FIRST AIDS WHEN YOUR SET FAILS!

Practical Wireless

3D.

AND PRACTICAL TELEVISION

EDITED BY F.J.CAMM

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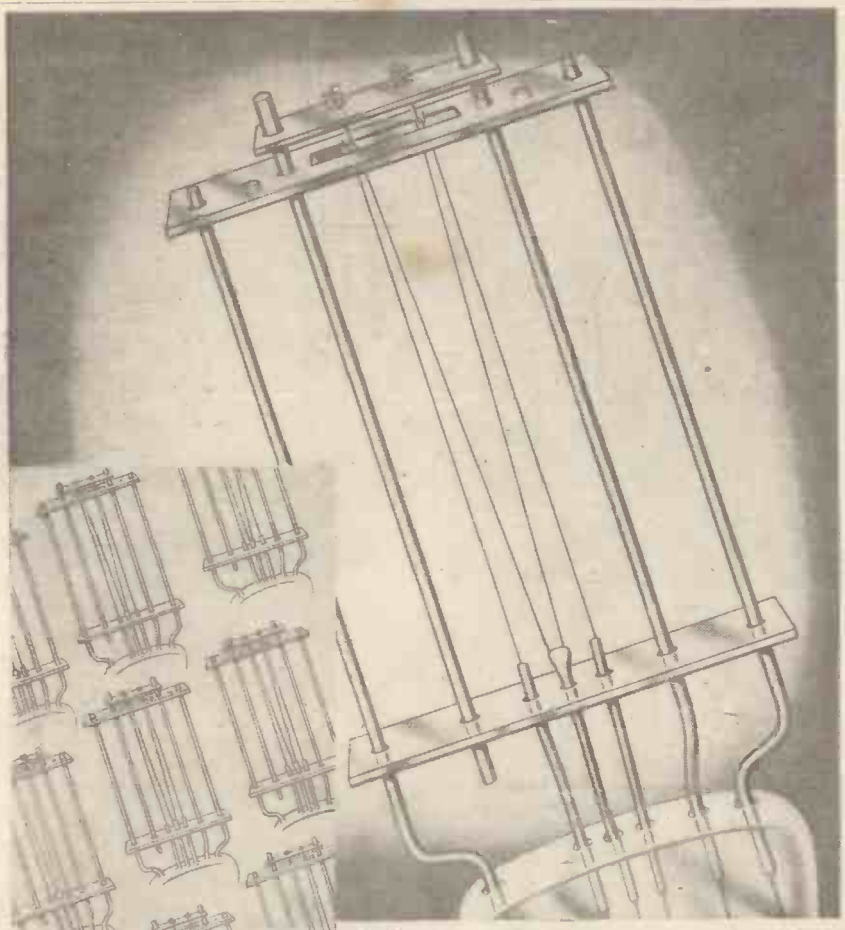
The Advance Details of

LEADER 3

Low Price & Efficiency Combined!



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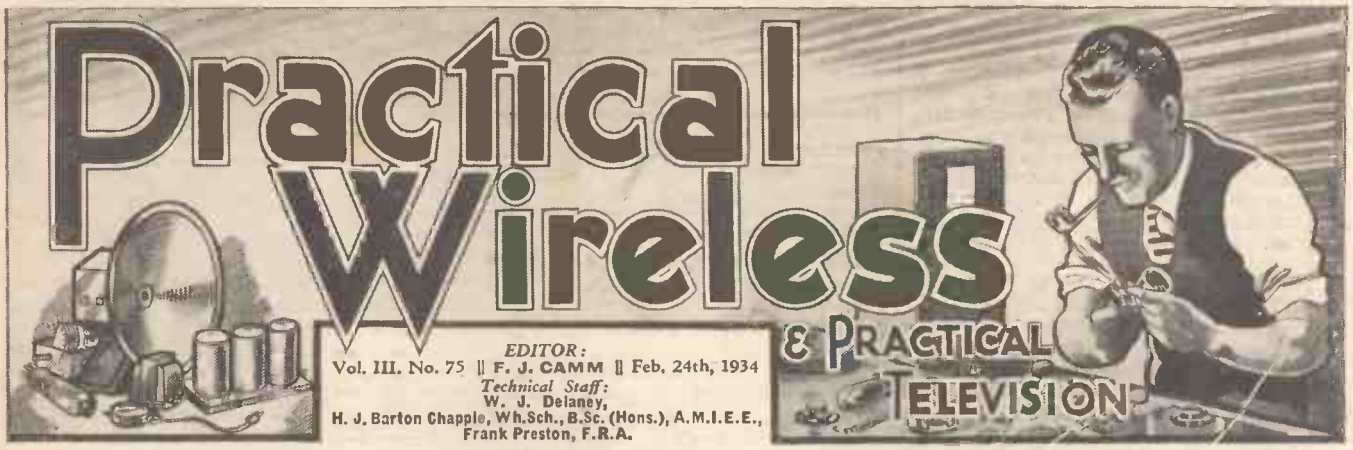
WE LEAD AGAIN WITH "THE LEADER"!

See Page IV, Television Supplement



ROUND *the* WORLD *of* WIRELESS

We Lead Again!

WE have received hundreds of letters from home constructors in the past few months complaining of the competition of the cheap commercial receiver. They direct our attention to the battery and mains-operated receivers which can be purchased at a price which equals the charge made for the parts of a home-assembled receiver. We have yet to learn of a satisfactory cheap commercial receiver. In order to get the price down the manufacturer skimps the components, the quality of the cabinet, and in this way is able to produce some sort of a wireless set. Such receivers give the maximum amount of trouble, as the enormous amount of correspondence we receive regarding troubles with cheap receivers proves. PRACTICAL WIRELESS is pleased to announce that in order to meet this competition it is embarking upon the design of a new series of receivers which combine low price with maximum efficiency. Readers should not be misled into believing that it is possible to buy for a few pounds a complete receiver which equals in efficiency, selectivity, quality, and station getting qualities a home-built receiver of similar value.

Free Blue Print of the "Leader Three"

THE first of the PRACTICAL WIRELESS receivers to be designed under this new policy is the "Leader Three," A FREE BLUE PRINT FOR WHICH WILL BE GIVEN WITH EVERY COPY OF NEXT WEEK'S ISSUE. It does not incorporate a stunt circuit, but nevertheless, modern features have been introduced, and great attention has been paid to the problem of selectivity. Order Next Week's Copy Now! A preliminary announcement appears on page IV of this week's Television Supplement.

Our V-notch for Wire-stripping

THE V-notch for wire-stripping, originally incorporated in our free-gift handy gauge (presented with January 28th, 1933, issue of PRACTICAL WIRELESS) was first introduced by the editor of this journal. It is flattering to note that this V-notch is now coming into general use, of course, without acknowledgment of its source!

Our Query Service—Please Note!

WE make no charge whatever for answering readers' queries, and we make a pleasure of assisting readers out of their difficulties. It is a service which is generously interpreted in these offices, but now and again we receive some tall orders. The other day, for example, we received a letter unaccompanied by the Query Coupon or a stamped and addressed envelope, and containing no less than twenty-five separate technical queries! Not only this, the reader requested a reply by return. We cannot answer any reader's queries unless a coupon is enclosed, and we cannot answer them through the post unless a stamped and addressed envelope is also included. We do not wish to impose any limitations within reason upon readers' questions, but they, in return, should be reasonable in their requests; nor can we answer queries over the telephone.

Two More Romanian Stations

SO far at Brasov (Romania), a 20-kilowatt transmitter has been operating on 1,875 metres; this is the channel on which Huizen (Holland) has worked for some years. An order has, however, now been placed with the Marconi Company by Romania for erection—possibly at Brasov—of a 150-kilowatt transmitter to take the main Bucharest programmes. In addition, a further 20-kilowatt station is also to be built by Marconi engineers for the same country.

Continental News Broadcasts

AS a rule, the European stations broadcast a greater number of news bulletins than do our home stations. Moreover, in most cases, they do not give general items, but subdivide the subjects and suit them to the time of day when they are given out. As an example, Vienna at 8 a.m. gives a review of the Austrian morning papers, and also a repeat of the previous night's bulletin; at midday extracts from the foreign press are given, stock exchange quotations, and so on. The 3 p.m. news contains theatrical items or kindred subjects. At 6 p.m. the first evening radio news is broadcast, and a final review of home and foreign items, weather report, and ministerial announcements at about 9 p.m.

China Adopts Beam Wireless

A NEW wireless station of the Marconi beam type has been opened at Chenju (China) for direct wireless communication with Great Britain; it is a preliminary step to the establishment of a radio telephony service between Shanghai and London.

A Wireless Mast that Made History

THE destruction by fire of the aerial mast used at the Admiralty station at Waltham constituted a piece of news which may have aroused little interest in the mind of the general public. Yet the mast possessed a history; it was from the Waltham wireless station that Great Britain communicated to the Fleet in 1914 that war had been declared.

ROUND *the* WORLD *of* WIRELESS *(Continued)*

"Music Hall" Broadcast

LESLIE FULLER, the film artist of *Not So Quiet on the Western Front*, gives his first broadcast on February 24th in *Music Hall*. He will bring a condensed version of this, his first, film to the microphone, and will have with him a cast of four or five artists. Leslie is at present engaged on another film at Elstree with Mary Glynne. It will be called *The Outcast*.

Band Concert from the Midland Regional

ONE of the premier bands of the Midlands, that of Creswell Colliery Institute, conducted by David Aspinall, gives an attractive programme in the Birmingham studio on February 25th. Among many notable awards, this band has won the Belle Vue Championship, which it carried off in 1925. The vocalists in the band concert are the McGowran Quartet, from Coventry.

Violin Solos by Eda Kersey

A BIRTHDAY present of a violin when she was only six was the unusual gift received by Eda Kersey, soloist with the B.B.C. Orchestra in the London Regional programme on February 26th. Miss Kersey has only been in London for four years, her home being at Southsea. She first broadcast from Bournemouth seven years ago, and was afterwards heard from other B.B.C. stations. When she performed at the Birmingham station, Joseph Lewis was so impressed with her playing that she has since broadcast under his baton on more than twenty occasions, one performance including the famous broadcast of the Dohnanyi Concerto the first time that it was transmitted in this country. Miss Kersey will again play under Mr. Lewis's baton on February 26th.

Scottish Studio Orchestra

IN February 27th an interesting concert will be given by the Scottish Studio Orchestra, and Christian and Mabel Brown, (duettists). The orchestra will be heard in works by Chaminade, O'Neill, Dvorak and others, while the duettists will give songs by John Ireland, Frank Bridge, and songs arranged by Alfred Moffat and Hewson.

"Press Paragraph"

THIS is the title of a play, in eight studies in reaction, by Hester Paton Brown, which will be broadcast on February 28th. It will be produced by Howard Rose. The problem of the machine: is it a blessing to mankind or is it a curse? To some it is the first of these, to some the other. What is to be the ultimate solution of this puzzle? *Press Paragraph* deals with some of these difficulties, as they react on the lives of various groups of people; on journalist, on employer, on workman, and on wife.

Gounod's "Faust"

THE Second Act of Gounod's *Faust*, to be given by the Carl Rosa Company in the Grand Theatre, Wolverhampton, is being relayed to the Midland Region on February 26th. Ivor John's *rôle* is that of Faust; Helen Ogilvie, Marguérite; and Ronald Stear, Mephistopheles.

INTERESTING and TOPICAL PARAGRAPHS

"The Play Evolves"

THE fifth of the series of dramatic surveys, under the general title *The Play Evolves*, will be given in the West Region on February 27th. The play chosen by Mr. Ifan Kyrle Fletcher, to represent the theatre of the nineteenth century, is *Money*, by Edward Bulwer Lytton. This play was first produced at the Theatre Royal in the Haymarket in 1840, and was revived in 1872, and again at Drury Lane in 1911, at a Royal Command performance in honour of Kaiser Wilhelm.

"Choir and Cloister" Cathedral Broadcasts

THE second of the "Choir and Cloister" series of Midland Regional relays from Midland Cathedrals is from Lichfield, on February 27th. This will be the first broadcast ever given from Lichfield Cathedral. The narrator is Walter Pitchford, of Lamport, Northants, and he will find plenty of material for picturesque description and human story in the church which St. Chad founded to be the centre of Christianity in the Saxon Kingdom of Mercia. The West front is famous for its statues of saints and kings and its rich decoration. It was carefully restored by Gilbert Scott. The Lichfield Cathedral Choir, conducted by Ambrose Porter, will give a programme of choral representing the development of choral music from Tallis to Parry. Mr. Porter plays two voluntaries.

Bach Programme from Northern Ireland

A PROGRAMME devoted to Bach's music will be heard by Northern Ireland listeners on February 27th. Those who dislike heavy music need not be anxious about this programme, because it is entirely light and tuneful. Two of the songs in it come from the "Coffee" Cantata, and one from the "Peasant" Cantata. These will be sung by Alex W. Rogers (baritone).

West Country Club

THERE are many radio clubs throughout the country, but a new radio club named "West Country Club" will be "on the air" on February 24th. As its exact whereabouts are very difficult to find, West Regional listeners are advised to depend upon their wireless sets in order to hear the doings on the opening night.

State Boosted Wireless Receiver

THE wireless set which the German Government officially launched on its markets for popular use has met with unprecedented success. In the course of five and a half months, owing to the great microphone and newspaper publicity given to the VE301—the name commemorating the date of the foundation of the Nazi régime—over six hundred thousand receivers have been sold.

Another Post Office Mystery Van

RADIO pirates, beware! The British Post Office is undertaking next month a fresh campaign to discover and expose the bootleggers of the radio world. One direction finding van will pay a month's visit to the Cardiff, Newport, and Swansea areas; it is timed to start on March 5th. So trot out your ten shillings and secure your licences in advance from the nearest post office. It saves trouble.

(*Continued on page 1044*)

THE LATEST TELEVISION APPARATUS

An instructor at a television class in a London Polytechnic holding Baird's new mirror-drum with a grid cell, motor, and synchronizing coils. The scanning-disc apparatus, seen in the illustration, is Baird's first commercial model.

SOLVE THIS!

PROBLEM No. 75.

Dobson purchased two screened coils and an appropriate wave-change switch and built a three-valve battery receiver. When completed and tested results on the medium wave-band were very good, but no results were obtainable on the long waves. The circuit and wiring was examined and found in order, but he was surprised to find that the long waves were received when one coil screen was removed. What was wrong? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes should be marked Problem No. 75, and must be posted to reach here not later than the first post February 26th.

Solution to Problem No. 74.

Tonkins had covered the upper surface of the chassis with metal foil, and when mounting the brackets below the surface he had used screws of such a length that the points had just protruded through the wood sufficiently far to come into contact with the metal foil. This, produced a short-circuit through the reaction condenser.

The following three readers succeeded in correctly solving Problem No. 73, and books have, therefore, been forwarded to them:—

H. J. Martin, 58, Manor Road, 8th. Norwood, S.E.25.
L. A. Young, 39, Reverdy Road, London, S.E.1.
R. H. Gentry, 12, Shepherd Street, St. Leonard's-on-Sea, Sussex.

D.C. MAINS WORKING

An Explanation of the Methods of Arranging the Heater and Cathode Circuits of a D.C.-Operated Receiver

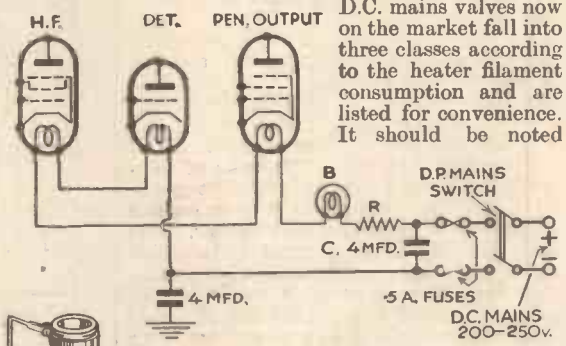
By T. S. DUTTON

THE amount of deserved publicity which has recently been given to Class B working is, no doubt, responsible for the fact that many listeners with mains installed are considering the incorporation of this scheme in their new set. The truth of this statement is borne out by the number of inquiries received by eliminator manufacturers and the technical Press regarding the conversion of mains units to meet the special needs of Class B. The listener with mains at his disposal should quite clearly understand, however, that he has nothing to gain, and much to lose, by the use of this system, the benefits of which are obtained by the battery user, and him only. If powerful and natural reproduction, sensitivity, selectivity, and trouble-free operation are the qualities required in a receiver it is much easier and cheaper to satisfy these requirements by a team of mains valves than by the equivalent number of battery valves including a Class B output stage.

These remarks apply equally to readers with A.C. or D.C. mains, but as the former appear well aware of the potentiality of their supply, judging by the small proportion of inquiries *re* class B from A.C. mains users, it is intended to take up the case of the reader with D.C. mains. As little space has been devoted in the technical Press to points peculiar to D.C. mains working, and small mention has been made of the high efficiency which D.C. mains valves have now reached, it is not surprising that fully fifty per cent. of those listeners with D.C. mains should use the eliminator-cum-L.T. accumulator type of receiver, and naturally desiring more punch than that obtainable with battery valves, turn to Class B as a means of reaching their goal. Also, many with a D.C. supply, having heard of the Grid Scheme and its purpose of supplying a universal A.C. supply, intend to tolerate their present equipment until such time as the change is effected. The Grid Scheme may, however, be theoretically complete, but it will be some years before the vast majority of D.C. users taste the delights of A.C. Also, it is not generally known that Electricity Supply Companies usually meet the listener in any expense occasioned by a change to A.C. This assistance is, of course, subject to him having notified the Company beforehand, in writing, of his intention to install the apparatus.

Points to Watch

The design of a D.C. mains receiver should present no difficulty to the reader with a working knowledge of Ohm's law, and is rather simpler than the A.C. type. Also, owing to the range of indirectly-heated mains valves which have recently made their appearance, the efficiency of the D.C. model now compares favourably with a similar A.C. receiver. It should be pointed out that as isolation from the mains is not possible with D.C. greater care in mechanical construction is necessary, and if the positive main is earthed there is the risk of a shock on touching the chassis or any metal part. The set should therefore be housed in a cabinet, grub screws well-sunk, and a double-pole mains switch be incorporated.



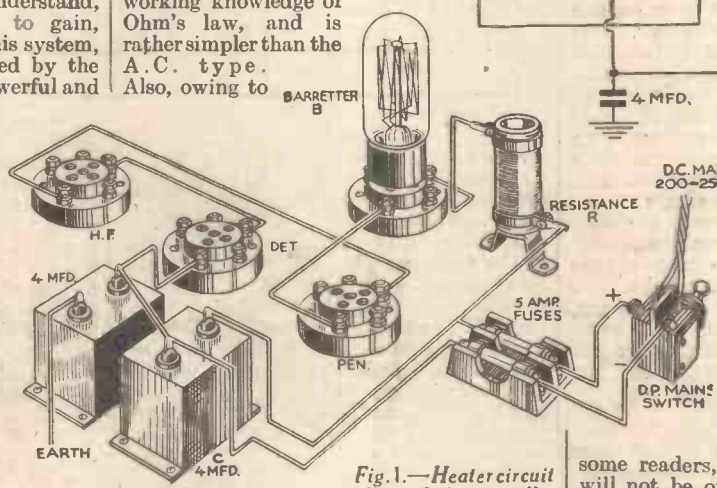
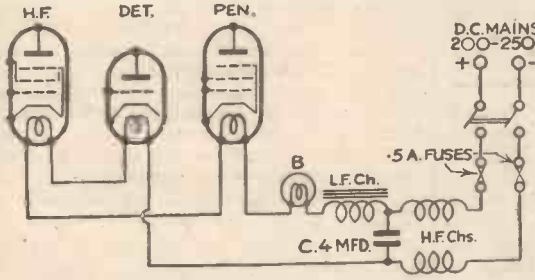


Fig. 1.—Heater circuit diagram shown pictorially and theoretically.

D.C. mains valves now on the market fall into three classes according to the heater filament consumption and are listed for convenience. It should be noted that in order to avoid unnecessary filament circuit complication the valves for the receiver should be chosen with similar heater current figures. Fig. 1 gives the filament circuit of a three-valve receiver, and it will be noticed that the heaters are wired in series, the detector being the last in the chain. The barretter lamp, B, may be new to some readers, and a word of explanation will not be out of place. The voltage of most D.C. mains swings on either side of the rated figure according to load conditions, and this has hitherto been responsible for the variable performance of D.C. mains receivers, as obviously with a voltage-dropping resistance of fixed value the current passing is dependent on the voltage applied. Consequently the valve heaters have been under-fed, correctly fed, and over-fed. The barretter lamp, which makes use of the characteristic of a hot iron wire in an atmosphere of hydrogen, varies in resistance, according to the voltage across it, in such a way as to pass a sufficiently uniform current over a wide voltage range. Of course, the barretter chosen must match the heater current of the valves used, and a table is given.



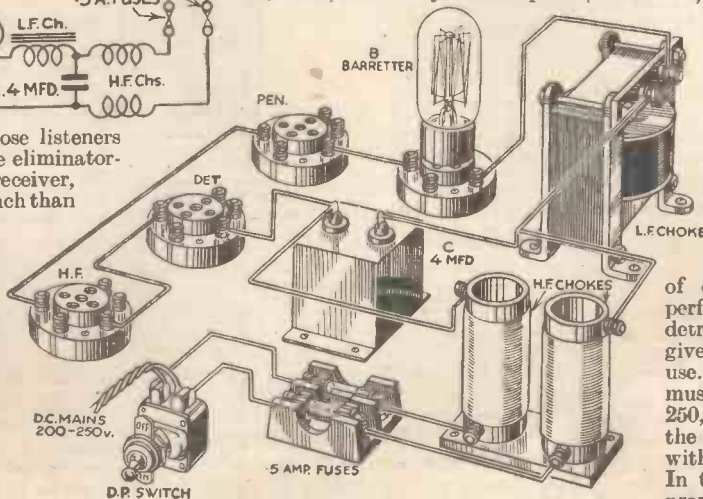


Fig. 2.—Heater circuit diagram showing the inclusion of suitable smoothing and interference-suppressor chokes.

Fitting a Barretter

It is also necessary when fitting the lamp, which is supplied with a four-pin base—the two filament pins only being used—to see that it is mounted clear of other components, the life or performance of which would be detrimentally affected by the heat given out by the barretter when in use. The 4 mfd. condenser C, which must have a working voltage of 250, will generally be found to smooth the supply sufficiently in conjunction with the resistance of the barretter. In the very rare instances when this proves insufficient the choke shown in Fig. 2, having an inductance of

(Continued overleaf)

(Continued from previous page)

about 5-10 henrys, and capable of continuously carrying the heater current of the valves chosen, should be tried. The resistance of this latter component should be so chosen as to allow the barretter lamp to receive the required voltage for the correct current. A choke to fulfil these conditions is rather expensive, and it is advisable to wire up without one, but using a small resistance, of correct wattage, and leaving sufficient space on the baseboard in such a position that if the choke is required induction will not be set up with the adjacent components.

Another type of trouble which sometimes occurs is when oscillating currents at radio frequencies leak through. These find little resistance in the L.F. choke and can only be stopped by H.F. chokes which the amateur can easily make himself. Each choke consists of about 200 turns of well-insulated copper wire of sufficient gauge to stand the continuous heater current wound on a 1½in. diameter former. The gauge should preferably err on the large side in order that the resistance in the common negative return lead shall be as low as possible. When finished the chokes should be carefully insulated by means of insulating tape or similar material or alternatively they could be mounted in a screened box, care being taken to prevent shorts at any point. Fig. 2 gives the filament circuit incorporating these refinements, which it should be understood are not always essential. The resistance and inductance of the L.F. choke can be varied if necessary, but should not be so high or so low as to cause the barretter to receive more or less than the limiting voltage figures for satisfactory working.

Automatic Grid Bias

As D.C. mains valves now available are of the indirectly-heated type grid bias can be obtained automatically. Most readers will be aware of the advantages of this method, but some may welcome a little explanation. Fig. 3 shows the heater and grid circuit for a three-valve receiver. It will be seen that the anode current of the variable-mu H.F. and pentode output valves flows through the resistances R and R_1 causing (by Ohm's law) a drop in voltage. Consequently the cathode is at a higher potential or voltage than the common negative to which the grid circuit is connected, which is equivalent to saying that the grid is negative with regard to the cathode. The condensers C and C_1 are necessary to prevent instability which might be caused by the resistances, and serve to by-pass the H.F. and L.F. currents respectively. The condenser C must be of the non-inductive type and should have a capacity of about 1 mfd. C_1 can have a value of 2 mfd. or upwards and may be of the paper type with a low working voltage or, better still, of the electrolytic type. The value of the biasing resistances depends on the requirements of the valves used, and is given on the data sheet, or in the maker's catalogue, but it is important to use one of sufficient wattage. The formula for calculating this value=

$$\frac{\text{Bias Voltage Required} \times 1{,}000}{\text{Valves anode (and screen) current (in m.a.)}}$$

The bias resistance of the output valve should preferably be in two sections, one fixed and the other variable, which enables accurate adjustment of bias to be made for varying conditions. The bias resistance for the variable-mu H.F. valve should consist of two portions also, the values of which, together with the potentiometer arrangement for supplying the screen, are important, owing to the need for correcting the tendency of the screen voltage to rise when the maximum value of bias is approached. In this case, also, the information should be obtained from the data supplied by the manufacturers. The advantage of this biasing arrangement is that the anode current is automatically controlled within limits, as obviously a rise in anode current produces a greater voltage across the bias resistance, and so increased negative bias is applied.

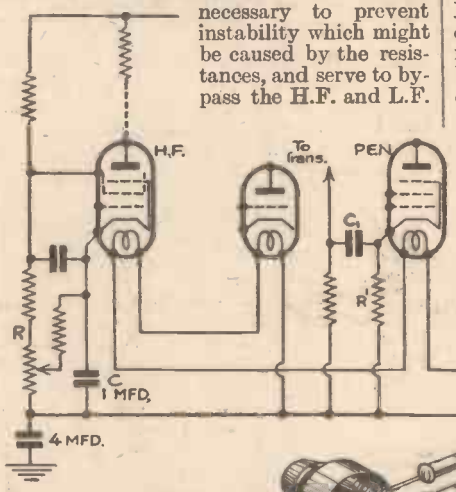


Fig. 3.—Heater and grid circuit arrangement.

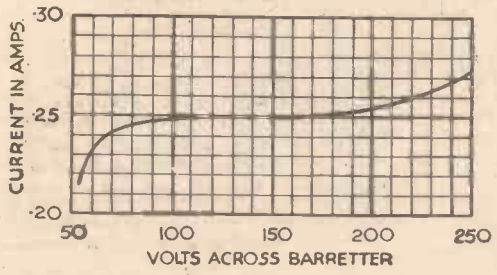
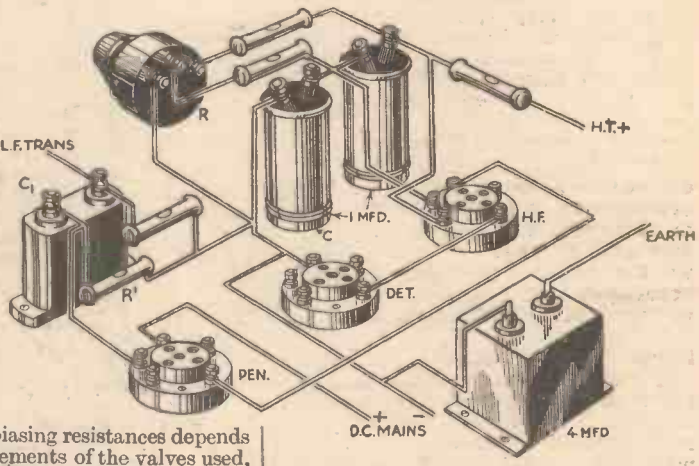


Fig. 4.—Typical barretter curve.

Heater Current	Valve Manufacturers
.1 amp.	Mazda.
.18 amp.	Mullard, Triotron, Tungsram, Dario.
.25 amp.	Cossor, Marconi and Osram, Lissen.

Smoothing D.C.

It is not necessary to devote such space to the H.T. arrangements, and those readers with eliminators feeding battery sets can naturally utilize the components of the same. It is the best practice in D.C. mains receivers to use two separate chokes for smoothing the supply to the output valve, and to the detector and H.F. valves. The choke feeding the H.F. valve and detector should have an inductance of about 50 henrys, and should be capable of carrying the small total anode current taken by these valves, which is about 10 m.a. The choke from an existing eliminator would serve admirably. In the case of the choke in the anode circuit of the output valve the choice is not so wide, and this component should not have a resistance of more than 1,000 ohms, with a maximum current rating of 50 m.a., and an inductance of about 20 henrys. Obviously a good output transformer could be used in place of the choke.



ROUND THE WORLD OF WIRELESS

(Continued from page 1042)

A Popular Short-waver

CONSTRUCTORS of short-wave receivers should bear in mind that one of the easiest transmissions to tune in is that of EAQ, Madrid, on 30 metres. It is on the air nightly from G.M.T. 10.30, and from midnight until 1 a.m. regularly broadcasts a programme of light orchestral or dance music with English announcements. On Saturdays it is also on the air between G.M.T. 6 and 8 p.m. The call is: *Radio España.*

The Opening of Droitwich

THERE appears to be every possibility that we shall soon be hearing tests by the new Droitwich high-power station, as its construction is now rapidly nearing completion. If all goes well, this 150-kilowatter should be formally opened on July 25th next, which, if our memory does not fail us, coincides with the date of Daventry's launch on the ether some years ago.

Television Temporarily Suspended

AS a change of studio is to be made necessitating the dismantling and re-installation of apparatus, the B.B.C. announce that there will be no television transmissions on February 19th, 20th, 21st and 23rd, but that the first programme from the new premises will be broadcast on Monday, February 26th, at 11 p.m.

Newcomers to the Microphone

TEA MIXTURE, a fresh B.B.C. feature advertised for Saturday afternoon broadcasts, starting on March 3rd, will present, as in the recent First Time Here, a series of new artists as well as some old favourites. The programme will also include a dance band.

IMPROVISED SWITCHES
And Their Application

A Practical Article Explaining how Several Useful Types of Switches can be Made from Odds and Ends.

By W. A. HARRISON

IT is evident to the enthusiast that multiple switching is very important in complicated circuits, and it is often better to couple one or more switches to enable the controls to be simplified. The wireless experimenter often needs a multiple switch, and may find that he has a few "simple" push-pull switches, old valve holders, adaptors, etc., at his command. Many applications of these parts may be made to give the required switching combinations.

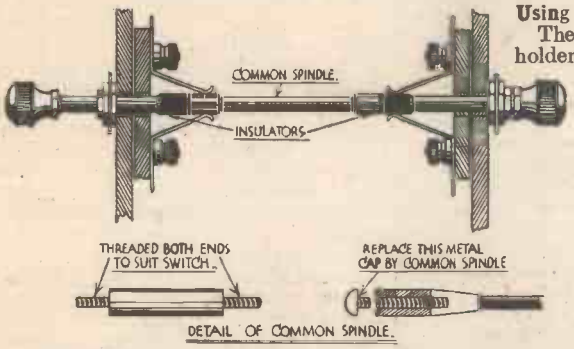


Fig. 1.—Two switches "back-to-back" to act as change-over switch.

Simple Push-Pull Switches

Let us deal with the simple push-pull switches; the usual type of switch consists of a sliding spindle upon which is an insulating sleeve held in position by a metal cap screwed into the spindle, the metal cap shorting the metal springs as the spindle is pulled forward; should a combination be required, say, of a three-point make and a three-point break, then two three-point switches may be coupled by connecting their spindles together. This is done by replacing their respective metal caps by a length of rod screwed at each end and mounting one switch upon a false panel. This arrangement is shown in Fig. 1. A six-point switch may be constructed in a similar manner, and, if desired, a three-position switch may be assembled by introducing an intermediate position in which both switches are in the "insulated" position.

Using Old Valve Holders

The use of old valve holders and adaptors is another interesting channel for development. For example, take a five-pin valve holder and pass a rod through the centre fixing; this will serve as the movable spindle. Bolt the five-pin adaptor on to the spindle through the centre fixing, and put a slightly longer spindle in the anode socket of the adaptor to serve as a guide. The arrangement is depicted in Fig. 2. If more convenient, an old valve base will serve the same purpose as the adaptor.

This latter scheme, however, has one disadvantage; two possible contact points are utilized for operating and guiding the switching. Instead of using the adaptor as the moving portion of one switch, we connect our valve holder to the spindle. By reference to Fig. 3, it will be seen that the valve holder fixing centres are used for our fixing and guides. The special brackets to hold the guide rods are shown in detail in Fig. 4, and the control spindle need not necessarily pass through the centre fixing of the holder and adaptor. Thus the switch may be utilized for five-point switching if so desired, and again, it is possible to fit two switches "back to back" to provide change-over features.

These few typical examples of the applications give some idea of the complicated switches that may easily be made from simple or obsolete components.

Before leaving the subject, I should like to point out some of the more interesting uses of these switching bases. Switching between two sets of six-pin short-wave coils can be done from a panel switch by fixing the coils to the baseboard and employing two bases coupled to a movable spindle. Loading coils may be cut out of a circuit, and a short-wave adaptor may be connected up to a circuit by the simple operation of a panel switch.

If required, certain terminals of the "switching base" may be strapped to short circuit any particular coil wound upon the "fixed coil" upon the baseboard.

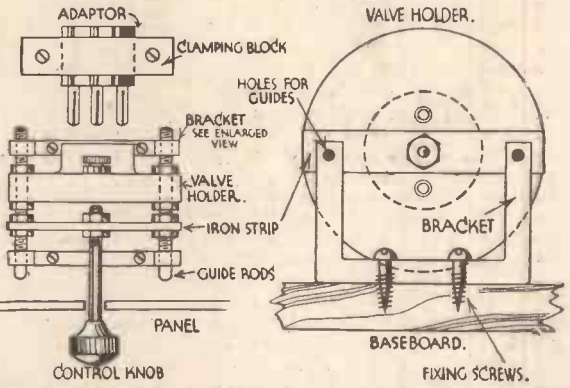


Fig. 4.—A valve holder may be converted as shown here to provide a very efficient switch.

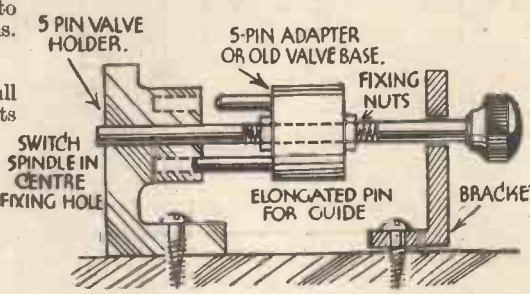


Fig. 3.—Using a valve base or similar adaptor for switching purposes.

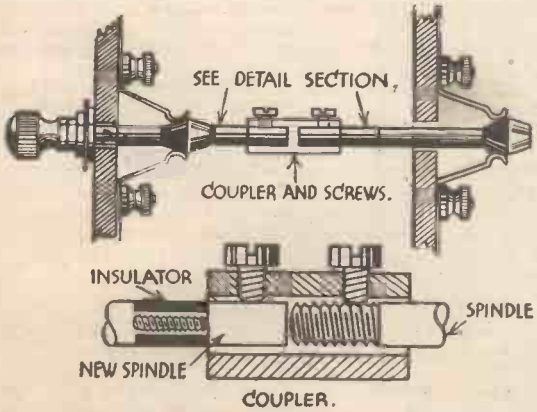


Fig. 2.—Coupling two or more push-pull switches to operate simultaneously.

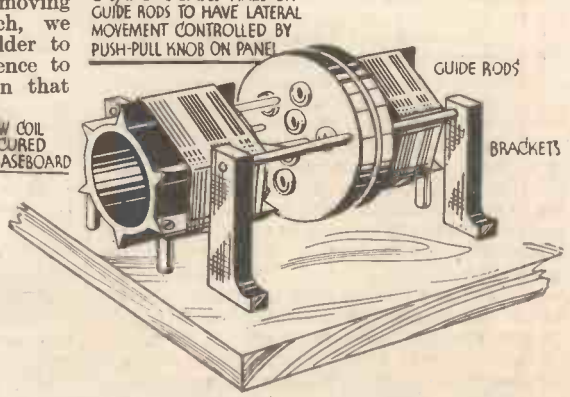


Fig. 5.—Short-wave coils which are assembled to plug-in and thus avoid switches.

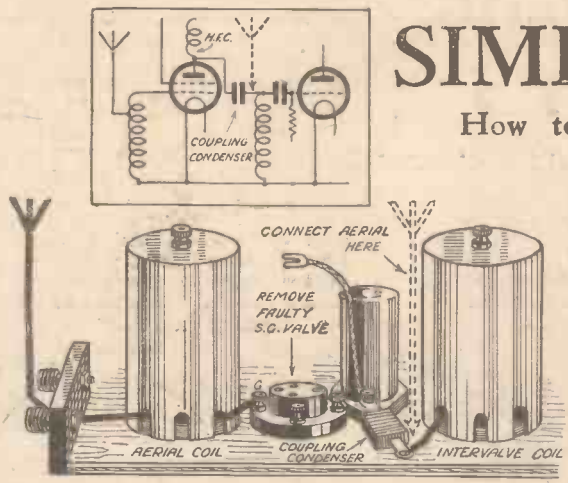


Fig. 6.—How to cut out the H.F. stage of a set in the event of an S.G. valve failure.

SIMPLE FIRST AIDS—

How to Make a Rapid Diagnosis and Carry Out—

WHEN the set breaks down, the first thing to do is, of course, to find out the cause of the failure. Notice if the set is "alive"—if there is that slight rushing sound from the speaker which is always present when a set is switched on, or whether it is absolutely "dead," as though switched off. If in doubt, touch one of the speaker terminals with your moistened finger—a distinct "click" will be heard if the set is "alive." If alive, it may be that the trouble is due to the aerial or earth, while if it is not, there is something wrong with the set itself or else the current supply. If the set appears to be "alive," try re-tuning it. It may be that the station to which it was tuned will be found to have altered its wavelength so that it comes in at a slightly different setting of the dial. In this case signals may also be very considerably reduced in strength, even when the station is properly tuned in at the new position. Such symptoms clearly indicate aerial or earth faults. The aerial may have blown down or broken; the lead-in wire may be scraping against an earthed metal guttering or, through constant swaying in the wind, may have fractured just where it joins the lead-in tube.

In the case of the earth, apart from the more obvious causes of failure, such as a broken contact between the earth plate (earth tub or water-pipe, etc.) and the earth wire, there is the possibility that the earth wire may be scraping against some intermediate metal work, such as a radiator, gas-pipe, or stove. It might appear at first that such contact would not matter very much, and certainly when the earth wire is short it doesn't; but when it is long, any intermediate connection with an earthed or partly-earthed object before the wire reaches its final earthing point will alter the characteristics of the aerial system, for it must be remembered that the earth wire is equally a part of the aerial tuning system with the aerial and lead-in wire. The result is that the wavelength is altered.

Aerial and earth faults can usually be rectified right away or, at any rate, remedied sufficiently to get the set working. Even a collapsed aerial can often be re-fixed at "half-mast" when it is impossible to re-fix it at its proper height, and in such a position it will still give useful reception. See Fig. 1.

Locating the Fault

If the receiver appears to be quite "dead," the cause may be one of many. Failure of the power supply, a faulty output valve or a speaker fault, naturally suggest themselves first. It is obvous that if the power supply (batteries or mains) is functioning properly, and the output valve and speaker are O.K., that the receiver will still be "alive," in spite of any defects in the earlier stages of the circuit. The first thing to do is to test the speaker

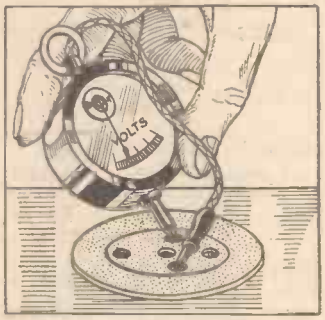


Fig. 2.—Testing filament voltage at the valve holder.

by connecting a pocket-lamp battery momentarily across its terminals when a distinct "click" should be heard if it is in order. Then go over all the

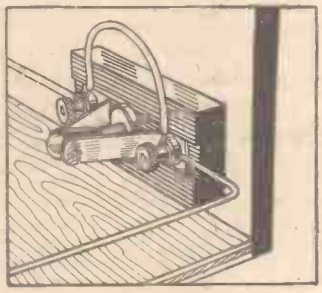


Fig. 3.—Short-circuiting a faulty filament switch.

leads and see they are not broken anywhere. Any suspicious-looking kinks in the speaker or battery leads should be straightened out and the connections to spade terminals, etc., carefully examined. Moving the wire about at these points will often locate a break which does not show owing to the insulated covering. It will be evidenced by "clicks" from the speaker and intermittent reception. There's just one point which should be remembered in this connection—don't remove the wander-plugs from the grid-bias battery while the set is switched on; it may damage the valves. Incidentally, when examining the leads, don't forget any fuses which may be included in the circuit. Sometimes a complete cessation of signals may be caused by nothing more serious than an overloaded fuse having burned out. A few spares should always be kept in readiness. However, if no replacement is available, it is not advisable to connect a wire across the holder, because, after all, the fuse is a protective device and may have "blown" because of some serious fault in the set.

Should the leads appear continuous, test if the current is reaching the filaments of the valves by removing each valve in turn and connecting a voltmeter across the filament sockets, as in Fig. 2.

Switching the set on and off while the meter is in position will show if the filament switch is functioning properly. It may be that sometimes when you switch on the meter does not read the full voltage. This indicates a faulty switch.

Switches of the push-pull type which have been in use for a long time are particularly prone to make bad contact. Cleaning the spring contacts with fine emery cloth and wiping away all trace of the abrasive will usually effect a cure, but where the springs have become weak or broken the best thing to do is to short-circuit the switch with a piece of wire, as in Fig. 3, until it is possible to get a replacement switch. In the meantime the set can be switched on or off by connecting or disconnecting one of the leads to the L.T. battery.

First Aid for Run-down Batteries

With a battery set a failure to get a voltage reading at the valve sockets clearly indicates a faulty switch or a break in the filament wiring. Of course, it might be only a run-down accumulator, but one would hardly resort to testing the set for such an obvious thing. However, suppose your accumulator does let you down at an awkward moment—at a time when you cannot get it replaced. Remember that if you have a car or motor-cycle you can always use one cell of the lighting-battery as an L.T. battery. Alternatively, it is quite easy to re-charge your L.T. battery from the

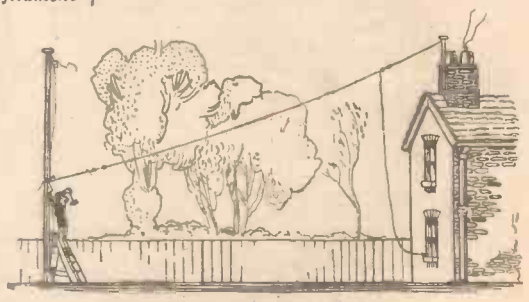


Fig. 1.—Fixing a fallen aerial at "half-mast" as a temporary measure.

—WHEN THE SET FAILS

——Makeshift Repairs in the Advent of a Sudden Breakdown

car battery. The most convenient way to do this is to construct the simple piece of apparatus shown in Fig. 4.

This, again, should form part of your first-aid outfit. It consists of a plug, a lamp-holder, a yard or two of flex, and two spade terminals. The plug is plugged into one of the lamps of the car, and the bulb (which is removed from the lamp) is placed in the holder. The accumulator to be charged is, of course, connected to the spade terminals.

The polarity of the current can be determined by dipping the two spade terminals in an eggcupful of water to which a pinch of salt has been added. Bubbles will rise from one spade terminal. This is the *negative* pole, and is connected to the negative terminal of the accumulator. The charging rate is determined by the rating of the bulb used. For instance, a 12-volt 36-watt headlamp will pass about 2½ amps. A 12-volt side lamp bulb, which is usually rated at 6 watts, would pass just under a ½ amp. Some cars are wired on the single-wire system, in which case there is only one "contact" to the bulbs, the return being made through the metal bulb cap and the braided metal covering of the wire to the chassis of the car. The negative pole of the car battery is connected to the chassis. In this case the charging apparatus would be modified, as shown in Fig. 5.

Testing the High-tension Supply

Assuming that on making the valve-holder test the L.T. circuit is found to be in order, then the H.T. supply should similarly be tested. An H.T. battery may be tested with a cheap voltmeter in the usual way, but in the case of a mains set a lower reading than the actual voltage will be obtained unless a *high-resistance* voltmeter is employed. However, a test with an ordinary meter will serve to show if there is a breakdown of the H.T. supply or not. With some receivers, especially the more complicated commercial mains sets, it may not be very clear which are the correct points from which to test the H.T. supply. In this case a still better test can be made by connecting a high-voltage meter between the anode socket and the cathode socket of each valve holder in turn. This test will not, of course, give an accurate voltage reading, but will show a lower figure—in some cases a considerably lower figure (where there is comparatively high resistance in the anode circuit). But the test suffices to show if there is any H.T. voltage available—which is the chief object. Naturally, when making this test at each of the receiving valve sockets, the rectifier valve (if one is used) must be left in position, since the rectifier supplies the current for the other valves in the set. It should also

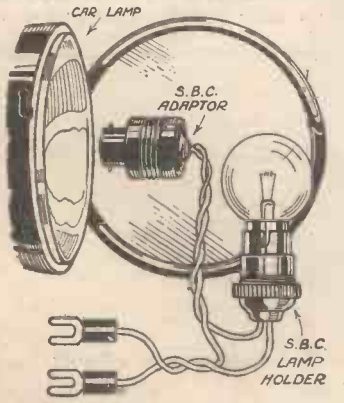


Fig. 4.—First aid apparatus for recharging your wireless battery from the car.

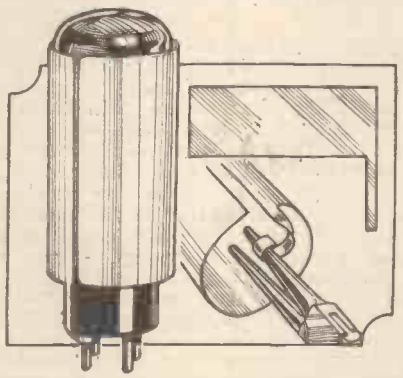


Fig. 7.—How to make a simple and effective valve screen for an unmetallized valve. The lug is connected to the negative filament pin or the cathode pin.

be noted that whereas in the ordinary way the centre pin of a mains valve is joined to the cathode, in the case of a directly-heated pentode the centre pin goes to the auxiliary grid; therefore, when testing at the holder of such a valve, the voltmeter should be connected across the anode socket and one of the filament sockets—not across the anode socket and the centre socket.

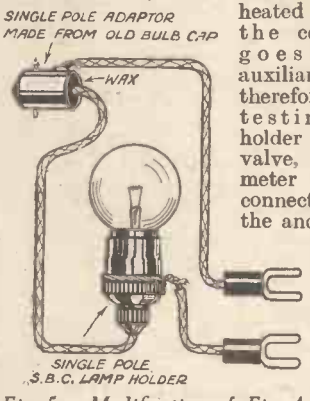


Fig. 5.—Modification of Fig. 4 when the "one-wire" system is employed.

Some Valve Dodges.

Supposing, after these L.T. and H.T. tests, the power supply is found to be quite in order, the next move is to test the valves. There is no need to describe the usual filament test with a dry cell and a voltmeter or headphones, but should it be found that one of the valves is a "dud" it is often still possible to get the set going again, even when no spares are available. For instance, if it happens to be an H.F. valve (either screen-grid, H.F. pentode, or other type), then this stage should be cut out by transferring the aerial to the grid circuit of the next valve, as shown in Fig. 6. If there are two H.F. stages and the second of the two valves is giving the trouble then the first valve should be placed in the second holder and the aerial connected to the grid winding of the intervalve coil in the same way. Should the detector valve fail, then it should be removed and the first H.F. valve substituted, the same transference of the aerial being made as before. You will now have a screen-grid valve acting as a detector. There will be no connection to go to the terminal at the top of the valve, but this will not matter—the valve will still function. In this connection it is worth remembering that an S.G. or an H.F. pentode valve can always be used, in an emergency, as a detector by simply plugging it in the holder without altering any connections. The results are not as good as when the proper valve is used, but nevertheless it works. What happens is that the screening grid acts as the anode, while the true anode is left idle.

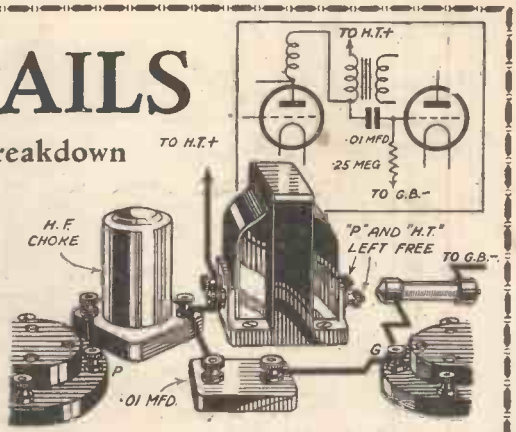


Fig. 8.—Connecting a broken transformer to work as a choke.

Faulty Transformers and Chokes

Another first aid measure in connection with valves is illustrated in Fig. 7. It shows how an effective valve screen may be made from a piece of sheet zinc or aluminium. It may be that a metallized valve in the set has to be replaced, in an emergency, with an unscreened valve. The replacement can then be rendered perfectly stable by this simple device.

Apart from valve failure, there is, of course, the possibility of defects in other components. The most likely faults are those caused by a break in the circuit or a short-circuit, and the ordinary continuity tests will usually disclose the seat of the trouble.

Such an occurrence as a broken primary of a transformer should not give cause for alarm, since the remaining winding can easily be connected as a choke and used for choke-coupling, as in Fig. 8. Admittedly a fixed condenser and a grid leak are needed to complete the alteration.

In the case of a faulty H.F. choke in the anode circuit of the detector valve, first aid can be rendered by substituting a resistance of about 20,000 ohms.

W. B. RICHARDSON.

ELECTRICAL CONDENSERS

A Practical Article Dealing with Their Construction and Application.

FUNDAMENTALLY, every condenser consists of one or more layers of dielectric material separating conducting plates, sheets or foils placed against opposite faces of the dielectric layers. The conductors are connected together alternately in pairs to form the opposite poles of the condenser. The choice of dielectrics is a very large one, but there are a number of factors which have to be taken into consideration and these limit the choice. The two dielectrics which are in general use in condenser manufacture are mica and paper.

The design of an efficient fixed condenser for use in a wireless receiver calls for careful consideration of a number of points. The most important are—

1. Accuracy and constancy of capacity.
2. High insulation.
3. Low H.F. losses.
4. Sound mechanical design.

Accuracy of capacity is ensured by careful checking and re-checking during manufacture. High insulation is obtained by the use of the highest class of mouldings. The problem of keeping the high-frequency losses low is an important one. It is not always realized that an inefficient condenser offers considerable resistance to currents flowing at high frequencies and this resistance increases with the frequency. It is clear then, that at radio frequencies, which are often of the order of millions of cycles per second, a serious source of loss will arise.

Mica Condensers

Condensers employing a mica dielectric have a wide range of application. They are to be found in almost every broadcast receiver and they are eminently suitable for use in wireless transmitting stations and whenever a condenser with high insulation resistance is required. The manufacture of the small mica "moulded in" condensers, such as are used in broadcast receivers, is an interesting operation. The mica which is imported from India comes in bulk form and the mica sheets are split into very thin sections by girls with slender steel knives (See Fig. 3). The sections are then cut to size and shape and each piece is measured by a machine which shows on a dial the exact thickness (Fig. 2). After being graded the mica sections which vary between 1/1000 and 3/1000 of an inch thick are each electrically tested by being placed on a metal plate connected to a high-frequency high-voltage circuit. A metal brush which is connected in the same circuit is moved over the face of the mica and a discharge of blue sparks runs over the mica and down on to the plate. If the sparks, however, appear to pass through the mica, the piece is electrically weak and is discarded (Fig. 1).

After being tested, the mica sheets are passed along to the department in which the condenser units are made up. Girls quickly assemble the condensers by interleaving mica and foil according to the size of condenser required. These units are then bound and pressed and each set of plates is spot welded. After one more electrical test, the units are ready for fixing in the mouldings. The condensers are next placed in moulding trays which each hold about one dozen units. A bakelite "pellet" is placed on each side of the condenser unit and the trays are then placed in the moulding press and subjected to pressure and intense heat. After being taken out of the press the surplus bakelite is removed and the completed condenser undergoes a voltage test. A capacity test follows and the value is then stamped on the case. The capacity tolerance is usually of the order of plus or minus 15 per cent.

Mica condensers are usually supplied in capacities from .00005 mfd. to .5 mfd. and, when a greater capacity is needed it becomes necessary, in order to keep down the size of the component to reasonable limits, to use paper as the dielectric.

Paper-Dielectric Condensers

Condensers utilizing a paper-dielectric have a variety of uses. They are widely used in wireless receiving apparatus, for power-factor improvement, and for wireless interference suppression.

Until recently the bulk of the paper used in the manufacture of paper-dielectric condensers was imported from Germany, but, owing to the enterprise of certain English paper manufacturers, supplies of condenser paper are now available in this country. After a great deal of research work they have produced an extremely thin sheet which is remarkably free from impurities.

The "plates" or conductors used in paper-dielectric condensers consist of either tinfoil, aluminium, or metallized paper. The latter is employed in the Mansbridge condenser, which has had a fairly extensive use. In the construction of this type of condenser, instead of using metal foil as the conductor, metal is deposited on one side

(Continued on page 1050)

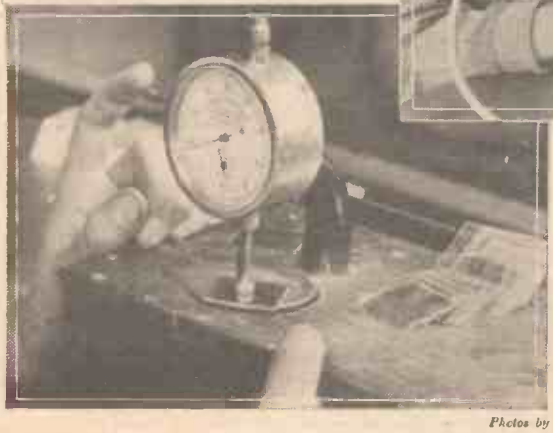


Fig. 1 (above).—Testing mica for insulation.

Fig. 2 (left). — A machine for accurately measuring the thickness of mica dielectrics.

Fig. 3 (right).—Splitting mica into thin sheets.

Photos by courtesy of Dubilier Condenser Co. (1925) Ltd.

(*Continued from page* 1048)

of the paper to form a conducting plate. The principal advantage claimed is that in the event of breakdown occurring the metal at the point of failure is so thin that it will be vaporized and the fault cleared.

Tinfoil and aluminium are used in the bulk of paper-dielectric condensers as they are obtainable in extremly thin sheets. Tinfoil is preferred as it is easily soldered.

One of the first processes in the manufacture of paper-dielectric condensers is the winding of the plates or conductors. The winding is done by girls on special machines and during this operation the foil is interleaved with the paper. Condensers which have to withstand large voltages have two or more thicknesses of paper between adjacent foils. The winding may be either inductive or non-inductive. For certain radio applications, such as for use in H.F. circuits where it is necessary to keep the internal inductance of the condensers at as low a value as possible, the non-inductive condenser is preferable.

After being wound the condenser sections are packed in frames and pressed flat. The loaded frames are placed in a drying oven, heated and evacuated. All traces of moisture are removed from the paper by means of pumps. Moisture has a detrimental effect on the life of a condenser and therefore precautions are taken to ensure that no moisture-laden air reaches the sections. The units are then placed in an impregnating tank filled with hot wax and are left there for at least twenty-four hours. The condensers are then cooled when the heat is cut off from the tanks. When they are removed from the tank, each section undergoes a series of tests.

Fig. 4.—Assembling fixed condensers in the factory.

Testing

The usual tests which a condenser has to pass are for capacity, insulation and voltage breakdown. Capacity and over-voltage tests are carried out before the units are assembled into a complete condenser. The test voltages are usually two to three times the voltages the condensers will have to withstand in operation. After assembly the capacity is re-checked, also the insulation resistance, and the condenser undergoes a further voltage test. The insulation resistance is usually placed at a minimum of 1,000 megohms per microfarad, and condensers of a lesser resistance than this are rejected. It is desirable in order to allow a factor of safety that the working voltage of a condenser in use should not be approached except in cases where it is known that the manufacturer's figures are conservative. Some manufacturers test their condensers on a voltage twice as great as the maximum value they are likely to encounter under practical conditions. These conditions depend on the circuit in which the condenser is used. If the supply across which the condenser is connected is D.C., the test voltage of the condenser should be twice the D.C. voltage.

If the supply is A.C., however, this is insufficient, for the rated voltage of supply is a mean value, whereas the alternating voltage rises to a maximum, at the peak of the wave, considerably above this value. The peak voltage is about one and a half times the rated voltage, the actual ratio depending on whether the supply has a good waveform or not.

Hence, with A.C., the condenser test voltage should be three times the rated value if it is to be twice the maximum working voltage. A similar state of affairs arises with rectified A.C. as used in high-tension units, for if the load on the unit is removed the voltage on the reservoir condenser will build up to the maximum peak value of the A.C. volts on the secondary of the transformer. For instance, a transformer with a 250 volt secondary, feeding a rectifier and smoothing circuit of the ordinary type, would deliver about 250 volts D.C. on load. If the load were removed, however, the voltage would rise to about 375, or even more if the transformer were of poor design giving a peaky waveform.

The test voltage chosen for condensers in such a case depends on the likelihood of the unit being used with no load. If the occurrence is likely to be rare a condenser of 500 volts (D.C) test could be used, but for complete safety a condenser of 750 volts test would be employed.

It may be objected that this factor of safety is unnecessary and that if the condenser is tested at 500 volts it will be safe to run it at any less voltage indefinitely. This is not so, for the test is of limited duration and a continually-applied strain at 400 volts may easily break down the insulation in time.

Overload

There is probably no piece of electrical apparatus more susceptible to the evil effects of overload than the paper condenser. A 10 per cent. overload cuts down the life by 50 per cent. If the voltage is doubled—that is to say, if the condenser has to withstand double its normal working voltage, its life would be reduced to one-thirtieth of the normal length of time. These facts indicate the necessity of conservative working voltages for paper condensers. In the absence of a rigid standard there is much variation in the meaning of "working voltage." It is obvious that condensers built up with a plurality of "papers" must be electrically stronger, and therefore capable of providing longer service, since at a given working voltage they will be less strained than those with less dielectric strength. In practically every paper-dielectric condenser disintegration of the dielectric takes place directly it is put into use. No matter how well the condenser may be constructed there is a certain leakage of current through the dielectric. This is almost infinitesimal in the best condensers, but it is nevertheless present. This leakage is greatest at the weakest spots in the dielectric and it accelerates as the weak spots deteriorate. This disintegration is probably due to the slight heat generated by the leakage and also to chemical changes.

Electrolytic Condensers

The electrolytic condenser is rapidly gaining favour with radio set manufacturers, as it is possible with this type of condenser to obtain a comparatively large capacity in a small space, at a cost of less than half that of a similar paper condenser.

Another great advantage possessed by the electrolytic condenser is its ability to withstand voltage surges. Whereas a surge is apt permanently to break down a paper-foil type condenser, it does no serious harm to an electrolytic condenser, as the dielectric film re-forms. Since this type of condenser is polarized it can only be used in circuits where the polarity is constant. This restricts the use of the ordinary electrolytic condenser to pure D.C. and pulsating D.C. circuits.

One of the leading condenser manufacturers has recently marketed a reversible type of electrolytic condenser. The principal advantage of this type is that it can be used on D.C. mains receivers without risk of damage, providing its normal working voltage is not exceeded. With the polarized type of electrolytic condenser the mains plug should never be reversed in its sockets, excepting where precautions have been taken to avoid damage to the condenser.

Electrolytic condensers are available in two types, *i.e.* wet and dry. The wet type uses a liquid electrolyte, whereas the dry type employs an electrolyte in the form of a paste or jelly.

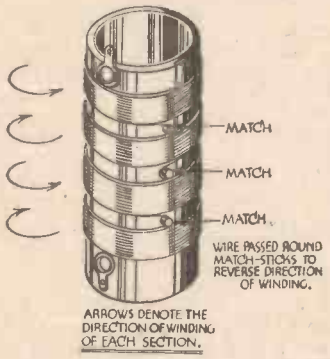
The operation of an electrolytic condenser depends on the formation around an aluminium electrode of a microscopically thin layer of gas, oxide or hydroxide which has a very high resistance to the flow of current in one direction, although its resistance to the flow of current in the opposite direction may be quite low. This thin film acts as a dielectric between the aluminium electrode and the electrolyte. The voltage rating of electrolytic condensers is determined by the materials used in construction and the voltage at which the film is formed. If the rated voltage is exceeded the leakage current through the condenser increases. The capacity of an electrolytic condenser is governed by the voltage at which it is formed and operated. If the condenser is formed at a high voltage and operated at a lower voltage the capacity will increase and *vice versa*.

READERS' WRINKLES

THE HALF-GUINEA PAGE

Non-Inductive Short-wave Choke

THE field of a short-wave choke can be greatly reduced, without impairing its efficiency, in the following manner: Small holes are drilled at intervals along the ebonite or paxolin former and a matchstick inserted in each. These matchsticks



A non-inductive S.W. choke.

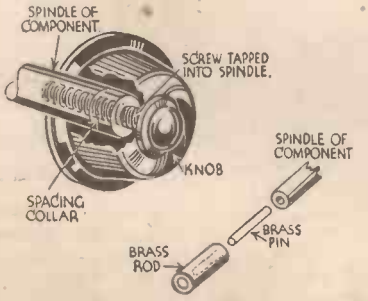
are cut off short, leaving about 1-16in. projecting. When winding the choke the wire is passed round each matchstick on reaching it, and the direction of winding reversed.

A dab of good celluloid cement will retain the matches in position if they are not a perfect fit in the holes.—J. S. S. (East Sheen, S.W.14).

Lengthening Control Spindles

IF the front of a cabinet is rather thick it may be found that the spindles do not project far enough for the knobs to be fitted. One way out of this is to grip the spindle firmly in a vice and drill a hole into the end about 5-16in. deep.

The hole should be of a size suitable for tapping either 6, 5, or 4 B.A.—the larger the better. Owing to the shallowness of the hole it may be necessary to use a taper and then a blunt tap. The top of the knob is then suitably drilled and a screw inserted, a spacing collar being fitted before fitting to the spindle. Alternatively the spindle can be drilled, a short pin fitted, and the end of the spindle tinned. A short piece of brass rod of a similar diameter to the spindle is also drilled and the end tinned. This is fitted to the spindle, the application of a hot soldering iron completing the union. A large iron is best because the solder will then run in a short time without heating the spindle unduly. (See illustrations.)—A. F. BIDDLECOMBE (St. Margaret-on-Thames).



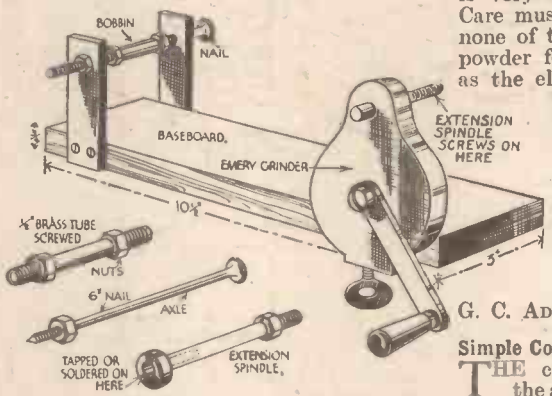
A neat method of fitting extension spindles.

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 £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be *original*. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

An Easy-counting Coil Winder

THE accompanying sketch shows an excellent device for coil and transformer winding which can be made up very cheaply from odd parts. The drawing will be self-explanatory, and the method of counting the turns is as follows: One



An easy-counting coil winder.

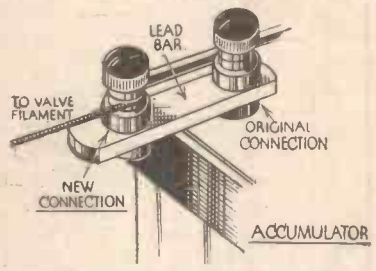
complete turn of the handle is equal to eight turns on the bobbin. Thus, a given number of turns on the bobbin are quickly calculated by taking note of the handle revolutions.

The following are the materials required: one emery grinder (from Sixpenny Stores); two ebonite, wooden or metal uprights; one piece brass tube, screwed both ends and fitted with nuts; one 6in. wire nail, screwed one end and fitted with nut; extension spindle for grinder, as shown; baseboard, 10in. by 3in. by ¾in.—J. CUSTICK (Blackpool).

Accumulator Terminals and—Corrosion

MANY people seem to have continual trouble with their accumulators, usually due to the corrosion of the terminals; bad contacts result, and the full benefit is not obtained from the cells.

Vaseline smeared on the terminals serves its purpose well, but, in bad cases,



An improved accumulator connection.

steaming (by allowing the steam from the spout of a kettle to play on the corroded part) is generally successful. Care must be taken, however, to see that the steam does not impinge on the glass case, as the latter may easily crack.

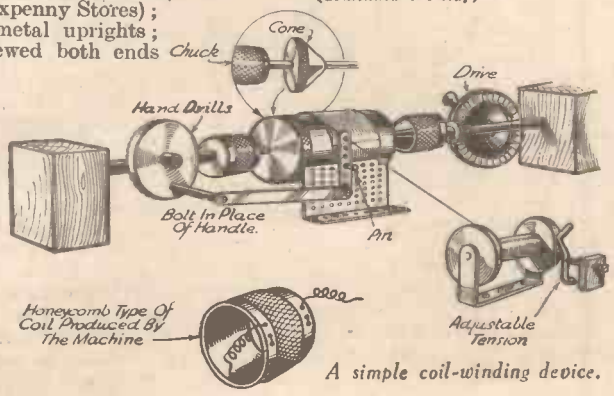
Again, an alkali, such as ammonia or washing soda, if applied to the terminals is very successful in stopping corrosion. Care must also be taken here to see that none of the reagent, whether in liquid or powder form, gets into the accumulator, as the electrolyte would naturally suffer.

However, probably the best thing to do, if corrosion persists, in spite of the above precautions, is to add a further connection by means of a small lead bar, as shown in the accompanying sketch. First smear the original terminal liberally with vaseline, as a further precaution, and then clamp the lead bar under it.—G. C. ADDISON (Douglas, I.O.M.).

Simple Coil-winding Device

THE coil-winding apparatus shown in the accompanying sketch is made from two cheap hand-drilling machines and a few "Trix" parts. The wire-spreader consists of a "Trix" strip coupled to another strip which is connected to a bolt placed in the screw hole used for the driving handle of one drill. This strip is fixed on a pin in a "Trix" plate, and can be moved

(*Continued overleaf*)



A simple coil-winding device.

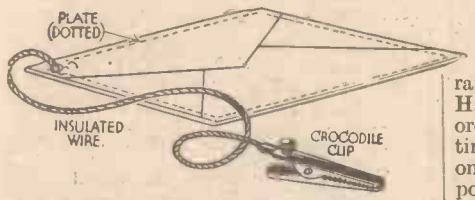
READERS' WRINKLES

(*Continued from page 1051*)

to give different swings. The wire is fed from a bobbin on which is placed a tension, adjustable by a spring and screw for various gauges of wire. The coil produced is of the highly-efficient honeycomb type, which is eminently suitable for long-wave reception or for use as a "loading" coil.—J. WILLIAMSON (St. Albans).

An Interaction Detector

IN many sets it is difficult to detect faults due to interaction between components, such as coils, chokes, etc.

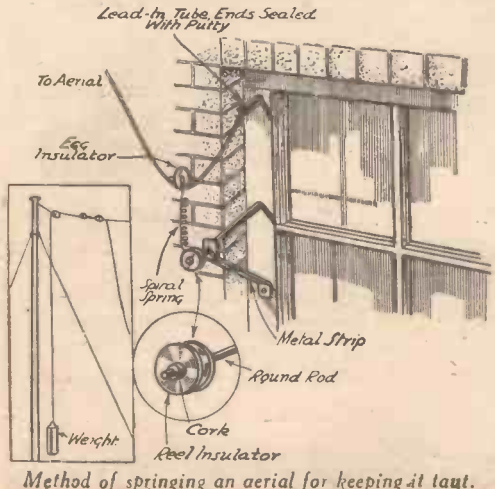


A simple device for detecting interaction.

To make the item described, a thin piece of copper or aluminium sheet has an insulated wire soldered or electrically connected to it, while the other end of the wire is fixed to a crocodile clip. The plate is then sealed up in an envelope of the foreign correspondence variety, or of other thin, good-quality paper. To use the temporary screen it is simply placed in various positions, while the set is working, without fear of short circuit, and may be bent round components, while the clip is fixed on any convenient earthed point. Plates of different shapes or sizes made up as above are an extra convenience.—A. ROBINSON (Hull).

Keeping an Aerial Taut

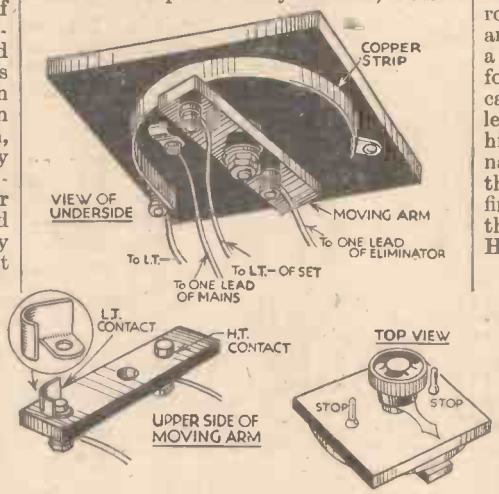
THE accompanying sketches show an effective arrangement which I have adopted for keeping my aerial taut. The brass rod is taken out of the lead-in tube, and one end of it is screwed into the side of the window frame. A reel insulator is fitted on the end of the rod, as shown, the end of the rod being supported by a metal bracket. The lower part of the down lead is passed through an egg insulator which is held down by a spiral spring attached to the reel insulator immediately below it. Each end of the lead-in tube through which the aerial wire passes is sealed with putty. A weight is used at the mast end of the aerial, and an insulator is used for a pulley. I have found this much better as it does not rust, and there is no possibility of the aerial becoming wedged. With the arrangement described the aerial gives to the wind and relieves the mast of a good deal of strain.—T. BURROWS (Penrhinceiker, S. Wales).



Method of springing an aerial for keeping it taut.

A Rotary Switch for H.T. Eliminators

READERS who have A.C. H.T. eliminators know that the filament current should always be switched on a few seconds before the H.T. from the eliminator reaches the plates of the valves, and that the reverse should always take place on switching off the set. The accompanying sketch shows the underside of a switch which I have made for this purpose. The one knob control is arranged to switch the L.T. and H.T. on or off in the correct order, and with the correct time lag. The parts used to make it are one old pattern condenser knob with pointer, a short piece of 2B.A. studding with nuts and spring washer and bush, ebonite for top and rotary member, 4 small terminals, some copper strip for contacts, two stops for pointer, and some rubber-covered flex for connections. The switch should be carefully made, and the flex firmly fixed to the terminals as the full voltage of the mains is across two of the contacts, and for the same reason it is recommended that the fixing bolt of the contact fixed to the underside of the ebonite top should be cut off short so that it does not come through the top.—J. MOYLER (London, N.).



A rotary switch for H.T. eliminator.

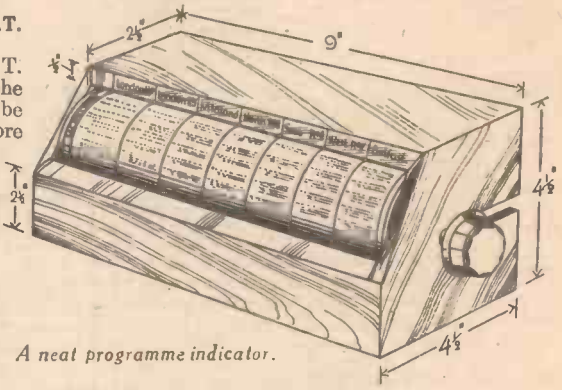
Ebonite Box Spanner for Trimmers

IN some receivers the trimmers on the tuning condensers have screws with hexagonal heads, and these are often situated in very inaccessible places.

A very efficient tool can be made with a length of ebonite tube. Place the nut of required size on a hot soldering bit, and allow it to get hot. Then press one end of tube centrally on nut until it is embedded in the ebonite tube, allow it to cool, shake the nut out, and the spanner is ready for use.—S. H. Moss (Totnes).

A Neat Programme Indicator

THE accompanying drawing shows a small cabinet which contains the *Radio Times* "Stations At A Glance"

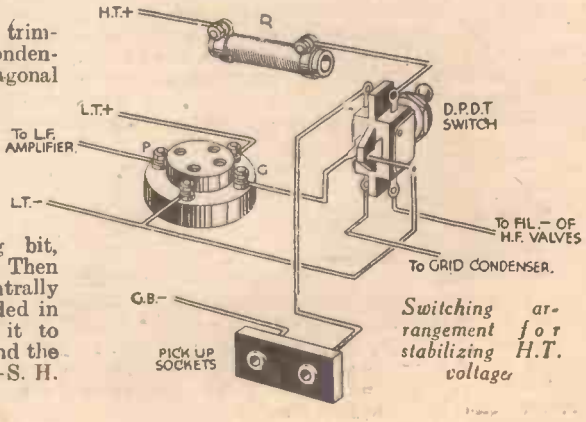


A neat programme indicator.

page, which, placed on or near the set, enables one to see the programme features of all the B.B.C. stations without having to consult the *Radio Times* for every item. The sheet is cut out each week and placed round the roller, the diameter being 3½in. and the length 8½in. The roller then needs a small turn each day to give the programmes for the week. The roller may consist of a cardboard tube or a portion of an old wireless pole. The back of cabinet may be hinged or kept in position by clips. The names of the stations which run across the top of the page should be cut out the first week and pasted along the bevel; this will serve for future weeks.—L. W. HAYES (Ilford).

Stabilizing H.T. Voltage

THE output voltage of the majority of H.T. mains units depends on the current taken from them. As it is customary to switch off the filaments of the valves not being used for amplifying, when using a radio receiver as a gramophone amplifier, it follows that the total plate current taken from the climinator drops, and the H.T. voltage on the plates of the other valves rises. Since this would necessitate an alteration to the grid bias, the scheme of switching shown in the accompanying illustration was adopted, the resistance R being tapped across the H.T. supply as the "radio" valves were switched off, its value being such that it draws the same current from the eliminator as they did, and so the voltage remains constant. Care must be taken to see that R is capable of handling the power safely.—M. L. HASELGROVE (Dorchester).



Switching arrangement for stabilizing H.T. voltage

"NAPS" No. 2—RESULT

£350 CASH PRIZES AWARDED.

FIRST PRIZE, £100

Miss Blanche Dobson, 107, Loughborough Rd., Kirkcaldy.
Simple Rule "Cross Here";—Else "Crown Yonder"!

SECOND PRIZE, £50

Mr. F. Richards, Sticklepath, Okehampton.
Why Pa Failed. "Hitched Waggon" to "Seven Stars."

THIRD PRIZE, £25

Mr. H. Moon, 64, Sir John's Rd., Selly Pk., Birmingham.
Gossip of Neighbours. Stabs in the Back-Yard.

FOURTH PRIZE, £20

Mr. J. Carley, 3, First Avenue, The Drive, Didsbury, M/c.
The Cup. "China" More Likely Than "Chelsea."

FIFTH PRIZE, £15

Mr. H. Coates, 1/D.W.R., Aldershot.
Justice. Ordered "Stonebreaking" To "Mend Path."

TWO PRIZES OF £10 EACH.

Mr. R. Coskins, 23, Burleigh Ave., Wigston Fields, Leicester.
Local Gossip. Confers More "*Titles*" Than "*Honours*."
Mr. E. C. Langford, 281, North St., Ashton Gate, Bristol 3.
The Newsagent. Gets "Penny" for World's "Thoughts."

FOUR PRIZES OF £5 EACH.

Mr. F. Culpan, 17, Morecambe Terr., Golcar.
The Football Cup. Takes Eleven Men to "Lift."
Mr. Wm. Earnshaw, 37, Hawthorn Rd., Preston.
What the Cockney Said. "Plain"—But What "Ornamentation"!
Mr. T. Haslam, Turnberry Hotel, Ayrshire.
Local Gossip. "Little Bird" and Usually "Mocking"!
Mr. J. Medlicott, 139, Abbey Foregate, Shrewsbury.
A Live Newsagent. Every "Poster," "Board" of "Trade."

Twenty Prizes of £2, 20 Prizes of £1, 80 Prizes of 5s., and 160 Prizes of 2s. 6d. have also been awarded. Space will not permit the printing of these names in PRACTICAL WIRELESS, but a full list may be seen at 39, King Street, W.C.2.

Practical Television

Conducted by H. J. Barton Chapple, Wh.Sch., B.Sc., Etc.

FEBRUARY 24th, 1934. Vol. I. No. 8.

COMPLETING THE MIRRORVISOR

Some Final Constructional Details, along with Operating Notes, are Given This Week

THE cogged wheel is fitted to the shaft and set exactly so that the teeth of the wheel just clear the pole faces (about .006in. clearance is best) as the motor shaft turns without any single tooth fouling a pole tip. The accuracy of individual workmanship will now be apparent, and the adjustments have to be made carefully so that in any position of the field magnet the wheel is free to rotate.

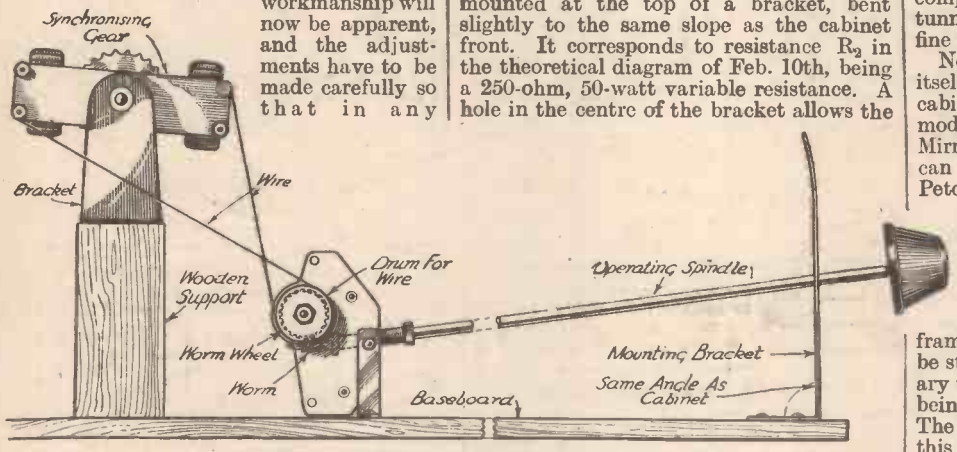


Fig. 1.—The arrangement of the "framing" control.

To "rock" the field coils a worm drive was built up, and the details of this are clearly shown in the illustration Fig. 1 above. A ¼in. shaft a foot long terminates in a worm screw which engages in a worm wheel, the plate holding the wheel and shaft bearing being held vertically on the baseboard by a right-angled bracket. Actually, this drive was part of a condenser assembly I found in my junk box, it being attached to an early type of Colvern condenser which was popular a few years ago. Similar gearing, if not obtainable from advertisers in this journal, can be found on the counters of second-hand radio stores, and with the illustrations to guide you the attachment is very easily assembled. On the shaft to which is attached the worm wheel is a cylinder having a thread on its surface so that as the extension shaft is turned by a knob fixed to its end it rotates the worm which drives round the screwed cylinder in either direction.

Now obtain a length of .014in. diameter piano wire, grip one end under a field-magnet back-plate nut and wind six or eight turns tightly round the grooves of the screwed cylinder, taking the free end under a second nut of the field magnet back-plate, as shown in the drawing. Rotating the extension shaft in either direction now rocks the field magnets slightly, the amount of movement (equivalent to two or three cogwheel teeth) being ample for framing purposes. Do not turn the shaft too far so that undue tension is applied to the piano wire, otherwise this may tend to twist the mechanism slightly. In use this control has only to be touched occasionally, so there is little chance of it going out of adjustment.

Panel Controls

The "trickiest" parts of the assembly are now complete, and no trouble will be experienced with the remainder. Two other panel controls are required—namely, the motor resistance and switch. The former is mounted at the top of a bracket, bent slightly to the same slope as the cabinet front. It corresponds to resistance R_2 in the theoretical diagram of Feb. 10th, being a 250-ohm, 50-watt variable resistance. A hole in the centre of the bracket allows the worm-drive extension shaft to pass through, while another near the bottom accommodates the extension shaft fixed to the rotary Bulgin switch. This switch is mounted on its own small bracket, as indicated in the baseboard drawings, and in this way the three panel controls appear one below the other on the front of the cabinet.

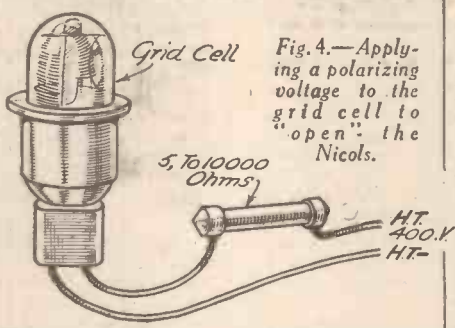


Fig. 4.—Applying a polarizing voltage to the grid cell to "open" the Nicols.

The lens-holders' position must now be measured up, but before fixing it to the baseboard, remove the holder and file the two vertical slots in which it slides, so that they extend another inch down each brass bar. This will give more latitude for correctly lining up the light beam later. In addition, as the viewing tunnel has to slide over this lens-holder, it is necessary to remove the wing nuts, replace with thin hexagonal nuts and washers and cut off the superfluous threaded portions. Place the cut lens so that the cut section is parallel with the baseboard, and with a hacksaw blade cut away the top of the lens-holder so that the top is flush with the lens. This is shown quite clearly in the illustrations. Small cleats and screws will hold the lens in place, but failing this it may be glued into the holder.

Next fix on the inclined mirror, being careful to see that, both in this case and that of the lens mount, their centres coincide with the optical axis 3in. inside the baseboard edge. As the lining-up procedure will be dealt with later, these two components can be left, and the viewing-tunnel runners fixed to the baseboard with fine tacks or glue.

Now we come to the screen and tunnel itself. In use this is pulled out from the cabinet to the correct focus, but is accommodated on the baseboard when the Mirrorvisor is not working. This assembly can be purchased complete from Messrs. Peto-Scott Co., Ltd., or, alternatively, the dimensioned drawing (Fig. 2) gives full particulars for those readers who want to undertake the construction themselves. It is made from three-ply wood with two wooden strengthening struts at the top, and a ⅜in. wide frame at the front. Over this front must be stretched the screen, consisting of ordinary tracing paper, or thin butter paper, it being glued to the framework to keep it taut. The addition of two small knobs completes this side of the work, and if the dimensions have been followed accurately it will be found to slide easily in the baseboard runners.

Wiring

Little more remains to be done now. Screw down the mains transformer; there is just room to accommodate it at the back, although in my own case I found it gave a little more scope for adjustment by cutting off one of the feet (the one nearest to the motor base) and raising one of the output terminals on the insulating flange. Screw down the tubular tapping resistance R_1, and 0.1 mfd. fixed condenser, so completing the assembly.

There is only a small amount of wiring to be undertaken, and this may be done with single and twin flex for convenience. Pay particular attention to the switch so that the numbered terminals are linked up in the manner shown in last week's wiring diagram, so as to give the double "on" position and one central "off" position. Small insulated staples anchor the wiring runs in place and prevent them fouling any gearing Terminate the mains lead in a universal main,

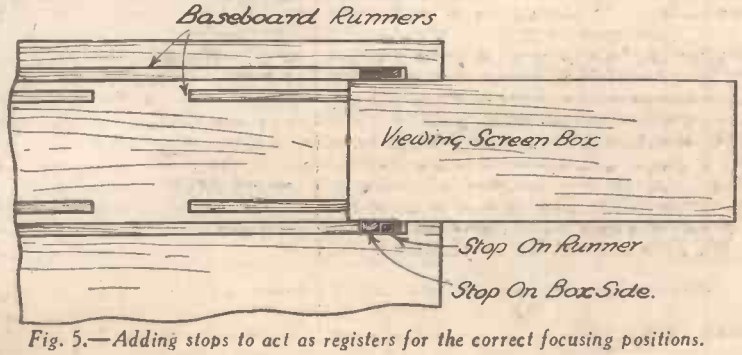


Fig. 5.—Adding stops to act as registers for the correct focusing positions.

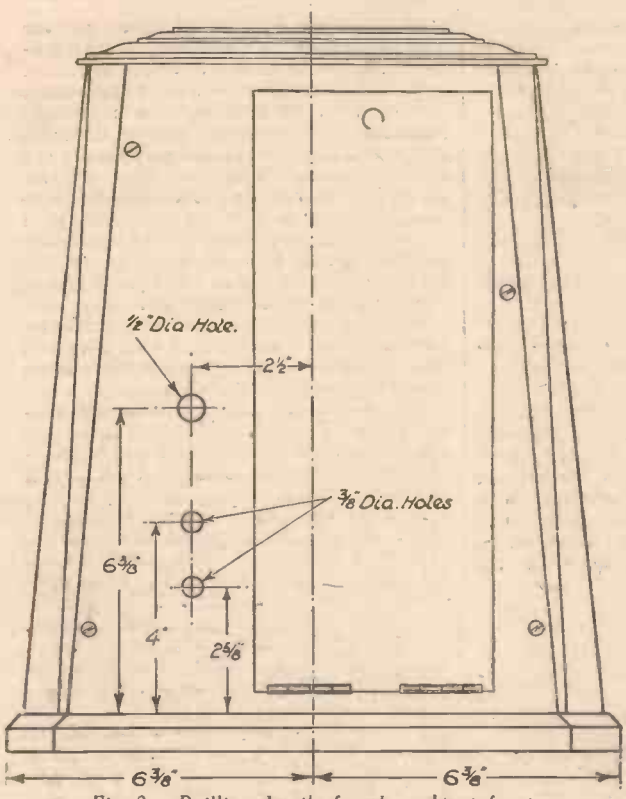


Fig. 3.—Drilling details for the cabinet front.

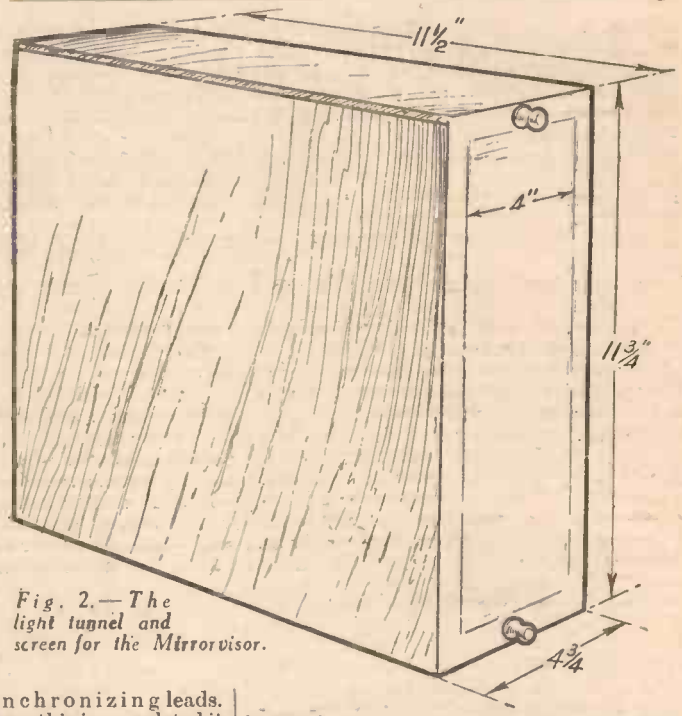


Fig. 2.—The light tunnel and screen for the Mirrorvisor.

plug (suitable for a twin socket or bayonet lampholder) and leave a reasonable length of flex free for the connections made to the synchronizing coils and grid cell.

The synchronizing coils must be wound in series so as to produce poles of opposite polarity. This is done by joining together the inner wire of, say, the left-hand field coil with the outer wire of the right-hand field coil. To prove this, join a flash-lamp battery across the two free ends, and by bringing a small pocket compass close to each pole tip it will be possible to see whether they are of opposite polarity.

Having checked the wiring and made sure that everything is firmly screwed down in place, it is necessary to ensure that the Mirrorvisor will comfortably be accommodated in the cabinet. This cabinet has a section cut out from the front, which is hinged at the bottom to act as a drop front when the screen is to be pulled out. If the holes on the left of this have not been made to allow the free passage of the three control spindles, these must be marked off and drilled (Fig. 3). Slide the baseboard in carefully from the back, taking care not to foul the mirror-drum or synchronizing gear, and ease the three spindles into their respective holes. Drop the front flap and ascertain whether the viewing tunnel can be withdrawn by pulling gently on the two knobs. This tunnel only just fits in the door to prevent extraneous light from spoiling the image, and the baseboard may need a slight movement to the right or to the left to allow of an easy passage.

The detachable cabinet back is cut away and covered with gauze to allow free air circulation, and this must now be positioned to ensure that the mains transformer adequately clears it. Three small slots should then be cut away for the flex leads, one in the bottom left-hand corner for the grid cell leads, another in the bottom right-hand corner for the mains lead, and the last one two-thirds up on the right-hand side for the synchronizing leads. When this is completed it only remains to optically line-up the image screen and conduct actual vision tests, and this section of the work must be followed carefully to ensure the best possible television images.

Lining Up

For lining up, the Mirrorvisor must be withdrawn from its cabinet and the screen pulled forward on its runners so that it is quite vertical and about 20in. from the front edge of the drum. From dry batteries or an H.T. eliminator source apply a potential of approximately 400 volts through a resistance of 5,000 to 10,000 ohms to the pair of leads from the Baird grid cell, as shown in Fig. 4. This procedure is necessary, as the cell is supplied having the Nicol prisms so orientated that a minimum of light is passed through when zero voltage is applied across the terminal pins. The application of the polarizing potential in the simple manner shown in Fig. 4 has the effect of "opening" the prisms, thus allowing a bright spot to pass to the screen.

To switch on the mains transformer feeding the 100-watt projection lamp, it will be necessary temporarily to disconnect one of the leads to the motor, as the two working positions of the switch are "motor alone" and "motor and lamp," and initial focusing is best undertaken with the motor stationary. Remove the back of the grid cell box and turn the rotary switch knob to the right, after having joined the universal plug to a convenient house mains point. The lamp will glow brilliantly, and care must be taken first of all to see that it is held vertically in the shaped holder, with the filament supports not shielding the direct rays to the condensing lens.

Careful Adjustment

The beam of light emerging from the complete cell passes between the two vertical supports holding the lens (see that the lens holder is not set down too low, otherwise the beam will be partially shielded) and strikes the inclined mirror. It is then reflected through the lens on to the mirrors of the drum, the direction again being changed to pass finally to the front screen. This is shown quite clearly in Fig. 1 in "Practical Television," dated 10th February. The inclination of the reflecting mirror, together with the height and angle of the adjustable lens holder, must now be attended to, so as to focus the light area on to the drum. The positions shown in the illustrations and photographs give these correctly, and both the lens holder and inclined mirror holder should be screwed just finger-tight and moved ever so slightly for each trial position while carrying out this operation.

Do not imagine that the light area focused on to the mirrors of the drum is a small spot. Actually, with the optical system I have used and specified, the light area on the drum should cover two mirrors. This is an important point and must be watched while lining up. Provided that the screen is centrally disposed on the optical axis, a square bright spot of light will be seen on the translucent screen. Try moving the screen backwards and forwards a little to focus the spot at its correct distance.

Screen Positioning

When this is satisfactory turn the drum round slowly until two light spots are seen on the screen from the first and last mirrors of the scan. The first will appear at the bottom right-hand corner of the screen (facing the front), and the last on the top left-hand corner. The screen size has been chosen so that the width will just make this possible, and if they cannot be seen together, loosen the grub screw holding the driving motor in its vertical mount and twist the motor *ever so slightly* to right or to left to make this possible. Then tighten the grub screw so that the motor is gripped firmly and rigidly.

The mirrors on the drum should not be touched, for this component is supplied ready adjusted, the individual mirrors being seated on milled back facets and held there by clips. By spinning the drum round with the fingers the movement of the light spot on the screen can be watched, and if the light area traced out

is satisfactory, as it should be if the instructions have been followed carefully, tighten up every nut and screw which has been loosened during the lining up process. Next switch off the mains, re-attach the lead to the motor, screw on the back of the cell box, and switch on the mains once more. The drum should now rotate in an anti-clockwise direction (facing motor end), and a complete light area made up from thirty strips will be viewed on the screen.

Make sure that no light "leaks" through the cell box at the top or side junctions. If there is a "leakage" it is likely to produce light patches on the screen or, alternatively, to mar the resultant image by producing secondary scanning spots, so the "cracks" must be closed or plugged. If desired, small "stops" may be fitted on both viewing tunnel and runners, as indicated in Fig. 5, so that when the apparatus is housed in its cabinet and the screen is drawn forward the stops will "register" at the correct focusing point. Alternatively, this can be left until an actual image is seen on the screen to make doubly sure the focusing has been done correctly.

Image Reception

Naturally, the true value of the Mirrorvisor cannot be judged by the constructor unless it is worked in conjunction with a wireless receiver suitable for bringing in the television signals free from distortion, and of adequate output. For *full* modulation an output of between 4 to 5 watts must be passed to the cell, but this does not mean that good images cannot be seen if the power is less, and the constructor has ample scope for experiment in this connection.

As a guide, it may be stated that a variable-mu high-frequency pentode stage feeding into an anode-bend detector valve without reaction, and followed by three stages of resistance-capacity coupling, will give first-class signal strength in normal situations within the service area of the London National station, which, of course, broadcasts the television signals.

Output Arrangements

One very important point which has to be considered is the method employed for feeding the signals from the output valve of the radio receiver to the grid cell. The cell is a voltage-operated device and takes no current, and in consequence resistance-capacity feeding is best suited for the work, while arrangements must be made for applying the polarizing potential. Bearing in mind my earlier remark concerning undistorted output, and remembering that the signal voltage for full modulation is of the order of 125 volts, a large super power is called for such as the Osram P.X.25, Mullard D.O.24 or Mazda P.P. 5/400. With this form of directly-heated A.C. output valve a very satisfactory coupling arrangement is indicated in Fig. 6.

Analysing the circuit it is seen that the output valve V is resistance-capacity coupled to the preceding stage, C_1 being not less than .1 mfd. capacity and R_1 .25 megohm. Assuming the full H.T. voltage available is 600 volts, R_2 can be 4,000 ohms and C_2 2 mfd. The grid cell G.C. is taken from C_2 to a single-pole change-over switch S, so that one electrode of the cell can be taken to high potential or earth potential. This is for the purpose of ensuring a positive picture and in operation, it makes no difference which cell pin is made positive.

A biasing potential to the cell is provided by the potentiometer R_4 and the two fixed resistances R_3 and R_5. Suitable values are 100,000 ohms for R_4 and 60,000 ohms for both R_3 and R_5. When receiving images it is necessary to adjust the position of the movable contact of R_4 so that the best potential is applied to the cell to give satisfactory contrast on the screen. The resistance R_6 gives bias to the valve V and a suitable value is about 600 to 700 ohms, while C_3 can be about 1 mfd. With an output circuit of this character in the radio receiver, and assuming the set is of good quality, first-class, very bright and properly contrasted black and white images will be seen on the screen of the Mirrorvisor.

Separate Synchronizing

Now we come to synchronizing. Whereas the grid cell is a voltage-operated device, the cogged wheel synchronizing mechanism which has been incorporated in the machine is a current-operated device. The proper and most satisfactory solution is a separate valve to feed the synchronizing cells, and this can very conveniently be one of the large super-power output valves mentioned for the grid cell. In order to secure the greatest amplification, and hence adequate power for holding the image steady, this valve can very well be an additional stage coupled to the grid-cell valve, and a scheme of this character is shown in Fig. 7.

The valve V_1 is coupled up identically to that shown in Fig. 6, and in consequence the component values are the same. The additional apparatus is lettered and consists of a second valve V_2 (identical to V_1), resistance-capacity coupled to V_1. The condenser C_1 must not be less than .1 mfd., while the potentiometer R_1 is 0.25 megohm. In the anode circuit is placed the synchronizing mechanism, R_2 of 2,000 ohms ensuring the correct anode potential feed to the valve. The condenser C_2 should have a capacity of 1 mfd., while C_3 and R_3 are similar to the previous biasing components, namely, 600 to 700 ohms for R_3, and about 1 mfd. for C_3. By varying R_1 the output to the synchronizing coils can be adjusted to suit individual needs, the ideal position of the control being such that any tendency for the image to "float" or "hunt" is reduced to a negligible quantity.

Operation

Assuming that the feeds to both the grid cell and synchronizing coils have been arranged for in the manner I have just detailed (the temporary biasing of Fig. 4 being disconnected after lining up), the method of operation is as follows. Plug the Mirrorvisor into the A.C. mains and turn the rotary switch knob to the left, and bring the motor up to its approximate speed of 750 revolutions per minute at least ten minutes before the transmission is due to start. Then tune in the television note on a loud-speaker so that it gives maximum volume. Switch over the loud-speaker output so that valves V_1 and V_2 of Fig. 7 are now in circuit, turn the rotary switch knob to the right, and pull out the front screen to its correct focusing position. Provided the Mirrorvisor is supported on a table the drop-front section of the cabinet will serve to keep the viewing tunnel horizontal. If not, then add two short supporting legs for this purpose.

It will now be possible to see whether the motor is running at its correct synchronous speed by watching any drifting of the images on the screen. If these tend to drift upwards or, alternatively, if the lines slope from the bottom left-hand corner to the top right-hand corner, the speed is too high, and if they drift downwards, or the lines slope from the top left-hand corner to the bottom right-hand corner, the speed is too slow and adjustments must be made on the variable resistance panel control to compensate for this. As soon as the motor speed is correct the synchronizing mechanism will take charge and hold the picture steady. Two phenomena are likely to be noticed. If the image is split about a vertical line (as recently explained in these pages) the apparatus is out of phase and the variable resistance control of the motor speed must be altered slightly until the images drift slowly upwards (or downwards) and to the left (or right). As soon as the image is centrally disposed between the two vertical screen sides, stop the drift by readjusting the resistance control to its previous position. It is now very possible for the image to be out of frame, that is split about a horizontal line. This is rectified at once by turning slightly the middle knob of the three panel controls. This operates the worm drive to the synchronizing mechanism and partially rotates the pair of field coils relative to the cogwheel. The effect will be a bodily raising or lowering of the image, according to which way the knob is rotated, and the image may be positioned correctly on the screen.

Do not forget to adjust the polarizing voltage to the cell (R_4 of Fig. 6) and the synchronizing signal strength to reduce

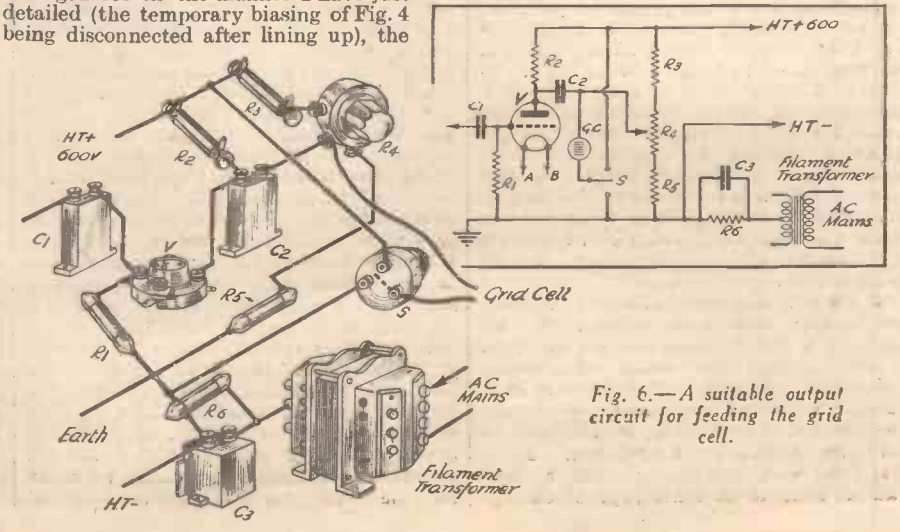


Fig. 6.—A suitable output circuit for feeding the grid cell.

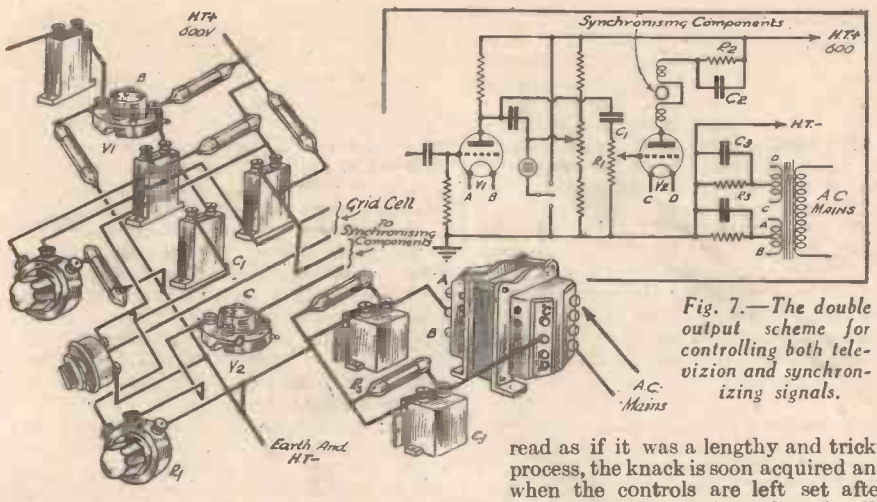


Fig. 7.—The double output scheme for controlling both televizion and synchronizing signals.

hunting (R_1 of Fig. 7), while if the radio receiver has its own volume control this can conveniently be adjusted to give the signal strength desired. Too strong a signal is liable to introduce image distortion, throwing up shadows or giving an over-exaggerated black and white effect, and this can be attended to according to individual needs.

Final Hints

In any case the constructor will be delighted with the way the instrument functions, and although the operation may read as if it was a lengthy and tricky process, the knack is soon acquired and when the controls are left set after using them once or twice, they hardly need touching for subsequent occasions. I strongly advise the reader to carry out his first two or three reception tests with the Mirrorvisor out of its cabinet, so that any slight readjustments of focusing, etc., can easily be undertaken.

Be sure that all the mirrors and lens are free from dust, and remember that a reasonable amount of heat is generated by the projection lamp, and in consequence free air ventilation must be ensured. The cell box is bright aluminium inside to give the maximum light, but black outside to give maximum heat radiation, while the "forced" ventilation produced by the revolving drum driving air into the slots in the box top (this escapes from the back ventilation holes) is an admirable scheme for this cooling operation.

If the constructor regards the paper screen as rather flimsy in character and liable to get damaged when withdrawn, he can replace it with thin ground glass, or better still, cover the front of the paper screen with thin plate glass held in place by clips, or even a passe partout frame will hold this rigidly. The screen is actually 11in. by 4in. and if the optical lining-up has been done correctly, the actual image field size will be approximately 9in. high by 4in. wide. The excess 2in. in screen height can be masked off with black edging, but I purposely made the screen on the large size so as to give a little latitude for image field positioning according to taste.

As the images are very bright the reception can actually be carried on in a lighted room provided no direct outside light is thrown on to the screen, but the best effect is given by having the room in semi or complete darkness. Finally, do not forget that the sound accompanying the dual television transmission is transmitted from the Midland Regional Station on a wavelength of 391 metres. This must therefore be received on a separate set, and to give the illusion of the sound actually emanating from the television image, the loud-speaker of this set should be placed as near as possible to the Mirrorvisor screen.

We Lead Again With "The Leader"

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Advance Details of Our New Receiver which sets a New Standard in Home-constructed Receivers, and Introduces a new Policy

THERE are a large number of listeners who are of the opinion that it is much cheaper to purchase a commercial make of wireless receiver than it is to build one. For some time now we have been aware of this notion, and from inquiries which we have made, both directly and indirectly, we have found that the idea has arisen through an erroneous comparison. For instance, readers of the technical Press have taken the receivers which have been described and, upon looking at the advertisements of the firms which supply complete kits, have seen that, for instance, a three-valve receiver costs, say, £10 or more, whilst it is possible to purchase for about that figure a four- or even a five-valve receiver from a large number of commercial set manufacturers. It is overlooked, however, that this comparison is not a fair one, and for the following reasons. Take, for instance, the Fury Four Super which was recently described in these pages. The total cost of the kit for this receiver was in the neighbourhood of £10, but is there a complete receiver on the market, even at the price, which embodies the features which formed the basis of this receiver? Very few cheap commercial sets work really well, and few, if any, are trouble free. Again, the home-constructor, when he purchases, for instance, a low-frequency transformer supplied by a *component manufacturer*, obtains a component which, apart from its actual electrical characteristics, is finished to have an attractive appearance. It is provided with terminals; has a substantial bakelite or other type of casing; and is generally of fairly substantial dimensions. The commercial set manufacturer, however, generally employs a "stripped" transformer, consisting simply of a core and the necessary windings, sometimes not even provided with connecting tags, but having only leading-out wires. Admittedly, the performance of this component may be identical with the previously described component, but the price will obviously be much lower.

Again, the set maker who is catering for a large public has to design the receiver so that manufacturing costs are low, and consequently he cannot always provide for the most efficient arrangement of the parts which are included in the receiver, owing to the necessity for mass-producing the article. The designers of receivers for the wireless journal, however, can work out the most effective circuit without any question of manufacturing costs, etc., and provided the receiver is not too complicated to construct, the actual arrangement is not of very much importance. Thus, to offset the price of the complete receiver, it is necessary to bear in mind the actual contents of the receiver, and if this point is taken into account when comparing respective receivers the actual price will be found to be quite favourable.

However, we fully realize that every home-constructor is not in a position to pay £20, or even £15, for a set of parts to build a receiver, no matter how efficient it may be. We set about, therefore, to design a receiver which, whilst it utilized standard components—by which we mean not the "stripped" variety used by set manufacturers—would cost a minimum amount without in any way sacrificing efficiency.

The objects were, therefore:—

1. Low cost.
2. Efficiency in operation.
3. Ease of construction.
4. Neatness of appearance.

Various circuits were experimented with, and all sorts of combinations were entered into in trying out cheap and medium-priced designs. Ultimately, a circuit was found which enabled the standard components to be employed in an arrangement which, whilst not new, at least would enable us to claim that once again we had shown a lead in producing a receiver which could compare with or even excel in performance any commercial receiver of similar circuit properties, and which, if not cheaper, at least would not cost more. During these experiments we did not attempt to cheapen the cost by sacrificing efficiency, neither did we attempt to get the impossible with standard parts. Rather did we take a standard circuit arrangement and find the most suitable parts, from the point of view of cost and efficiency, to enable the idea to be put into effect. Needless to say, we have succeeded in our endeavours, and the results are embodied in the three-valver which we have named "The Leader." The circuit is the standard H.F., detector, and output, and modern coils have been incorporated. Although not of the iron-cored type, these have been designed since the Lucerne Plan was put into effect, and they enable the maximum benefits to be obtained under this new scheme.

THE EASY ROAD TO RADIO

THE BEGINNER'S SUPPLEMENT

REACTION CONTROL FOR THE AMATEUR

In This Article we Deal with a Number of Practical Points Concerning Reaction and the Best Methods of Applying It.

WHEN thinking of reaction the amateur often has in mind the howling and squealing sounds which are produced when the reaction knob is turned too far round. But that is not a fair way of considering reaction, for it need not be misused at all, and, properly employed, it is one of the greatest aids to long-distance reception with the simpler type of receiver. Before dealing with the more practical aspects of reaction it will be helpful to consider just what it is, what it does and how it functions. The meaning of the word might be better understood if it were changed to feed-back, for that is what the process of reaction really consists of. Signal voltages are applied to the grid of a valve, which amplifies them so that they appear in the anode circuit in magnified form. If some of the amplified signal voltages are passed back from the anode to the grid circuit they will pass through the valve a second time, and so they will be amplified still further. It is not difficult to imagine the signal voltages passing through the valve in this way, time after time, until they attain a strength considerably in excess of their initial one.

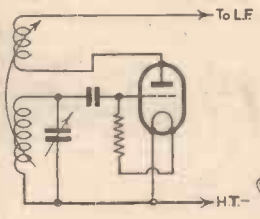
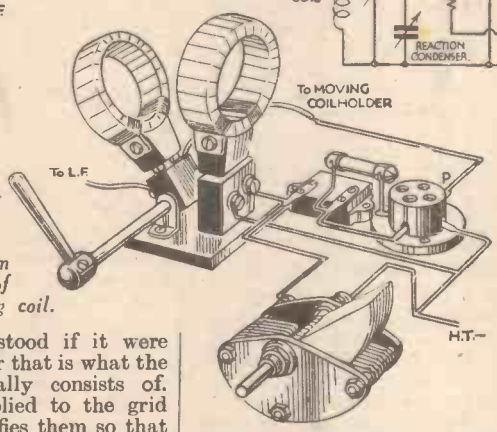
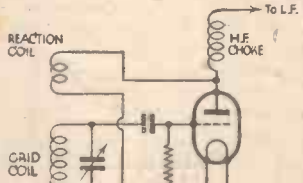


Fig. 1.—The simplest form of reaction—by means of a swinging coil.



Self-oscillation

There is, however, a limit to the amount of amplification which can be obtained in this way, because, after a certain point has been reached, the valve falls into self-oscillation, signals are seriously distorted and (generally) a high-pitched whistle is heard. At least, that is what occurs when reaction is used in the usual manner in conjunction with the detector valve, but rather different effects are produced when reaction or feed-back occurs in the circuits of other valves. Almost invariably reaction in these cases is undesirable and occurs due to bad design of the receiver. This is mentioned chiefly to emphasise the fact that reaction is not necessarily confined to the detector valve. Unwanted reaction has been dealt with in recent articles in PRACTICAL WIRELESS under the headings of "Causes and Cures for H.F. Instability" and "Causes and Cures for L.F. Instability," so there is no need to consider it again at this point.



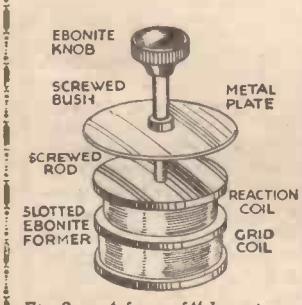


Fig. 3.—A form of "damping-plate" control which was successfully employed in some of the earlier receivers.

What we are more concerned with are the methods by which legitimate (detector) reaction can be produced and, what is more important, *controlled*. It is the problem of varying its effect which presents most difficulty, and it will be apparent that unless it can be under complete control, reaction can do far more good than harm.

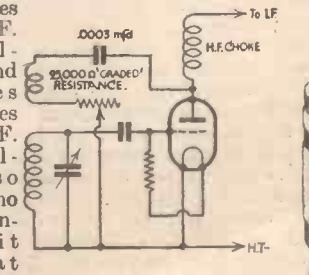


Fig. 5.—Resistance-controlled reaction. The variable reaction condenser is replaced by a fixed condenser and "graded" variable resistance.

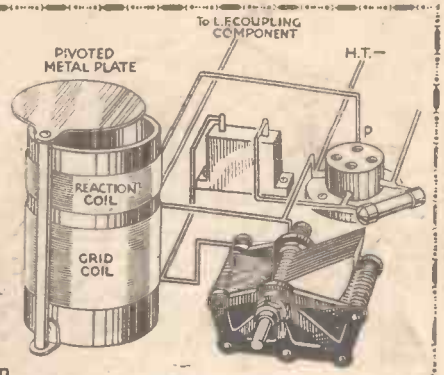


Fig. 2.—A method of reaction control in which two fixed coils are used in conjunction with a "damping-plate."

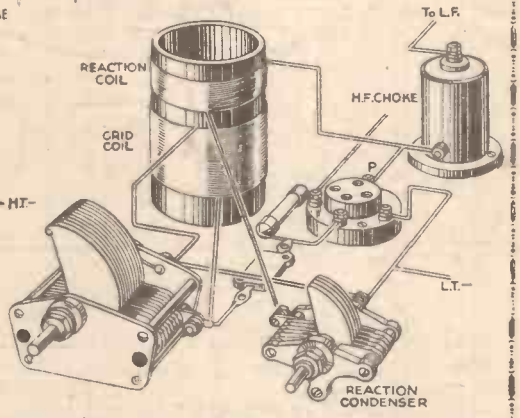


Fig. 4.—The above theoretical and pictorial circuits show the arrangement of the Reinartz system of reaction which is now universally employed.

Methods of Reaction Control

Let us consider the methods of applying reaction. The idea is to provide a means whereby high-frequency currents can be fed back from the anode to the grid circuit of a valve. The simplest method is shown in Fig. 1, where a coil connected between the anode of the detector valve and the L.F. coupling component (transformer primary, L.F. choke, or resistance) is placed near to another coil connected between the grid and filament of the valve. The grid or tuning coil supplies the input to the valve, whilst the anode

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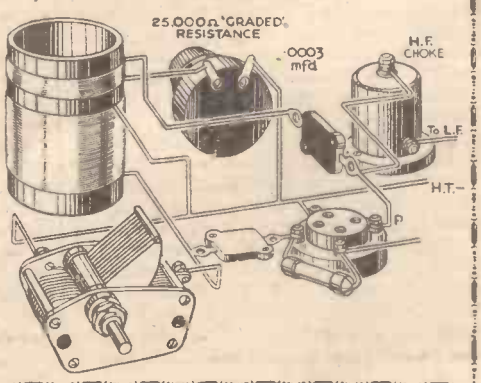

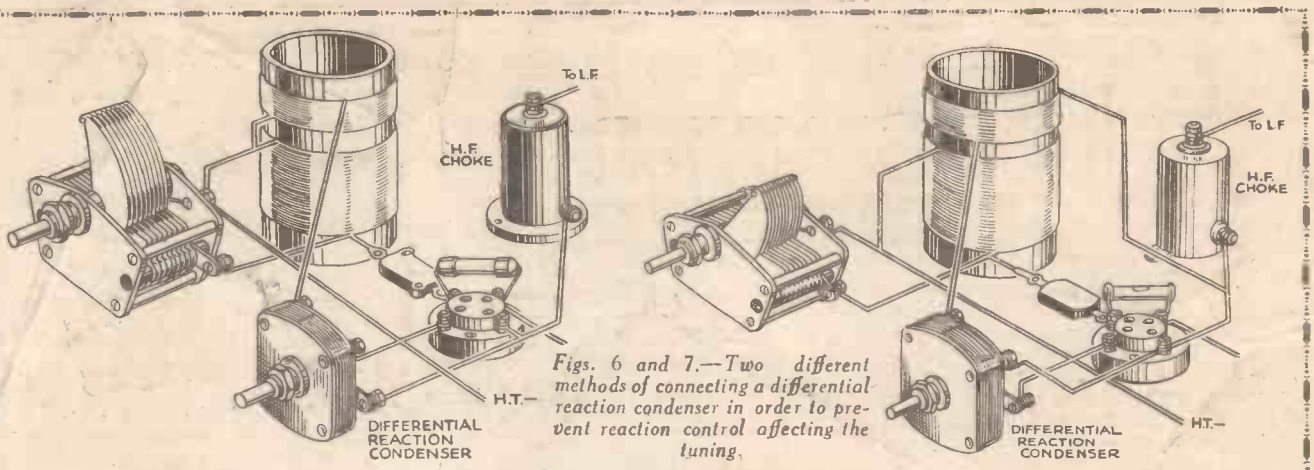

Figs. 6 and 7.—Two different methods of connecting a differential reaction condenser in order to prevent reaction control affecting the tuning.

(*Continued from previous page*)

coil carries the output. When the two coils are placed near together high-frequency currents can pass between them by "magnetic induction." In other words, a magnetic field is created round each coil by the currents passing through it, and if the two fields are allowed to "overlap" there is a certain "mixing" action between the currents causing them.

It is essential, however, that the reaction and tuning coils be connected in the correct "sense"; that is, in such a manner that the two magnetic fields "assist" each other. If the reaction winding is connected in circuit wrong way round, it will reduce, rather than increase, signal strength. When it is found that signals become weaker as the reaction control is advanced the connections to the ends of the winding should simply be reversed.

From this it will be apparent that the *amount* of feed-back can be varied by altering the relative positions of the coils. This is the oldest form of reaction control, and it was made use of in the early days of broadcasting. In many ways it is excellent, but it is not applicable to present-day methods of receiver design, because the coils occupy too much space and cannot easily be screened.

"Damping-plate" Control

A modification of the idea which has been used with some success is to place the two coils close together in fixed positions, and to vary the amount of feed-back by means of a metal plate moving over them as shown in Fig. 2. The plate "absorbs" some of the high-frequency energy from the reaction coil, the extent of the "absorption" depending upon the closeness of the plate to the coil. Thus, the degree of feed-back can easily be controlled by moving the plate. An arrangement such as this is generally fairly bulky, but this difficulty was overcome in at least one receiver which was very popular in the early days by fixing the plate on a threaded bush which could be screwed down a rod passing through the coils—see Fig. 3. Even this system is far from efficient because the metal plate not only "absorbs" some of the H.F. energy from the reaction coil, but also from that used for tuning. Although the methods of reaction control so far described are obsolete, they are somewhat historic, and those amateurs who have not tried them will find it interesting and instructive to do so.

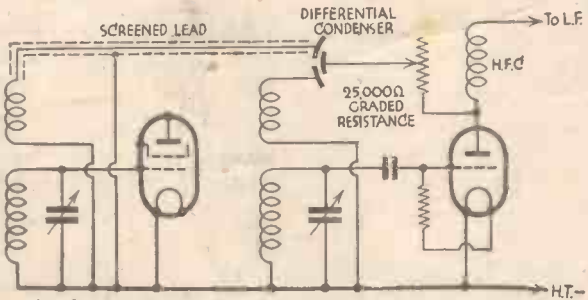

Fig. 8.—A skeleton circuit showing how double reaction can be obtained by feeding back from the detector anode to the grid of both this and the preceding valve.

Topical Technicalities.

ELECTROMAGNETISM.

When an electric current is passed through a coil of wire which is wound round a piece of iron, the actual atoms in the iron move about and the iron becomes what is known as "magnetized." When, however, the current is discontinued, the iron does not lose the magnetic property instantly, the atoms taking some little time to get back into their original position. The property of the iron to maintain the magnetism is known as "hysteresis," and the electrical energy which is used up in magnetizing the iron is known as "hysteresis loss." Obviously, therefore, in a circuit where the current continually changes at a rapid rate, for instance, in a low-frequency transformer, it is necessary to ensure that the iron which is used for the core shall be of such a nature that it will not require too much energy to change its magnetism, and, therefore, we do not want great hysteresis losses. Certain materials have very low losses of this nature, notably soft iron, annealed iron and other types of soft iron, or steel, and these, therefore, form the best materials for L.F. transformers and similar components. On the other hand, steel and the harder forms of such material form the best media for permanent magnets; that is, they retain the magnetism which has been imparted to them.

Capacity Reaction

An entirely different system (in practice only, however) of reaction control was devised by an experimenter named Reinartz, and his method is now universally employed in some form or other. The arrangement of a capacity-controlled circuit (generally referred to as a Reinartz reaction circuit) is given at Fig. 4. It will be seen that a high-frequency choke is inserted in the detector anode circuit and that the reaction coil is connected in series with a variable condenser between the anode and earth. The reaction coil generally consists of a fixed winding placed near to the tuned grid winding and H.F. currents are passed back just the same as in the arrangements previously described. The object of the H.F. choke is to prevent the passage of high-frequency currents into the L.F. circuits, so that they can be fed back into the reaction winding. Now, a condenser, although a perfect insulator so far as ordinary direct-current is concerned, will pass H.F. currents quite easily, its resistance to them being inversely proportional to its capacity; the greater the capacity, the easier will the condenser pass the currents. It can thus be seen that perfect control of feed-back can be accomplished by varying the capacity of the so-called reaction condenser. In practice, the size and position of the reaction winding are usually arranged so that complete control over reaction can be accomplished by means of a .0002 mfd. or a .0003 mfd. condenser. Just the same as in the simplest form of reaction described earlier, it is essential that the reaction winding should be connected in the proper direction.

The Position of the Reaction Condenser

It has been said that in Reinartz reaction the variable condenser is connected in series with the winding, and in Fig. 4 this condenser is shown as being between the winding and the anode of the valve. Actually, however, it may be either in this position or between the other end of the winding and earth. In practice the latter arrangement is generally to be preferred, because the condenser is then at "earth potential," the circuit is less susceptible to "hand capacity," and smooth control is more

(*Continued on page 1062.*)

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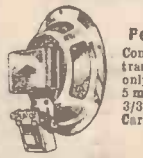

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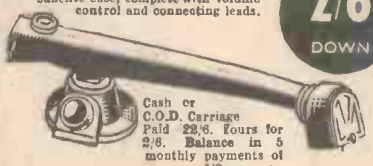

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BEGINNERS' SUPPLEMENT

(*Continued from page 1060*)

easily to be obtained. The moving vanes of the reaction condenser, which are in contact with the spindle to which the control knob is attached, should be connected to earth. In the same way, when the condenser is in the position shown in Fig. 4, the moving vanes should be connected to the "earth" side of the circuit—*i.e.*, to the "top" end of the coil.

Resistance-controlled Reaction

It is not always realized that an excellent control of reaction can be obtained by replacing the variable condenser by a variable resistance. This is fairly obvious really, because, as was previously explained, the variable condenser actually serves as a variable resistance *to high-frequency currents*. The method of using a variable resistance in this way is shown in Fig. 5. It will be seen here, though, that a fixed condenser is also connected in the reaction circuit; the object of this is to prevent a short-circuit of the high-tension supply to the anode of the detector valve. In this arrangement the fixed condenser should have a capacity of about .0003 mfd. and the resistance should have a maximum value of approximately 25,000 ohms. The resistance gives a very smooth reaction control, particularly if a "graded" potentiometer is employed and wired as shown in Fig. 5. A difficulty occurs in connection with this system, however, since there are very few variable resistances or potentiometers available which are perfectly silent in operation. It is essential that the component *should* be silent, and it is best to choose one of the non-wire-wound variety and of good make.

In addition to giving excellent control of feed-back, the resistance method of reaction adjustment has the further advantage of preventing "parasitic" oscillation, which is often introduced by various unavoidable means. Parasitic oscillation is generally indicated when the setting of the reaction control differs widely at different settings of the tuning condenser. It is also indicated when reaction "goes dead" at certain parts of the wavelength range. When this nuisance occurs, and a condenser is employed for reaction control, it can nearly always be overcome by inserting a fixed resistance of about 200 ohms in series with the reaction coil. The resistance must be completely non-inductive, and one of the many metallized or composition types is perfectly suitable.

When Reaction Affects Tuning

It frequently happens in a set which has not been very carefully designed that tuning is affected by reaction control. This is a nasty fault which becomes very troublesome when an attempt is made to tune in a rather weak signal. The trouble is due to the fact that the capacity between the anode and filament (or cathode) of the detector valve is changed as the reaction condenser is varied in capacity. This can be cured by using a differential condenser for reaction control, the object of which is to keep the anode-to-cathode capacity constant. A differential condenser can be wired in various ways, but the two most convenient are shown in Figs. 6 and 7. In both cases the condenser is so connected that, as the capacity to earth *via* the reaction circuit is reduced, there is a corresponding increase directly between the anode and earth.

When it is not desired to employ a differential condenser, or where this course is precluded by the design of the particular coils in use, an almost equally satisfactory result can be obtained by connecting a fixed condenser of between .0001 mfd. and .0003 mfd. between the detector anode and earth. The fixed condenser also tends to prevent L.F. instability.

"Double" Reaction

Although it is usual to apply reaction from the anode to the grid circuit of the detector valve only, it is often worth while to employ what might be termed "double" reaction; that is, reaction which is effective on both the detector grid circuit and also on the grid circuit of the preceding H.F. valve. This arrangement used to be very popular in the early days when "swinging-coil" reaction was in favour, but it is seldom made use of to-day. For those who care to try it, the circuit is shown at Fig. 8, where it will be seen that a differential reaction condenser is used in conjunction with a variable resistance. The resistance controls the total amount of feed-back, and the differential condenser controls the relative amounts of feed-back applied to the grid circuits of the two valves.

THE PILOT CLASS B FOUR KIT SET

MESSRS. PETO-SCOTT need no introduction to our readers as suppliers of kits for all kinds of receivers, and the latest design issued by this firm is well up to the standard associated with Peto-Scott products. The latest Class B Four is a remarkably efficient set at a moderate price. It can be obtained, like all Peto-Scott kits, in three types—Kit "A," which comprises all the parts for the set, with blueprint and full constructional details, but less valves, cabinet, etc.; Kit "B," which includes a set of matched and tested Peto-Scott valves, and Kit "C," which is complete with valves and the consolette cabinet illustrated on this page. The prices of the three kits are £3 10s., £5 2s. 6d., and £5 15s. respectively for cash or C.O.D., but any one of these can be obtained on very generous hire-purchase terms. So much for the prices, which speak for themselves, and now to deal with the set.

Reliable Circuit

The circuit is on straightforward lines, and includes a variable-mu H.F. stage, followed by a grid-leak detector, a driver L.F. valve and a Class B output stage. This is, of course, one of the most popular valve combinations at the present time, and is one which makes for reasonable simplicity in design and construction, besides giving a signal output which is ample for every domestic purpose combined with an adequate degree of selectivity to make it a simple matter to receive and separate most of the high-power stations working under the new Lucerne Plan. The lay-out, as shown by the blueprint (free with any of the kits), is very "clean" and straightforward, so that it should present no difficulty even to the merest novice in wireless construction.

A pair of efficient Colvern coils, provided with integral switches and selectivity tappings, are used for tuning, in conjunction with a well-made British Radiogram two-gang air-dielectric condenser. To ensure accuracy of tuning the second section of the condenser is provided with a trimmer which can quickly be adjusted by means of a screwdriver, thus ensuring correct matching of the two tuning circuits whatever type of aerial-earth system is employed. A reaction condenser is made integral with the ganged tuning condenser and is controlled by means of a small knob which is made concentric with the main tuning knob. This arrangement makes for ease of control and a welcome reduction in the number of knobs on the front of the set. Tuned-grid coupling is used between the variable-mu and detector valves, an excellent B.R.G. high-inductance sectionalized H.F. choke being employed in the anode circuit of the first valve.

The Pilot Class B Four. Compact, cheap, and of excellent quality.

The detector feeds into the driver valve through a B.R.G. low-frequency transformer, and a separate H.T. positive lead is used to supply the anode current to this valve. A special driver transformer is used to feed the Class B output valve, this having a two-ratio Class B output transformer in its anode circuit to enable the set to be accurately matched to different types of loud-speaker in the simplest possible manner.

It should be added that all the components are mounted on a Peto-Scott metallized baseboard, which simplifies the making of numerous earth-return connections and adds to the overall efficiency of the receiver.

Pleasing Cabinet Design

The consolette cabinet is of attractive and pleasing design and there are three main controls coming through the front; these are the tuning (with combined reaction), variable-mu volume control and

(*Continued on page 1063*)

(Continued from page 1062)

wave-change switch knobs. Incidentally, the on-off switch is mounted on the terminal strip attached to the rear of the set, so simplifying the appearance of the front of the cabinet. The terminal strip also carries two aerial terminals, one for the earth lead and two for a pick-up. The alternative aerial terminals are for obtaining different degrees of selectivity, and that marked "A.2" is wired in series with a .0001 mfd. fixed condenser and is particularly useful when the set is being used near to a powerful station, or when extreme selectivity is called for.

Easily Followed Instructions

In addition to the blueprint, Messrs. Peto-Scott also supply two simply-worded instruction sheets; one of these refers to the assembly and wiring, and the other to the method of operation of the set. No one will find any difficulty in following these instructions, for they are very clear and devoid of unnecessary technicalities.

On test the "Pilot Class B Four" did not fall short of the anticipations which were formed by examination of the circuit and lay-out. In fact, it proved to be better than the average receiver of its type, in regard to the volume of output, quality of reproduction and the degree of selectivity. The volume was certainly quite comparable with that obtained from a powerful mains-operated receiver, and the quality was very pleasing. When the set was tested on an aerial of average proportions and situated some eleven miles from Brookmans Park, both the London stations could be eliminated within a few degrees of the tuning scale, even when the aerial was connected to the lesser-selective terminal. When terminal "A.2" was employed the stations could be cut off very cleanly with a very small movement of the tuning knob. Naturally the volume to be obtained from the "locals" was too great for normal listening unless the volume control was set well back from its maximum position.

Selectivity Control

Besides serving for its normal purpose, the volume-control potentiometer also proved very useful as a means of increasing selectivity when receiving otherwise "difficult" stations. By reducing the setting of the control and advancing reaction, selectivity could be increased to almost any desired extent. It should also be mentioned here that the potentiometer was found to work very smoothly indeed and without those annoying crackles which are noticeable in the case of too many sets; this control could, in fact, be truly described as entirely noiseless.

Current Consumption

After convincing ourselves that the set could thoroughly be recommended on the score of performance, measurements were taken of the H.T. and L.T. current consumption. The filament current taken from a 2-volt accumulator was found to be .5 amp., which can be considered as very modest in view of the enormous output. The anode current, when using a 120-volt battery, was just under 10 milliamps when the set was not tuned to a station, and fluctuated between this and some 30 milliamps when a powerful signal was tuned in. The average consumption over long periods of listening would probably work out at something rather less than 15 milliamps, so that any Class B high-tension battery should have a useful life of several months.

RADIO RAMBLINGS

By JACE

Jottings from my Notebook

New Amplifiers for the House of Lords

DEEP down in the cellars which extend in all directions for many hundreds of feet beneath the House of Lords is a room about 50ft. square. This lies directly beneath the Chamber in which the House sits during its sessions, and houses at the moment a new amplifying equipment which has just been installed. The Chamber of the House is very imperfect acoustically, and, particularly in the Strangers and Press Gallery, some of the speech is inaudible.

The equipment now in use replaces an amplifier which has been used in the House of Lords for the last eight years, and is a model of all that a public address amplifier should be. In the Chamber itself are four microphones: two are on a table in the centre—one facing east and the other facing west—two more are hidden beneath the table facing the Woolsack. The two microphones beneath the table are of the magneto moving-coil type as used by the B.B.C. for outside broadcasts, and are capable of picking up speech at 35ft. The amplifier itself has five amplifying stages and is battery driven throughout. The output is divided into five circuits, each with an independent volume control.

The Chamber is equipped with sixty-five hand earphones, each accommodated in a special recess at the back of the seat. Each member, when using the earphone, takes it from the recess in front of him and applies it to his ear; when he has finished with it he replaces it, a special spring roller coiling up the wire as the earphone is returned to its socket. The room referred to above in which the amplifier is installed has many historical associations. Indeed, on the very spot where the amplifier now stands, Guy Fawkes, hundreds of years ago, placed his gunpowder and other explosives on the occasion of his abortive attempt to blow up the Houses of Parliament.

Second Radio Change-over

EUROPE'S second radio upheaval is now in progress. Change-over No. 1 (transmitters only), affected only 232 stations. The second change-over will affect well over a million stations, this time receivers. Most transmitters have now settled down, more or less, to their new allocations, and listeners are very busy calibrating their sets for the new settings. As we mentioned a short while ago, manufacturers have been very busy issuing new scales to suit their various types of receiver, but Messrs. E. K. Cole have tackled the job in a very novel and efficient manner. They realize that the new wavelengths may not be permanent, or that a fresh re-shuffle may be occasioned in the future, and they also realize that their receivers will be wanted by listeners for some time without becoming obsolete. They have, therefore, invented the arrangement which is illustrated on this page, from which it will be seen that they are providing their receivers with a scale which is calibrated in wavelengths only. It will also be noticed that the scale is evenly spaced and has no crowding at one end or the other. In addition to this scale, however, a separate transparent strip is supplied, and this is engraved with station names, arranged in such a manner that when the strip is fixed to the permanent scale, by means of the studs provided, the names become part of the actual scale, and thus station selection is simplified. The advantage which this scheme possesses is, of course, that new strips may be made at a very low cost, and are easily fitted by the user with absolutely no technical knowledge or skill of any kind being required. In fact, the screen may be inserted while the set is actually working. Needless to say the manufacturers have patented this ingenious scheme, and it will do much to still further popularize the products of this go-ahead concern.

"Power—from Coal to Grid"

THIS is the title of an interesting broadcast in the London Regional programme on February 23, from the new Battersea generating station, which will be carried out by courtesy of the London Power Company, Limited. The broadcast

The new Ekco replaceable dial which is described on this page.

will consist of a tour round the robot building at Battersea, with its silent stokers and sootless smoke belching forth from 240ft. stacks. The story will start with the coal fuel in progress from the top of the transporter belts; the banks of blowers; mighty turbines which every hour use eight million gallons of condensing water from the River Thames; generators; and safety valves. The listener will also be taken through the Control Room with its flashing coloured lights, the nerve centre of the whole building, and the switch-room with rows of giant twelve-ton switches.

Multiple Valves

WITH all the multiple valves now on the market one is inclined to ask just how far this business of making one valve to do several pieces of work is likely to go. Double-diode triodes and double-diode pentodes appear to have become fairly well established, whilst the heptode, pentagrid and other similar valves are being very widely used. The Class B valve is now taken entirely for granted, of course, and another double output has recently been developed by one of the leading valve manufacturers.

These double- and triple-duty valves are very convenient in some respects, but one wonders if they are really "worth the candle"—to use a popular expression. They do help the constructor to make his set more compact, but they invariably entail the use of more crowded wiring because of the comparatively large number of pins on the bases. In addition to this, the failure of one section of the valve renders the whole component useless and calls for an expensive replacement. Another thing which is not in their favour, especially from the point of view of the new constructor, is the difficulty in recognizing the many contact points on the appropriate holders. Seven-pin holders for Class B valves were bad enough for the beginner, but how is he going to get along with nine contacts—all placed close together at that?

A Novel Way of Testing Valves

READERS are often inclined to think that the lot of those experts who serve our Queries Department is an easy one, but the following example will prove that this is not by any means always the case.

In the course of an enquiry a reader recently asked what could be wrong with his mains set, which functioned correctly when first switched on, but after working for a short time the signals gradually became very weak and practically faded out. After explaining this, the querist stated: "I have taken both valves out of the set and put them in the coldest part of the house, *i.e.*, on the pantry floor, and left them for an hour. I then put them in the set, which had been left in the warm room; after they had warmed up the set worked quite normally. I then took the valves out of the set once more, and left them in the room while the set had a turn in the cold. On being fitted up and switched on once more the old trouble started again. This, I think, should clear the valves of any suggestion of fault, and I think you will come to the same conclusion."

The expert who dealt with this inquiry felt very much inclined to reply: "We suggest that you buy the set some warm underwear, and obtain a refrigerator in which to store the valves when the set is not in use." Instead, however, he asked for some further information which would be more likely to be of assistance in solving the problem!

FACTS & FIGURES

BY THE PRACTICAL WIRELESS TECHNICAL STAFF

THE ROTHERMEL PIEZO-ELECTRIC SPEAKER

THE photograph below illustrates one of the new special combination loud-speakers which was referred to recently in these pages. Unlike the usual type of dual loud-speaker, this embodies an ordinary permanent magnet moving-coil unit, together with a speaker of the piezo electric type. The latter may be seen on the right of the complete unit, and is, in appearance, somewhat similar to the ordinary balanced-armature type of loud-speaker. The circular-box arrangement contains the piezo crystal, and connection from this to the centre of the cone is made by means of a pivoted stylus not unlike an ordinary gramophone reproducer. It is very finely balanced, and connection to the cone centre is firmly made by means of a soldered joint. The cone is held in such a manner that it appears almost as free to move as the normal moving-coil instrument, and the overall diameter is 8¼in. The other unit on the complete assembly is a de luxe P.M. model, and this has a cone of 7in., with the standard permanent magnet and input-matching transformer. The piezo unit is connected to the transformer on the M.C. unit, one lead being fixed and one provided with a plug so that matching may be accurately carried out. The baffle upon which the two speakers are mounted is of ¼in. plywood. The combination was tested and found to give very good results indeed, the higher notes in the scale being remarkable for their clarity and brilliancy, whilst other notes had an added richness, presumably due to the better reproduction of the harmonics. Naturally, the best effects are experienced when the receiver is of the type which will reproduce the higher frequencies, and this was noticeable when a flatly-tuned receiver was employed in place of a very sharply-tuned superhet. With a suitable baffle reproduction was very lifelike, and certain instruments became much more realistic when this combination was employed in place of a standard moving-coil unit. The cymbals, piccolo, violin, piano, and various jazz-drum effects were particularly noticeable in the improvement of balance which was obtained, and the speaker should certainly appeal to those who are in search of better reproduction. The price of this particular combination is £5 2s. 6d., whilst the piezo unit alone costs 55s. Other combinations are obtainable at prices down to £4 10s., and these, of course, incorporate different models of the moving-coil unit.

The Rothermel dual loud-speaker.

R. & A. "MULTEX" REPRODUCER

THIS loud-speaker is claimed, by the makers, to be the only all-purpose reproducer on the market. By the term "all-purpose" is meant the application of the speaker to any existing receiver, irrespective of whether or not a speaker is already incorporated in the receiver, and also independent of the type of such a speaker. The illustration shows the cabinet model (costing 45s.), whilst the unit itself is also obtainable without the cabinet at 30s. The speaker is of the permanent-magnet type, having an 8in. chassis, and a special material is used for the diaphragm. It is in the input transformer, however, that the novelty is displayed, for this provides no fewer than twenty-seven different ratios—twelve high ratios for triode and pentode valves; six ratios for Class B and other push-pull circuits, and nine low ratios for use with a low impedance additional reproducer. These various ratios are obtained by the aid of ten sockets and four plugs, two of which are joined to the transformer primary, and two to the output leads from the receiver. An instruction sheet supplied with the reproducer shows three tables under which various values are given, and shows instantly which sockets and which coloured plugs to employ. Thus matching may be carried out very quickly, and there is no hit-or-miss principle involved. The tables show that the approximate load may vary between the limits of .75 ohms and 24,000 ohms, and thus it should be possible to match this speaker to practically any existing combination. In the unlikely event of the exact load required not being given in the instruction leaflet, it should be quite a simple matter to select a probable value and try adjustments on either side in order to arrive at the best results. The speaker has been thoroughly tested with various commercial receivers, and it has been found to be a very simple matter to do this, and the results obtainable from the speaker are fully up to the usual high R. and A. standard.

NEW MULLARD 3 IN 1 BATTERY VALVE

MESSRS. MULLARD announce that in the near future they will be issuing their first battery double-diode-triode. This will be known as the T.D.D.2 (to distinguish between the A.C. version known as the T.D.D.4). The usual two diodes and triode will be incorporated, and the triode characteristics are :—

Impedance, 12,000 ohms.
Amplification factor 16.5
Mutual Conductance 1.4mA/Volt.

The valve will be issued with metallized bulb only, and the base will be of the standard five-pin type, the grid connection being made to the top cap.

The "Multex" extension loud-speaker manufactured by Reproducers and Amplifiers, Ltd.

(Continued from previous page)

W/B 9-PIN VALVEHOLDER

THE illustration below shows the new W/B moulded bakelite valveholder, designed especially for the new 9-pin valves which will appear on the market shortly. It will be noticed that the pins are arranged in practically a circle, and to ensure accurate registration when plugging the valve into the holder, an arrow is engraved on the holder. This

A valve-holder for the new 9-pin valves. This is a W/B component.

arrangement is being adopted on all the new holders, and assists in getting the valve in the correct position without the risk of forcing it in the wrong way round. This particular model costs 2s. 3d. Chassis-type holders will be available at a later date.

T.M.C. HYDRA CONDENSERS

THE well-known continental condensers which bear the Hydra trade mark are now made in this country by the Telephone Manufacturing Company, Ltd. A very wide range is at present available, and this is being increased from time to time in order to meet every demand for a high-class condenser of any capacity for various requirements. We have received a number of samples, one of which is illustrated below. This is the 4 mfd. 750 volt D.C. working type, and costs 13s. 6d. There are a number of novel features incorporated in these condensers, one of which is the method of incorporating the complete condenser

The new T.M.C. Hydra condenser.

unit in a sealed paper container, thus ensuring that there is absolutely no possibility of atmospheric conditions having any effect upon the condenser. This process is carried out after the condenser is assembled, and it is claimed that this method is superior to the customary wax or composition filling. It will be noticed, too, that terminals are not fitted to these condensers, but neat soldering lugs project from the bakelite top of the condenser and these are slotted and well tinned, thus enabling a good connection to be made. These condensers are available in all capacities from .1 mfd. upwards, with voltage ratings from 250 to 750 volts. In addition, blocks are obtainable with various combinations, and these will be described in a future issue.

MARCONI Q.P.21 VALVE

WE recently mentioned in these pages that the Marconiphone Company had developed a double-pentode valve for use in the Quiescent push-pull arrangement, and this valve was known as the Q.P.21. The makers have now decided on the price of this valve, and it is 22s. 6d. The ordinary pentode costs 16s. 6d., and therefore the price of this new double valve is quite reasonable, as there are two complete pentodes incorporated in the glass bulb, and the only additional components required are the input and output transformer or choke).

PRACTICAL LETTERS FROM READERS

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

Soldering Tags or Terminals

SIR,—I have just finished reading the second batch of letters on the question of "Soldering tags or Terminals," and would like to give my own views. Dealing with terminals, they are an advantage for anyone in lodgings who cannot always heat a soldering iron when required. Also, when changing one or two components it is quicker to loosen terminals than to wait for the iron to get hot. Against that is the fact that when constructing a big set, undoing terminals, making loops in the wire, and then screwing on the terminal again takes a long time.

Turning to soldering, if one possesses an electric iron that is a definite advantage. Also, it is not necessary to be so particular when cutting the wire for connections and, when building a four or five-valve set, it is quicker to solder; also it is quicker to unsolder a number of connections than to undo terminals.—S. DANIELS (East Ham).

In Favour of Terminals

SIR,—I think you err in assuming that a soldered connection is the more popular one. Personally, I much prefer the terminal. Soldering takes longer to prepare, requires a clean heat, and is messy. The great trouble is the mentality of manufacturers of components. Time after time I have, in putting up a set, substituted a non-recommended part because of the ridiculous terminals which are on the component. Sets of to-day are much more intricate than five years ago, and their parts placed by designers more closely together. Large, gripping terminals are essential to take the greater number of wires meeting at a terminal, and a good one will give efficient contact. Besides, how much easier to make a change. We do not want to handle a red-hot iron when disposed to make little alteration just to see its practical effect. —JAYDEE (Kensal Rise).

Eliminator for Class B Set

SIR,—Referring to a query on page 887 of the January 20th issue on the above subject, I have just had a similar experience. I purchased a new eliminator for a class B 4-valve set, on the assumption that my old eliminator, which did good work with the set before Class B output was added, would not suit it after the alteration. All I had read about Class B amplification seemed to justify this assumption. The set worked well with the new eliminator, supposed to be built specially for Class B sets. After working well for a few hours it suddenly stopped. I then took it off and connected the old eliminator with satisfactory results. The new one was sent back for examination and returned in a few days without any comment. The explanation, however, is, I think, obvious—a burnt out mains transformer. —THOS. W. YOUNGMAN (Derby).

"Jace" Still in Hot Water

SIR,—Having just become a registered reader of PRACTICAL WIRELESS, I am rather perturbed on opening this week's issue to see what I consider a very unfair reply by "Jace" to a fellow reader's letter. I refer to Mr. H. W. Turner's letter relating to dance music. I won't enlarge on Mr. Turner's excellent remarks in support of that much maligned subject, but "Jace's" reply is surely proof that Mr. Turner is right as he cannot answer any of Mr. Turner's statements beyond referring to the journalist's God-send, song-plugging! May I state with reference to the "pushing of songs down the listener's throat," that since the B.B.C. decided to pay O.B.'s, people who should know say there has been no plugging over the air. I'm afraid Jace knows little of his subject, as in another reply on the same theme, namely, dance music, he says "rhythm" is "timed movement—little to do with music, or even slovenly ragtime." I agree, with regard to ragtime! There is no ragtime nowadays, but music definitely does rely on "timed movement." Even such firm favourites in different classes as the *Blue Danube* and Schubert's *Unfinished Symphony* would lose 80 per cent. of their charm if it were not for their distinctive "timed movements." It's about time that people realized that the modern dance band player and conductor are experienced musicians who know their subject from A to Z.—C. S. MOBBS (Westminster).

[*All jazz music is rubbishy stuff.*—JACE.]

Personal Opinions Not Wanted

SIR,—I read in the issue of January 20th the item in "Radio Ramblings" by "Jace," respecting dance music. It is apparent that Jace has an intense dislike for dance music, but in my opinion his remarks about this music, also his reply to K. Butcher in the issue of February 10, show bad taste. I would suggest that all music is "timed movement" from one note to another.

When PRACTICAL WIRELESS was first published, I read that it was to be a publication differing from other wireless books, and deal entirely with the practical side of wireless, but I feel that the article in question does not deal with "Practical Wireless." I do not want to know Jace's likes and dislikes on the subject of dance music, any more than he does mine, but if he must let readers know, he could do it in a less forceful manner.

I have read many interesting articles under "Radio Ramblings," and wish Jace would, in his Ramblings, keep more to radio.—ROBERT J. WRIGHT (Ashford).

[*Sorry, but opinions simply ooze from me!* —JACE.]

Too Much Dance Music

SIR,—When reading your issue of February 10th, 1934. I noticed two letters on the subject of dance music. I am writing to support the views of "Jace." I did not read "Jace's" article, but from the context of the letters referred to, I can see that he is against modern hot jazz. Personally, I like dance music, but not the sort of dance tunes we are getting every night now, the tunes around which are written stupid little stories are, I consider, fit for only children or imbeciles. I agree with H. W. Turner, of Newcastle, when he says that the B.B.C. are doing all they can to meet the needs of all tastes. Your correspondent's idea that people dance to the dance music provided is, I am afraid, untrue. I have never yet come upon anyone who does so. Dancing at home, as I know it, is usually done to music provided by records.—B. O. MYERS-NORRIS (Birmingham).

A Popular Circuit

SIR,—I write to support your correspondent I. Jones (Barry), in his contention that expense is the primary consideration in the building of a new set by the amateur constructor. Of course, everyone desires efficiency, but that can be secured without heavy expenditure, as witness the circuit published in your issue for February 3rd, page 941 (figure 3). Were a variable-mu S.G. valve with a pentode output incorporated in that circuit, the requirements of the majority would be met, and it is more than probable that many constructors would build the set. I feel sure that many of your readers would welcome the publications of plans for such a set as described above.—A. GILMAN (Aldershot).

New Portuguese Station: S.-W. Transmissions

SIR,—In a recent issue of PRACTICAL WIRELESS, I see you ask, in the "Round the World of Wireless" article, if any reader has heard a new 5-kilowatt Portuguese station on about 350 metres. During the last few weeks of 1933 I heard a new Portuguese station testing after midnight. The wavelength, however, was not 350 metres but 431 metres, the wavelength of the old Parede station. The call was also given in four languages, including English, and it was stated that the station was

(Continued on page 1070.)

CUT THIS OUT EACH WEEK.

Do you know

—THAT an output valve is obtainable which will deliver an undistorted output of 30 watts.
—THAT the anode voltage for the above valve is rated at 1,000 volts.
—THAT a directly-heated output valve may be operated from the same heater supply as indirectly-heated valves in a multi-valve receiver.
—THAT care must be exercised in choosing the value of a grid stopper resistance when using high efficiency output valves.
—THAT it is necessary to decouple the biasing circuit of indirectly-heated resistance-coupled L.F. stages.
—THAT a British-made superhet is now obtainable which covers all wavelengths from 13 to 2,300 metres.
—THAT the short-wave band in the above receiver is divided into four groups covering from 13 to 160 metres.
—THAT a three-pentode set is now possible, using an H.F. pentode, a pentode as detector, and a pentode output valve.

NOTICE

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL WIRELESS. *Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor,* PRACTICAL WIRELESS, *Geo. Newnes, Ltd.,* 8-11, *Southampton Street, Strand, W.C.2.*

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

RADIO CLUBS AND SOCIETIES

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

ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY

The television demonstration, held by the Uxbridge District Branch of the Anglo-American Radio and Television Society, on February 7th, created enthusiastic interest among members and the general public. A few moments before 11 p.m. everyone was marshalled as near the television screen as possible, and "turns" were taken in seeing the programme that followed. Miss Alicia-Markova, Miss Thea Phillips, and Mr. Govin Gordon provided fine entertainment until 11.30 p.m., when the programme was discontinued. The receiver, of the disc type, gave clear and distinct images, but although detail was present at times it was not consistent. Even so, the demonstration proved that television can be quite an entertaining pastime. Indeed, the results were better than was generally expected. A further television demonstration will be held by this branch—probably upon February 28th. There will be no charges, and everyone is welcome. Full particulars of the Uxbridge District Branch, and of the Society, may be obtained from Mr. Leslie W. Orton, 11, Hawthorn Drive, Willowbank, Uxbridge, by enclosing stamped addressed envelope.

INTERNATIONAL SHORT-WAVE CLUB (LONDON)

Under the auspices of this Club, a special world-wide broadcast has been arranged for all short-wave listeners from the Dutch station PAOASD, 3,770 kc/s, 79.57 m., on Sunday, February 25th, from 03.00—05.00 G.M.T. There will be a special musical programme after each item and also a bugle call, to identify the station. We hope all readers of PRACTICAL WIRELESS will listen to this broadcast. Reports will be appreciated either at this address or Radio Station PAOASD, Nassaukade 93, Amsterdam, Holland.—A. E. Bear, 10, St. Mary's Place, Rotherhithe, London, S.E.16.

BOLTON RADIO CLUB

At a meeting of the above Society, held on February 9th, an interesting lecture was given by Mr. Henderson, of the G.E.C. He dealt with new valves, new circuits, and how modern improvements benefit broadcast reception. Slides were shown of A.V.C., triodes, Class B, double pentodes, and heptodes. Two of the company's latest sets were on view, and the meeting closed after a number of questions were asked by an appreciative audience.—Sec., M. Prescott, 125, Deansgate, Bolton.

EXETER AND DISTRICT WIRELESS SOCIETY

"The Heaviside Layer," was the title of a most interesting lantern lecture, given to the Exeter Wireless Society, on Monday, February 5th, by Mr. V. Searle, M.Sc. The lecturer, who had the gift of making a difficult subject appear simple, showed that the early wireless stations gave results quite different from those predicted by the Austin-Cohen formula, which at the time was thought to cover all the facts. He went on to show that these results could only be explained by the existence of a second wave arriving out of phase with the first and causing wave-motion interference. He then explained at length the theory put forward by Heaviside in England, and Kennelly in America, and gave four different methods by which the height of the layer had been measured, each method giving a practically identical result.—Hon. Sec., W. J. Ching, 9, Sivel Place, Heavitree.

Mar.

2nd Demonstration of Cathode-Ray Television, by Mr. T. D. Humphreys, of the Edison-Swan Electric Co., at the Washington Singer Laboratories, U.C.S.W. Lecture at 8.30, demonstration at 11.0 p.m. Sponsored by the U.C.S.W. Scientific Society in co-operation with the E. & D.W.S. As the accommodation will be strictly limited, admittance will be by ticket (free) only. All members and friends are invited and should apply for tickets to the Programme Secretary at once.

5th Open Night. Members are again requested to bring magazines.

ILFORD AND DISTRICT RADIO SOCIETY

On Thursday, the 8th inst., the members of this Society heard the first lecture, to be given by Mr. David S. Richards, on the subject of "Radio on the Mount Everest Expedition, 1933," and over one hundred lantern slides were shown to illustrate it. Mr. Richards who is a past Secretary of the Society, organized the whole of the radio communications used on the Expedition. With the help of certain firms who supplied at short notice the large amount of transmitting and receiving apparatus, and the dry batteries and accumulators, not to mention motor generators, the whole consignment was shipped to India. On arrival it was transported to Darjeeling, which was used as a base, and here the Post Office was turned into a radio station, for transmitting messages to the climbers who were ascending Mount Everest, 115 miles away. This station, together with an amateur station VU2CS were coupled to the main telegraph lines, and by this means they were able to telegraph direct to London first-hand news from the various camps on the slopes of Everest.—Hon. Sec., C. E. Largen, 44, Trelawney Road, Barkingside, Ilford.

SLADE RADIO

A talk on the 1201 A.C. Supersonic radio-gram was given by Mr. R. G. Hodges, of the Radio Gramophone Development Co., Ltd., at the meeting held last week. In this he described the model in question stage by stage, showing diagrams of the circuit and also explaining the unusual features. An explanation was also given of the methods used for testing, and the apparatus, which includes a cathode-ray oscillograph, was described. The talk, and also the demonstration which followed, was thoroughly enjoyed by the members.—Hon. Sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

LEICESTER EXPERIMENTAL SHORT-WAVE SOCIETY

This Society has recently changed its name to the Leicester Amateur Radio Society, to enable the Society to cover a greater scope of radio interest. The Society holds its meetings at the Turkey Café, Granby Street, Leicester, fortnightly. It has a membership of nearly one hundred, and the subscription is half a crown yearly. The following lectures will be given during the ensuing quarter :—

Feb. 27th—H. S. Hughes. Subject: Amplifiers.
March 13th—Westinghouse and Saxby Signal Co. Subject: Westinghouse Metal Rectifiers.
March 27th—General Meeting.
April 10th—Members' Dinner.
April 24th—Ediswan Co. on Cathode-Ray Oscillograph and its application to Television.

During the summer months we hope to arrange visits to the B.B.C. short-wave stations and Daventry, to the Post Office at Rugby, and to other places of radio interest. Will readers desirous of joining this Society please come to any of the meetings at Turkey Café, or get into touch with the Secretary, A. Stimpson, 88, Welford Road, Leicester.

THORNTON HEATH RADIO SOCIETY

A meeting of this Society was held at St. Paul's Hall, Norfolk Road, on Tuesday the 6th inst. Mr. S. J. Mears presided. Mr. R. D. G. Mussett gave a demonstration of the all-wave Unirad receiver. This set has three ranges, 16 to 25 metres, 220 to 550 metres, and 950 to 2,000 metres. Mr. Mussett, who designed the receiver, said that it was primarily intended for use in the tropics, and explained the methods which had been adopted to render it damp proof. So far as the circuit is concerned, Mr. Mussett explained that the H.F. valve is tuned on all wavelengths, band-pass-coupled on medium and long waves, and tuned-grid coupled on short waves to detector oscillator valve. This is band-pass-coupled to the intermediate frequency valve, which is similarly coupled to the double-diode pentode operating as diode second detector automatic-volume control and first L.F. valve. This is resistance-capacity coupled to the power pentode output valve driving an energized moving-coil speaker. Particulars of future meetings and demonstrations can be obtained from the Hon. Sec., Mr. Jas. T. Webber, 368, Brigstock Road, Thornton Heath.

INTERNATIONAL SHORT-WAVE CLUB (MANCHESTER CHAPTER)

The fourth meeting of the above Chapter was held at 75, Long Street, Middleton, on February 6th, at 8 p.m. Two transmitting amateurs, G2BK and G5XJ, both of Royton, attended the meeting. A talk on the work of the Royal Naval Wireless Auxiliary Reserves was given by Mr. McFarlane, of Withington. From reports received from members who had been doing special listening on and around the 49-metre band during January, it was noticed that W8XK (48.86 m.) was the most consistent and strongest DX station heard. The waveband for special listening during February was

Members of the London Chapter, International Short-wave Club, at a recent meeting.

fixed as the 20 to 25-metre band. The next meeting will be held at 75, Long Street, Middleton, near Manchester, on Tuesday, March 6th, at 8 p.m. The meetings are open to all radio enthusiasts.—R. Lawton, Secretary, 10, Dalton Avenue, Thatch Leach Lane, Whitefield, near Manchester.

(Continued from page 1068)

situate about sixteen miles from Lisbon and operated by the Radio Club of Portugal. The strength of the station was R6-7 on the loud-speaker with slow fading. The programme consisted of gramophone records. Reports on reception were asked for, but I did not note the address.

May I draw your attention to a reply you gave Searcher (Glasgow), in "Replies to Broadcast Queries," in the January 20th issue of your paper. You give the answer to his first query as PRBA, Rio de Janeiro, Brazil, on 36.65 metres. Early last year I received a Brazilian station on 36.65 metres, and the call was given in English, and reports asked for. The call was given as PRA3, A Voz do Brasil (The Voice of Brazil), and the station was operated by the Radio Club of Brazil. I sent them a report and received a postcard verifying my reception of the station. The information given on the card is that PRA3 transmitted simultaneously on 860 kc/s and 8,185 kc/s. The address of the station is—Broadcasting Station PRA3, The Radio Club of Brazil, Rio de Janeiro, Brazil.

Long may your paper continue on the same lines as it does at present.—DUNCAN T. DONALDSON (Leven, N.B.).

CATALOGUES RECEIVED

To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL WIRELESS, &co. Newnes, Ltd., 8/11, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this should be enclosed with applications for catalogues. No other correspondence whatsoever should be enclosed.

WEARITE COMPONENTS

THE name "Wearite" on any radio component stands for quality and dependability as constructors all over the world already know. For over fourteen years the firm of "Wearite" has been recognized by expert designers and amateur constructors as makers of wireless components of the highest class. In a well-illustrated booklet, just issued, a full range of "Wearite" components in accordance with the latest practice is described, including "Nucleon" iron-core coils for "straight" circuits, H.F. chokes, "Class B" and Q.P.P. components, and a new smooth-contact potentiometer for volume control, and other purposes. There are also mains transformers, and a useful range of handy and efficient switches for receiving sets and radiograms. Some of the components are fitted with a new type of terminal nut which can be tightened or loosened with fingers, pliers, screwdriver, or spanner. Other components listed are a "Nucleon" iron-core I.F. transformer, Paxolin formers and panels, valve-holders, and frame aerials. Copies of the booklet can be obtained for threepence from Wright and Weaire, Ltd., 740, High Road, Tottenham, London, N.17.

FERRANTI RECEIVERS

THE excellence of Ferranti receivers and radiograms is well known to our readers, and a fine range of the latest models is described in an attractive booklet recently issued by Ferranti, Limited. In the Lancastria series there are the Parva and Magna Consolettes, both high-class superhets, giving reproduction, power, sensitivity, and range of a high order. The Lancastria Radiogram is a fine instrument, and is fitted with an electric gramophone motor, combined tone control and scratch filter, and a Gloria moving-coil speaker. There are also the Arcadia and Gloria series of receivers and radiograms all of which are superhet models. All the instruments included in the list are designed for use only on A.C. mains. Copies of the booklet can be had on application to Ferranti, Limited, Hollinwood, Lancashire.

NEW MULLARD LITERATURE

LISTENERS who are thinking of using screened (H.F.) pentodes in their next receiver should obtain a copy of a new Mullard leaflet on these valves which has just been issued. The special properties of the screened pentode are fully described, and are followed by full operating data and characteristics, with curves of the two Mullard types—V.P.4 and S.P.4—and practical operating hints for using these valves in modern circuits.

DARIO VALVES

IN a folder just received from Impex Electrical Ltd., a price list and tables of characteristics of the complete range of Dario valves are given. Included in the range are 2-volt battery valves; directly—and indirectly—heated A.C. mains valves, and half and full wave rectifiers. Copies of the folder can be obtained from the above-mentioned firm at 47, Victoria Street, Westminster, London, S.W.1.

"YOUR MICROPHONE"

THE history, principles and development of the microphone are dealt with in an interesting booklet bearing the title of "Your Microphone" which has recently been issued by Electradix Radios, 218, Upper Thames Street, London, E.C.4. In addition to the ordinary carbon transmitters, the Reisz microphone, moving-coil microphone, crystal microphone (using Rochelle salt crystals), and siesme microphones are described. There is also a chapter on home-made mikes and experiments, and prices and particulars of various types of Electradix meters are also included. Readers interested in the subject can obtain copies of the booklet from Electradix Radios, 218, Upper Thames Street, London, E.C.4.

EELEX SHORT-WAVE CONVERTERS

THE problem of getting an efficient S.W. superhet type of converter to work with superhet receivers has been solved by J. J. Eastick and Sons, who have produced a range of compact converters of single and two-valve types, the two-valve models having an extra stage of amplification. The converters are suitable for all types of broadcast receivers which are designed for reception above 1,000 metres. The wavelength range of the converter with the standard coil supplied is 15-60 metres, although this range can be increased to 120 metres by means of an additional coil. Copies of a booklet containing full particulars can be obtained from the above-mentioned firm at 118, Bunhill Row, London, E.C.1.

REPLIES TO BROADCAST QUERIES.

EDITOR'S NOTE: Querists must limit their queries to three per letter.

G. WILKIE (Leith): WIOD, Miami Beach (Fla.) on 230.6 m. This station belongs to the N.B.C. network; possibly relaying WTIC, Hartford (Conn.), in the same network. T. G. REYNOLDS (Wexford): Regret, but cannot trace transmitter without call sign. M. S. COMBE (Carlisle): We regret to say that so far as we know there is no complete list published. T. O. I. PICK (Northallerton): We can trace the following call signs—G6KV, A. R. Dellbridge, "Normanhurst," High Road, Laindon Hills (Essex); G600, T. Woodcock, 8, George Street, Bridlington (Yorks); G2DQ, H. Collin, Highfields Cottage, Rectory Grove, Southend Road, Wickford (Essex); G2YI, R. C. Horsnell, "St. Neots," Wick Drive, Wickford (Essex); G6FR, A. Freeman, 2, Carpenters Road, Lozells, Birmingham; Call sign G605 is mutilated; if G601, Major J. Timbrell, King Ed. VI School, Stourbridge (Worcs.); G2XU, C. W. Shillam, 36, Bayswater Avenue, Redland, Bristol; G6MF, M. Munroe, 1, Paisley Avenue, Edinburgh; G5SY, W. B. Sydenham, B.Sc., "Sherington," Cleveland Road, Torquay (Devon); G2NN, F. Crocker, "Deepside," 17, Cross Deep, Twickenham (Mdx.); G2CD, W. H. Matthews, 132, Hainault Road, Romford (Essex); Not G28L, but if G2AL, W. Halstead, Briar Lane, Thornton-le-Fylde, Blackpool; G5CL, M. Shaw, 6, Brian Road, Smethwick (Staffs); W1SC, First Corps Area Radio Club, AARS, Army Base, 666, Summer Street, Boston (Mass.), W1BTA, W. W. Oliver, 2, Florence Street, S. Portland (Maine); W2GO, A. Jones, 920, Caldwell Place, Union (N.J.); W2AOG, F. L. Seufert, 30, Palmer Street, Bloomfield (N.J.); W2PT, S. P. Marion, 347, East 65th Street, New York City: W3US, C. G. Roberts, 200, Highland Street, Moorestown (N.J.); W3TA(T ?), A. H. and T. G. Ross, 421, West Johnson Street, Germantown (Pa.); W3VX, C. H. Jenkins, 617, Third Avenue, Audubon, (N.J.); W3EX, A. Morley, 1,916, S. 57th Street, Philadelphia (Pa.); W4TW, W. S. Wallen, 28, Hudson Street, W. Asheville (N.C.); W9GLS, J. C. Thomas, 361, 4th Street, David City (Neb.); W9AJJ, F. E. Young, USNR, Minnesota Boat Club, Raspberry Island, St. Paul (Minn.); W9BHD, F. H. Vandenberg, 4,036, South 22½ Avenue, Minneapolis (Minn.); Regret, but cannot understand the other calls you give, as all U.S.A. amateur call signs include one figure; if W2BYM, M. J. Cranmer, Union Avenue, Lakehurst (N.J.); if W8CYT, E. C. Wood, Brewerton, (N.Y.); if W2ASQ, B. J. Toegel, 172, Brook Fall Avenue, Townley (N.J.); ON4BI, M. Muhr, 40, Rue Vinave d'Ile, Liége, Belgium; PA0BK, A. Moerman, Schoonbergerweg 16, Rotterdam, Holland; FACS, S.S. *Castor*; Surely PA0CK, and not CA0AK. PA0CK is given as J. G. Spiering, Balistrasse 45, The Hague (Holland); CJL, Selwyn Inlet (B.C.); CJR, Wakman Sound, Kingcome Inlet (B.C.); not CJ5, but if CJY, Jackson Bay (B.C.). SHORT WAVER (Bristol): (1) Moscow (U.S.S.R.) on 50 m. working with Alma Ata, South-west Russia (South of Kiev), (2 and 6) Regret, but cannot trace without call signs, (3) G6RX, Rugby working with Montreal, (4) Either W8XK, East Pittsburgh (Pa.) on 48.86 m. or W2XE, Wayne (N.J.) on 49.02 m., (5) G2DQ, H. G. Collin, Highfields Cottage, Rectory Grove, Southend Road, Wickford.

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO QUERIES and ENQUIRIES by Our Technical Staff

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

If a postal reply is desired, a stamped addressed envelope must be enclosed. Every query and drawing which is sent must bear the name and address of the sender. Send your queries to the Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2.

SPECIAL NOTE.

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

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

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

D.C. RECEIVER WANTED.

"I recently studied your D.C. Ace, but this did not fulfil all my requirements. I should be glad to know why you do not publish more D.C. circuits, and I am anxiously waiting for some other details from you for D.C. mains users. Can you cater for us, please?"—T. Y. (Hackney).

We are at present perfecting a D.C. receiver, and as soon as all details are settled it will appear in our pages. We quite realize the need for D.C. apparatus, but we also realize that the D.C. mains users are in the minority, However, we have not forgotten them, and, as stated, details of our new D.C. set will shortly appear.

A.V.C. UNITS.

"Will you kindly inform me whether there is any other automatic volume control unit than the Varley? I want one which works on the same principle and has similar connections."—E. L. (Sheringham).

Messrs. Wright and Weaire make a similar unit, although in the case of the Varley component an H.F. choke is included as part of the complete circuit arrangement. In the Wearite component no choke is included, and therefore this component has to be purchased separately if it is desired to incorporate reaction in the detector stage. We trust this is the information you require.

VALVE WANTED.

"I have added a second L.F. stage to my mains receiver, and the circuit is enclosed. You will see that the output current totals 50 milliamps as the set now stands, and the maximum current from the rectifier is 60mA. I want a valve to place in the new stage which will just load the rectifier, and will give maximum amplification. Could you please let me know which valve to get and give me the value of the biasing resistance?"—T. U. (Prestatyn).

You have 10 mA to spare to fully load the set, and therefore you should obtain a Cossor 41 MLF valve, which has a normal anode current of 9 mA. The impedance of this valve is just under 8,000 ohms, and this will be best matched with the transformer which you show on your sketch. The grid bias at maximum anode volts is 5.5 volts, and you will therefore require a 600-ohm resistance in the cathode lead for biasing.

MAINS SUPPLY VOLTAGE.

"I have an old relative living in Barnstaple, and she wants me to make her a set to work without any trouble or difficult adjustments. The electric mains are fitted to the house, but she does not know what type of supply it is. I have not been there for some time, and do not know myself what it is. Is it possible for you to tell me the supply and recommend one of your sets that would suit her?"—G. R. E. (Hampstead).

So far as we can trace Barnstaple has a D.C. supply rated at 230 volts. You would therefore need a D.C. receiver, or alternatively one of the Universal type. We recently described one of the latter, using two valves, and this would be most suitable for a non-technical user. Full details were given in PRACTICAL WIRELESS for October 7th.

TELEVISION MOTOR UNSUITABLE.

"I have now finished my television receiver built from your recent Portovisor instructions. I could not afford the special motor which you specified, and I also made my own disc. When I first switched on I could get nothing. After several nights' experiment and alteration of my wireless set I have succeeded in getting something but I feel that it is not right yet. When I switch on after 11 o'clock I get a lot of lines running across the opening, and sometimes these lines come straight and I can see several heads, something like a section of a sheet of postage stamps. I can't get the pictures any bigger to fill the opening. They seem quite good for details and are recognizable, but I want them larger. Can you help me?"—W. E. R. (Chorley).

Undoubtedly, your motor is unsuitable. The small pictures indicate that the motor is not running fast enough, and you should be able to verify this by observing the direction in which the dark lines pass just before the pictures form up. When the motor is started up whilst a transmission is in progress these dark lines will appear to pass downwards across the opening. When they become horizontal the speed is correct, and if the motor is permitted to go still faster, the lines will appear to travel upwards. This should therefore assist you in determining the speed of your motor. You have probably used a small motor which is incapable of turning the disc at the appropriate 750 revolutions per minute. Although the disc is quite light, a certain amount of power is required to turn it owing to its large diameter, and you should not overlook this fact.

DATA SHEET No. 75

Cut this out each week and paste it in a notebook.

HIGH VOLTAGE OUTPUT VALVES

Maker	Type	Anode Volts	Grid Bias	Undistorted Output (Milliwatts)	Price
Cossor	680.P	400	40.0	1,000	25/-
	680.XP	400	125.0	2,500	25/-
	620.T	100	75.0	4,000	30/-
	660.T	500	120.0	11,000	105/-
Marconi & Osram	PX.25	400	62.5	5,500	25/-
	LS.6A	400	63.0	5,000	30/-
	DA.60	500	120.0	10,000	110/-
	DA.100	1,000	100.0	30,000	210/-
Mazda	PP.3/425	425	100.0	3,000	30/-
	PP.5/400	400	32.0	6,000	25/-
Mullard	DO.24	400	34.0	5,500	25/-
	DO 25	400	92.0	7,500	25/-
	DO.26	400	112.0	7,000	30/-
	DO.60	500	95.0	10,000	110/-
	DO.75	1,000	55.0	18,000	160/-
Six Sixty	SS.HV.6/5	400	95.0	5,000	30/-
Triotron	K.480	550	86.0	4,500	22/6
	K.450/25	400	50.0	5,000	22/6
	K.450/50	400	50.0	12,000	45/-
Tungsram	P.4100	400	50.0	3,500	14/6

FAILING REACTION

"I have had my commercial set now for just over four years, and it has given remarkable service all through. Just lately, however, I have noticed a gradual failing in signal strength, and the reaction condenser had to be turned up farther each time until now I am at the end of the travel and cannot get any more reaction. I should be glad if you could give me any idea what is the cause of this, and how to cure it."—H. T. (Chislehurst).

There are two possible explanations for your trouble. Firstly, the detector valve may be losing its emission and require replacing by a new and up-to-date valve. Secondly, the anode resistance which is included for decoupling, or voltage dropping in the anode circuit of that valve may be deteriorated and so increased in value that it is preventing the application of the correct voltage to the detector stage. We presume, of course, that you are using a new H.T. battery and are not trying to run the receiver on the original supply.

DIAL LIGHT RATING.

"I have built the Quadpack, and when fitting this in the cabinet I purchased a 4-volt bulb to light the dial. I find, however, that this only lasts about three nights, when it blows. I have tried three different bulbs (all of the correct 4-volt rating), but in every case I cannot get them to last a week. Can you suggest any reason for this?"—W. D. (Hampstead).

The bulbs for lighting the dials should be of the 6-volt type, when you will not experience any trouble from blowing. The usual "4-volt" bulb is actually of the 3.5 volt type, and this is overloaded when connected to a 4-volt A.C. supply which is probably rated at, 6 amps. and is supplying only four 1 amp. valves.

INCREASING TUNING RANGE.

"I would like to thank you for the suggestion in January 21st for extending the tuning range of manufactured coils. I must say that I cannot understand why I had not thought of this idea myself. My difficulty seemed to be to arrange the connections so as to get the two coils in series, as this usually means disconnecting one end of the present coil. I now see that you connect the second coil in parallel with the long-wave coil. You will therefore see that the explanation you give in the text is not correct as the long-wave coil is in circuit when reception is taking place on 425—925 metres. Perhaps a note of explanation in a future issue would help other readers who find this discrepancy."—Reader from No. 1 (London, N.W.).

There is no discrepancy in the text. It is stated that the coil is wired in series, which is correct, and means simply that the end of the present dual-range coil is joined to the beginning of the new coil. This connection is permanent. The switch which is then fitted is arranged (as shown in the small theoretical sketch in the wrinkle in question) so that the additional coil is connected in parallel with the long-wave section for reception on the new band. You have apparently been misled by the term "series," and have taken this to mean that the coil is used as a series-wound section of the complete coil.

WRONG REACTION CONNECTIONS.

"I have an ordinary straight home-made 3-valve set with R.C.C. and large power valve. The coil is home-made, which with the new valves just bought seems unsatisfactory, especially on the long waves. Reaction is very ploppy and ends in motor-boating, which I am sure is *not* due to insufficient decoupling. I have tried various H.F. chokes, but there is no improvement. Can you please give me details for winding a more efficient coil which will give smooth reaction on both wave-bands? I enclose a circuit diagram showing the decoupling circuits in red."—H. S. (London, E.C.3).

You have fallen into a very old trap, H. S., when wiring your reaction circuit. The purpose of the H.F. choke is to prevent the passage of the high-frequency currents into the low-frequency section of the receiver, and the currents which are so choked back are employed for reaction purposes. Therefore it is obvious that the reaction connections must be made from the anode side of this choke, and not from the output or L.F. side. You have fitted a by-pass condenser to the anode side of the choke, and this will effectively by-pass the H.F. current, leaving none at the other end of your choke for reaction purposes. In addition, you have wrongly connected the decoupling resistance in the detector stage. As you have drawn your sketch you are using the 50,000 ohm decoupler as a coupling resistance, and the 500,000 ohm resistance which you intend for a coupling resistance is simply acting as a grid stopper on the L.F. side. The L.F. side of the H.F. choke should feed the L.F. valve *via* the .01 condenser and the junction of choke and condenser should go to H.T. positive through the 500,000 and the 50,000 ohm resistances in series. The 2 mfd. decoupling condenser should be joined between earth and the junction of the two resistances.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word prepaid — minimum charge 3/- per paragraph—and must reach this office not later than Tuesday for the following week's issue. All communications should be addressed to the Advertisement Manager, "Practical Wireless," 8 Southampton Street, Strand, London.

PREMIER SUPPLY STORES

offer the following Set Manufacturers' Surplus New Goods at a fraction of the original cost; all goods guaranteed perfect: carriage paid over 5/-, under 5/- postage 6d. extra (Ireland, carriage forward).

PREMIER SUPPLY STORES announce the purchase of the entire stock of a world-famous Continental valve manufacturer. All the following types of standard mains valves at 4/6 each. H. HL. L. Power. Directly heated 6-watt Pentode. Directly-heated 9-watt Pentode. High magnification Screen-grid, low magnification Screen-grid. Variable-Mu Screen-grid. 250 volt 60 milliamp. full-wave rectifiers.

THE following types 5/6 each. Indirectly-heated Pentode. 350 volt 120 milliamp. full-wave Rectifier. 500 v. 120 ditto, 6/6. Dario Battery Valves 4v. filament. Set of 3, consisting of Screen-Grid, Detector and Power or Super-Power, 6/6 the lot. Power or Super-Power, 2/6.

ELIMINATOR Kits, including transformer, choke, Westinghouse metal rectifier, Dubilier condensers, resistances and diagram, 120v. 20 m.a., 20/-; trickle charger 8/- extra; 150v. 30 milliamps., with 4v. 2-4 amps. C.T. L.T., 25/-, trickle charger 6/6 extra; 250v. 60 milliamps., with 4v. 3-5 amps. C.T. L.T., 30/-; 300v. 60 m.a., with 4 volts 3-5 amps. C.T. L.T., 37/6; 150 volts 50 milliamps, 27/6.

AMERICAN Triple Gang 0.0005 Condensers, with trimmers, 4/11; Premier chokes, 25 milliamps, 20 Henries, 2/9; 40 milliamps. 25 hys., 4/-; 65 milliamps. 30 hys., 5/6; 150 milliamps. 30 hys., 10/6; 60 milliamps. 80 hys., 2,500 ohms, 5/6.

HARLEY Pick-up, complete with arm and volume control, 12/6.

BRITISH RADIOPHONE Wire Wound Potentiometers, with mains switch incorporated, 10,000 ohms, 3/6.

PREMIER British-made Meters, moving iron, flush mounting, accurate, 0-10, 0-15, 0-50, 0-100, 0-250 ma., 0-1, 0-5 amps.; all at 6/-.

SPECIAL Offer of Mains Transformers, manufactured by Philips, input 100-120v. or 200-250v., output 180-0-180 volts 40 m.a., 4v. 1 amp., 4v. 3 amp., 4/6; 200-0-200v., 4v. 1a., 4v. 3a., 4/6.

ALL Premier Guaranteed Mains Transformers have Engraved Terminal Strips, with terminal connections, input 200-250v. 40-100 cycles, all windings paper interleaved.

PREMIER H.T.8 Transformers, 250v. 60 m.a., rectified with 4v. 3-5a. and 4v. 1a. C.T. L.T., screen primary, 15/-; with Westinghouse rectifier, 25/-.

4V. 3a. C.T., 6v. 2a. C.T., 9v. 1a., 12v. 1a., 7/6 each; 4v. 3-5a., 22v. 1a., 8/6 each; 10v. 3a., 14v. 4a., 10/- each.

PREMIER H.T.9 Transformer 300v. 60 m.a., with 4v. 3-5a. and 4v. 1a. C.T., L.T., and screened primary, 15/-; with Westinghouse rectifier, 26/-.

PREMIER H.T.10 Transformer, 200v. 100 m.a., rectified, with 4v. 3-5a. and 4v. 1a. C.T., L.T., and screened primary, 15/-; with Westinghouse rectifier, 26/-.

PREMIER Mains Transformers, output 135v. 80 m.a. for voltage doubling, 8/6; 4v. 3-4a., C.T., L.T., 2/- extra; Westinghouse rectifier for above, giving 200v. 30 m.a., 8/6.

PREMIER Mains Transformers, output 250-0-250v. 60 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 1-2a.(all C.T.); with screened primary, 15/-.

PREMIER Mains Transformers, output 350-0-350v. 90 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 1-2a. (all C.T.), with screened primary, 15/-.

PREMIER Mains Transformers, output 400-0-400v. 100 m.a., 4v. 4-5a., 4v. 2-3a., with screened primary, 15/-.

PREMIER Auto Transformers, 100-110/200-250v., or vice versa, 100-watt, 10/-.

MULTI Ratio Output Transformers, 4/6, Twin Screened Wire 3d. per yard.

CENTRALAB Potentiometers, 50,000, 250,000 half meg., any value, 2/-; 200 and 400 ohms. 1/-.

RELIABLE Canned Coils with Circuit, accurately matched, dual range, 3/- per coil. Please state whether Aerial or H.F. required. Ditto iron core, 3/6.

PREMIER L.T. Supply Units, consisting of Premier Transformer and Westinghouse rectifier, input 200-250v. A.C., output, 2v. ½amp., 11/-; 8v. ½amp., 14/6; 8v. 1 amp., 17/6; 15v. 1 amp., 19/-; 6v. 2 amp., 27/6; 30v. 1 amp., 37/6.

MAGNAVOX D.C. 152, 2,500 ohms, 17/6; D.C. 154, 2,500 ohms, 12/6; D.C. 152 Magna, 2,500 ohms, 37/6, all complete with humbucking coils; please state whether power or pentode required; A.C. conversion kit for above types, 10/-; Magnavox P.M., 7in. cone, 18/6.

CRAMPIAN M.C. Loud Speakers, 2,500 ohm field, 9in. cone, handles 5 watts; 21/-.

CRAMPIAN P.M. Loud-speakers, 9in. cone, handles 4 watts; 18/6.

(Continued at top of column three)

(Continued from column one)

B.T.H. Truespeed Induction Type (A.C. only) Electric Gramophone Motors, 100-250v.; 30/-, complete. Type YH 100/250v. A.C. or D.C., 42/-.

WESTERN ELECTRIC Condensers, 250v. working, 2 mfd., 1/-. 2 mfd. 400v., 1/6.

SPECIAL Offer of Wire Wound Resistances, 4 watts, any value up to 10,000 ohms. 1/-; 8 watts, any value up to 15,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

POLAR 2-gang, with complete disc drive, padding condenser and trimmer, 0.0005, 6/6.

EDISON BELL Double Spring Gramophone Motors, complete with turntable and all fittings, a really sound job, 15/-.

AMPLION Cone Loud-speaker Units, 1/9, complete with 12in. cone and chassis, 3/11 each. Worth treble.

ORMOND Condensers, 0.0005 2-gang, semi-shielded, 2/6; brass vanes, with trimmers, 3/6.

WIRE Wound Potentiometers, 15,000 ohms, 1/6; 50,000 ohms, 2/-; 500,000 ohms, 3/-.

HOME Radio Microphone, complete, 5/-; simply plug in to pick-up terminals.

A LARGE Selection of Pedestal, table and radiogram cabinets, by best manufacturers, at a fraction of original cost for callers.

WESTERN ELECTRIC Mains Transformers, 500-0-500v. 150 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 2-3a., 4v. 1a. C.T., 4v. 1a. C.T., 19/6.

1,000 Ohm 150 m.a. Wire Wound Variable Resistance, 2/-; Burndept 2-watt resistances, all values from 0.5 to 50 ohms. 3d. each: holders, 2d. each.

T.C.C. Condensers, 250v. working; 2 mf., 1/9.

T.C.C. Electrolytic Condensers, 440 volts working, 8 mf., 3/-; 15 mf., 50v. working, and 50 mf. 12v. working, 1/-; 25 mf. 25v. working, 1/3.

T.C.C. Block Condensers, 250v. working, 2 x 2 x 2 x 0.1, 2/-; 2 x 2 x 2 x 1, 2/3; the above condensers at same price by Dubilier 300v. working.

H.M.V. Block Condensers, 400v. working; 4 x 4 x 1 x 1 x 1 x 1 x 0.1 x 0.1 x 0.1, 6/-; 4 x 2 x 1 x 1 x 1 x 0.5, 4/6.

DUBILIER Condensers, 2 mf. 1,200v. working, 4/-; 8 mfd. dry electrolytic, 450v. working, 3/-.

THE Following Lines 6d. each, or 5/- per dozen.—Chassis valve holders, 5, 6 or 7 Pin, screened screen-grid leads, any value 1-watt wire end resistances, wire end condensers, 0.0001 to 0.1, R.I. .0005 varicaps, trimming condensers, T.C.C. 6mfd. 50v. electrolytics.

PLEASE mention PRACTICAL WIRELESS when ordering.

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20-22, High Street, Clapham, S.W.4, MACaulay 2188. Closed 1 o'clock Wednesdays; open to 9 o'clock Saturdays. Nearest Station, Clapham North, Underground.

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ERICSSON 3/1 L.F. Transformers. List Price, 17s. 6d. New and guaranteed. Our price, 2s. 3d. post free U.K.—Pioneer Radio, Coptic St., London, W.C.1.

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GRAMOPHONES. Radiograms, 64 page. How to make 'm, 8d. Motors, Arms, Pick-Ups, Speakers, Horns, Springs, Repairs, Accordions. Regentprac, 120, Old Street, London, E.C.1.

TELEVISION Illustrated Constructors' Handbook, 1/-. "Practical Wireless" Apparatus Listed.—Bennett Television, Redstone Copse, Redhill.

SOUTHERN RADIO'S Bargains.—Set manufacturer's guaranteed surplus.

VARIABLE Condensers.—Lotus 3-gang 0.0005, 12/6; Lotus 2-gang. 0.0005, 3/6; Lotus Dyblock single, 0.0005, 4/9 (list 9/6); all these condensers are complete with dials, escutcheons, knobs, fully screened with trimmers, and boxed; Igranic variable, 0.0003 and 0.0005, 2/3; Hydra block condenser, 16 mfd. (2+2+8+2+1+1), 1,000 v. D.C., 7/- each; 20 mfd. (2+2+2+2+2+2+2+2+1+1+1+1), 1,500 v. D.C., with terminals, 11/6; Dubilier 4 mfd. (2+1+1), 1,000 v. D.C., 2/9; 4.5 mfd. (2.25+2.25), 3/-; fixed 4 mfd., 2/3; 2 mfd., 1/6; 1 mfd., 1/-.

SPEAKERS.—Blue Spot permanent magnet, with Universal transformer for power, pentode, super power or class B, 23/- (list 39/6); D.C. mains energised, all voltages, 16/6; Celestion Soundex P.P.M. permanent magnet, 17/6 (list 27/6); Blue Spot 100U inductor, complete with chassis, 13/6 (list 39/6); Celestion permanent magnet type P.P.M.W. universal transformer, 25/- (list 49/6).

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PICK-UPS.—B.T.H. Senior 1934 model, with volume control, 28/6 (list 37/6); Blue Spot, model "88," with volume control, 26/- (list 63/-); Marconi No. 19 (1934), 26/- (list 32/6).

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FRAME Aerials.—Lewcos dual wave 235-550 metres and 1,000-2,000 metres, 10/- each (list 37/6).

IGRANIPAK complete tuning unit, comprising (1) Completely screened coils with built-in wavechange switch; (2) Igranic 3-gang Condenser with cover; (3) Escutcheon and Disc Drive Assembly with pilot lamp attachment; (4) Mains Switch; (5) Three 5-pin Valve holders; (6) Grid Leak and Condenser; (7) Engraved Terminal Board. Complete with circuit. List price 57/6. Our price, 26/-.

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ALL Transformer and Chokes Guaranteed for 12 months.

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L.E.C. 'GOLD-MINE' KIT BARGAINS represent absolutely unprecedented value. They cover a comprehensive range of up-to-date circuits which will meet every home constructor's requirements. Supplied complete with diagrams, instructions and all sundries in sealed cartons.

THE 'RADIO GOLD-MINE' GOLD SHEET for the greatest bargain offers in Radio History. (See below.)

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LOTUS .0005 variable condenser with slow motion disc drive pilot lamp fitting, knob, escutcheon, 4/-.

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