.F. source to indicate the "null point" of the pointer on the scale. A 10,000 ohm wire-wound potentiometer is employed with a series of condensers and resistances of fixed values, and these are selected according to the range desired by a double-pole double-throw and a rotary switch, the former being to change from capacity to resistance or vice versa.

There is an attenuator at the input to control the strength of the input signal, and there is also provision for testing electrolytic type condensers. By using a neon tester with this instrument the complete state of a condenser can be found, and by the addition of an amplifier and a cathode-ray "electric eye," as much for tuning receivers, a visual indication is also possible.

The Panel

The panel may be of ebonite, wood, or aluminium, and the writer recommends the latter as it can be earthed and gives the instrument stability. The size is not critical, but if a scale is being used, and in all the for the addition of the "electric eye," it would be necessary to make it about 1 ins. long by 3 ins. high. The sockets are of the bushed type, which must be insulated from the metal if a metal panel is being used, and the spindles of the variable resistances and switches must not be attached to the moving contacts, or they would short-circuit. The components are fitted to the panel as shown, and there is room later to drill a hole to take the electric eye; this is shown in the Fig. 2 by the dotted lines. A baseboard will also be required if

Instrument is to give the constructor an exact picture of the circuit, but on the panel this will be reversed when seen from the back and will be as shown in Fig. 3. The condensers are wired in order of capacity value from contact 1 to contact 5, and will therefore be .001 to contact 1, .001 to contact 2, .01 to contact 3, .1 to contact 4 and 1 mfd. to contact 5 (all the readings being anti-clockwise). The 1 mfd. condenser is mounted on the panel as it is of the non-durable type.

The free ends of the resistances are likewise connected to the bottom section of the switch, and these are joined up so that when the switch arm is on the contact of the .001 mfd. condenser, the bottom switch arm is on the contact of the 10 mfd. condenser.

The battery BI is an ordinary 4-volt dry cell, and is connected so that its positive side is attached to the positive terminal socket for the testing of electrolytic condensers. This battery is left in the containing case or cabinet. The rest of the wiring is very simple, and can be done from the circuit diagram. It is only necessary to point out that one side of the input sockets, each volume control, and the two sides of the "unknown sockets" are all connected together, and also to the panel, if this is metal, and these can be earthed in this way.

The Dial Scale

To make the dial, take a piece of stiff paper or thin white cardboard and with a compass draw a circle of radius 3 or 4 ins., and between the outside of the potentiometer knob and this circle draw in 10 other circles, this will give a total of 11 circles. Each of these circles can then be divided up into resistances or condenser values, six of the circles for resistances and five for condensers, this is shown in Fig. 2. In this way not only can the value be determined from a graph, but plenty of direct values may be taken by the pointer position.

Two lines are then marked at the bottom parts of the circles where the pointer

In This Article Details of Useful Unit for...
**Construction are Given of a the Experiment**

swing will end, and the potentiometer may need to be turned round to get this effect; the scale is slipped over the spindle during this operation and the knob marked if not already done. The scale is then removed from the potentiometer, and is cut out around the outside of the outer circle in order to give room to mark in the values later. The lines at the bottom are then ensued, and this gives a number of three-quarter circles with two ending lines to indicate the termination of the pointer swing.

A piece of celluloid is next cut to fit over the scale, and this, together with the scale, is held in place over the potentiometer bushing with the screw nut which holds this in place. The celluloid is not, of course, placed in position until the instrument is calibrated.

The pointer is constructed from a piece of strip wire, and can be soldered to the potentiometer spindle or soldered to a small strip of tin which can then be clipped to the spindle.

**The Cabinet**

The cabinet is best constructed of wood, and it is made so that the panel, and baseboard if required, can fit in flush with the inside. Small battens are fitted to allow the panel to be secured, and it is recommended that the inside be lined with tin-foil, which can be electrically connected to the panel with a short length of wire.

**Calibrating**

After the wiring has been completed and the panel placed in the cabinet, including the small battery, the calibrating of the instrument can be undertaken. Two methods are recommended; the graphical, for the subsequent reading of small intermediate values of resistance or capacity, and the direct readings marked on the dial for quick selection of standard values.

Connect up the external I.F. source (a beat-frequency generator will be assumed to be in use) and plug in the 'phones to the proper sockets. Commencing on the resistances, first put the selector switch at the resistance position (this can be determined before assembly) and the range switch at position 1; then, taking a number of known values of resistances from 1 ohm to 100 ohms connect these in turn in the sockets.

The instrument provides a very small range of reading, and it is found convenient to use, as one is sometimes saved the trouble of switching over from one range to another when the two values, or more, are in the same range. Actually, it will be found that the instrument reads lower values than the minimum values given above, and this can be marked in, but the above values are taken from the nearest correct calculated value and will be found to be correct in use. A small scale similar to that for the pointer can be used with the range switch to indicate the range covered in different positions.

Once calibrated, the values of other unknown resistances or condensers are easily and quickly found.

**Operation**

To use the instrument connect as already instructed and, taking the unknown resistance or condenser, put the selector switch in the appropriate position. Put the range switch at the highest reading if the operator has no idea of the value required, and swing the pointer knob slowly over the scale. If there is no reduction in the strength of the signal, then the range switch must be put at the next lowest position, and the operation repeated until a range is found at which the signal weakens and fades almost out. Reference to the scale or graph will then give the required value. Should no signal be heard on any range at all, then the connections must have an open circuit, and if the signal cannot be reduced to minimum, then the value must be.

(Concluded on page 112)
MOST experimenters know that when the sound emanating from a loudspeaker differs from that performed in the studio, "distortion" has been introduced. Distortion can occur in almost every stage of a receiver, but in most cases it is a simple matter to guard against it by using components of good design and high quality and by keeping a careful watch on operating conditions in order to ensure that valves and other apparatus are not overloaded, and that correct bias and anode voltages are applied.

There are, however, certain conditions under which a definite amount of distortion is inevitable. It cannot be prevented from occurring, and until recently distortion of this kind has had to be endured with what patience the listener could command.

The Use of Reaction

Distortion of the kind referred to is due to the effects of reaction. Practically every receiver of reasonable efficiency is capable of reproducing at good volume the programme radiated by the local station without recourse to reaction, and a modern set employing a screened grid high-frequency stage should be able to give a fairly wide choice of programme without the reaction knob requiring attention. If the more elusive foreigners are to be picked up at comfortable strength, however, the additional flexibility of sensitivity given by wisely applied reaction is of great assistance.

As most listeners know, reaction is a process in which part of the energy in the anode circuit or "output" circuit of the detector valve is returned to the grid circuit and is re-amplified. The amount of energy so fed back is controlled in a modern set by a variable condensate, which passes more or less energy, according to the adjustment of the knob, back to a reaction coil, the normal scheme of connections being indicated simply in Fig. 1.

Now not only does reaction greatly increase the volume of sound from the loudspeaker, but it adds also to the apparent selectivity of the set, that is to say, the receiver can be more sharply tuned when a fair amount of reaction is applied than when the reaction control is turned back to zero. But undue sharpening of the tuning has the effect of cutting off some of those important side-bands which represent the higher tones of the musical scale. The reproduction, therefore, tends to become gruff and "drummy"; the brilliance of the treble notes and the tone colour due to the higher harmonics are reduced, and the programme quality becomes decidedly unpleasant.

Distortion With Distinct Reception

How serious this distortion can be is realised by anyone who has ever tried to pick up a very weak and distant signal by pushing reaction to the critical point. The hoarse, croaking voices and the traveley of music issuing from the loudspeaker are scarcely distinguishable as in the normal range of volume.

"Hit or Miss" Principles

Such principles are usually of the "hit or miss" type, and as examples mention may be made of the use of a pentode-output valve in conjunction with a moving-coil loudspeaker known to be rather "boomy." Again, needle scratch in a pick-up circuit, which means, in effect, the addition of extraneous high notes, can be reduced by using a filter to divert all the part of the notes above a certain frequency from the amplifying stages. Usually, too, no attempt was made to secure the use of compensating devices should be self-adjusting. Based entirely upon the electrical characteristics of various pieces of apparatus, the arrangement was so planned that tolerably good quality resulted under normal conditions; but it was seldom possible for all conditions. Moreover, as it depends largely upon making up for poor design (but having the opposite effect), in a second component, the results could never be more than a compromise, and seldom achieved its purpose perfectly.

In a modern automatic tone-balance circuit, however, matters are better arranged. The rising losses due to the attenuation of the higher musical frequencies when reaction is increased are balanced by an increase in the lower frequency range. A new designed low-frequency transformer, which couples the detector valve to the next stage. (Continued on opposite page)
Transformers With Rising Characteristics

Theoretically, a perfect low-frequency transformer should give a perfectly even response to all musical frequencies. There are, however, certain losses due to the electrical characteristics of a transformer which may, or may not, be compensated for by the component. Most good-low frequency transformers have a frequency response which is substantially lower than the moving vanes at all frequencies at some part or parts of the musical scale. A transformer selected for use in an automatic tone balance circuit must have a characteristic in which the voltage amplification, or response at the higher audio frequencies is somewhat greater than at the lower frequencies—what engineers term a “rising” characteristic.

It will be clear that, if due to reaction, the detector stage creates losses in the higher register while the interstage transformer produces an increased upper register response, there will be one setting of the reaction control at which the high note will be balanced exactly at the high note gain. At all other settings of the reaction control, large unbalance will not occur—smaller settings will result in a reduced high-frequency response, with consequent shirrellike ringing. If this condition exists while greater reaction settings will produce a net loss of high-frequency and the reproduction will be flat.

Automatic compensation, however, can be arranged without a great deal of difficulty. It is achieved by shunting a condenser arrangement across the primary winding of the low-frequency transformer, and so designing the circuit that the value of this capacity shunt is varied simultaneously with the adjustment of the reaction setting. The effect of a fairly large capacity shunted across the transformer would be to reduce the high-note response while the capacity were decreased the high-note response would be correspondingly increased. The correct amount of capacity shunt is provided by the use of a differential reaction condenser of somewhat special design, and connected in a manner which differs slightly from the normal.

Reaction Control

The conventional way of connecting a differential condenser for the control of reaction is shown in Fig. 2. The moving vanes are joined to the detector anode, one set of fixed vanes to the reaction coil, and the other set of fixed vanes to earth. When the moving vanes A are fully meshed with the earthed vanes B, little or no energy can be transferred to the reaction coil. As the position of the moving vanes is altered by turning the knob, their coupling with the earthed vanes B is reduced and the coupling with the anode A is increased. More energy will therefore pass to the reaction coil but both B and C being at earth potential, no capacity between the anode and earth will be constant, so that tuning will not be affected by adjustment of reaction.

The automatic tone balance arrangement is shown in Fig. 3. Here the anode is connected to one of the fixed vanes and to the end of the reaction coil, the other end of the reaction coil is joined to the second set of fixed vanes, and the moving vanes are connected to earth. Further, a fixed condenser of fairly high capacity, say, 0.1 µf, is interposed between the anode and the differential condenser, while the reaction condenser is so constructed that, when the moving vanes are fully meshed with the "anode" vanes (i.e., when zero reaction is applied), there is a direct connection between the moving vanes and the "anode" vanes—in other words, half of the reaction condenser is shorted to earth.

Examining the circuit when adjusted to zero reaction, as indicated in Fig. 4, it will be admitted that, in effect, the 0.1 µf condenser is connected across the transformer primary. Actually, the shunt consists of the 0.1 µf condenser, the high-frequency choke and the high tension battery in series, but from the audio-frequency and capacity point of view we may neglect the high-frequency choke and the battery.

Now if the reaction control is moved over so that a certain amount of reaction is applied, as in Fig. 3, a certain amount of capacity, i.e., that due to the "anode" and moving vanes of the reaction condenser, is placed in series with the 0.1 µf condenser. As most listeners are aware, two condensers in series have together a smaller capacity than either one of the single condensers, so that, as the reaction is increased, and the capacity between "B" and "D" decreases, so the capacity shunted across the transformer is decreased, and the more nearly the frequency response of the transformer approaches its true characteristic. As this characteristic is a rising one, the high-note response will increase in proportion as reaction is increased, thus giving automatic control.

The perfection of this control depends upon two things: first, the actual frequency characteristic of the transformer, and then the correct choice of capacities and condenser characteristics. In both cases the correction balance. It is for this reason that specially designed automatic tone-control transformers need to be used, and the other essentials of the circuit must follow religiously the types and sizes specified.

**NEWNES TELEVISION AND SHORT-WAVE HANDBOOK**

5/- or 5/- by post from

GEORGE NEWNES LTD., 67-68 STRAND, LONDON, W.C.2.

**ELECTRADIAD**

**SIGNAL EQUIPMENT FOR ARMY & NAVY WORK**

**direct.vib.**

**COPPERHEAD PHONO HEADPHONES**

**DOUBLE HEADPHONES**

**WITH RESISTANCE ATTACHMENTS FOR SERVICE USE**

**COILS & TRANSFORMERS**

**LOW-PASS FILTERS**

**HIGHER FILTERS**

**HIFI HEADPHONE CORP.**

**CONSUMERS PHONE CORPS.**

**TEL. M.E. 1030**

**LETHERWHEELED**

**LOW-PASS FILTERS**

**HIGHER FILTERS**

**HIFI HEADPHONE CORP.**

**CONSUMERS PHONE CORPS.**

**TEL. M.E. 1030**

**ELECTRADIAD**

**216, UPPER THAMES STREET, LONDON, E.D.8**

**TO CYCLISTS! Your wheels will not be rounded and true, unless the spokes are adjusted.**

**Write for Free Book on the art of "soft" adjusting and ask for address of HARDENING STEEL and TEMPERING TOOLS with FLUXITE."
Transformers, H.F., L.F., and Mains

These General Notes Will Help to Clear Up Many of the Points which are Often Misunderstood.

Principles of Transformer Operation are Briefly Explained, Along With Practical Limitations.

Most readers are so familiar with the use of transformers that they have never stopped to consider how they operate and how their performance is affected by the soundness of design. The type of transformer best known is that employed for coupling in an L.F. amplifier. Essentially, it consists of two windings (having, perhaps, something like 20,000 turns between primary) but with the laminated iron core. In most cases there are fewer turns on the primary winding than on the secondary, for it is the ratio between the numbers of turns which governs the voltage step-up provided.

Would be changed to 2 volts, 29 mA if the ratio were 10 to 1—again neglecting losses. Whether or not we step up or step down the original voltage depends upon whether or not we are supplying a voltage-actuated or a current-actuated device. As you are aware, a thermionic valve is, in most of the methods in which it is used, a voltage-actuated device, since in the fluctuating voltage applied to its control grid which regulates the corresponding flow of anode current, and hence the amplification produced and the output made available in the anode circuit.

Voltage and Power

But in another form of amplification, class B, the valve is a power-operated device, and current is required to flow in the grid circuit of the double valve. That is why a step-down or sometimes an even-ratio (one to one) transformer is used to feed it. In almost every case an attempt is made to reduce grid current to zero. It will be remembered that in class B amplification a so-called driver valve precedes the class B valve; it is the purpose of this valve to provide the power required. This should not be confused with the nomenclature generally applied to a large L.F. or output valve. This is a voltage-actuated valve, the purpose of which is to provide power (to operate the speaker) in its output or anode circuit.

The principle of operation of all transformers is the same. An alternating or high-frequency current is passed through the primary winding. This causes a magnetic field to be built up around the winding and the cores (which consists of air in the case of an H.F. transformer). The magnetic field also surrounds the secondary winding, with the result that a current is induced in it. The secondary voltage is governed by the number of times that the magnetic field is cut, and thus by the number of turns.

The Auto-transformer

Mains-transformer Design

In designing a mains transformer of the double-wound type it is first necessary to determine the number of turns required per volt. This is dependent upon the shape, weight and dimensions of the core, and must be such that no primary current flows when the secondary windings are not connected to a closed circuit. In that case the primary can be said to be "tuned" to the supply, just as a coil-condenser circuit is tuned to a signal. When tuning is accurate, the resistance or impedance of the coil and condenser is infinitely high.

Once the number of primary turns has been decided, the number required for each of the secondary windings can be found by multiplying the turns-per-volt figure by the output voltage wanted. After that it is necessary to find the total secondary transformer need not necessarily have two distinct windings. It might consist of a single tapped winding. The component is then known as a auto-transformer. If an alternating current is applied between the ends of the winding, the voltage between one end and a tapping is less than the applied voltage. Whereas, if the input is applied between one end and a tapping, a higher voltage can be obtained by making connections between the two ends. So, in tapping-off a voltage is concerned the auto-transformer can be compared with a potentiometer used in a D.C. circuit. The comparison is illustrated in accompanying diagrams. The principle of the auto-transformer is employed in the case of many resistance-fed L.F. transformers, in which case it is possible to effect a saving in the total amount of wire used because the "primary" winding is also a part of the "secondary."

The principle of the auto-transformer can be used in an A.C. mains circuit, but such a transformer should not be employed to supply a mains receiver. It is contrary to I.R.E. regulations, since the output (used to feed the rectifier) is not isolated from the A.C. mains.

Auto-transformers can be made so that when the device is turned, part of the secondary winding is tapped off, and this part is connected to the primary winding. This is controlled by a suitable potentiometer; hence it is possible to have a control grid in the valve, and by using the appropriate of the principal circuits, the current can be controlled exactly.

A class B transformer steps down, because the valve is power operated; an ordinary L.F. transformer steps up because the L.F. valve is voltage operated.

The step-up effect of an H.F. transformer is limited, due to the capacity between primary and secondary windings, and the number of turns required on the primary.
Overcoming Television Flicker

Specifications Published.
54723—Marconi’s Wireless Telegraph Co., Ltd.—Superheterodyne wireless receivers.
54776—Scophony, Ltd., and Rosen—A H.—Natural colour television systems.
54640—Johnson Laboratories, Inc.—Image suppression system for wireless receivers.
54650—Fernseh Akt.-Ges.—Television or like systems.

Printed copies of the full Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at the uniform price of 1s. each.

NEW PATENTS
These particulars of New Patents of interest to readers have been selected from the Official Journal of Patents and are published by permission of the H.M. Stationery Office. The Official Journal of Patents can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.1, price 1s. weekly (annual subscription, £2 15s.).

Abstracts Published.
VALVE AND AMPLIFYING CIRCUITS.
Baird Television, Ltd., and Truefit, E. V. No. 508038.

In an amplifying circuit employing a valve having a method 1, a control grid 2 to which signals are applied, a screen grid 3, an anode 4 from which output signals are taken, and a secondary-emitting electrode 5, a fixed or variable resistance or impedance 19 is connected. By varying the size of the circuit of electrode 5 to modify as regards frequency of shift as a whole the level of the curve relating output to input. Specification 508038 is referred to.

WORKSHOP
CALCULATIONS
TABLES AND FORMULAE

By F. J. CAMM

3/6

or by post 3/10 from

GEORGE NEWNES, LTD.,
Tower House, Southampton St., London, W.C.2.
SHORT-WAVE SECTION

IMPROVED SHORT-WAVE RESULTS

How to Make Certain of Getting Those News Bulletins Satisfactorily
By W. J. DELANEY

MANY listeners own all-wave receivers, but in the past have not made a great deal of use of the short-wave section owing to its unsatisfactory performance. Now that there are many interesting news bulletins being broadcast on the short waves, however, they express a desire to operate on the short waves but do not know why the receiver fails to give the desired performance. If the receiver is a commercial model it may be inadequate and that, the tuning-knob components are satisfactory and the poor performance may thus be due to the use of a coil or condenser. Remember that short waves call for higher insulation than is needed for normal broadcast reception on the medium and long waves, and therefore overhauling your aerial if your set is not bringing in the short-wave stations. Don't make the aerial bad enough to improve results. Rather cut down the length of the aerial so that a total of about 15 to 20 ft. is in use, and improve the insulation at each end. If there are any joints in the aerial or lead-in, solder them and wrap with insulation-tape to improve the weather-resisting properties. Remember, also, that the receiver must be handled much more gently on the short waves. You cannot expect to run round the dial and pick out a suitable station as you can on the medium wave.

Turn the tuning-knob very slowly and listen for every sound as the needle travels across the scale. At the slightest sign of a signal stop, and then operate the knob so that the pointer travels very slowly backwards and forwards over that spot, at the same time operating the gain or receive controls which are fitted. Of course, when once a good station has been located the exact position will be noted and it will be possible to return to that setting, but I am dealing now with the operation of a receiver which has not in the past been used for short-wave reception.

Suitable Components

If, on the other hand, the receiver is a home-made model, then it may be quite possible that one or more parts are unsuitable for satisfactory short-wave work and some change will have to be made. For instance, the reaction may be found inadequate or the choke may be due to the reaction condenser. A choke may easily be added, or fitting either a spare all-wave choke, or adding a special short-wave choke in series with the existing component, and connecting the new choke on the anode side of the existing choke. If this fails to effect a cure, then a few turns may be added to the reaction winding, or a larger reaction condenser obtained. Such changes as these may, however, affect the performance on the other wavelengths, depending upon the circuit which is used. In some receivers there is a complete change of coils when the wave-change switch is operated, whilst in others portions of a coil are short-circuited as the receiver is switched to lower wavelengths, and therefore the H.F. choke modification is preferable as this will not affect the medium- or long-wave performance. In some cases a change in the value of the grid-leak or condenser or both may be found desirable. A common trouble experienced on the short waves is that known as hand-capacity effects, and these are evidenced by the fading of a signal as soon as the hand is removed from the tuning control or from the reaction control. In some cases this is due only to the fact that the fixed vanes of these two condensers are earthed, instead of the moving vanes. As the moving vanes are connected to the operating spindle, it is obvious that the holding of a control knob is connecting the spindle and thus the moving vanes to earth through the capacity of the body. If these vanes are not already at earth potential, therefore, there will be some modification in the capacity when the hand is removed, and therefore the first step in the cure of such a trouble is to earth the moving vanes.

Earth Screens

If, however, the spindles are earthed, then the usual cause of hand-capacity effects may be found to be an unsuitable earth connection and an improvement here should be effected. If this does not cure the trouble then a metal plate should be placed behind the panel and connected to earth. Clearance holes should be drilled in it to clear all components mounted on the panel, and it should be fixed to the panel by bolts at two or three places to prevent it from moving and perhaps short-circuit some vital point to earth. If desired, however, the lock-nuts which hold on the tuning and reaction condensers, provided these are already properly earthed, may be used for fixing the screening plate in place.

Fading

Finally, remember that short-wave signals fade rather more noticeably than those on other wavebands, and do not be disappointed if you find, when you tune in a known station, that it cannot be heard. Wait a few minutes, and it will return to normal volume. Some commercial receivers are fitted with automatic volume control to compensate for fading, but when switched to short waves the A.V.C. circuit may be cut out at the receiving end because there is a form of fading present on certain short wavelengths which is so rapid that normal A.V.C. circuits cannot cope with it, and the trouble may be accentuated. Do not be disappointed, therefore, and think that the receiver is out of order if you find that your short-wave signals fade. They may pass right out into inaudibility, but this is a perfectly natural function which can only be overcome by a specially designed receiver, but if you want to put yourself in your mind concerning this fact, your dealer or the makers of your receiver will inform you whether or not the A.V.C. is effective on the short waves on the particular model which you are using.

Battery Connections

CERTAIN plugs are manufactured for battery leads in which the end of a length of wire has to be inserted. Usually a small part of the wire is bare, rolled up and this portion is inserted into a hole part of the plug then being screwed up tightly. A case of trouble was recently investigated where on the L.T. side such a plug was used, but in screwing up the wire the rubber covering was left rather long and when inserted in the plug the rubber made contact with the metal and there was no connection to the actual plug and thus the L.T. supply was interrupted.
DX on the Medium Waves

Sir.—It was with the greatest of pleasure I read the article on M.W. DX receivers in the December 9th issue of Practical Wireless, and I feel that many readers with not quite the full technical knowledge to follow the job of DXing would welcome full details of a receiver of this type. Apart from the DX side the 선택, selectivity will appeal to all my knowledge.

As to DX on the broadcast bands this may seem to some new readers rather hard, but I can assure them that if they take the trouble to stay up late enough and keep at the game, their “catchers” will be far superior to any S.W. catches.

To be more concrete, I may add that over 4,000 American stations alone have been heard in this country, and over 80 recorded to my knowledge. The majority of these stations were of powers of 29 kW, and less, and, in fact, stations of power as low as 100 watts have been heard, e.g. KDB, Santa Barbara (Cal.) and even the most hard-boiled S.W. fan will admit this is a catch.

I myself heard CJM2 (200 watts), Cuba, in August!

Nor does M.W. DX confine itself to the Americas: over 300 stations have been heard here as well as stations from India, Siam, Siberia, Africa, and the Hawaiian Islands.

As to the merits of this type of DX I will leave readers to judge for themselves which is the better set: a V.A.O on short wave or a VAC on the broadcast bands.

The answer will be quite obvious, I feel sure.

What do other readers think? —W. Berton, Assistant European Representative, International DX'ers Alliance (London, E.S.)

Shortening an Aerial: Correspondent Wanted

Sir,—I have written to DX and read many much enjoy reading Practical Wireless and am particularly interested in other readers’ experiences and experiments. Recently my aerial fell down, and I needed a new one, so I put about a quarter of the old aerial. Imagine my surprise at now being able to give “Home Service” stations much better. I found that fusing is reduced by a considerable extent, although I must add that the results is also reduced.

Finally, I should like to correspond with any S.W. listener about my own age, which is 18 years. I will answer all letters received. Wishing Practical Wireless continued success.—J. F. Potter (5, Council Houses, Ducklington, Witney, Oxon).

Correspondents Wanted

Sir,—I have been a reader of your excellent journal for 15 months, and find it very helpful indeed to begin with myself. I should be greatly pleased if any of your readers would care to correspond with me concerning S.W. listening and transmitting. Also I would be very glad to exchange my S.W. card with any full ticket holder, A.A. or in any station abroad.—John Hunter (49, Twist Lane, Leigh, Lancs, England).

PRACTICAL WIRELESS SERVICE MANUAL

By F. J. CAMM.

See plan 42 for full list of the 69 cards from the Publishers, George Stevens, Ltd. (Farnham).
The text appears to be a classified or proprietary document, possibly related to electronic components or equipment. The content is not clear due to the nature of the text and the presence of numerous abbreviations and codes. It seems to be a catalog or inventory list, with entries for various items, possibly related to radio or telecommunication equipment. The document is not easily readable due to the extensive use of codes and abbreviations.
A reply to your letter

Screening a Valve

"I have built an A.C. set in which the detector is of the plain glass variety. I am troubled with hum and have done practically everything I can think of to cure it without result. I believe that screening the valve would prove useful, but I am uncertain whether this is so, and if it is, how to do it. Could you help me in this problem?"—S. R. (Leominster)

ALTHOUGH the screening of a detector valve will probably result in a reduction in hum, and perhaps in its complete removal, there is one point to watch. In some types of mains valve the screen must be a certain distance away from the electron, otherwise damage may result, if the valve has the type with a top-grid cap, that the grid condenser should be included inside the screen, preferably on the right on the grid connection. Special valve screens may be obtained from advertisers in these pages.

Coupling Winding

"I have some home-made 4-pin shortwave coils but am now rather interested in modifying them to include a coupling winding for ari-al—present windings giving secondary and reaction only. I believe you once published details in which you stated that the aerial winding could be put inside the grid winding, but I cannot fix the article although I have looked all through my back numbers. Can you give me any reference to this subject?"—L. E. R. (W.C.T.)

WE think you probably refer to a general article on aerial coupling in which three or four different methods of arranging for Westinghouse were described. A small former is used, round which the primary winding may be wound, and this is inserted inside the former carrying the other windings. To ensure that the new winding will be held central and rigid inside the outer former, three or three small pieces of cork are cut and fixed to the outside of the new former, so that these cork pieces are being adjusted so that the former is in a tight fit. The same idea may be applied to standard 4-pin coil formers.

S.G. Valve for L.F.

"I am making a small amplifier which I need for a deaf-aid, and I wish to get as much gain as possible into the small amount of equipment which will be used in a very small box. I think it is possible to use an S.G. valve in such an amplifier in order to obtain high gain, but I am not sure whether the standard method of feeding the screening grid is the best. It is certainly possible to use S.G. valves in such an amplifier, and a good design would be to use two such valves feeding a good L.F. valve. In view of the limited H.T. which would be used in a portable deaf-aid amplifier, R.C. coupling would be employed, and with the valves in question an appreciable gain at low H.T. consumption would be obtained. We suggest the Osram Midget valves, types S.12 for the S.G.s, two being employed with a gain-control in the form of a variable grid-leak, and for the output an L.12. Forty-five volts should be ample for H.T.

Quality Amplifier

"I wish to build a really good quality amplifier for A.C. work, and for domestic purposes. I believe that a really high output is needed for quality, and am un-doubtedly a good push-pull circuit is the best. This should preferably be of the all-resistance type, and a separate phase reverser is desirable. You would need really good valves for such an amplifier, and the stage should be capable of about 8 or more watts. This will give good handling capabilities without need of being turned full on, and if a suitable input is provided to the L.F. and phase-reverser stage you should find nothing to complain about from the quality point of view. Do not, however, forget the requirements of H.T. for such an amplifier.

Replenishing Batteries

"Is there any way of renewing torch cells or similar cells such as are used in G.B. batteries? I find that when these are run out they will give a fairly weak light on a torch, but if I could strengthen them in any way they would be useful. Have you published any circuits for making such batteries?"—H. G., and others.

Q.M.A. cells may be given a new span of life, provided the zinc cases are not eaten away. To do this piece a number of small holes round the lower part of the cell and then stand it in a solution of sal-ammoniac. This will give a certain amount of improvement, but generally speaking a replacement is the most satisfactory plan. We have published and constructed data on batteries, and as previously pointed out, it is not an econ-omical plan to make them. Formulas will, however, be found in our handbook on Accumulators, price is.

Repairing a Valve

"I have pulled the top of an S.G. valve and wonder if it means another, or whether I can mend this valve."—B. B. (Perth).

IF the small leading-out wire is not broken off flush with the glass, then a satisfactory repair can be made. The small solder blob on top of the threaded rod must be found to be hollow and a hot iron should be applied to the top, and it should then be shaken hard when the small solder blob should come away and leave a clean hole. Failing this, pierce it carefully with a needle so that a clean hole is left. Carefully clean and tin the leading-out wire, but if this has been broken off short, another length of wire must be soldered to it. Do this carefully and then push the cap over the wire so that it projects through the hole in the threaded rod. Solder this and cut off the surplus. This will give a good fit of the top of the valve by Chatterton's Compound or any other adhesive.

REPLIES IN BRIEF

The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because of general interest.

C. F. (Oxley). You should communicate with the makers of the set as the pickup may not be usable with this particular combination. The single output stage may provide inadequate amplification, and this may not be fitted up at all.

H. H. (Larkhall). It is not possible to guarantee any receiver when pick up any station, without details of local conditions. Any good receiver should give satisfactory under normal conditions, but inquiries from your local dealer or neighbours will give you an indication of what results in the district.

J. P. O. S. (Astonfield). You presumably need a straight H.F. amplifier, and this H.F. stage may, therefore, be used.

H. W. A. (Flamstead). We regret that we have no details of the makers of the particular make of set mentioned by you.

J. B. (Newport). It would appear that there is a short circuit, perhaps in one of the electronic condensers. On the other hand, remember that the lead in crowning H.T. there is bound to be a spark when this circuit is made and broken, and thus there are two possibilities as to the cause of the fault.

B. W. C. (Weelingborough). The speaker may be used with direct input, so that no coupling is necessary with that particular type of unit.

T. S. (Wellingboro.). The single large grid which will add to the load, or alternatively there may not be enough of the special tubes for the battery in series with the H.T. We suggest you contact the makers regarding the matter.

C. J. B. (Norwich). We have given several articles on this subject, but the matching of an output transformer is a matter only dealt with in our new "Short-Wave Handbook."

R. E. (Winchfield). The serial is unaltered and we suggest a small square frame, about 8in. square with good Litz.

G. W. R. (Perth). The transformer is of the 7 to 1 ratio type and is not now obtainable.

K. E. (Southend-on-Sea). We would not advise the building of the set. Some difficulty will be experienced in obtaining valves and transformers, and L. S. (Broms). The firm is no longer in business.

R. A. S. (Harpersden). The wavelength is in the millimetre band, which you will find marked on the dial of your set.

W. T. (Raglan). Not less than 150 volts should be used. The G.B. is 15 volts.

K. T. (Cambridge). If you think the second alternative desirable and the speaker may be made up on one of the makers' sets, then:

K. R. T. (Cambridge). Not less than 50 ft. should be used and the stranded wire is best. Solder all joints.

The coupon on page iii of cover must be attached to every query.
TONE CONTROL BY NEGATIVE FEEDBACK

(Continued from page 320)

The circuit L, C is provided between the sliding contact S and the right-hand end of the resistance R. This leads to such amplification curves in relation to the position of the sliding contact S, as is shown in Fig. 4 for the two extreme positions. In this circuit the counter-coupling for the medium frequencies remains always large, resulting over the whole range in a great reduction of the non-linear distortions. It is merely in the one extreme position (a) that the counter-coupling for the high and low tones is equal to that for the medium tones, whereas in the other extreme position (b) the counter-coupling for the high and low tones is greater than for the medium tones, which is desirable for counter-coupling for the latter is only increased very slightly.

The circuit shown is particularly suitable for use as a complete fading compensator, or for low-frequency amplifiers for record reproduction in which the medium input A.C. potential is mainly the same, and in which also a large medium voltage is required. The effect in this case is that of a pure tone-control.

CAPACITY-RESISTANCE-BRIDGE METER

(Continued from page 321) be extremely small, or a dead short circuit. To test electrolytic condensers, connect to the sockets marked" electrolytic," the positive side of the condenser being attached to the positive socket and read as for ordinary condensers. It will be found hard to get an exact minimum on these condensers, but the effect of the internal battery helps to produce a minimum sufficiently close to the most values, and only where the condenser is very old or defective will trouble be experienced, and this will sometimes be an indication of the condenser's state.

There are no snags in the making and the circuit of this little unit, and once made it is quite trouble free, and the last point to mention is that as the condenser to be measured, decrease sensitivity, so increases the note frequency from the oscillator to compensate for this to some extent.

SOUTHERN RADIO'S BARGAINS

ALL GUARANTEED. POSTAGE EXTRA.

5/- Parcel of Useful Components, comprising Condensers, Resistances, Voltage Controls, Wire, Circuits, etc. Value 50/-, 5/- per parcel.

15/- Service Man's Component Kit. Electrolytic Condensers, Volume Controls, Resistances. Valentine, Metz, Paper Condensers, Valve Holders, etc. 120 articles contained in strong carrying case, 9½ x 6½ x 1½ inches.

21/- Small Trader's Parcel of Components. 350 condensers, 90 transistors, 300 valve caps, 30 sets of Valve Holders, Resistances, Chokes, Coils, Wire, etc. Value 15/-, 21/- the parcel.

2/- Tool or Instrument Carrying Cases, etc. Government Stock; Wood 9½ x 7½ x 2½ inches.

SPEAKER, Other, Limited number. 1½, 2½, 5/-, 10/- each.

SOUTHERN SPECIALS. LF, Medium, High frequency units, 5/-, 10/-, 15/-, etc. London, W.C. Gerrard 6032.

VAUXHALL—All goods previously advertised are still available; send in remittance price list, free—Vauxhall Utilities, 10th, Strand, W.C.2.

BANKRUPT BARGAINS. Brand new 1955 models, condensers, sealed carbon, with guarantees, of less than 40 cent, below listed prices; also Midgets, portable, radio, etc. Send 1st class stamps, 9d. for catalogue. Radio Bargains, Dept. P.W., 361-3, Littlefield Road, Acton, Birmingham.

5/- Bargain Parcel comprising Speaker Cabinet, 5½ x 5½, 3½ deep. Latest design. Free postage, Valves, etc. Schurman Radio, 19, Muswell Rd., South Croydon.


RELIABLE Switches, Resistances, and all quality radio and electrical components. Capable repairs. Send 3d. stamp and we will send catalogue No. 162. BULGIN, BARKING.

LOUDSPEAKER REPAIRS


REPAIRS to moving coil speakers. Cones/voiles fitted or rewoven. Finite drivers or sound. Prices quoted, including eliminators. Pick-ups and other sound and voice units. Guaranteed satisfaction. Prompt service.


NEW LOUDSPEAKERS


LOUDSPEAKER CONVERSIONS

B A K E R E ' S Triple Cone Conversions Will Immediately Improve Reproduction of Your Present Speakers. Enables you to build up to date and obtain really realistic reproduction and music at cost of little more than from the Glasgow Manufacturers of Moving Coil Speakers since 1948—Bakers Schurman Radio, 19, Muswell Rd., South Croydon.
As a practical man you will enjoy reading PRACTICAL MECHANICS, the splendid illustrated monthly for the home handyman, the mechanic and all who are interested in scientific matters in a popular way.

PRACTICAL MECHANICS has a staff of experts who deal with their subjects so that you can understand, and their articles are profusely illustrated with photographs, drawings, diagrams & plans.

In the January PRACTICAL MECHANICS

WORKSHOP PRACTICE
Gear Cutting and Grinding

A SMALL STEAM BOILER

SOME PRACTICAL ASPECTS OF ELECTRONIC ENGINEERING

THE PRINCIPLES OF THE ELECTRIC ORGAN

NEW METHODS OF CAMOUFLAGE DETECTION

TOOLMAKING AND TOOL DESIGN
Making Press Tools, Jigs, Gauges and Fixtures

THE MODEL WORLD

SCIENCE AND INVENTION

And Many Other Interesting Features

Order your copy to-day—on sale Friday, December 29th.