MAKING YOUR OWN I.F. TRANSFORMERS

Practical and Amateur Wireless

AND AMATEUR TELEVISION

3d EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

Vol. 6. No. 137. May 4th, 1935.

Practical and Amateur Wireless

Edited by F. J. CAMM

Technical Staff: W. J. Delaney, H. J. Barton Chapple, Wh.Sch., B.Sc., A.M.I.E.E., Frank Preston.

VOL. VI. No. 137. May 4th, 1935.

ROUND *the* WORLD *of* WIRELESS

Great Britain's Record

IT is pleasing to learn that the United Kingdom has now reached the seven million mark in its number of licensed listeners. At the end of March the figure was 7,011,616, as compared with 6,259,653 at the same period a year ago, showing an increase of three-quarters of a million licences in the course of twelve months. And this number is yet far from saturation point. Germany, the European runner-up, is nearly one million behind us.

Form Fours by Broadcast

THE Polish War Office is installing wireless receivers in military barracks throughout the country. By this means during recreation hours the soldiers will secure the benefit of wireless entertainments, but in addition the authorities also propose to broadcast educational courses. Experiments also are to be carried out in drilling recruits by orders given through the loudspeaker and broadcast direct from Warsaw.

Early Morning Broadcasts

GERMANY has decided that its listeners shall have music for twenty-one hours a day, as according to a recent official announcement the stations will only be silent for three hours out of the twenty-four. In future Breslau and Königsberg will start up at 5 a.m., and the latest concerts will be transmitted from the Frankfurt and Stuttgart group until 2 a.m. Musical entertainments are now radiated from 6 to 8 a.m. for the benefit of workers in factories as well as a two-hour concert to fit in with the midday meal-time period.

Where to Find Announcers

RECENTLY in Belgrade a statement from the studio to the effect that an extra announcer was required brought in replies from several hundred applicants. Contrary to what was expected, but few actors and lawyers offered themselves for the post; the majority of the would-be announcers were either engineers or architects, demonstrating that these were the two professions in Belgrade in which unemployment was most prevalent.

No Radio Increase

ALTHOUGH on many occasions attempts have been made to establish a broadcasting system in Greece, and early this year a scheme was actually promoted, it is now definitely stated that in view of the recent revolution the police authorities have decided that the country is not yet ripe for such a service. On the outbreak of trouble in March last, all aerials were forcibly dismantled and owners of receiving sets were compelled to put them out of action until further notice. Listening even to foreign programmes has been forbidden.

An Example of Expert Synchronisation

WITH the bringing into operation of the new Coblenz 1½-kilowatt transmitter, the German authorities in the Frankfurt-on-Main network are now operating six stations on a common wavelength. The total kilowatt output on this channel (251 metres) is 28½ kilowatts. If you listen to the Frankfurt programme on this wavelength you will notice the strength of the signal and how accurately the stations have been synchronised.

French Relays of Outdoor Broadcasts

EVERY year in the historical cities of Arles and Orange (Southern France), the inhabitants take part in ancient Greek or Roman classical plays much on the lines of the Oberammergau (Bavaria) festival. These are given in the original Roman arenas. This year the P.T.T. transmitters have decided to relay these performances, and it is expected that they will also be taken by other Continental transmitters.

A Colourable Imitation of Sing Sing

FOLLOWING the principle adopted by some of the U.S.A. prisons in which the convicts are allowed to listen to certain radio entertainments, a Belgian philanthropic society has endowed the main penitentiary at Louvain (Belgium) with receiving apparatus, and has installed headphones in every cell. Prisoners during certain hours are thus given extracts from the Brussels programmes as well as educational lectures and selections of gramophone records.

Radio for the Forecastle

ACCORDING to a new decree issued by the Nazi Government all German ships of the Merchant Marine, including fishing craft of a higher tonnage, are to be equipped with wireless receivers for the benefit of both passengers and crew. In order to encourage the installation of receiving sets, a purely nominal licence fee is being charged.

How Many Listeners in Europe?

ACCORDING to statistics published by the Union Internationale de Radiodiffusion, Geneva, there are twenty-three and a half million homes in Europe in which wireless is installed. On this basis it is computed that daily the total number of listeners to the European programmes is roughly ninety-four millions.

Improvement on Long-wave Band

NOW that Eiffel Tower has been removed to 206 metres, listening to stations on the long waves has been rendered somewhat more pleasant, and broadcasts from Motala now reach us without the perpetual heterodyne whistle. Warsaw also can be tuned in more effectively, and generally speaking a marked improvement is to be noted on all transmissions above 1,000 metres. Stand by now for tests from the new Motala 150-kilowatt station, which is completely installed.

More Aerodrome Stations

WITH the increase in civil aircraft services the Air Ministry is opening a greater number of transmitters at airports. Three further stations have been recently inaugurated, namely, at Jersey, Portsmouth, and Heston. The channel used for the telephony transmissions is 862 metres (348 kilocycles).

ROUND the WORLD of WIRELESS (Continued)

Accession Day Broadcast

ON Accession Day, May 6th, when the King and Queen attend a Thanksgiving service at St. Paul's, the route from Temple Bar to the Cathedral will be wired to enable two commentators to describe the scene, as well as for "effects" to be picked up from various places. Hitherto it has been customary during outside broadcasts to make the commentaries the main features; but a different method will be adopted on May 6th. Descriptive detail will be reduced to the minimum, and the B.B.C. will provide listeners with a sound-picture supported by brief descriptions from eye-witnesses. The voice of London will be left as far as possible to speak for itself. After the service, which will be broadcast in its entirety, Their Majesties' departure will be described from the gallery in the west façade of the Cathedral, where the commentator has a unique view of the scene. The microphones will be so placed that as the Royal Procession advances the cheers of the spectators will be heard by listeners almost continuously from Aldwych to St. Paul's.

Twenty-five Years of the King's Reign

SEVERAL important broadcasts will take place during the evening of Accession Day. A special Jubilee feature programme is at present being composed by Dr. Harold Temperley and Laurence Gilliam, who, it will be remembered, were jointly responsible for the "Twenty Years Ago" programme broadcast on August 4th last. The Jubilee programme is to consist of a review of the twenty-five years of the King's reign, with special reference to the various constitutional and social activities of His Majesty during the period. It will conclude with messages of loyal greeting to the King from the various parts of the Empire.

INTERESTING and TOPICAL PARAGRAPHS

The Song of the Nightingale

THE Outside Broadcast Department is making arrangements to broadcast the song of the nightingale at various suitable times during the week beginning May 13th. It should be understood that nightingales are temperamental artists and, as in previous years, will be switched into the programmes when in good voice and when the programmes are suitable. This is a popular broadcast for listeners, as the nightingale in England is not the familiar bird that it is on the Continent. Many who served with the Salonika Expeditionary Force may remember how they had to stone the bushes at night in order to get a little sleep. The song of the nightingales this year will be relayed from southern England, as usual.

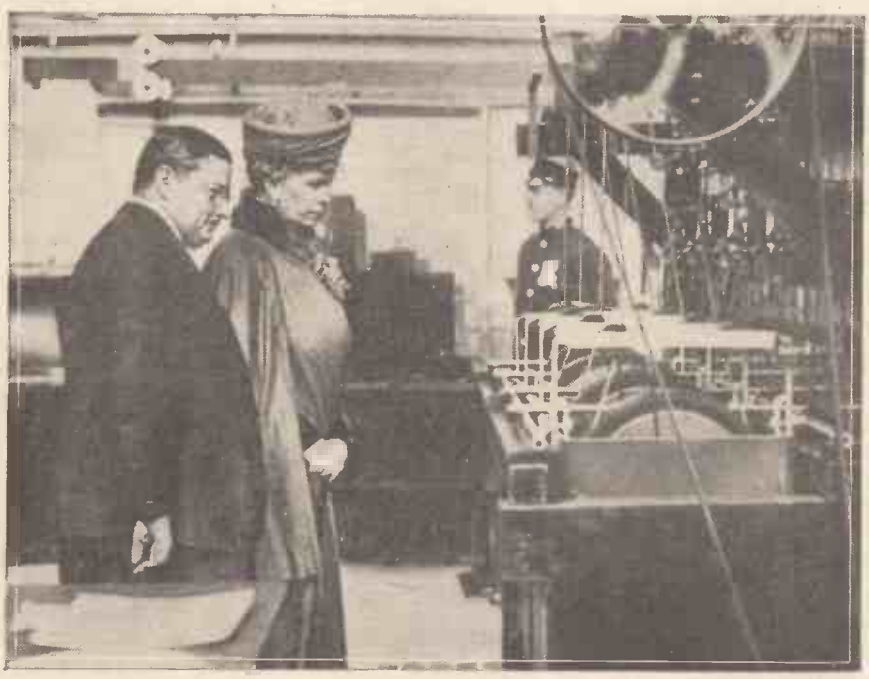
"Hiawatha's Wedding Feast"

CONDUCTED by F. Smith, the Staveley Old Works Choral Society are to broadcast Samuel Coleridge-Taylor's Cantata, "Hiawatha's Wedding Feast," to Northern listeners on May 11th. The choir will be supported by the B.B.C. Northern Orchestra, under the direction of T. H. Morrison.

Variety from Birkenhead

A SPECIAL bill, lasting for an hour, will be broadcast to Northern listeners from the Argyle Theatre, Birkenhead, on May 10th. The programme will consist of Jenny Howard and Percy King (comedy duo), the Seven Elliotts (musical act), Frank Randle (comedian), and Ellis Rimmer (famous Sheffield Wednesday and International footballer) in a musical act with Morrell and Melville.

ROYAL INTEREST IN RECORDS



As Royal Warrant holders to their Majesties The King and Queen and H.R.H. The Prince of Wales, "His Master's Voice" have often had the honour of visits by Royalty to see how radio gramophones and records are made in the H.M.V. Hayes factories. Here Her Majesty the Queen is seen displaying close interest in a factory process at the H.M.V. works.

For Northern Listeners

THE Scottish Military Band, conducted by John MacIvor, will play March, "Tannhauser," by Wagner; Overture, "The Magic Flute," by Mozart; Three Humoresques, Op. 28, by W. B. O'Donnell; and excerpts from "Manon Lescaut," by Puccini, on May 10th.

"Colour in Advertising"

CONTINUING the "Spot of Colour" series of talks about the application of colour to everyday life in the North, Peter Ryan, advertising manager of a big Northern firm, is to speak on "Colour in Advertising" on May 9th.

"Songs of the King's Reign"

A PROGRAMME of "Songs of the King's Reign" will be broadcast to Northern listeners by Harry Hopewell (well-known Nottingham-born baritone who is also "Uncle" Harry of the Northern Children's Hour), on May 6th. The songs will be divided into three distinct groups—pre-War, Wartime, and post-War.

London Music Festival

THE period called by the B.B.C. the London Music Festival, 1935, is to be the peak of the radio musical year. The festival extends from Friday, May 10th, to Friday, June 14th, the series comprising eight concerts in all. Dr. Adrian Boult will conduct the first concert, which consists of Bach's Mass in B Minor, and on Friday, May 17th, Wednesday, May 22nd, and Monday, May 27th, Serge Koussevitzky, the conductor of the Boston Symphony Orchestra, will conduct the B.B.C. Symphony Orchestra in three programmes. Arturo Toscanini, the conductor of the New York Symphony Orchestra, will then conduct the B.B.C. Orchestra on Monday, June 3rd, Wednesday, June 5th, Wednesday, June 12th, and Friday, June 14th.

SOLVE THIS!

PROBLEM No. 137.

Smithers had a superhet which gave very good results except for troublesome whistles on practically every station. He decided that these were due to the local station which was situated nearby and accordingly he purchased a modern iron-cored tuning coil and inserted this in his aerial lead with a .0005 mfd. condenser in parallel. He tuned to a station upon which interference was experienced, and then adjusted the wave-trap until the whistle disappeared, proving his theory that the local was responsible. He found that the trouble was cured and enjoyed an evening logging foreign stations in comfort. The next day he wished to hear the local, but when he turned to the tuning point of this station it was practically inaudible, and no adjustment of the controls would build up the signal. Why was this? Three books will be awarded for the first three correct solutions opened. Envelopes should be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 137 in the bottom left-hand corner, and must be posted to reach this office not later than the first post Monday, May 6th, 1935.

Solution to Problem No. 136.

Owing to the fact that there is no current flowing through the potentiometer as Whyte had connected it, there would be no possibility of obtaining a variation in bias voltage and consequently no control of volume could be obtained.

The following three readers successfully solved Problem No. 135 and books are accordingly being forwarded to them:

R. Curtis, 2, William Place, Bartons Bank, Aston, Birmingham 6.

G. A. Hinkley, 47, Woodside Road, Tunbridge Wells, Kent.

A. E. Andrews, 36, Denmark Street, Folkestone.

Making Your Own I.F. Transformers

Full Constructional Details are Given in this Article for Intermediate-Frequency Transformers for Frequencies of 110, 150 and 465 kc's. By FRANK PRESTON

FOR some reason or other the average constructor generally avoids the task of making his own intermediate-frequency transformers, even though he is quite prepared to construct most other of the components required. This is probably due, in most instances, to the fact that the I.F. transformer is not fully understood, and is, therefore, considered to be a complicated unit. Actually, of course, it is nothing of the sort, and is nearly always of simpler construction than an ordinary tuning coil. We say "ordinary" tuning coil because the I.F. transformer is, in fact, a tuning coil of a rather particular kind; instead of being designed to respond to a wide range of wavelengths or frequencies, however, it is intended to operate at one, fixed frequency only. The frequency in question is not entirely standard, but it is common practice in modern superheterodynes to employ an intermediate frequency of 110 kilocycles, 150 kilocycles, or 465 kilocycles. The first-mentioned frequency is probably used to the greatest extent, but the higher frequencies have lately come into more widespread use, especially in the case of receivers intended for use on short and ultra-short wavelengths.

Variation of Intermediate Frequency

It is unnecessary in this article to refer to the advantages and disadvantages of the three different frequencies, for that matter has been covered in previous issues. What we are more concerned with in the present instance is how the transformers can easily be made at home and at little expense. It is not claimed that the home-made component will be quite so satisfactory as that made in the factory, but it will function perfectly well and provide the enthusiast with interesting material for experiment. The home-made transformer will also prove useful to those experimenters who wish to try the effect of employing a different intermediate frequency in an existing superhet without having to buy new components. In this respect, however, it should be mentioned in passing, so as to avoid any misunderstanding, that it is not possible to change from one I.F. to another in a receiver having a gang condenser with special oscillator section, except by changing this condenser also.

Similar to a Loose-coupled Tuning Coil

Most readers are aware that an I.F. transformer consists of two tuned windings, inductively coupled one to the other; in this respect the component can be compared with an ordinary aerial-tuning coil with loose-coupled aerial winding. Instead of the tuning of the two windings being variable, however, it is usually fixed or semi-variable. In the case of the home-made unit it is practically essential that the tuning should be semi-variable, so that variations in inductance and capacity of the two windings can be compensated for. This can be provided by connecting a pre-set condenser of about .0005-mfd. maximum capacity across the ends of the primary and secondary windings, so that these condensers can be adjusted until the two circuits are exactly at resonance.

Probably the simplest method of making a reliable I.F. transformer with variable coupling between the primary and secondary windings (and this is always desirable) is that illustrated in Fig. 1, and of which a detail of one of the coils is shown in Fig. 2. In this case use is made of ribbed ebonite coil former to take the windings, and the former is so chosen that the inner circular bore will fit tightly over a length of

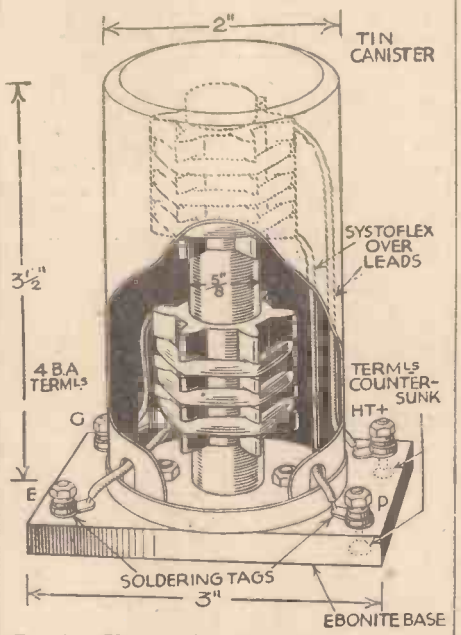


Fig. 1.—Showing how the coils are arranged and how the screening can is fitted to the ebonite base.

⅝in. wooden dowel rod, this being obtainable from most joiners if a suitable piece of wood is not to hand.

Materials Required

The other requirements are a 2in. length of size No. 6C. Becol ebonite ribbed coil former—this is 1¼in. diameter outside the ribs and has a bore of ⅝in.—a piece of ¼in. thick ebonite measuring 3in. by 2in., a 2oz. reel of 36-gauge enamelled wire, a tin canister approximately 2in. in diameter and not less than 3½in. long, and a few odd screws and terminals. The main details of construction will be clear from an examination of Fig. 1 and the method of procedure is, briefly, as follows:—First of all prepare the ebonite base by making four holes for the terminals near the corners and countersink these on the under side so that the round or countersunk heads will not project. Next, drill a ⅝in. diameter hole half-way through the ebonite from the top and in the centre, and run a ¼in. hole right through the centre of this. Next take the lid of the canister and make a ⅜in. hole in the centre of this and two other holes to take fixing screws passed through the metal and the ebonite. The wooden rod can then be fixed in a vertical position by placing the end in the appropriate hole and, if necessary, running a ⅜in. wood screw into it from the under side of the base. This may not be necessary if the rod is a tight fit in the hole, for it can then be fixed by applying a liberal coating of strong glue to the end of the rod. When a screw is required, it will be better to use thicker ebonite for the base, or otherwise to place two sheets of ebonite together so that the lower end of the hole can be countersunk.

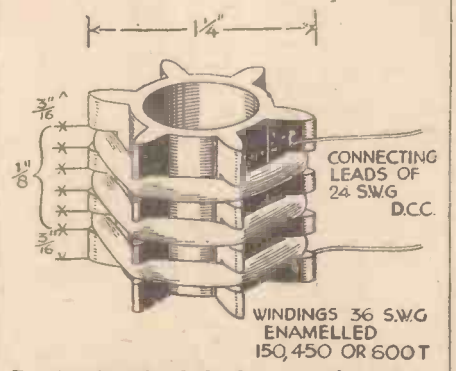


Fig. 2.—Details of the formers and windings. Two complete formers are required, these being arranged as shown in Fig. 1.

The method of mounting the lid of the canister is made obvious by the illustration, and the next step is to prepare the main body of the tin by making notches in it through which the leads from the coils can be passed later to the soldering tags fitted under the terminal nuts. These slots can most easily be made by placing the tin on a wooden rod or stout cardboard tube and drilling ¼in. holes about ¼in. from the end, next cutting up to the holes with shears or strong scissors.

Slotting the Former

Last of all we come to the important task of preparing the former and winding on the wire. It will be seen from Fig. 2 that notches ¼in. wide (they should be made about 3/16in. deep) are made in the ribs of the former, and these can be formed in a lathe by filing or by sawing, in the latter case using two or three hack-saw blades held together. All six slots can be made while the former is in one length (incidentally it is bought in a 3in. length, and costs 4d.), and the two 1in. lengths sawn off afterwards.

When the slots have been made, two small holes should be made in one of the ribs near each end of both formers, as shown in Fig. 2. Anchor a 10in. length of 24-gauge d.c.c. wire, or a similar length of flex in these holes, and solder the end of the 36-gauge enamelled wire to one end of this. The winding can then be proceeded with, placing the same number of turns in each of the three slots, and finishing the windings by soldering the fine wire to the second length of stouter gauge material. The winding is continuous throughout, and the wire should be led from one slot to another as indicated.

Number of Turns

We have now to consider the number of turns required, and this clearly depends upon the intermediate frequency it is proposed to employ. For 110 kilocycles the total number of turns for the primary and for the secondary should be 600; for 150 kilocycles a total of 450 turns will be required, and for 465 kilocycles, 150. The

(Continued overleaf)

(*Continued from previous page*)

method of construction is just the same in each instance.

When the coils have been wound they should be mounted on the upright wooden rod, upon which the formers should be a fairly tight fit, so that they will stay in any position in which they are placed. If it is found that there is slight looseness, this can be corrected by varnishing the rod, but this point will probably have been settled before the construction has been commenced.

In mounting the coils and connecting the leads to the various terminals indicated in Fig. 1, it is important to ensure that the turns in both cases are in the same direction; if, for any reason the coils are mounted so that the turns on one coil are clockwise and in the other anti-clockwise, when looking down on the assembly, the connections of one coil should be reversed. In making connections to the terminal soldering tags, the leads should be protected from short-circuit against the edges of the screen; this means that when d.c.c. wire is used it should be passed through lengths of insulating sleeving.

The Connections

There is no need to give instructions for the use of the transformers, since the connections are shown in Fig. 1, and also in Fig. 3. Pre-set condensers of .0005 mfd. should be connected in parallel with the primary and secondary windings, and these must, of course, be adjusted in the normal manner until optimum signal strength is obtained. The coupling between the primary and secondary windings can be varied by sliding the coils up and down on the wooden rod, but in some cases it might be found better to employ a loose (magnetic) coupling and to use a form of "top-capacity" (as in a band-pass circuit) coupling by connecting a third pre-set condenser between terminals P and G, as shown in broken lines in Fig. 3. For the two lower frequencies this condenser should have a maximum capacity of .0001 mfd. or less, but for 465 kilocycles a much lower capacity is needed, and this can most easily be provided by joining a length of insulated connecting wire to the two terminals and twisting these together for a distance of about 3ins.

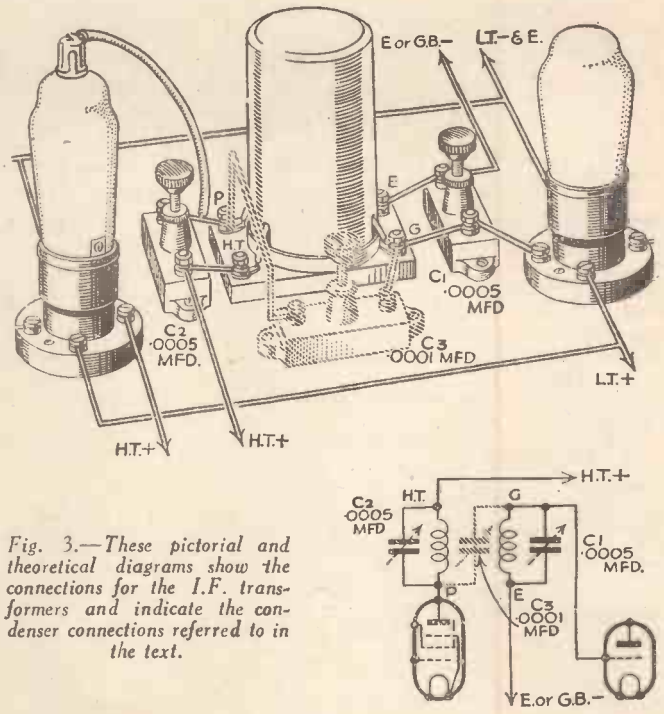


Fig. 3.—These pictorial and theoretical diagrams show the connections for the I.F. transformers and indicate the condenser connections referred to in the text.

It must be understood that when a gang condenser is used for tuning the first detector and oscillator circuits the pre-set condensers will require to be adjusted until the two coils tune to the exact I.F.; when separate tuning condensers are used this is not important, and it is only necessary to ensure that both primary and secondary are tuned to the same frequency. Another point which should be mentioned is that although a tin canister is suggested as a simple screening box, an aluminium or copper screen would be better, and should be used if available. Nevertheless the tin, especially if fairly heavily plated, is reasonably efficient at the frequencies to which the transformer will be tuned.

An Aerial Hint

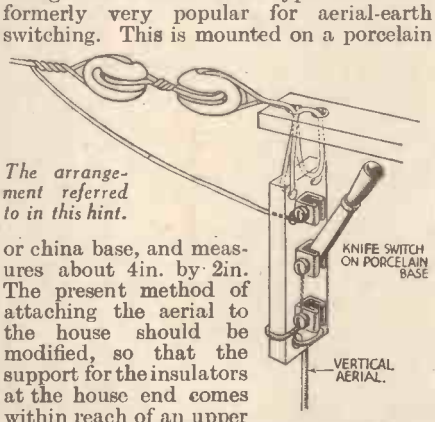
MANY difficulties encountered by listeners in cutting out the local station may be removed by adopting a vertical aerial system in preference to the customary horizontal arrangement which is in general use. Furthermore, the reception of short-wave stations seems to be not only much more reliable when this type of aerial is used, but certain difficulties which arise from directional effects and from "dead spots" seem to be removed if a definite length of vertical aerial is employed.

What Length?

Unfortunately it is not possible to state that a certain length of wire will prove most efficient. Some experiment is necessary according to the situation and the particular wavelengths upon which it is desired to work. With the modern two-storey house, however, it has been found that a wire running from a lower window up to the eaves provides a splendid all-round type of aerial, giving ideal results on broadcast and short-wave lengths. From this it will be seen that the usual lead-in wire coming down from the customary horizontal type of aerial could be turned to account, and many listeners who already have an aerial of this type erected and wish to employ a vertical wire will find this hint will enable them to use either type at will, thus obtaining the benefits which in their particular case will be found with each individual type of aerial.

A Simple Scheme

All that is required is a single-pole-change-over switch of the type which was formerly very popular for aerial-earth switching. This is mounted on a porcelain or china base, and measures about 4in. by 2in. The present method of attaching the aerial to the house should be modified, so that the support for the insulators at the house end comes within reach of an upper window. In most cases a short wooden arm attached beneath the wooden gutter support will be found ideal. The insulators should be attached to the end, and a strong screw-eye should then be passed through the support from below. To this attach a short length of wire (in preference to rope, which may rot and break) and when the wire is firmly anchored pass the other end through the screw holes in the base of the switch, looping it round and firmly attaching the switch with the operating arm facing the house.



The arrangement referred to in this hint.

Now cut the lead-in wire so that a short length extending from the horizontal wire may be attached to the upper contact on the switch, and pass this wire through the appropriate hole in the base and attach it firmly. The end of the vertical wire should then be passed through the hole for the lower contact and attached to both this and the arm contact, making a very secure join which will take some strain. Now smear the wires where they join with vaseline or similar grease to prevent corrosion, and at the lower window attach a similar arm of wood. Two insulators may be attached to the end of this, or holes may be drilled in the wood, and the vertical wire is then firmly attached, drawing it taut so that it will not sway in the wind. Lead it in through the window in the usual way. Now, by operating the switch from the upper window the combined horizontal and vertical portions of the aerial may be employed for "reaching out" on the broadcast band, or the vertical wire for selectivity aid or short-wave lengths. If desired, a metal cowl could be attached above the switch to prevent difficulties due to rain, etc. W. D.

COMPONENTS

Their Action, Principle & Purpose

In this Third Article of the Series, the H.F. Coupling Circuit between the First Two Valves is Discussed

IN the previous article of this series it was explained how the variable-mu high-frequency valve functions, and we saw how the values of the variable-mu potentiometer and the various by-pass condensers are decided upon. Following through the circuit in sequence we now have to consider the high-frequency choke (marked H.F.C.), the coupling condenser C.5. and the second tuning circuit, L.2, C.2.

H.F. Coupling

The form of coupling illustrated is popularly known as tuned-grid, and this is the most commonly-used system, although there are modifications known as tuned anode and tuned transformer. For the moment, however, it will be sufficient to consider the action of the tuned-grid arrangement and the choice of the components involved.

First of all, let us look at the high-frequency choke, the object of which is—as the name implies—to choke back H.F. currents.

Before considering the H.F. choke from a technical viewpoint it will be better to gain a knowledge of its functioning by taking an analogy. The choke can be considered as a spring such as those used on a motor-car or other vehicle to mount the road wheels; the spring absorbs the up-and-down movement of the wheels, with a result that these movements and vibrations are not transmitted to the body of the vehicle (see Fig. 2). The same idea applies in the case of an anti-microphonic type of valve-holder, where vibration of the holder is not transferred to the valve itself.

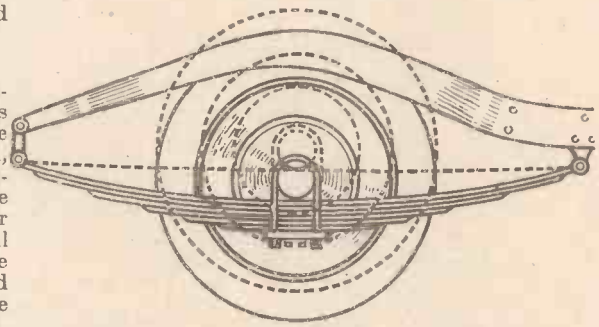


Fig. 2—The action of an H.F. choke can, in some respects, be compared with that of a road spring on a car. The spring prevents the up-and-down movement of the wheel being transferred to the chassis. In a similar manner the choke prevents H.F. oscillating currents from passing through it into the rest of the circuit. The analogy is not strictly correct but helps the beginner to gain a knowledge of one of its important functions.

Another Analogy

In the analogies mentioned above, the vibration can be considered as the mechanical equivalent of the high-frequency currents with which the choke has to deal, and which it has to prevent from passing through it. But the choke has also to perform another function, since it has to carry the steady direct current from the H.T.+ terminal to the anode of the valve. In this respect it might be considered as a sieve or filter, which allows all particles of less than a certain size to pass through it, but at the same time effectively restricts the passage of larger particles. (The H.F. current corresponds with large pieces and direct current with smaller particles.)

All of the above analogies are, perhaps, rather loose and general, but they should convey the main idea of the component. The reason that the choke can readily pass the steady direct current is that it consists of a length of copper wire which is, of course, a good conductor of electricity; the construction of a typical screened choke is shown in Fig. 3. The reason for the component offering resistance to the passage of high-frequency current can only be understood completely by going into technicalities.

We saw in the case of the tuned aerial circuit that a magnetic field is set up round a coil when an electric current is passed through it, and we also saw that when there is a condenser in parallel with the coil there is a rapid transference of energy from the coil to the condenser and *vice versa*. It was shown that current passing through the windings first causes a magnetic field to be set up, after which the field "collapses" and causes current to flow from the coil to the condenser in the opposite direction to that of the original applied current.

The Function of the Choke

An H.F. choke is, essentially, an inductance coil, although its inductance is generally a good deal greater than that of a tuning coil. Thus, the alternating high-frequency currents applied to it result in the creation of a varying magnetic field round the windings. There is no condenser connected in parallel with the windings, but there is capacity between the turns of wire themselves and this has the same effect. When alternating current is applied to the choke the magnetic field is constantly being created and disturbed, but a certain length of time (almost infinitesimal, but important nevertheless), is required for the field to build up.

The intensity of the field and its strength are directly proportional to the number of turns on the winding, and it is not difficult to appreciate that if the frequency of the high-frequency alternating current reaches a certain figure the current flowing "backwards" through the winding, due to the "collapsing" of the magnetic field, will coincide with the current flowing "forward," the result being that the two currents tend to neutralise each other. If the currents were of equal intensity the result would be that no current (H.F.) would actually pass through the windings. Such an ideal state cannot be reached, because there is bound to be a loss of current when it is

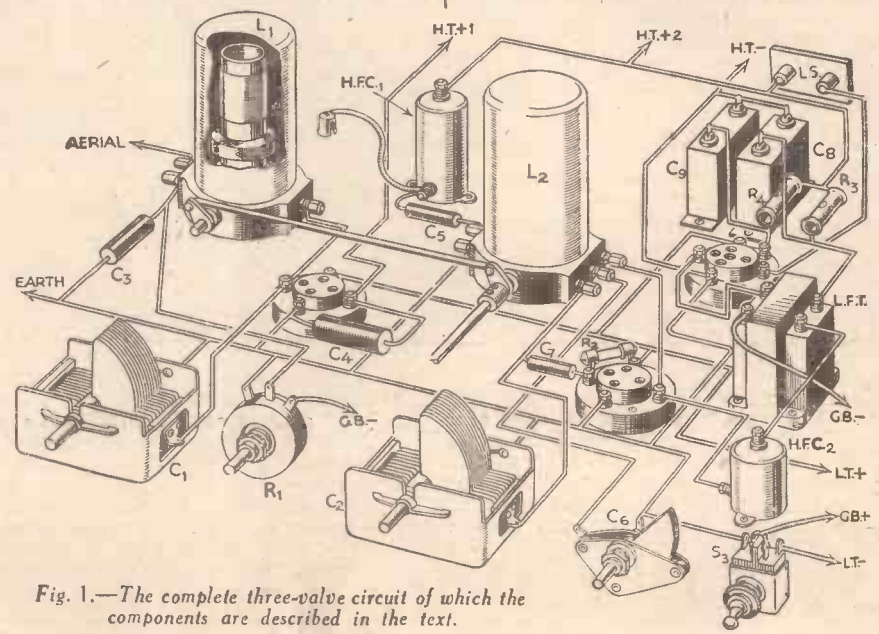


Fig. 1.—The complete three-valve circuit of which the components are described in the text.

transformed into magnetic energy and then back again into current electricity. Nevertheless, by making the choke of a sufficient number of turns its resistance or *impedance* to high-frequency current can be made so high that the amount of current passing is negligible.

Reactance or Impedance

The impedance of the choke is proportional to the inductance and to the frequency of the current passing through it, and can be found from the formula: Z (impedance or reactance)=$2\pi f L$, where π is a constant and equals 3.14, f is the frequency of the current, and L is the inductance of the choke in henries. As an example of this it might be stated that the impedance offered by an H.F. choke of 300,000 microhenries to a current of frequency 1,000 kilocycles (equivalent to 300 metres) is approximately 1,800,000 ohms. The same choke has an impedance to a frequency of 200 kilocycles (1,500 metres) of only 560,000 ohms, which is one-fifth of the previous figure.

As the choke marked H.F.C. in the circuit diagram has to function satisfactorily at all wavelengths between, say, 200 and 2,000 metres, its inductance should be chosen so that a suitable impedance is obtained at an average frequency of, say, 500 kilocycles (600 metres). For optimum results the impedance of the choke should be not less than the impedance of the valve in whose anode circuit it is connected; the impedance of an average variable-mu valve is 500,000 ohms, so that a suitable value for H.F.C. would be 160,000 microhenries. But this value is arrived at without considering the self-capacity of the windings, which affects results to a marked extent. It is thus generally better to employ a choke of somewhat higher inductance than the figure found by calculation.

At the same time it must be borne in mind that self-capacity is a very important factor, and that a choke having a lower inductance than the calculated value, and with a very low self-capacity might prove to be more satisfactory than a component having a higher self-capacity and also a higher inductance. As a general rule the capacity of a good H.F. choke for use in the circuit position under consideration should not be greater than about 3 m.mfd.; unfortunately, however, there are few makers who give figures relative to this factor.

The Reaction Choke

It will be convenient at this point to consider the requirements of the H.F. choke (often referred to as the reaction choke) which is included in the anode circuit of the detector valve, and which is marked H.F.C.2 in the circuit diagram. The purpose of this component is to prevent the passage of H.F. currents into the low-frequency amplifier. In other words, it has to offer such an impedance that the H.F. currents find it easier to pass through the reaction coil and condenser (marked C.6) where they can usefully be employed. The impedance of the reaction circuit is comparatively low, so that if the choke is of higher impedance than this it will function successfully. An inductance of approximately 150,000 microhenries is adequate. This point will be referred to more fully at a later stage.

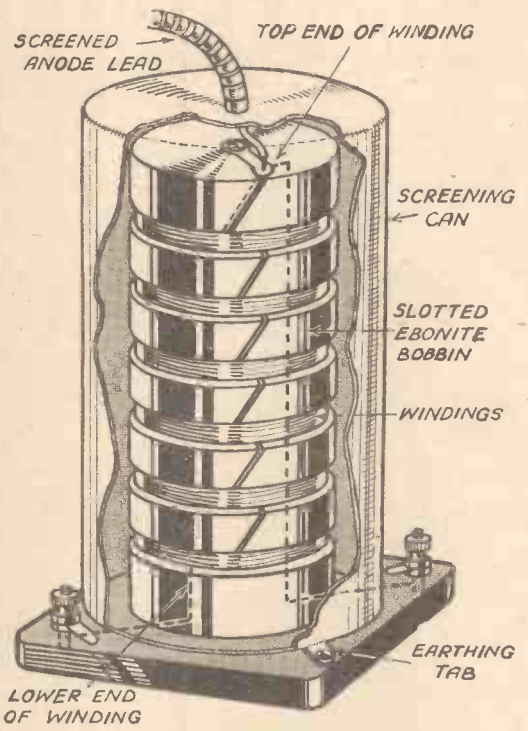


Fig. 3.—Showing the construction of the usual type of H.F. choke used in a tuned-grid circuit and connected to the anode of the H.F. valve.

It is desirable that both chokes should be screened, so that the magnetic fields do not "link"; if linkage did occur there would be a transference of energy from one choke to another, amplified signal currents being passed back from H.F.C.2 to H.F.C., so introducing unwanted reaction effects.

The Second Tuned Circuit

It now remains to consider the function of the coupling condenser C.5 and the tuning circuit L.2, C.2. The latter will be fully understood because it is exactly the same as that of the first tuned circuit, L.1, C.1, which was explained in the first article of this series.

The object of the condenser is to provide an easy path for the amplified H.F. signal currents appearing in the anode circuit of the variable-mu valve, and at the same time to prevent the high-tension voltage applied to the anode of the valve from being short-circuited to earth and H.T.—through the tuned-grid coil (so called because it tunes the grid circuit of the detector valve). In this respect the condenser might be considered in the same light as the choke—as a filter. From the illustrations of condensers reproduced last week it will be evident that ordinary direct current cannot pass through a condenser because the plates or sets of plates are insulated from each other. But it can pass H.F. current, because the condenser is charged and discharged rapidly due to the application of alternating current to it. Like the choke, also, the condenser offers a certain impedance to H.F. currents, but the impedance is *inversely* proportional to the frequency of the applied currents. That is to say, the impedance is less to high frequencies than to low, and can be found from the formula: Z (impedance or reactance)$=\frac{1}{2\pi f C}$, where π is again 3.14, f is the frequency in cycles per second, C is the capacity in farads, and Z is in ohms. Thus, the impedance of a .0005 mfd. condenser to a frequency of 1,000,000 cycles (300 metres) is 320 ohms. Another method of finding the impedance of a condenser is by using the formula: Impedance$=\frac{\text{wavelength in metres}}{\text{capacity in micro-microfarads}} \times 53$ and this is sometimes more convenient.

Theoretically, the impedance of C.5 is not critical, provided that it is much less than that of the choke, and a value between .0001 mfd. and .0005 mfd. is generally employed. The lower capacity provides rather better selectivity by reducing the "damping" effect of the first valve on the second tuning circuit, but the higher value makes for somewhat greater signal strength due to its offering a lower resistance or impedance to the signal currents.

ITEMS OF INTEREST

Military Service at York Minster

THE annual military service at York Minster, originally started in memory of General Gordon, will be relayed in the Northern programme on May 5th. Listeners will hear massed bands of various units of the Northern Command.

"Silver Trumpets"

THE Liverpool Jubilee Pageant, "Silver Trumpets," will be the subject of a descriptive relay to Northern listeners on May 11th. The trumpets are being used to proclaim the twenty-five years of the reign of the King and Queen, and mounted trumpeters will accompany the various tableaux, decorated cars, and so forth which make up the procession. This magnificent cavalcade will wend its way through the streets of Liverpool.

"St. George's Bells"

UNDER the title "St. George's Bells" the story of the famous Chester Cup Race will be unfolded in a radio-dramatic feature which is to be broadcast to Northern listeners on the night of the race, May 8th. The joint authors are G. H. Dayne and A. R. Parker, and the bells referred to are those presented in 1609 by Richard Ambrye, ironmonger of Chester, to be disposed on St. George's Day to the winners of a race on the Roodeye Course. The race no longer takes place on St. George's Day, and has since changed considerably in many other ways, as will be shown in the programme.

"Music Hall"

HILDEGARDE, the famous French-American diseuse, has been secured by Eric Maschwitz for "Music-Hall" on May 2nd. She will also be heard during the Jubilee week in a half-hour by herself. This actress is unique in the manner in which she sings French songs in broken English.

Accordion Band Concert

HENRY CROUDSON, whose organ recitals at the Paramount Theatre, Leeds, are well known to Northern listeners, is to broadcast for the first time on May 9th as the leader of his own accordion band. This band was formed some six months ago, its members being recruited "off the streets" by Croudson. Croudson found that though they were all good players, none of these men could read music and consequently he had to set to work teaching them collectively and individually.

A PAGE OF PRACTICAL HINTS

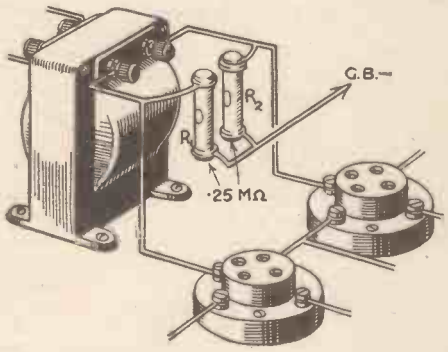
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

Converting an Untapped Transformer

FOR experimental purposes a constructor often wants to have a push-pull circuit going, but an input transformer may not be at hand. This can easily be remedied by the simple "hook-up" shown in the accompanying sketch. The resistors R_1 and R_2 were not found to be critical, and can be of a value from 150,000 to 500,000 ohms.

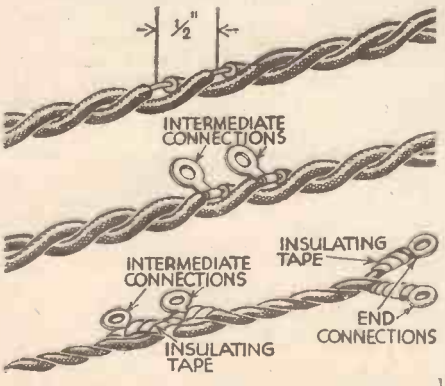


A simple method of adapting an untapped transformer for push-pull working.

Wiring Valve-heater Connections

IN several of Mr. Camm's receiver designs —the A.C. Superhet, the A.C. Hall-mark, and the new All Mains Short-wave Three—the valve-heater wiring is by flex carried from valve to valve. The usual method of doing this is either to make two separate connections to each valve socket, or to strip enough of the flex to loop under the heads of the tightening screws of the valve-holders. This, in both cases, involves the risk of a stray strand of wire "shorting" on an adjacent connection. A better method is shown in the accompanying sketches.

Having measured off the required length of flex, bare about ½in. where each of the valve sockets will come, take a 6 B.A. soldering tag (the smaller in overall size the better), bend and solder the tail of the tag around the bared flex, and bind with insulating tape, passing from one side of the tag to the other in a spiral, and leaving only the ring of the tag uncovered. The adjoining flex should be bared about ½in. away (the distance apart of the valve legs) and the tags for the last valve should be left straight, the flex soldered longitudinally and taped as already described, leaving only the rings bare. When complete the tags can be screwed down to the socket ends, making a much neater job and entirely obviating any risk of trouble from a "whisker" of flex that might otherwise have escaped notice during the wiring up. —G. E. BRIDDON (Barnsley).



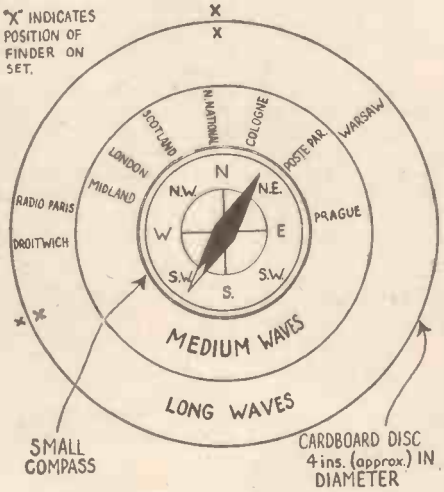
A method of preparing flex for making valve-heater connections.

THAT DODGE OF YOURS!

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

Direction Finder for a Portable Set

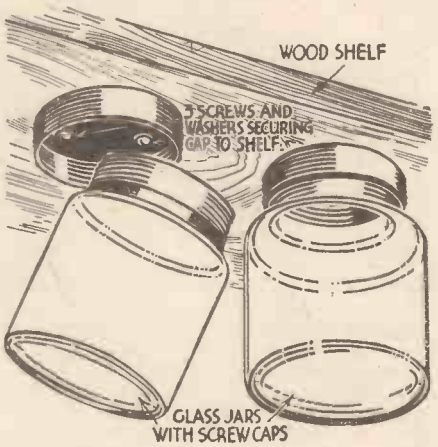
HERE is a simple method of making a direction finder for a portable radio. To the centre of a disc of cardboard a small compass is fixed by means of a spot of suitable adhesive. The portable set, with the finder laid flat on top, is then placed on a fairly large-scale map of Europe, as described in February 23rd issue of PRACTICAL AND AMATEUR WIRELESS. In this way the correct position to set the portable for different stations is ascertained; as the set is rotated to each position a tiny mark is made exactly in line with point of compass indicator and the name of the station being received is printed opposite this mark. If a little care is taken in the marking of the stations, and placing the finder always in the same position on the set, one can have quite an efficient direction finder.—F. W. RITCHIE (Macduff).



A direction-finding device for a portable set.

For the Wireless Workshop

THE accompanying sketch shows a handy space-saving dodge for the wireless workshop. It also helps to keep constructors systematical in their work. All that is needed are some empty honey jars with screw caps and three brass screws and washers for each. Bore three holes in each cap and screw them to the under side of any shelf in the workshop, as shown in the sketch. The containers thus provided will keep small parts such as nuts, bolts, screws, panel pins, washers, etc., clean and free of rust.—E. G. EVANS (Ferndale).



A space-saving dodge for storing small parts, screws, etc.

Making Small Dial Indicators

MY set has a polished mahogany front and after adding a two- or three-valve change-switch I found it necessary to have the various positions of knobs clearly indicated, so as not to cause confusion, at the same time making a dial which would match my mahogany panel and knobs. This was done by printing on photographic self-toning printing out paper. The gelatine was stripped from an old negative, and the necessary characters neatly scribed by hand in Indian ink. After exposing a print the strength of the hypo bath necessary for the required tone was found by experimenting on a small strip of the paper. When dry the required portion was carefully cut and glued in position.

To obtain perfect detail for very small markings the proposed dial should be drawn five to ten times full size on black paper with white Chinese ink. Focus in good light before the camera so that the resulting image is the actual required size; then photograph and print as before. —HUBERT T. NOAR (Elderslie).

Introducing

F. J. CAMM'S ALL-WAVE

A.C. SILVER SOUVENIR

Preliminary Notes and Advance Circuit Details of an Efficient Mains Version of This Popular All-wave Receiver.

IN previous issues full details have been given concerning the arrangements adopted to obtain efficient all-wave working from a receiver, without introducing difficulties and losses from wave-change switching. Generally speaking, it has been found difficult to cover short waves with the same degree of efficiency as medium waves unless certain precautions were taken, and these have led to expense or difficult constructional work. When a simple detector stage is employed these difficulties are removed, but then the receiver becomes rather insensitive, and although good long-distance reception is possible on the short waves under average conditions, on medium wavelengths the absence of a good H.F. stage becomes very noticeable.

The Silver Souvenir and its attractive cabinet.

How the Switching is Arranged

Consequently, it was thought desirable in the Souvenir series of receivers to adopt an H.F. stage, and various schemes were tested and tried to avoid difficulties which arise when an H.F. stage has to be switched with a detector stage, as interaction between the two necessary sets of coils must be avoided at all costs. The success which attended the design of the Silver Souvenir battery model shows that the scheme which was finally adopted is the most efficient for the production of consistent results on all wave-bands. Consequently in the A.C. version of this receiver the same tuning arrangements have been retained, and thus the receiver becomes, in effect, a two-in-one set, complete with special short-wave coil and tuning condenser.

A Modification

In view of the greater efficiency of the indirectly-heated type of A.C. valve, it has been found possible in this receiver to dispense with the pentode detector valve and to utilise in its place an ordinary triode. This naturally results in a slight saving, as voltage-dropping resistances and by-pass condensers will not be required. In all other respects the circuit is identical, except for the necessary introduction of the mains equipment for the supply of the H.T. and L.T. voltages. An examination of the circuit diagram reproduced on this page will show that the usual mains input transformer is used, together with a rectifier of the metal type for the H.T. circuit. The H.F. pentode is of the variable-mu type, and thus for the control of volume a potentiometer is included in the cathode circuit of this stage and regulates the volume obtainable by modifying the bias applied to the valve. Switching of the coils is carried out by the ganged switch scheme and introduces the aperiodic aerial scheme for short-wave work, whilst enabling band-pass coupling to be employed on the normal broadcast bands for good selectivity consistent with high quality. It will be noticed that a biasing resistor is included (together with the appropriate by-pass condenser) in the cathode lead of the detector valve, and this is to enable the receiver to be used for the reproduction of gramophone records. No switch has been included for the pick-up, however, and this point may be left until the actual constructional and operating notes are given, as each individual constructor has his own ideas concerning the inclusion of this type of switch. If the receiver will not be needed for gramophone reproduction, this biasing resistor and condenser may therefore be ignored and the cathode connected direct to earth. Parallel-fed transformer coupling is again employed between detector and output stages, and this ensures adequate low-note response whilst permitting of good characteristics in the upper register and removes all risk of transformer saturation, etc. The output valve is of the directly-heated type, fed from a common heater winding on the mains transformer, and the maximum undistorted output obtainable from this valve is 2.6 watts. Thus on powerful stations a really good output may be obtained, sufficient for all ordinary listening purposes, and in general gramophone records will deliver this output. The speaker specified is of the Stentorian type, capable of doing justice to this output, and the quality of reproduction is really above reproach. The choice of mains components and the lay-out adopted in the complete apparatus preclude all risk of hum troubles, and the receiver is as simple to construct and use as the battery model. Full constructional details will be given next week, and for those who wish to commence by obtaining or ordering the necessary components a list of these parts is given this week.

LIST OF COMPONENTS FOR THE A.C. SILVER SOUVENIR.

COILS.
One set Three-gang, type WL-QRT (Wearite).
One Short-wave coil, type SPC with type SPB base (B.T.S.).

CONDENSERS (Variable).
One Three-gang, .0005 mfd. Baby condenser with S.M. dial C1, C2 and C3 (J. B.).
One Single S.W., .00016 mfd. type EJ with S.M. dial (C4) (Polar).
One Reaction, .0002 mfd. type QJ, C5 (Polar).

CONDENSERS (Fixed).
Four .5 mfd. type 65 (C6, C7, C8, C9)
One 2 mfd., type 65 (C14)
Three 25 mfd. 25 volt electrolytics (C10, C11, C12)
One .0001 mfd., type M (C13)
One .01 mfd., type M (C18)
Two 4 mfd., type 84 (C15, C16)
One 8 mfd., type 802 electrolytic (C17)
} T.C.C.

RESISTANCES.
Two 50,000 ohms (R1, R2)
One 20,000 ohms (R3)
One 2,000 ohms (R4)
One 250 ohms (R5)
One .5 megohm (R6)
One 750 ohms (R7)
One 25,000 ohms (R8)
One 5,000 ohms (R9)
One 350 ohms (R10)
One 10,000 ohms (R11)
} Amplion 1 Watt type.

CHOKES.
Two H.F. type HF3 (Bulgin).
One 40H-60 m.A L.F. (Premier).

VOLUME CONTROL.
One 5,000 ohm wire-wound potentiometer (R12) (B.T.S.).

TRANSFORMERS.
One L.F. Type DP21 (Varley).
One Mains transformer, type W31 (Heayberd).

SWITCHES.
One QMB on-off, type S80 (Bulgin).
Four change-over, type S81B (Bulgin).

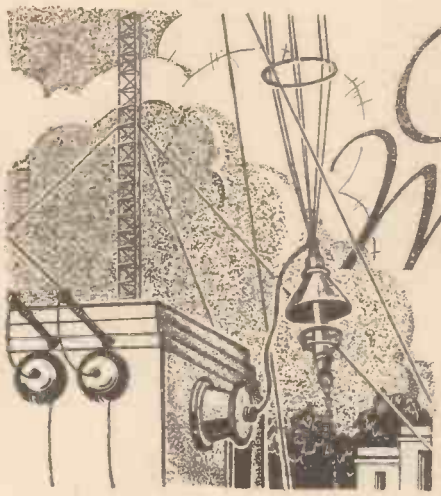
RECTIFIER.
One Style H.T.8 (Westinghouse).

CHASSIS.
Metaplex, 12in. by 12in. with 3½in. runners (Peto-Scott).

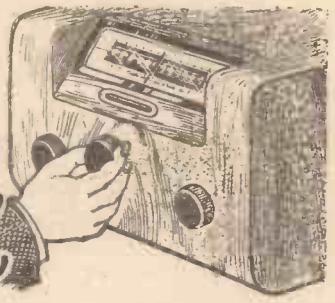
VALVES.
One MVS-PEN, one 41MHL and one PT41 (Cossor).

VALVEHOLDERS.
Three five-pin chassis type airsprung (Clix).

ACCESSORIES.
Four component brackets (Peto-Scott).
One ten-way group board (Bulgin).
One 9in. by 5/32in. shaft (Bulgin).
Two terminal strips, L.S.-P.U., A., E. (Clix).
One Stentorian Senior loudspeaker (W. B.).
One Silver Souvenir Cabinet (Peto-Scott).



On Your Wavelength



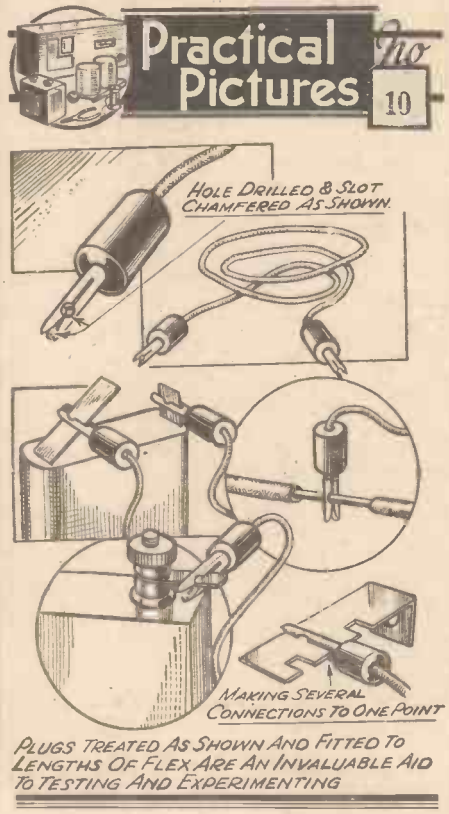
By Thermion

Unusual Causes of Instability

DURING some probing into unusual faults some very interesting facts have been unearthed by an experimenter friend of mine. He showed me several receivers which have been constructed, and which are faulty—either from the point of view of the results obtained, or in instability and similar troubles. A careful test with each receiver fails to reveal the trouble, and I guarantee that many an expert would hunt for hours in these receivers without being able to track down the trouble. It is not possible to go into all the points here, but one little defect should be worth mentioning, as it occurs in many receivers, even in some of commercial make. The trouble takes the form of instability evidenced by oscillation at various wavelengths. In some parts of the tuning scale the receiver is perfectly docile, yet in others it is uncontrollable. Careful isolation of various parts of the circuit have enabled my friend to trace this trouble to interaction with the anode cap of an S.G. valve. The particular receiver in which this trouble arose utilised a metallised valve, and the lead to the anode was only 2ins. long, screened and came through the top of a screened coil. Yet when a metal cover (earthed) was placed over the anode cap, the set was instantly tamed and yielded a correct performance. The point is worth bearing in mind when you have experienced instability troubles and have tried practically everything without success—and one of the special screened "top connectors" should prove of use for the purpose.

Stereophonic Reproduction

I THINK a lot can be done in the way of improving the realism of reproduction from the ordinary broadcast set. I have carried out a number of tests, but nothing I have hit on yet has enabled the instruments to "stand out" in the manner in which a stereoscopic picture gives relief to the objects. The nearest approach I have obtained to real distinction between instruments has been with two loud-speakers, one of the small type and one large, sold by the makers as a matched pair for balanced reproduction. The small speaker was mounted on the ordinary type of baffle—actually a 4ft. square of ply, with an opening for the speaker. The large speaker was then mounted below this one, but facing the opposite way. A number of "trumpets" were then made up from cardboard, using various shapes and lengths, and by making a more or less logarithmic horn, wound round and round, occupying the entire back of the baffle, and opening away from the baffle, I succeeded in getting very good results when the complete unit was placed in a corner. The idea is, of course, simply to obtain a delay between the reproduction from the two speakers, and I prefer to delay the low notes rather than the high ones for several reasons.



PLUGS TREATED AS SHOWN AND FITTED TO LENGTHS OF FLEX ARE AN INVALUABLE AID TO TESTING AND EXPERIMENTING

Readers may care to try some experiments in this direction and let us hear the results, but do not suggest two loud-speakers in different rooms, as this is not really a practical solution to the problem. What is required is a moderately small unit giving good delay between two separate reproductions, and I think there is a good field for experiment here.

Transformer Output

AN interesting technical point arose recently when I was giving to an enthusiastic amateur some details regarding the construction of a mains transformer. I explained that, for the core he was using, the correct number of turns per volt for both primary and secondary windings was six. As he wished to obtain an L.T. voltage of 4, at 3 amps. (to feed three indirectly-heated valves), I recommended the use of 20-gauge wire for the secondary winding. He pointed out, however, that he might later modify the receiver so that an L.T. output of 6 amps. was required from the winding. I therefore suggested that he might wind the secondary with, say, 16-gauge wire and then use a fixed resistance of $1\frac{1}{2}$ ohms to "absorb" the excess current. This is, of course, a usual procedure, but my querist was most anxious to understand fully the whys and wherefores of everything, and argued that, since six turns per volt was the correct figure, and that by using twenty-four turns of wire he must have an output of 4 volts, the gauge of wire could make no material difference. He could understand that it might be impossible to obtain, say, 5 amps. by using wire of which the maximum current rating was 3 amps., but he would not have it that the voltage could be greater than that determined by the number of turns if the gauge of wire were heavier than that required.

I must confess that I had a good deal of difficulty in proving to him that the gauge of wire must be taken into account, but I will leave you to consider the problem; perhaps you can think of a convincing proof.

Incidentally, I would impress upon all those constructors who make their own transformers that it is always a wise plan to measure the voltage output when the particular winding is normally "loaded." The voltmeter must be of a type which is suitable for A.C., and a good moving-iron instrument is quite satisfactory.

Potential Dividing

IT is fairly generally considered that the voltage obtained between one end and a tapping on a potentiometer is exactly proportional to the position of the tapping in relation to the total resistance and the maximum voltage. If I may explain my point more clearly, I should say that the general opinion is that if a centre-tapped 50,000-ohm resistance were connected across a voltage supply of 200 volts the voltage between one end of the resistance and the tapping would be 100. Actually, this is not the case, and in fact it does not apply unless there is no current being taken through the tapping point. If a current is being taken, the actual voltage is less than the apparent voltage, becoming smaller as the current loading is increased. There is no need to enter into the mathematics of the question here, but it will be sufficient to explain that there is a voltage drop across that portion of the potentiometer which is not loaded, just as there is across a coupling or decoupling resistance.

(*Continued overleaf*)

(*Continued from previous page*)

U.S.W. Adaptors and Convertors

A CERTAIN measure of confusion appears to exist in some quarters as to the value of ultra-short-wave adaptors and convertors in connection with the forthcoming high definition television service. It is hardly necessary to remind readers that these units are attached to ordinary radio receivers employed on the medium and long wavebands in order to make the "home set" receive transmissions radiated on the ultra-short waves (below ten metres). They are excellent pieces of apparatus for this special purpose when properly made and used with sets of reasonable quality, but they are absolutely useless for obtaining a television signal of the high-definition class so as to work vision apparatus. This form of vision signal can certainly be heard on the loud-speaker, but in addition to being radiated on the ultra-short waves they embrace a side-band up to about two million cycles. The average set cuts off or starts to attenuate any signal above five thousand cycles, so this rules out at once any thought of adaptors or convertors being used for this particular work.

Certainly they will enable the user to familiarise himself with the strength and nature of the signals he can receive in his own locality in this particular waveband, and in that connection fulfil a very useful purpose, but please dismiss from your minds all thought of adapting your home broadcast set to enable you to look in at high-definition pictures. On the other hand, since it has now been made known officially that the sound which is to accompany the high-definition television is to be radiated also on the ultra-short waves, then these units will prove useful to listen to that side of the programme. This will save the expense of an entirely new receiver, but, as these sound signals are likely to embrace a sideband much in excess of that now allowed to European broadcasting stations, the combination of unit and home set will not allow you to take full advantage of the improved reproduction which will result from this type of transmission. The whole situation is a very intriguing one, but the home constructor stands to gain very materially. He will be in a position to make his own high-fidelity receiving apparatus to use on these very low wavelengths at a cost far below that of the commercial finished product, and so stimulate interest in the work connected with this new order of things.

Herewith a Letter Received from a Yeovil Reader:

DEAR "Thermion." In fear and trembling I venture to address you, fearful that I should commit one of those sins which some of your correspondents evidently do! I enjoy reading your column, or should I say chapter, every week; what if you do not always agree with me?

Now to get down to what I want. Although I have been playing at radio since about 1921 I am a very "newcomer" to short waves; however, I have at last managed to rig up a short-wave set (det. and L.F.) from old broadcast parts. (Like many others I am unemployed; don't be alarmed, I don't want you to give me anything!) Well, on tuning in the amateurs I find them conversing in a strange language, consisting of Q.R.M., R's, etc. Can you or someone else on the PRACTICAL AND AMATEUR WIRELESS staff give us a dictionary of the terms used?

Radio-gramophone Conversion

DURING the last few years the quality of reproduction obtainable from the radio receiver has improved to such an extent that the reproduction of gramophone records by acoustic means has practically become obsolete. Most modern radio receivers are fitted with a pick-up socket, but there are probably many listeners who own reliable radio sets designed two or three years ago that are not fitted for gramophone reproduction. In the majority of cases, however, it is an easy matter to fit the necessary pick-up terminals. If the receiver is of the popular three-valve type, using an H.F. stage in conjunction with a detector and one L.F. stage, the signal from the pick-up should be fed to the detector grid, but if two L.F. stages are used it is usually found that sufficient volume and better quality of reproduction is obtained by connecting the pick-up to the first L.F. valve. It is advisable to use a three-terminal change-over switch for this purpose, connecting the centre terminal of this to the grid of the detector or L.F. valve and the end terminals to the grid lead and to one of the pick-up leads respectively. The other pick-up lead should then be connected to the G.B. voltage tapping suggested by the manufacturers for the particular valve in use. A bias of —1½ volts is generally found to be sufficient for the average detector and general-purpose valve.

Class B Amplifiers

IT is not generally realised that the substitution of a Class B stage for a normal triode or pentode transformer coupled output stage does not provide an increase in amplification. After such a substitution has been made the volume obtained from distant stations decreases, as the driver transformer used in the Class B stage has a step down ratio. A Class B valve should not, therefore, be fitted if the only desire is to increase sensitivity. This type of valve can be used to great advantage, however, if greater undistorted volume is desired from stations that are normally received at good strength. The average small power valve has an undistorted output of approximately 150 m.w. and economy pentodes have an output of about 450 m.w. Compared with this, Class B valves have outputs varying between 1,250 and 2,000 m.w., according to the type used.

Curing Instability

WHILST experimenting with a four-valve superhet, using modern valves of the multiple type, a roaring noise was experienced when tuned to a strong signal if the volume control in the grid circuit of the triode section of the double-diode-triode was moved beyond approximately half-way setting. The usual decoupling component sizes were then fitted with a view to stabilising the various stages, but very little improvement was effected until the heptode and I.F. screen and oscillator anode by-pass condensers were increased to 1 mfd. Further experiments definitely proved that the capacity of the by-pass condenser is of more importance in curing instability of this type than the value of the decoupling resistances.

I hear them say "I am getting you R8-R9 on the loud-speaker," which from the tone of the speaker is evidently good I forgot the hi! hi! which one of the amateurs always concludes his sentences with (forgive the preposition).

How can I tell whether the R8 he talks of is the same as I call "good reception."

I feel there must be others whom this would interest.

Thanks in anticipation, and congratulations to PRACTICAL AND AMATEUR WIRELESS for a really good journal. May your fountain-pen never run dry!

H. A. HALL.

(I have arranged with the editor to publish a short article on this subject in an early issue. Meantime, I would say that much of the code is very loosely arranged, so as to be almost valueless.)

The Order of Wander Plugs!

THE title of this paragraph does not refer to some association which is a rival to the Frothblowers, but relates to the numbering of wander plugs and the order in which they should be inserted into their appropriate sockets. As most readers know, we adopt the ascending order, so to speak; that is to say, H.T.1 is usually plugged in to the lowest voltage, say, from 60 volts to 80 volts, H.T.2 is plugged in to say, 120 volts, and H.T.3 to maximum H.T. voltage. We also adopt the same system with the grid-bias plugs. I think this is the best arrangement, and I am reminded of it through testing a friend's receiver the other day. From force of habit I have become accustomed to connecting H.T.1 to a tapping appropriate to the screen-grid voltage, whereas in the particular receiver under test the order was the other way round. Quite naturally, when I plugged in H.T.1 to 150 volts the results were truly awful! It was a few seconds before I detected the correct order. Unfortunately, some manufacturers adopt this reverse order of things, and I suggest that they should now standardise along the PRACTICAL AND AMATEUR WIRELESS lines.

SHORT-WAVE GOSSIP

Although they are now seldom mentioned, both PCJ, Eindhoven, and PHI, Huizen (Holland) are working to a regular schedule. The former is still in an experimental stage, although one of the oldest short-wavers, as it was opened in 1927, and on 19.71 metres (15,220 kc/s) broadcasts simultaneously with PHI on Sundays only. The Huizen transmitter on 25.57 metres (11,730 kc/s) sends out on its own a programme on Monday, Thursday, Friday, and Saturday of each week between G.M.T. 13.00-15.00 or 15.30, with an extended transmission on Sundays to 16.00. The programmes open with the Dutch National Anthem.

Whilst on the subject of European short-wavers, it will be well to mention ORK Ruysselede (near Bruges), which acts as the short-wave outlet of the Belgian programmes for their nationals in the Belgian Congo. The wavelength is 29.04 metres (10,330 kc/s) and the call: *Ici Bruxelles, Poste Colonial Belge*, also repeated in Flemish. So far, the station has limited its working to some seventy-five minutes of broadcast, namely, from G.M.T. 18.30-19.45, during which period it gives gramophone records, topical talks, and news items in both French and Flemish. Occasionally, it relays a portion of a concert from either the Brussels No. 1 or No. 2 studios.

TELEVISION FOR ALL

FURTHER NOTES ON H.D. TELEVISION RECEPTION

By H. J. BARTON CHAPPLE, B.Sc., A.M.I.E.E.

AS was intimated in the last article, the absence of any form of test transmissions for high-definition television signals makes it impossible for readers to carry out quantitative experiments with specially designed radio receivers. Certain factors have to be settled and announced by the Advisory Television Sub-committee, the principal ones being number of lines to be used in each picture frame, ratio of horizontal picture width to depth, number of pictures per second, percentage width of synchronising strips, whether the scanning is to be a simple linear one, or whether some form of interlacing is to be employed, and so on. On these important facts many points of design evolve, so, apart from treating the scheme in a general fashion at the moment, no effort will be made to particularise, otherwise the reader will become confused.

A few months ago, however, the test results of several interesting television experiments spread over many months were revealed in America, and a reference to these will show some useful lines of thought which will assist matters later on. For example, we can take as our basis a 240-line picture repeated twenty-five times per second, and assume that the picture ratio is the usual photographic plate one of 4 to 3, the horizontal length being the longer edge (see Fig. 1). If, now, we assume that each arbitrary picture element has a square shape, and that the whole picture was made up of alternate black and white squares, then each pair of squares would constitute one cycle of changes from complete black to complete white.

Video Frequency

The total number of picture elements under these conditions would be 240 by 240 by $\frac{4}{3}$ which equals 76,800. To calculate the

Fig. 1.—Showing the conventional 4 by 3 picture shape with horizontal scanning.

maximum picture frequency this figure must be multiplied by 25, and divided by 2 (two elements in our arbitrary picture formation of black and white squares represents a complete cycle, hence the necessity for halving the total to give the positive and negative halves of the wave). This frequency now becomes 960,000 cycles per second. It may be necessary, however, to make some allowance for control functions, that is, synchronising, flyback-stroke suppression, etc., and in the American experiments referred to, an allowance factor of 10 per cent. was included for this, the result being to extend the frequency by a factor of $\frac{10}{9}$ making the total now 1,067 kilocycles.

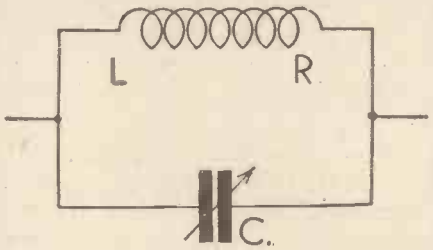


Fig. 2.—The simple form of tuned resonance circuit.

This picture frequency has been termed in the United States the "video" frequency, the Latin expression meaning "I see," the relation to television, which in brief is the science of seeing by electrical methods of communication, being very apt. It is quite possible that this term may ultimately come into general use, just the same as we have audio-frequency in relation to sound. To accommodate the video or picture frequency the maximum communication channel band will, therefore, be twice this figure, that is, 2,134 kilocycles.

Detail Lacking

Since the carrier-wave frequency must be considerably higher than the maximum-modulation frequency, it is, of course, quite obvious why the ultra-short waves must be used, and a satisfactory wavelength to meet the conditions stated would be 6 metres. If, subsequently, improvements are effected, or a demand is made for better pictures than those represented by the conditions stated, it will mean that wavelengths still lower in the ultra-short region will become necessary, but this should not cause any prime technical difficulty when it is borne in mind that micro-waves (measured in centimetres) have been demonstrated under quite practical conditions.

Of course, it must not be thought that if a radio set for high-definition television reception does not embrace completely the extremely high frequencies, then the results will not be worth looking at. Any side-band cutting will naturally cause the pictures observed to be lacking somewhat in very intimate detail, while a slight blurring will be apparent, but unless the set is extremely poor (comparatively) then the pictures will not be ruined.

A Sound Note

Dealing now with the radio receiver itself, it is possible to have two separate and distinct sets, each of which is tuned to its own particular transmission; that is, one for sound and one for vision. On the other hand, as has been indicated previously, a single initial tuning circuit can be used, provided the radiated carrier includes picture and sound carriers with their respective modulations, which, in the case of the former, incorporates the low-frequency and high-frequency synchronising pulses.

If the sound set is regarded as a separate entity, its design is quite a standard one; but it should be borne in mind that sound radiated *viâ* the medium of ultra-short waves will include a much wider sideband than is the case with medium- and long-wave broadcasts. The set, therefore, must make provision for this, and the resultant reproduction (assuming, of course, that a loud-speaker is employed which is capable of responding to the wide range of acoustical frequencies) will be far superior to that from a standard broadcast set.

Band Pass

To accommodate the wide video frequency previously mentioned, a form of band-pass tuner is required. It is well known that by a proper design of the constants (inductance, capacitance and resistance) it is possible to secure a band width which will embrace any desired frequency. The vision radio set is not one where selectivity is the important criterion as is the case with ordinary radio. Every effort must be made to counter the selective properties of the circuits used within the limits imposed.

(*Continued overleaf*)

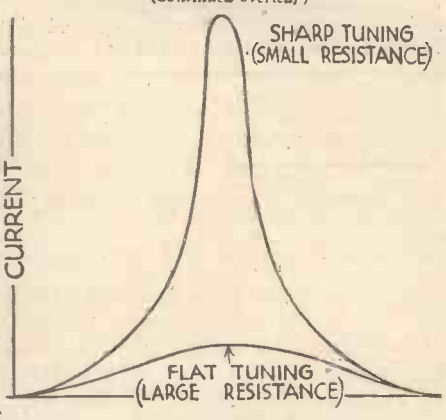


Fig. 3.—By adding resistance the sharp resonance effect is broadened to a flat curve.

(Continued from previous page)

It will not be out of place to remind readers of an important point in connection with tuned resonant circuits—namely, the part played by inherent or artificially-added resistance in the circuit. With any simple tuned circuit such as shown in Fig. 2, consisting of inductance L, capacitance C, and resistance R, the current within the circuit builds up to a maximum at what is termed the resonant frequency. This is indicated in Fig. 3. When there is very little resistance (or losses) in the tuned circuit the current builds up to a high value at resonance, giving the effect of sharp tuning. That is to say, on either side of the resonant point the curve or current response has a steep slope, so that only a comparatively narrow band of frequencies is embraced at high current values.

I.F. Stages

When the resistance of the circuit is high, however, the current is "damped" down considerably, rising to quite a low value, while the response curve is reasonably flat over a wider frequency band. It is this condition that is demanded by video frequency reception, and steps are taken to artificially ensure this. For example, assuming that a superheterodyne set is employed, since this receiver lends itself so admirably to ultra-short-wave reception of this special character, the intermediate-frequency amplifier will be made up of a number of band-pass H.F. transformers.

Both primary and secondary windings will be tuned, and the wide band-pass characteristics can be obtained by winding both the primary and secondary with resistance wire. The coupling between these two windings can then be adjusted to give the flat-topped response curve which is so essential. As far as the intermediate frequency is concerned, this can be of the order of 8 to 10 megacycles for a carrier wavelength in the neighbourhood of 7 metres, which was the wavelength used in the recent radio demonstrations of television from the Crystal Palace.

Nature of Received Signals

Every screening precaution must be taken with the construction of a radio set of this character, and if need be adequate filtering must be included in the supply leads to prevent any lack of stability from common couplings.

Reverting again to the American experiments mentioned at the beginning of the article, it will be instructive to examine the nature or shape of the composite signal made up from the picture modulation and the double synchronising modulations. This is shown in Fig. 4. From previous articles which have appeared in this series the reader will have learnt that a strong modulation corresponds to the light portions of the picture, while a weak modulation produces the "blacks." A full picture signal modulation should therefore range from black to white, and in the cathode-ray tube itself the voltage range for this requirement to be fulfilled varies with the type of tube employed. This is the portion of the signal which is applied to the modulating cylinder in the tube. In Fig. 4, therefore, the video or picture signal is shown between the black and white brightness limits.

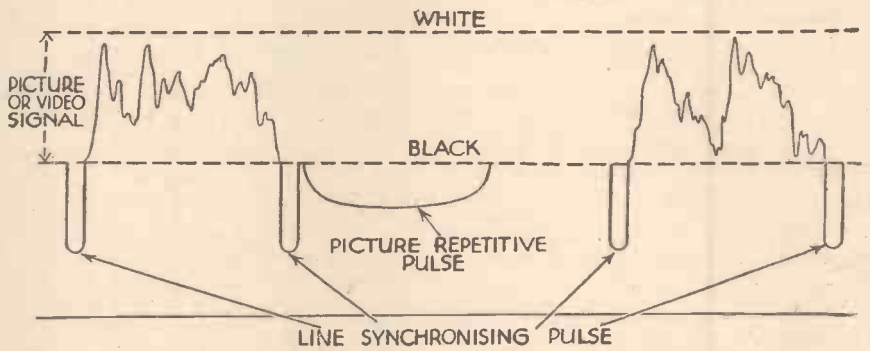


Fig. 4.—Showing how a composite picture signal would be formed when the double synchronising pulses are added.

Synchronising Pulses

It has also been pointed out previously that at the end of the traverse of each horizontal scanning line a synchronising pulse is generated and injected into the picture modulation. This pulse voltage is seen in Fig. 4, being really superimposed on the "black" portion of the signal, and made of sufficient strength and time duration to bring about the H.F. time base triggering at the receiving end. The L.F. or picture repetitive pulse is of longer duration, occurring in the space between the pictures, and still in the black portion of the composite signal.

Since the range of the video or picture modulation ceases at the line limit labelled black, it ensures that this part of the signal can in no way upset the nature or shape of the two sets of synchronising pulses. In the receiver this composite signal is separated or divided into its two component parts, selector valves taking charge of their respective L.F. and H.F. synchronising pulses for application to the grids of the two time bases which generate the saw-tooth scanning voltages, while the video-frequency passes to the cathode-ray tube modulation cylinder.

This may at first sight seem a very complicated action, but in actual practice it is a straightforward task to arrange for the appropriate selector valves and circuits for this to happen. It is a matter which can more conveniently be deferred for a detailed discussion until the arrangements are completed for the installation of the scanning and radio equipment in the London television station. When the selection of the site has been finally settled, progress will be rapid, many manufacturers being anxious to make plans in connection with component and receiver design to suit the standards which the Advisory Committee will then issue.

MEMORISING THE MORSE CODE

MANY methods have been devised for memorising the Morse code of dots and dashes, and a new and ingenious one is shown in the accompanying diagrams. In Fig. 1 the shaded squares represent a dash, and conversely, the white ones represent a dot. On the left half will be found all letters starting with a dot, and on the right all those beginning with a dash. The diagram (Fig. 2) indicating figures is worked out on the same principle. To find a letter, one reads from the top of the diagram downwards, either from left or right side, according to whether the initial sign of the signal is a dot or dash, until the wanted letter is found. As an example, dash dot dot dash takes you to the letter X, or dash dash dot dot to Z, and so on.

There are many other excellent methods of memorising the Morse code and, as with all other branches of science, practice will be found the best tutor.

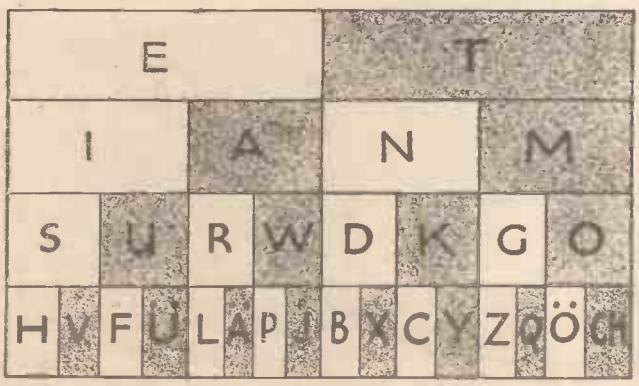


Fig. 1.—Showing how to mark out a chart for memorising Morse code letters.

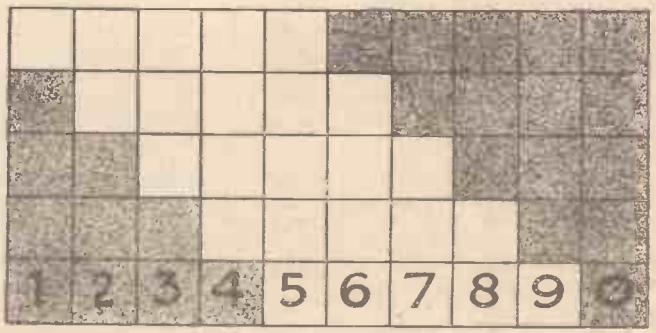


Fig. 2.—How the chart is marked out to indicate figures.

AERIAL INPUT SYSTEMS

BEGINNER'S SUPPLEMENT

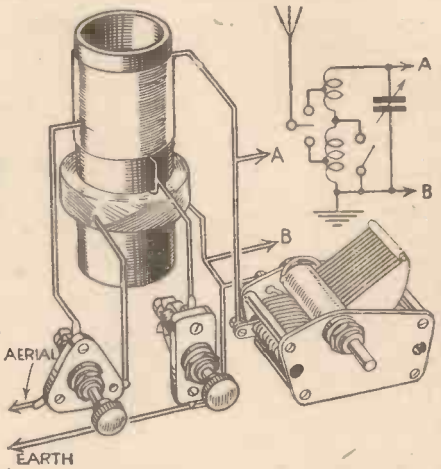


Fig. 5.—A transfer tapping may be provided on medium and long-wave coils.

The Efficiency of a Receiver May Often be Improved by Modifying the Aerial-coupling System, and Some Notes on the Importance of Design of this Part of a Receiver are Here Dealt With by W. J. DELANEY.

THERE are dozens of methods of joining the actual aerial system to a receiver, and although the majority of these are now well-known, the various advantages of individual systems are not often appreciated. The following notes may therefore be found very useful, especially to those constructors who are employing home-made coils, although in some cases improvements to commercial coils may be made. This must not be taken to infer that the commercial coil is inefficient, but that it is not being used to its best advantage. A coil may be designed by a manufacturer and answer readily to all the tests which the maker puts to it. It may, however, be purchased by a constructor who has to use it in a receiver delivering poor amplification, or who is situated in a bad locality, and thus advantages which would be obtained by a constructor in another situation will be lost. In many such cases the constructor blames the coil, whereas it is, in fact, the conditions which are to blame for the inferior results.

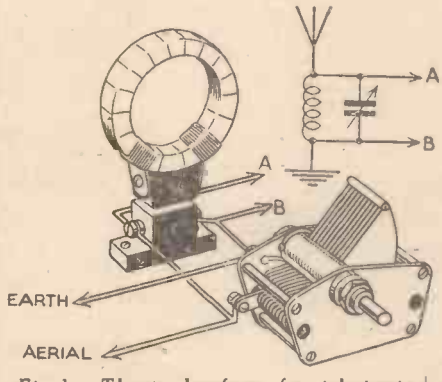


Fig. 1.—The simplest form of aerial circuit.

Standard Couplings

In its very simplest form, the aerial is joined to the first tuned circuit direct, as shown in Fig. 1. An arrangement of this nature is not of much use to-day owing to the lack of selectivity which is obtained by such a scheme. It will, however, if the coil is of efficient design, deliver the greatest signal strength across the points AB. To explain the function of this circuit in non-technical terms, it may be broadly stated that all signals arriving at the aerial pass down through the coil to earth. When the condenser is adjusted so that the coil and condenser (known as the oscillatory circuit) are tuned to the desired station, that frequency will be reproduced more strongly across AB, but naturally some of the other frequencies will also be heard as they are passing through the coil. That means to say, the desired station will be heard with a background of many other stations, static and other noises arriving on the aerial.

Improving Selectivity

To improve this circuit, it is necessary to cut out all other frequencies than the desired one, and this is the great difficulty underlying the design of the coil. As we have seen that all frequencies pass from the aerial to earth, it will be obvious that one way of eliminating all but the desired station would be to fit some sort of by-pass, and in Fig. 2 is what might be thought an obvious solution. A coil is joined between aerial and earth, but the tuned circuit of Fig. 1 is not separated from the aerial-earth system, and as the transference of energy from one circuit to another is greater when the two circuits are "in tune," it would seem that this is a solution to the difficulty. Actually however, if the two coils are close together, the effect will be very little better than the Fig. 1 arrangement, as a wide band of frequencies will be transferred. This may be limited by separating the coils, but as the coils are moved farther away from each other, so the amount of energy which is transferred is less, so that although the selectivity improves, the signal strength falls off. It is possible to obtain such a separation and balance in size between the coils that only the desired station will pass between the two, but then the signal strength will be so poor that the scheme would be useless.

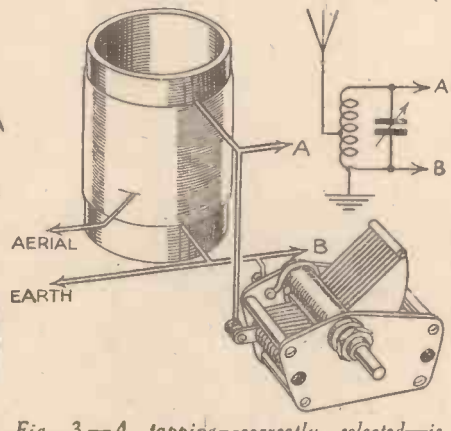


Fig. 3.—A tapping—correctly selected—is practically identical with a loose-coupled circuit.

A compromise has therefore to be adopted, and it has been found that when the coil is made of a certain size (dependent upon the general characteristics of the coil) and is spaced at a certain distance, the general effect is no better than tapping the coil at a certain distance from the earthed end, as shown in Fig. 3. Thus, it may be stated, without going into figures, that if the correct tapping

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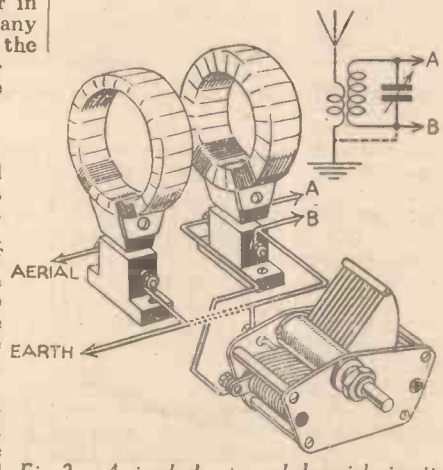


Fig. 2.—A simple loose-coupled aerial circuit.

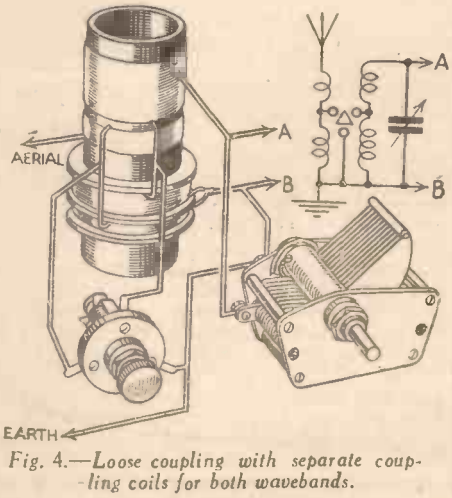


Fig. 4.—Loose coupling with separate coupling coils for both wavebands.

point is found in a circuit of this nature, the results are identical with the arrangement of Fig. 2, and a saving in wire is effected and a simpler construction is found.

Long-wave Complication

Unfortunately, it is necessary in this country to listen on two wave-bands, and this introduces a complication, as some form of switching has to be adopted. To utilise the separate coil scheme a three-point switch will be required, and the arrangement is shown in Fig. 4, whilst for the tapping scheme a single-pole change-over switch is necessary, as shown in Fig. 5. When correctly chosen, as in the case of a single circuit, the efficiency of the tapping point and the separate coil is practically identical.

Improving Existing Coils

In cases, therefore, when an existing receiver is failing to give satisfaction due to either inselectivity or lack of volume due to a too-selective aerial circuit, the method of improving things is obvious. Examine the coil and ascertain what type of aerial coupling is employed. If a separate coil is used, as in Fig. 2, it may be too large, too small, or too close to the grid coil. If inselectivity is the trouble, the coil is either too large or too close to the coil, and the improvement will consist in moving it away, if this can be carried out without upsetting the coil in any way, or stripping off a few turns. If a tapping point is employed, it may be shifted, and the new point selected by connecting the acrial lead, or the lead from the aerial terminal, to a needle and sticking this through the insulation covering the wire, moving it about until the best new position is found.

Where the long-wave switching can be ascertained the same remarks apply, and new aerial-coupling coils or tapping points may be adopted as above.

Variable Coupling

It may be found a good idea with some of the older types of large-diameter coil to adopt a coupling coil wound on a small former inserted inside the present former. This will enable the position of the aerial-coupling coil to be varied and the best position for normal requirements found, whilst still permitting a tightening of the coupling when desired. To retain the new coil former in position small wedges of wood may be cut to insert between the two formers.

Organising a Radio Society

ONE of the big advantages of a radio society is that members can be sure of meeting other amateurs at a definite place and time, thus avoiding invasions of each other's homes at odd and possibly inconvenient hours. Then, if the proper atmosphere exists in the society, the combined knowledge and experience of all the members is pooled and made available to each. The club is also a never-failing source of new knowledge and practical assistance, and provides the best possible outlet for that technical enthusiasm which is not always appreciated at its full worth at home.

Many societies go into recess from Easter until the autumn, but a large number keep their members together during the summer by means of occasional social functions, a direction-finding field day, or something of the kind, and here are some tips as to how to go about the business of forming a society and of running it when formed.

How to Start

The first thing to do is to rope in three or four friends who are interested, and enlist their co-operation in canvassing their friends, to the end that a tentative membership of at least twenty is secured. It is almost impossible to run a successful society, and make it self-supporting, without a round two dozen active members. On the other hand, a smaller organisation, which might be called a "radio group" can be made a very useful and pleasant affair with only a dozen members or so—but it would have to be run on very informal lines.

Having obtained a fair number of promises for membership, it is next advisable to call a public meeting at which the society can be formally inaugurated. Some notices—typewritten or hand printed, should be prepared, and distributed among friendly shopkeepers with a request that they be displayed in their shops. Do not omit the local radio and music shops, who will usually be only too pleased to assist in this way, for a radio society means set construction which, in turn, means sales of components and valves. Often the proprietor of the newspaper shop will oblige by delivering a copy of the notice with each copy of PRACTICAL AND AMATEUR WIRELESS he sells.

If the editor of the local paper is friendly, he may give you a short paragraph about the meeting—and don't forget to write to the Editor of PRACTICAL AND AMATEUR WIRELESS, who will always mention the proposition to form a society; but in this connection remember that the paper goes to press two weeks before publishing day, so give ample notice.

A mobile transmitter used by a radio society on a field day.

Where to Meet

The meeting should be held in a conveniently-situated hall—a school, church hall, or the like. Local conditions will guide you here. It will be perfectly in order for you, as the instigator of the scheme, to preside at the meeting, which should open with a few remarks concerning the need of such a society and the benefits which it would confer to members. At this point a vote should be taken as to whether a society should be formed, and it is a foregone conclusion that the motion will be carried.

In anticipation of this, you should have come prepared with a set of draft rules, which should be read one at a time and put to the meeting for discussion before being voted upon.

These rules should be neither numerous nor complicated, and should cover only the bare necessities for the initiation of the society. They can always be extended as time goes on. The main points to be covered are:

1. The name of the society.
2. Its objects.
3. That the society shall be bound by the rules, which can only be added to or altered by a General Meeting.
4. The various offices in the society should be listed and their duties defined.
5. The subscription should be fixed.
6. Times and places of meeting should be fixed.

There is sure to be some discussion on all these points — unless they are extremely well drafted—but eventually an approved set of rules will be decided upon. The only point upon which it is intended to dwell at present is the question of officers. The essential officers are a chairman, a general secretary, a treasurer and, of course, a committee. The chairman will, of course, preside at all meetings, including committee meetings. It might be as well to appoint also a deputy chairman or else arrange for a secretary to act as "Mr. Vice."

The secretary will, of course, keep the minute book containing a record of all meetings, make all detailed arrangements regarding the hall, and the society's business affairs generally, attend to all correspondence, and so forth. Actually, the general secretary is the hardest-worked officer in the society, and the success of the scheme largely depends upon his enthusiasm and efficiency.

(To be continued)

LEAVES FROM A SHORT-WAVE LOG

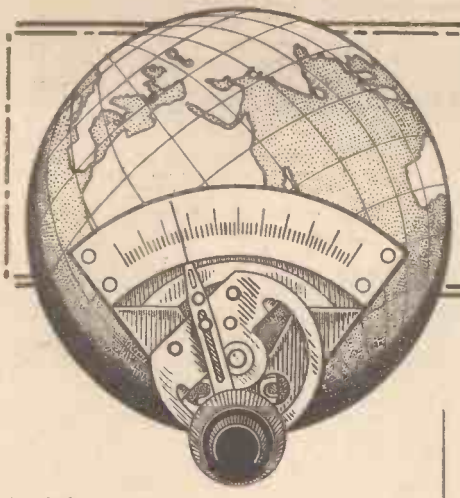
By J. G. ABRAHAMS

IN previous years the change over to Summer Time has usually spelt a reduction in the hours spent with the wireless receiver. This year, in view of the fact that the new season has opened with boisterous weather, the radio set has not been so quickly forsaken. Notwithstanding the period of the year the number of stations logged during the past week has been considerably greater than the figure shown in the log twelve months ago, and this, without doubt, is due to the fact, firstly, that since 1934 most of the transmitters have increased in power, and secondly, that there are many more stations to pick up. Personally, I have long ago come to the conclusion that it is impossible to turn to the short-wave set at any time of the day or night without finding something of interest, and this, as we all know, cannot be said for listeners who only possess a broadcast receiver.

During the past week the bag was a very rich one as, in view of the weather, many evenings were spent in searching the various bands. If any advice may be given, it is to make a note at the time of every station tuned in, with details of what has been heard, even if all the data cannot be completed at one sitting. Particulars registered in the log are invaluable when on a future occasion the same transmission is found, and when such an opportunity arises, with the information already in hand there is never any difficulty in identifying the origin of the signal. Moreover, in most instances, it will be found that some information is given regarding either a change of wavelength or an alteration in the schedule of the broadcasts. At this period of the year all stations retime their transmissions and usually stick to these schedules until the end of the summer.

There are two new South Americans reported to be on the air, one of which, the former, has been picked up by several listeners over the last few days. Here they are: HJ4GA, Medellin (Colombia), on 25.61 metres (11,710 kc/s) and HP5J, Panama City (Republic of Panama), 31.28 metres (9,590 kc/s). It would appear to be a new station, not to be confused with HP5B, Panama, on 49.75 metres (6,030 kc/s) and to which reference has often been made in these columns. Immediately above a batch of commercial channels, you should try for COH, Havana (Cuba), on 31.8 metres (9,428 kc/s); although on most nights it broadcasts its own programmes, occasionally it relays CMCY, Havana. The time to listen is between B.S.T. 23.00 and 03.00. In the announcements (Spanish and English) references are frequently made to the General Electric Company and to the Cuban National Lottery. The interval signal consists of chimes, and the hours are marked by the striking of a clock somewhat reminiscent of Big Ben.

For a search, a good jumping-off point is PRF5, Rio de Janeiro, on 31.58 metres (9,500 kc/s). Work up slowly, passing the Rocky Point and other commercials, and you should strike COH, just below PLV, Bandoeng (31.86 metres), whose morse signals may sometimes interfere. Your limit of search should be HAT4, Szekesfehervar (Hungary), on 32.88 metres (9,125 kc/s), which possibly you have already logged.



SHORT WAVE SECTION

At the Short-waver's Bench—3

Several Useful Hints for the Experimenter are Given in This Article

Aerials

AS the outside of my house is in the hands of painters, my short-wave aerial has had to be temporarily abandoned, and I am at present using about a dozen feet of flex across the room as an aerial. The result has not been a sudden cessation of signals; on the contrary, all the same stations still come in, but at slightly reduced strength. An advantage that has been found is that morse stations are not nearly so troublesome, and searching is greatly simplified. A tip for those troubled by morse is, therefore—try a reduction in the size of the aerial.

Short-wave Selectivity

Contrary to the popular idea, there is a very definite need for selectivity on the higher frequencies, and for this reason, among others, the *tuned* H.F. amplifier is becoming more popular as opposed to that using an H.F. choke in the grid circuit of the H.F. amplifying valve. Some readers may like to try the experiment of adding an additional tuned circuit to the ordinary detector-L.F. set, and three of the circuits which would be the most useful in this respect are given in Nos. 1, 2 and 3. The main point with which to experiment concerns the reaction winding, and it is suggested that the following ways of coupling the coil be tried out:—

(i) Reaction fed into second tuned circuit as is normal.
(ii) The winding split and reaction fed thus into each circuit.
(iii) A reaction coil coupled to the first, *i.e.*, the aerial coil, circuit.
(iv) The aperiodic winding which is used for the coupling between the circuits in Fig. 7 may also be tried as a reaction winding.

These variations should provide some extremely interesting results and also provide considerably increased selectivity.

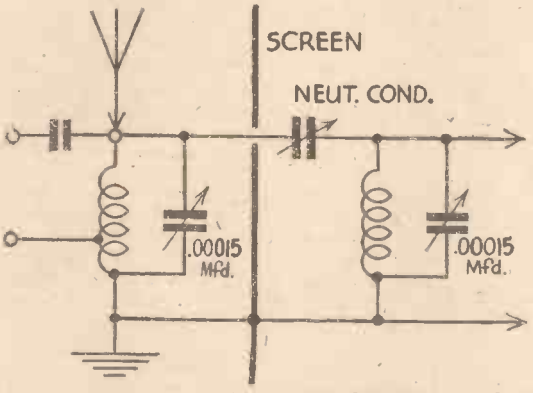


Fig. 1.—One method of adding a tuned circuit to a detector L.F. set.

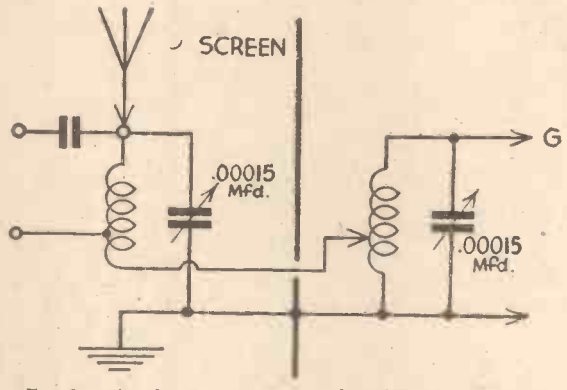


Fig. 2.—An alternative circuit to that shown in Fig. 1.

Volume Control Circuits for Short-wavers

In other than super-het circuits I do not think the variable-mu system of volume control is to be recommended. The reason is simple, in that the amount of amplification given by the H.F. amplifying valve of a short-wave set is already so small that we cannot afford to reduce it even for volume-control purposes. The best form of short-wave control is one on the L.F. side of the set, and this may take one of the forms shown in Figs. 4, 5 and 6. The first and second are not so good as the third one, as the former two tend to cut the "top" as well as reduce the volume. The third form of control reduces the bass, rather than the top, and is thus the most preferable for short-wave work.

A novel use for a class-B valve

A very excellent two-valve headphone set can be made using only one valve! A somewhat surprising statement which, however, is clarified when we mention that the valve used is of the class-B type. As most readers know, a valve of this type actually consists of two high-impedance triodes in one glass envelope, and the circuit used in this "one-valve two" is shown in Fig. 7. Resistance-coupling is used as, for a receiver using 'phones, it gives

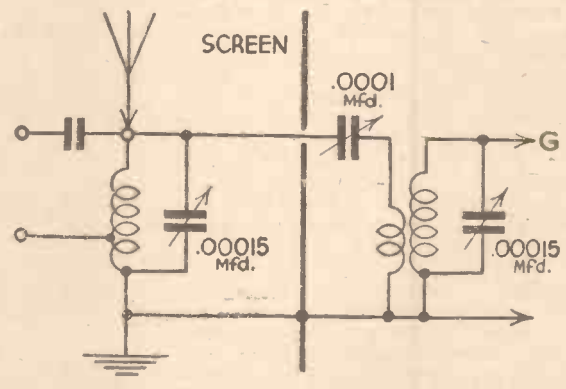
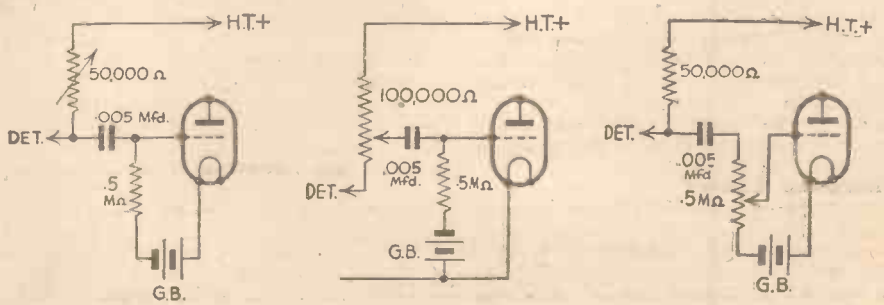


Fig. 3.—In the arrangement shown here a separate winding is used as a coupling between the two tuned circuits.



Figs. 4, 5 and 6.—These circuits illustrate three different forms of L.F. volume control. All are referred to in the text.

sufficient amplification to be of use, with but small background noise.

With the addition of an H.F. stage such a set would become a very powerful two-valver.

Simply-made Low-loss Components

There is no doubt that "low-loss" still is of great help on the higher frequency bands, and a "hotted-up" set of all low-loss design proves itself a highly efficient instrument. Points to watch in this respect are the aerial coupling condenser and the grid condenser. Both of these components

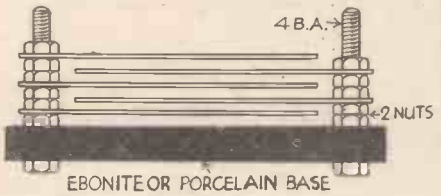


Fig. 8.—Showing how efficient air dielectric fixed condensers can be made for use in the grid and aerial circuits.

may often help towards improved results if their dielectric is air, and such condensers are very simply made, as shown in Fig. 8. With a few pieces of thin sheet aluminium, some four B.A. studding and nuts, components of suitable value for both these positions are easily assembled. Two plates about 2ins. by 1in. interleaved with two other plates of similar size should be right for the aerial condenser, whilst three of each, of the same size, should be of suitable value for the grid condenser. It is useless making such low-loss condensers if the material upon which they are mounted is of poor quality, causing leakages. This should be of the best ebonite or porcelain, and as narrow as possible.

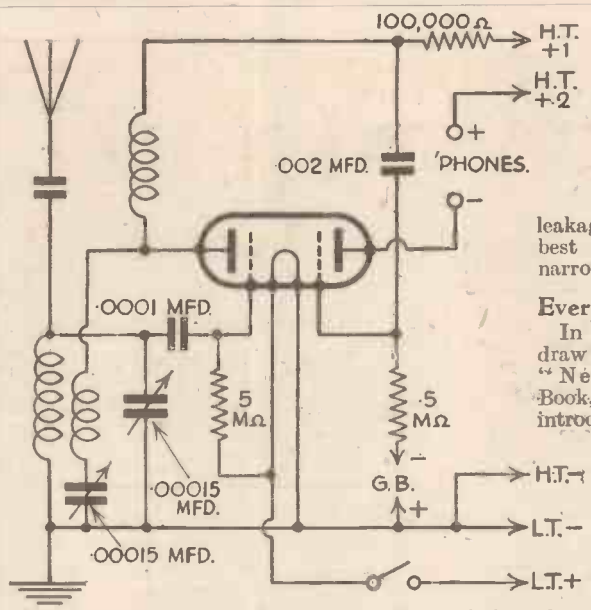


Fig. 7.—An uncommon, but interesting circuit in which a class B valve is used for detection and L.F.

Everyman's Wireless Book

In conclusion, I should like to draw the readers' attention to "Newnes Everyman's Wireless Book," which contains a useful introduction to the subject of short waves and contains also valuable information on circuit arrangements, tracing faults, and the principles of wireless generally. It is a handy supplementary volume to the famous "Wireless Constructors' Encyclopædia," many thousands of copies of which have been sent to every country in the world. Both of these books can be obtained from the Publishers of PRACTICAL AND AMATEUR WIRELESS for 5s. 6d. by post.

Technical Topics

In This Article the Author Gives Several Useful Hints for the Short-wave Constructor

THERE are many amateurs who, although keenly interested in short-wave technique, are not actively engaged in short-wave constructional work and receiver operation. Probably, they imagine that extensive technical knowledge, tuning skill, and trouble-tracking abilities are necessary in order to obtain satisfactory results.

These ideas are, of course, erroneous, because a carefully-built receiver will prove to be both reliable and efficient. Short-wave and broadcast receivers respectively have much in common fundamentally. Differences there are, of course, all of which are most desirable and necessary, taking into account the exacting requirements of high-frequency reception.

Troubles Easily Overcome

The troubles associated with short-wave receivers are few and may be overcome. A little common-sense reasoning and experiment usually proves that things are not so bad as they at first appeared to be. Short-wave receiver troubles may be listed as follows:—

Body capacity effects.
Dead spots in tuning.
Lack of sensitivity.
Threshold howl.

Body capacity effects are not so prevalent nowadays, owing to improved mechanical and electrical methods of construction, and the use of specially designed low-loss components. Chassis construction and under chassis wiring are undoubtedly most suitable to short-wave requirements.

Metallised Chassis

The foil-lined and metallised wooden chassis are deservedly popular; many constructors think, however, that when this form of chassis is used a metal panel or back screen is unnecessary. In a well-tried and efficiently-designed receiver this is sometimes correct, but not always.

In order to cut down expenses, metal shielded slow-motion dials are used, the screen or shield being earthed. Whilst this type is highly satisfactory, other things being equal, it should not be forgotten that when the lay-out is bad, the hands of the operator near the dials, even with screens earthed, will produce instability and very bad B.C. effects, which can only be minimised by unearthing the dial screens. Interaction between magnetic fields due to faulty lay-out and wiring are, of course, the basis of the trouble.

The most satisfactory procedure is to use a screened chassis, panel, and cabinet. Screened dials may then be earthed to the panel; the moving vanes and frames of the tuning condensers, if of metal frame construction, will be automatically at earth potential when mounted directly to the metal panel, and the latter earthed to the foil at two widely separated points in order to take full advantage of potential differences.

The metal or foil-lined cabinet is a disadvantage unless properly and completely earthed. The most satisfactory method to assure this is to make four or more copper angle pieces about a half-inch wide and fasten them to chassis, cabinet, and panel by means of 6 B.A. bolts.

Coil Construction

Short-wave coil construction is within the capabilities of the average constructor. There is, however, a vast difference between constructing and designing a set of coils, and the home constructor is advised to copy as accurately as possible coil data available or to use commercial products.

The number of turns, spacing of turns, distance between windings and gauge of wire used are most important factors, which do not appear to be realised to the extent they should be. In some instances, the opinion seems to be that formers of larger or smaller dimensions may be used with more or less turns, and different spacing between turns and complete windings and other variations will make absolutely no difference whatsoever. Practical tests, however, remove any doubts, and drastically adjust wrong ideas.

Reaction Effects

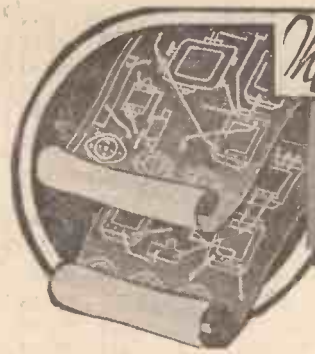
Sometimes, when testing out a new receiver, reaction is fierce. After slacking back the reaction to zero code signals are heard. The reason is, of course, that at the zero dial reading zero reaction effect is not in evidence, and the detector valve is still in oscillation due to excessive plate voltage.

H.T. voltage to the detector plate should be reduced. It is not unknown for inexperienced short-wave constructors to remove reaction turns and ruin a set of commercial coils, finding later that reaction is still fierce or has entirely ceased, according to the number of turns removed. A higher capacity reaction condenser is sometimes fitted, and patchy reaction or one big dead spot results.

Sometimes reaction turns are increased and oscillation is damped entirely, especially within the fundamental and harmonic tuning ranges of the aerial system, individual coils, and tuned circuits.

Dead Spots

Thus we move from instability and parasitic oscillation effects to dead spots. Dead spots may be cured if the fundamental phenomena relative to them are understood Briefly, dead spots are due to absorption or cancellation, and may be experienced with straight, high-frequency, and superheterodyne circuits. In the latter instance both absorption and cancellation types may be met with, but in straight circuits the absorption type is most common. What is the difference between absorption and cancellation dead spots? This point will be dealt with in a later article



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Three-valvers: Blueprints, 1s. each.

World-ranger Short-wave 3 (D, R.C, Trans)	Out of print	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-waver	*Jan.* 19, '35	AW463
Short-wave Adapter	*Dec.* 1, '34	AW456
Superhet. Converter	*Dec.* 1, '34	AW457

Four-valvers: Blueprints, 1s. 6d. each.

"A.W." Short-wave World Beater (HF Pen, D, RC, Trans)	2.6.34	AW436
Empire Short-waver (SG, D, RC, Trans)	*Mar.* '33	WM318

Mains Operated.

Two-valvers: Blueprints, 1s. each.

Two-valve Mains Short-waver (D, Pen) A.C.	10.11.34	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	*Aug.* '34	WM368
"W.M." Long-wave Converter	*Jan.* '35	WM380

Three-valvers: Blueprints, 1s. each.

Emigrator (SG, D, Pen), A.C.	Out of print	WM352

Four-valvers: Blueprints, 1s. 6d. each.

Gold Coaster (SG, D, RC, Trans) A.C.	*Aug.* '32	WM292
Trickle Charger	*Jan.* 5'35	AW462

Facts & Figures

COMPONENTS TESTED IN OUR LABORATORY

Bennett Television Equipment

ACCESSORIES for the construction of efficient television apparatus are illustrated below, and these are products of the Bennett Television Company. The viewing tunnel, shown in the centre of the group, is a sturdily-constructed piece of apparatus, utilising multi-ply board for the central unit and having a tunnel of stout metal finished in a matt surface, thus excluding all reflections and preventing difficulties arising from light rays striking the lens. Stout metal standards are affixed to the base of the apparatus to enable it to be mounted firmly. On the right of the group may be seen the simple lens-mounting device, wherein the bi-convex non-distorting lens is held firmly, but may be removed in an instant if desired for cleaning purposes. To enable a suitable motor to be mounted with speed control resistance, etc., the stout bracket on the left of the group is supplied by the same company, and these pieces of apparatus are supplied as a complete kit for those who wish to obtain all Bennett parts. The Single-lens Viewing Tunnel retails at 10s. complete with a 4in. bi-convex non-distorting lens, and the complete kit—including the tunnel—costs 70s. In addition, an interesting handbook is obtainable from the company for 1s. and will prove valuable to those who wish to take up this new branch of radio.

Items from the Bennett Television kit which is reviewed above.

Another Mullard Valve Modification

WE are interested to learn that Mullard have recently modified their A.C.044 triode output valve. The characteristics remain unaltered, but the electrode assembly has been further strengthened, and the electrodes are firmly held in position by a mica spacer fitting inside the new domed bulb with which the A.C.044 will in future be supplied.

One important result of the change in design is that the dimensions of this valve have been appreciably reduced—from 164 x 67 mm. to 150 x 50 mm.—which means a saving in the overall height of just over half an inch.

Our readers hardly need to be reminded that the A.C.044 is a triode output valve having a maximum anode dissipation of 12 watts. The heater rating is 4 volts at 1 amp. with a maximum H.T. of 250 volts. Under normal conditions the anode current is of the order of 48 m/A with G.B of 29 volts. The A.C. power output is 2.7 watts and the optimum load 2,500 ohms. It is, of course, fitted with the standard four-pin base, and the price is 16s. 6d.

Telestat Cable

A FURTHER interference-eliminating device has been received from Messrs. Ward and Goldstone, who, as already reported in these pages, now have a most exhaustive range of apparatus designed for use with broadcast and short-wave receivers for the elimination of interference arising from man-made static. The new device consists of twin cable, in outward appearance resembling the ordinary heavy single wire cable used for house-wiring and similar purposes, but internally it employs two single wires, each separately insulated, and passing down separate channels in the rubber covering. When using doublet, di-pole and other similar types of short-wave aerial systems it is necessary to use a twin feeder to the receiver, and this cable will be found ideal for the purpose. The cable costs 6d. per yard and will be found very efficient for the purpose for which it is designed.

Measuring Instruments

NO experimenter can conduct tests, etc., without the use of a measuring instrument, and in these days there is no excuse for not possessing a really good instrument. Although the amateur can construct a multi-purpose meter with the aid of a simple low-reading milliammeter, there are a number of instruments which cannot be so constructed, or which are better obtained in a ready-made form in view of the accuracy which is desired in that type of instrument. Electradix Radio (Leslie Dixon and Co.) have a most exhaustive range of measuring instruments of all types, including micro-ammeters, battery-capacity indicators, voltmeters, milliammeters, etc. Prices range from 5s. 6d. up to £5 and more, and from this wide selection it is possible to choose a meter for practically any purpose. Readers who are interested should write to the above-mentioned company for a copy of the leaflets, Specification No. 102 (moving-coil instruments) or Specification No. 103 (moving-iron instruments).

Epoch Loud-speakers

AMONGST the range of speakers manufactured by the Radio Development company, the 20C Alni models are of particular interest. In the past, where ordinary cobalt magnets have been fitted, if a good flux density was to be obtained a magnet of somewhat large proportions was necessary. The magnets used in these models, however, are of special composition, and it is possible to introduce a magnet of very small physical dimensions with a high flux density. Furthermore, a more permanent magnet is obtained, and it becomes possible to construct really small speakers highly suitable for use in portable equipment, without loss of efficiency. The Epoch range includes the famous Domino (energised) model which handles up to 10 watts and is provided with a 10in. interchangeable diaphragm. This costs £9 5s. for the A.C.-D.C. model, and at the other end of the scale will be found the S.D. model ("Super Dwarf"), costing £1 3s. 6d.

New T.C.C. High-voltage Condensers

THE increasing use of high-voltage apparatus, such as is called for in cathode-ray apparatus and public-address amplifiers, has called for improved insulation and reliability in certain types of condenser, and the Telegraph Condenser Company have now developed some condensers in which the dielectric comprises multiple windings of pure linen rag condenser tissue, impregnated in petroleum jelly, which is a great improvement on the ordinary wax impregnation. The jelly offers similar advantages electrically to oil, but the use of jelly removes the possibility of leakage and "creeping," as no free liquid is used. The condensers are filled with a specially-prepared mixture, the basis of which is also jelly, to allow satisfactory working under tropical conditions, temperatures up to 140 degrees F. being permissible. The metal case is hermetically sealed on all sides and the terminals are a specially designed moulded bush pattern. Type 111 is of the 1,000-volt D.C. working pattern, and Type 121B is of the 1,500-volt D.C. working pattern, and the condensers are non-inductive and available in capacities from 0.5 mfd. to 10 mfds.

An Epoch Speaker with the new "Alni" magnet.

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.)

One-valve S.W. Set

SIR,—I am interested in Mr. Stephen J. Keen's One-valve S.W. Set, and shall be obliged if you can give me particulars regarding the cost—complete with 'phones and batteries, etc.—and instructions for building it. I wish to say I have no knowledge whatever of radio, though I have been a regular reader of your paper for over ten months.—E. C. OOI (Taiping, Federated Malay States).

[*Perhaps Mr. Keen will get into touch direct with Mr. E. C. Ooi, c/o The Ayer Kuning Rubber Estate, Taiping, Federated Malay States.*—ED.]

A D.C. "All-wave Silver Souvenir"!

SIR,—Noticing your last sentence on page 119 of the April 13th issue of PRACTICAL AND AMATEUR WIRELESS, since I am still on D.C., I am naturally interested. I have previously understood that the D.C. demand is too small to justify publishing a design—might it then be possible to so adapt your A.C. set as it is, or otherwise make it as a universal set?—E. KEMP (Worthing).

A.C. and Universal "All-wave Silver Souvenir"

SIR,—I, along with several other members of the club to which I belong, wish to thank you for your excellent new receiver, the "Silver Souvenir," but we are not building same as we are waiting for the A.C. and universal model. This is what thousands of constructors have been waiting for, and we all think it will be one of the biggest hits for many years.

Might we add a suggestion that when you have given us the A.C. and universal model, you also give us a push-pull circuit, the same as with the universal Hall-Mark Four with an output of four watts.—E. F. A. (Parsons Green.)

An amateur transmitting station, G5LC, operated by Mr. Leslie Cooper, of East Molesey, Surrey.

A Reader's S.W. Transmitting Station

SIR,—I enclose a photograph (reproduced on this page) of my short-wave transmitting station, which may prove of interest to a number of your readers.

The transmitter in the centre is a crystal oscillator—neutralised buffer amplifier and locked T.p.T.g. rig for 20 and 40 metres, using a 7,168 kc/s crystal. In the foreground is the microphone and amplifier, with the modulator for the series modulation system. The transmitter on the left is for 80 and 160 metres, using a pentode crystal oscillator and power amplifier, the crystal frequency being 1,773 kc/s. The power supply is switched from one transmitter to the other, and gives 50 watts for C.W. and 12 watts input for telephony.

The station holds the "Worked All Continents" and "Worked the British Empire" Certificates.

Fifty-two countries have been worked, and the station is licensed for every band granted to British amateurs.—LESLIE COOPER, G5LC (East Molesey, Surrey).

Four-valve "Straight" Set

SIR,—I think quite a large number of your readers would welcome the suggestion put forward by Ernest F. West, published in your issue of April 13th for a straight set, 1 H.F., det., 1 L.F. and power output, mounted on a flat baseboard. Such a design would be useful not only for building as a new set, but also for modernising old sets, especially if it included iron-cored coils and ganged condensers.—MR. G. BRIDGER (Brighton).

"Trade Apathy"

SIR,—The experience of one of your Edinburgh correspondents, related by Thermion, in the April 13th issue, does not coincide with my own personal knowledge of the dealers of that city. To test the accuracy of his statement I got a friend in Edinburgh to pay a visit to three wireless shops which I named—two of the three were able to supply the article in question!

Regarding his assertion that the assistants in the wireless shops in Edinburgh had a low standard of technical knowledge, I think I can assert that their standard is at any rate comparable with that of any other city. In fact a very large percentage of them have commenced to study wireless engineering in a systematic manner.

I do not dispute the very low standard of technical knowledge displayed in wireless shops throughout the country in general, but I do maintain that it is wrong to level the accusation in particular against Edinburgh dealers.—ALFRED T. FLEMING (London, S.W.).

From a Reader in Nigeria

DEAR "THERMION,"—I would like to heartily applaud your remarks on dance bands in the issue of March 9th last, as I am always driven into a frenzy of rage when I hear their idiotic signature tunes, crooners, lyrics, etc. For some reason, although some of the tunes are quite good as tunes, the bands do not seem to be able to get any life into them, and I have often noticed that when Continental bands play the same tunes they manage to get more "go" into the tune. I am no musician so am unable to explain what I mean, but the effect is very noticeable.

In your article you praise the colour code scheme for resistances, but personally I consider this one of the most damnable schemes ever conceived. What can be simpler than a plain set of figures stamped on the body of the resistance?

You may be interested in a curious experience which I have had with a battery catkin detector, a triode. The valve has only been in use for two months and has received good treatment, but has recently taken to causing very bad crackling and even refusing to function. On switching off and then immediately switching on again, the trouble appears to be cured. Another trick it has is to suddenly cut right out without the least warning, and if I bring my hand within a few inches of the panel it starts working again. The set is a 4-valve superhet short-waver, and I have definitely established that it is the detector which is at fault by replacing it with another detector.

I have had the above set for about three years and am very satisfied with it, as I can get worth-while entertainment from it at almost any hour of the day or night. I always smile when the old question "Are short waves good entertainment?" crops up.

Finally, I would like to say that I find your page easily the most interesting in the paper, and hope that you will long continue to give us such pleasant reading.—C. L. WILLIAMS (Gusau, N. Nigeria).

CUT THIS OUT EACH WEEK

Do you know

—THAT an interference-eliminator impedance-matching aerial system has now been perfected for use on all wavebands down to the very short wavelengths, without switching.

—THAT the resistance of the normal grid circuits of valves in mains receivers should be kept as low as possible in order to avoid hum troubles.

—THAT the output from two valves in push-pull is greater than double that of each single valve.

—THAT when mixed couplings are used in L.F. amplifiers, the better coupling should always be placed in the early stages.

—THAT a tapped choke may be used in a pentode anode circuit for loud-speaker matching purposes.

—THAT wire-wound resistors may be made non-inductive by doubling the wire and winding as one so that the current flows both ways and thus neutralises the inductive effect.

—THAT in some cases existing resistors may be converted into non-inductive components by cutting the wire at the centre and connecting the two sections in opposition.

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

IMPRESSIONS ON THE WAX

By T. Onearm

COLUMBIA has certainly shown considerable enterprise by its prompt issue of interesting records in celebration of the King's Silver Jubilee, for there are four new ones this month following the delightful "Scrapbook" record of last month, with its historic characterisation of the year when our King came to the throne.

It is fitting that a Jubilee record should trace for us part of the musical history of the King's reign, and Columbia provide us with a happy and tuneful survey of the twenty-six musical comedies of the years 1910 to 1935, on *Columbia DX*679-80. The tunes range from "Come to the Ball" (from "The Quaker Girl") to "I'm on a See-Saw" (from "Jill, Darling") and are played with capital continuity by Geraldo and his Orchestra, supported by Miss Natalie Hall and Monte Rey in the vocal refrains.

An "Empire Pageant" by Debroy Somers and his Band, on *Columbia DX*681, is virtually an Empire Cavalcade in tune and song. The record opens with "Here's a Health unto His Majesty!" then, after the airs of the British Isles, we go on to Canada and India; indeed, we are taken right round our far-flung Empire, with melodies expressive of each country and its national character.

"The Songs that Live for Ever"

One of the best of new recording artists is introduced in the person of Lance Fairfax, on Columbia this month.

He has been signed up to record exclusively for Columbia, and for his first record, just issued, he has sung "For Love Alone," together with a group of well-known ballads collected under the title of "The Songs that Live for Ever." The number of this record is *Columbia DB*1523.

"How the First Song was Born" and "The Moon was Yellow" is Turner Layton's latest solo record—*Columbia DB* 1526. His famous partner, Johnstone, joins him on another record in two popular tunes—"I've Got an Invitation to a Dance" and "The Object of my Affection" —*Columbia DB*1527.

Orchestre Raymonde Gems

The Orchestre Raymonde has established a place for itself both on records and on the air, and they give a superb performance this month of Suk's "Chanson d'Amour" and Eric Coates' "By the Sleepy Lagoon," on *Columbia DB*1519. These little gems will increase the already high prestige of the clever Orchestre Raymonde.

The astonishing realism so markedly noticcable in recent Columbia piano records is again to be heard in a remarkably fine performance of Miss Ania Dorfmann in Scarlatti's "Pastorale and Capriccio" and Mendelssohn's "Songs Without Words," No. 5 in F sharp minor on *Columbia DB*1517. The "Pastorale and Capriccio" is a splendid example of the three hundred or so works which Domenico Scarlatti wrote for the harpsichord. Even on the piano the delicacy and sweetness of the harpsichord composition are maintained. The recording is a supreme example of Columbia's advanced methods in this department.

A New Recording

Berlioz's "Symphonie Fantastique" was among the earliest electric recordings, and for so peculiarly scored a work it was felt that a modern recording, with its mastery over problems that were then insurmountable, would be well received. So Columbia issue this month a brand new one that occupies six 12-inch records, and which, incidentally, is played by France's famous Orchestre Symphonie in an authentic interpretation as Berlioz intended. A free album and a descriptive leaflet are given with the six records.

Columbia are providing admirers of the late Peter Warlock's songs with ideal interpretations by Parry Jones. "The Fox" and "Sleep" on *Columbia DB*1521 form the third record by Warlock's acknowledged exponent.

Following his sensational success with his mouth organ in Ravel's "Bolero," Larry Adler essays an even more difficult task. The weird "Fire Dance" from Manuel de Falla's ballet "Love the Magician," is the last thing on earth one would expect to hear on a mouth organ, simply because one cannot imagine this fascinating barbaric tune—with its tricky harmonics—ever being performed on a mouth organ at all. There is no trickery, every bit of the melody is there in its instrumental colours, the imitation of the orchestral parts being extremely good. He plays "Caprice Viennois," by Kreisler, on the other side—*Columbia DB*1522.

REPLIES IN BRIEF

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

C. D. W. (Catford). Would suggest careful checking of wiring, especially of the coils. The set is obviously unstable, and from your remarks concerning tuning is not working on both wavebands.

H. W. S. (Bournemouth). The use of the condenser in question would make no difference to the output. What reason have you in mind for using the condenser?

B. E. H. (Hants). Regret cannot supply transmitting details. You must have licence for this, and if you do not possess sufficient knowledge to erect receiver you will be unable to obtain licence.

E. A. L. (Catterick). The All Pentode Three did not employ a transformer, but an auto-transformer capable of various ratios according to the method of connection.

S. A. R. (Kilburn).—We regret the only details we have of a one-valve portable on the lines you set out is the Wrinkle given on page 40 of our issue dated March 31st, 1934. This used the 4 G.B. batteries in series for H.T.

B. McG. (Cumberland). It is not our practice to give editorial comments until specimens have been submitted for test. We have been unable to obtain samples from the manufacturers, and regret, therefore, that we cannot test the new tuning coil to which you refer until such a sample has been submitted.

T. H. (Newcastle). We think the coil in question could be used in the manner outlined by you, but would suggest that you communicate with the manufacturers to confirm the fact.

A. E. McL. (Hendon).—Regret cannot give you the data you ask for. We do not know the connections of the commercial receiver, nor do we recognise the reference number of the Ekco eliminator you give.

L. A. (Haverfordwest). As you are not using the specified coils you may have mistaken the connections, and we can only advise you to check the circuit carefully, using the coil makers' diagram sheets in conjunction with the published circuit of the Fury Four. Back numbers cost 4½d. post free from this office.

J. E. J. (Southampton). We cannot quite grasp your idea. Ordinary push-pull does not require a driver, and a Class B output transformer or choke would not be of low impedance. The make-up of the driver type of transformer is not the same as a straight push-pull transformer. Do you want ordinary push-pull, or Class B?

T. H. (Oldham). You will probably find it worth while to short-circuit the series-aerial condenser on long waves. Your coil may not be suitable for this particular receiver.

H. P. (Sutton). Connections in question are: 8 to grid condenser and tuning condenser; aerial to 1 or 2; switch contacts to 3, 4 and earth; 2 to earth; 6 and 7 to reaction condenser and anode, or reaction condenser and earth.

R. G. D. (S.E.14). Obviously some intermittent break is present, but as it is a commercial receiver we would advise you to take it to a service agent or back to the makers.

H. G. (Earlswood). Cannot give definite advice without circuit details. Suggest you follow the scheme outlined in AC/DC Two, using the same heater wiring. This is probably your trouble.

J. C. (Plymouth). We regret there is no book on volume. We would suggest you read the various articles on the subject which have appeared in our pages.

G. R. B. (Colchester). Would suggest you study the recent article on pick-up and instability. If the circuits are not accurately ganged, you will hear stations at two or more places on the dial.

H. P. T. (Hucknall). You must not carry out any transmitting experiments until you hold the necessary licence. Read the article on the subject in the Beginners' Supplement last week.

J. F. (Orumsna). Ordinary battery-receiver faults may be traced with a cheap meter, but it always pays to obtain a good instrument, as it would then be useful on a mains receiver or with a mains H.T. battery eliminator. The firm in question supply all the necessary parts for making the H.T. battery. We do not advise any departure from the published specification.

E. S. (S.E.16). We regret we have no blue prints of public address amplifiers. Messrs. Leslie Dixon, of Upper Thames Street, can supply various types of microphone.

A. W. B. (Swindon). A frame aerial is used instead of a tuning coil and we would therefore recommend an indoor type of aerial. Can you run a wire inside the roof, round a room or along a passage? Try experiments with each type, regarding length, bends, etc., in order to find the most suitable. In general, no twists or bends should be made unless absolutely unavoidable.

H. H. (Dalston Lane). Obviously trouble is due to mains unit, but may arise from incorrect value of H.T. on the detector valve.

S. E. (Newton). Your trouble is probably due to the fact that you are unused to the pentode tone. Use a tone corrector circuit across the loud-speaker. A .01 condenser in series with a 10,000 ohm resistance joined across the L.S. terminals will probably be useful.

R. K. (Dewsbury). You may not be able to use the speaker as it is necessary to energise the field, and as this has a resistance of 2,500 ohms there will be a considerable voltage drop. A circuit diagram or details will be necessary before we can advise definitely.

H. V. T. (Chingford). Obviously there is some serious fault in the receiver, but we cannot diagnose it until you have experimented a little more and endeavoured to trace the trouble. A meter will probably be useful in tracing the fact that the valves are in order, but careful checking of the wiring will be necessary for the coils. Write us again if you cannot get any signals.

L. C. E. (Abertillery). Unit should be quite suitable for your set, without alteration.

J. P. (Hanwell). The only improvement to the circuit would be to use a pentode valve in the output stage. You would, however, have to guard against overloading this valve on the local. A better arrangement would be to rewire the circuit to use an H.F. stage.

O. D. (Rotherham). You will not damage your valve with the voltages you mention. The values are correct, but the best is not being obtained from the set and more H.T. and G.B. should be applied if possible. This will give louder signals and much better quality.

N. P. (Thornton Heath). It is not possible to give the details you ask for, without knowing the size of the former, tuning capacity, etc. A set of coils could be made to cover any wave-band, and for a range from 10 metres, a former of 1in. would be most suitable.

W. P. (Chatham). Regret we have never heard of the valve you mention.

K. G. B. (Folkestone). The "Wireless Constructor's Encyclopædia" deals with all the points you mention, there is no other book which explains them all.

R. H. (Hertford). The A.C. Fury Four is the nearest receiver which uses the parts you set out, but it does not employ all of them, and certain additional parts would be required.

G. T. E. (Hove). From your remarks the circuit is not functioning, and the A.V.C. arrangements should be carefully checked.

E. K. (Clontarf). Your circuit is not functioning correctly, and wrong values of voltage are in use in the H.F. stages. Cannot give further details without a diagram and values, etc. The whistle is in order, as the H.T. is at maximum until the valves are fully heated. A delay-switch would avoid the difficulty, although when correctly wired you should not experience this trouble.

C. C. 1590. Write to the stations which you receive, and they will generally send verification. Addresses may be obtained from the "Amateur Call Book," which costs 6s. from F. L. Postlethwaite, 41, Kinfauns Road, Goodmayes, Essex.

S. W. (Kingston). Would suggest that H.T. applied to the detector is too high, or H.F. choke is defective. Examine both points.

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.

WHITSTABLE SHORT-WAVE CLUB

WILL any readers in Whitstable, Tankerton, and District who are interested in short and ultra-short-wave work, and are desirous of helping the existing small band of members in the district to make a success of the club, please communicate with the secretary, W. Crosland, "Griz-Nez," Queens Road, Tankerton, Kent?

THE RADIO, PHYSICAL, AND TELEVISION SOCIETY

AT the meeting of this society held at 72a, North End Road, West Kensington, on Friday April 12th, a Lantern Lecture on "The Romance of the Post Office" was given by Mr. E. G. Nurse. The lecturer described how the Post Office had gradually evolved itself from the various private letter-carrying concerns which had existed since the beginning of the Roman Empire. Slides were shown of modern travelling Post Offices which contrasted strangely with the old mail coaches.

Also, there were slides dealing with the Radio and Telegraph section of the G.P.O. Among these slides were pictures of the station at Rugby which, the lecturer said, cost £500,000 to build. The experimental research station at Dollis Hill was the subject of several further slides.—M. T. Arnold, Assistant Hon. Sec., 12, Nassau Rd., Barnes, S.W.13.

SHORT-WAVE CLUB FOR STRATHAVEN

IT is the intention of a few enthusiastic short-wave fans to form a short-wave club in the Strathaven district, and interested readers residing in the locality are invited to get in touch with Mr. Wm. L. Howat, 11, Kirkland Park Avenue, Strathaven, Lanarkshire.

INTERNATIONAL DX'ERS ALLIANCE

THE April meeting of the London Chapter of the International DX'ers Alliance was held on Tuesday, April 16th, at the Chequers Restaurant, Essex Street, Strand. This month, by courtesy of the Post Office, visits have been paid to the International Telephone Exchange at Faraday House, and to the Post Office Research Station at Dollis Hill. Future visits include the Battersea Power Station on May 17th and the Post Office Radio Research Station on May 27th. Any reader who would care to accompany us on either of these visits should get into touch with Mr. H. M. Blaber, 9, Stanton Road, London, S.W.20.

A short-wave contest commenced on May 1st, the medium-wave contest finishing next August. A component exchange club has recently been formed, and should prove very popular. The next meeting of the chapter, to which readers are cordially invited, will be held at the Chequers Restaurant on Tuesday, May 21st, at 8 p.m.—Arnold G. Ward, Publicity Manager, 59, Balaam Street, Plaistow, E.13.

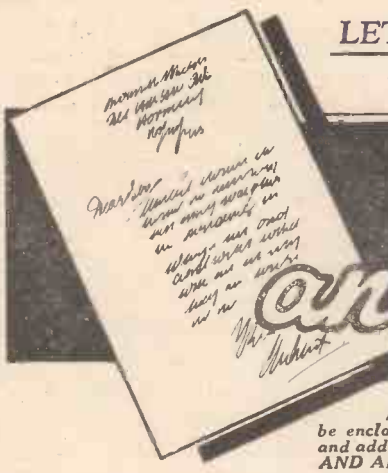
SLADE RADIO

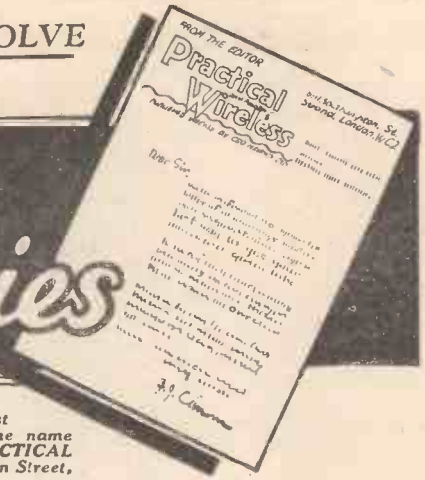
AT a meeting of this society on Thursday, April 11th, Mr. Cape gave an illustrated lecture, the title of which was "The Electrification of Palestine." The subject was full of exceptional interest. It dealt with a combination of civil engineering, technical engineering and electrical engineering. Slides were shown of Palestine and the surrounding district, both before and after the electrification. The immenseness of the schemes, and the improvement effected, was perhaps the most arresting feature of the address.

On Thursday, April 18th, one of the society's famous junk sales was held, during which time many components, some of which had exchanged hands before, were seen again and knocked down to various members of the society. Mr. Chilvers once again acted as auctioneer.—Hon. Secretary, Chas. Game, 40, West Drive, Heathfield Park, Handsworth, Birmingham.

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

Queries and Enquiries





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 AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, 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 of receivers described in our contemporaries.
(3) Suggest alterations or modifications to commercial receivers.
(4) Answer queries over the telephone.
(5) Grant interviews to querists.

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

Amplifier Not Working Properly

"I have built a mains amplifier with 350 volts 120 m.a. H.T. The first valve is MH4 R.C. coupled to AC/P fed into two PX.4s in push-pull. The amplifier works well, but I am certain that I do not get the maximum output, either on radio or records. The bass response is not good although high notes are good. I have measured the voltage at all points under load and they are correct—also the bias, which is correct. If you can help me I shall be extremely grateful."—J. N. F. (Dover).

We regret that it is not possible to state why you are getting a weak output from your amplifier, although we presume that you are not expecting too much from the output. This should be approximately 6 watts, which is quite a loud signal. However, if you can send us a sketch of the circuit (preferably in theoretical form) we shall be pleased to examine it and endeavour to locate the cause of the trouble. We would suspect the bias circuits—either the by-pass condensers being of too small capacity, or lack of decoupling resulting in feed-back in this particular part of the circuit.

'Phones and A.C. Receiver

"Would you please tell me how to connect a pair of headphones (2,000 ohms) to a mains (A.C.) receiver? I have heard tales of shocks and burnt-out windings, so that although there are sockets for an extra speaker I am afraid to connect them. Also could you tell me where I can obtain a diode (battery) for detection purposes, and the approximate cost."—A. J. V. (Tonbridge).

It would, generally speaking, be unsafe to connect the 'phones direct in the anode circuit of the output stage of an A.C. mains receiver. If, however, the extra L.S. sockets are connected to form a filter output, that is, using the existing speaker as a choke, we see no harm in using the 'phones at that point. A safeguard may be adopted by connecting a 2 or 4 mfd. fixed condenser between each lead of the 'phones and the L.S. sockets. No signals will be obtained however with this scheme if the sockets are connected in the anode circuit. An ordinary triode may be used as a diode by connecting together grid and anode. A battery diode is manufactured by Messrs. Cossor and is known as type 220 DD, the cost of the valve being 5s. 6d.

Fitting a Volume Control

"I have a two-valver, and I am anxious to fit a volume control. What is the best method of doing this?"—R. G. (Rothesay, Bute).

We presume that you are using an L.F. transformer for coupling, and the simplest form of volume control would consist of a potentiometer connected across the secondary of this. Join the two secondary terminals (marked IS and OS or G, and GB, according to the make of the transformer) to the two outside terminals on the potentiometer, and disconnect the lead at present joined to the grid terminal of the L.F. valve. This terminal should then be joined to the centre terminal on the potentiometer. The most suitable value for the control will probably be about 500,000 ohms, although a great deal will depend upon the make of the transformer.

D.C. Unit on A.C. Mains

"I have a D.C. H.T. unit, giving various outputs at 15 or 25 m.a. I wish to convert this for use on 230 volt A.C. mains. I require a maximum output of 150 volts at 25 m.a. Could this be produced by merely adding a transformer and rectifier, and if so, what rectified output would be necessary to give the required voltage and current after passing through the D.C. unit?"—R. J. (Edinburgh).

The simplest solution to your problem is to supply your D.C. unit with a rectified output equivalent to that formerly obtained from your mains. For this you will need a transformer and rectifier, the H.T. 8 probably proving most suitable. This delivers a smoothed output of 250 volts, 60 m.a. and there are probably tappings on the input to your D.C. unit to adjust it for various mains voltages up to 250 volts. A more efficient scheme would be to dismantle the D.C. unit and utilise the choke and smoothing condensers in the construction of a really good A.C. unit, providing at the same time for heater supplies for indirectly-heated A.C. valves, and a maximum output of 250 volts, so that at some future date a change to all-mains working could easily be carried out without additional expense.

Using a Directly-heated Pentode

"I have a home-made straight three A.C. set. The last valve is an I.H. pentode which has been in use for some considerable time. I have a spare directly-heated pentode which I should like to use instead of the old one. Could I change these round, and would it be safe to use the D.H. pentode with two I.H. valves, obtaining their low tension from the same source? I have one filament tapping for the set on my present mains transformer."—D. W. S. (Salisbury).

There would be no difficulty about the proposed change, the D.H. pentode simply being plugged into the socket at present occupied by the I.H. pentode. The only difficulty you may encounter, and which is not shown in your proposed sketch, is automatic bias. With the I.H. valve you may have used a resistor in the cathode lead, but this will not apply bias to the D.H. valve. Therefore, the biasing resistor must be inserted in either the H.T. negative lead, or in the centre-tap lead from the filament or heater winding. If you send a sketch of the remainder of your receiver (if this point is not clear to you) we will indicate the appropriate position.

A Reaction Problem

"I have a receiver on similar lines to the Hall-Mark III—home-made and run from a D.C. mains unit. Reaction is not so good (differential), and if I touch the set screw the set oscillates, and I have to turn it down. Of course, this only happens when I touch the screw, and it is all right when I take my finger off."—B. B. (Aldershot).

The trouble is no doubt due to the manner in which the differential reaction condenser is wired. The set-screw is in contact with the moving vanes, and no doubt you have connected these to the anode of the detector valve. This causes the oscillation when you touch the screw which amounts to touching the anode. Change round the connections so that the moving vanes are earthed, connecting one end of the reaction winding to earth and the other end of that winding to one set of fixed plates. The other set of fixed plates should then be joined to the anode of the detector valve. Do not omit the .0002 mfd. fixed condenser between anode of the detector valve and earth.

The coupon on Page 228 must be attached to every query.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face type and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. Radio components advertised at below list price do not carry manufacturers' guarantee. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.

PREMIER SUPPLY STORES

ANNOUNCE a City Branch at 165 and 165a, Fleet Street, E.C. (next door to Anderton's Hotel), for the convenience of callers; post orders and callers to High Street, Clapham.

OFFER the Following Manufacturer's New Surplus Goods at a Fraction of the Original Cost; all goods guaranteed perfect; carriage paid over 5/-, under 5/- postage 6d. extra; I.F.S. and abroad carriage extra; orders under 5/- cannot be sent C.O.D.; please send for illustrated catalogue, post free.

PREMIER SUPPLY STORES Announce the Purchase of the Complete Stock of a World-Famous Continental Valve Manufacturer, all the following standard mains types, fully guaranteed, 4/6 each. HL, L, Power. High, Medium and Low Magnification Screen Grid. Variable-mu Screen Grid; 1, 3 and 4 watt A.C. output, directly heated Pentodes; 250-volt 60 ma. Full Wave Rectifiers; A.C./D.C. types, 20 volts .18 amp. Filaments; Screen Grid; Variable-mu Screen Grid; H, HL, Power and Pentodes.

THE following types 5/6 each; 350v., 120 ma. full-wave Rectifiers; 500v.,'120 ma. full-wave Rectifiers, 2½-watt indirectly-heated Pentodes.

2-VOLT Valves, detector, H.F., L.F., 2/3; power, low consumption power, super power, 2/9; screened grid, variable-mu screened grid 5- or 4-pin Pentodes, Class B D.D. Triodes, 5/-.

THE Following American Types, 4/6; 250, 210, 245, 226, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 27, 77, 78, 2A5.

THE Following Types, 6/6 each: 42, 25Z5, 30, 38, 83, 39, 44, 53, 6B7, 2A6, 2B7, 5Z3, 6C6, 6A4, 6D6, 6F7, 43, 59, 1A6, 1C6, 1V, 12A8, 12Z3, 19, 30, 31, 32, 33, 34, 41, 49, 56, 57, 75, 76, 79, 82, 84, 6Z4, 85, 89.

LISSEN 3-gang Superhet Coils, with switching; listed 30/-, with circuit, 6/-.

LOTUS 3-gang Band-pass Coils; 12/6 per set; with switching.

BEST British make Bakelite cased 0-1 m.c. Milliampmetres, 2¾ inch outside diameter 18/6, 3¼ inch outside diameter 22/6. Westinghouse Rectifiers for above 12/6 extra.

12 TO 2,000 metres. Huge Purchase of All-Band 2 gang Coils from prominent British manufacturer. Fully Screened with switching for S.G. Det. type receivers, 4 Separate Bands, 12 to 2,000 metres. 12/6 with circuit.

SPECIAL Offer B.T.H. Moving Coil Speakers, matched pairs, specially manufactured for McMichael Supervox; 8in. diameter, 1,500 ohms-7,500 ohms (1,500 speaker as choke, 7,500 ohms speaker in parallel with H.T. supply); complete with special dual output transformer for pentode, 15/6 per pair; A.C. kit for above pair, 12/6.

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, 16/6; 9in. cone, 22/6.

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

T.C.C. Electrolytic Condensers, 15 mf., 50v. working, 1/-; 50 mf., 12v. working, 1/-; 15 mf., 100v. working, 1/-; 25 mf., 25v. working, 1/-.

CONDENSER blocks, H.M.V., 400v. working, 4+2+1+1+1+0.5, 3/9; 2+2+1+1+1+0.5, 3/-.

ALL-ELECTRIC 3-stage Amplifiers, 200-250v., 40-60 cycles, 10 watts undistorted output, complete with 5 valves, and Magnavox Super 66 energised speaker, £12/10/-.

ELIMINATOR Kits, including transformer, chokes, Westinghouse metal rectifier, condensers, resistances, and diagrams, 120v. 20 m.a., 20/-; trickle charger, 8/- extra; 150v. 30 milliamps, with 4 v. 2-4 amp., 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., 37/6; 200v. 50 m.a., with 4v. 3-5 amps., L.T., 27/6.

PREMIER Chokes, 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; 25 milliamps., 20 hys., 2/9.

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

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

B.T.H. Truspeed Induction Type A.C. only, Electric Gramophone Motors, 100-250v., 30/- complete; ditto, D.C., 42/6.

COLLARO Gramophone Unit, consisting of A.C. motor, 200-250v. high quality. pick-up and volume control, 49/-; without volume control, 46/-.

(Continued at top of column three)

PUNCH AND QUALITY

G. Marconi

WHEN you are building that new battery set to celebrate the Jubilee, put a worthy output stage on it. Selectivity and range you will have in plenty, so match the H.F. side by really good L.F. performance, with quality, punch and economy.

We have some notes on the L.F. side of battery sets, which should be useful to every enthusiast and which we shall be pleased to send you.

WRITE TO THE VALVE DEPARTMENT, MARCONIPHONE COMPANY LIMITED, 210 TOTTENHAM COURT RD., LONDON, W.1, MENTIONING THIS PAPER.

MARCONI VALVES

THE CHOICE OF THE EXPERTS

(Continued from foot of column one)

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

SPECIAL Offer of Wire-wound Resistances, 4 watts, any value up to 50,000 ohms, 1/-; 8 watts, any value up to 100,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

WHITELEY Boneham Energised M/c Speakers, 2,000 or 2,500 ohms. 8 inch diameter, 9/11. Please state which type transformer required.

COSSOR Permanent Magnet M/c speakers, large Darwin Cobalt Steel Magnet, 8 inch diameter, please state transformer required, 13/6.

LISSEN 2-Gang Condensers, Uniknob Trimmer, Disc Drive, .0005 each section, 5/6.

POLAR STAR, manufacturers' model, 3-gang condensers, fully screened, 7/6, with trimmer; unscreened, 5/-.

WIRE End One Watt Resistors, our assortment, 2/- per dozen.

ORMOND No. 4 Variable Condensers, 0.00025, 1/6. O.K. for Short Waves.

SPECIAL Offer Western Electric Mains Transformers, input 200-250 volts, output 350-0-350 volts, 120 milliamps, screened primary, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-5 amps., 9/6; input 100-250 volts, 300-0-300 volts 60 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 6/6; input 200-250 volts, screened primary, output 500-0-500 volts 150 milliamps, 4 volts 3-5 amps., 4 volts 2-3 amps., 4 volts 2-3 amps, 4 volts 1 amp., 4 volts 1 amp., 19/6.

MAINS Transformer, with Westinghouse rectifier, output 200v. 30 milliamps, and 4 volts 3 amps., L.T., 15/- the pair.

U.S.A. 3-gang Condenser, .0005, with trimmers, 3/11; a really solid job; Utility disc drive, 1/6.

SPECIAL Offer.—0.00015 brass short wave tuning condensers, with slow motion and complete dial, 3/9; short-wave chokes, 10-200 metres, 9d.

DUBILIER Electrolytic Condensers, 12 microfarads, 20 volts, 6d.; 8 plus 4 microfarads, 500 volts, 4/-; 50 mf., 50 v., 1/9; 8 mf., 500 v., 3/-.

RELIABLE Intervalve Transformers, 2/-; M.C. Multi-ratio output transformers, 2/6; 2-1 or 1-1 output transformers, 2/6; microphone transformers, 50 and 100-1, 2/6; 3 henry chokes, 2/6. 100 henry chokes, 2/6.

KOLSTER BRANDES Model 301 Pick-up with Arm; list price, 35/-; our price, 10/6.

RELIABLE Canned Coils, with Circuit, accurately matched, dual range, iron.core, 2/11.

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T.C.C. Condensers, 4 mf., 450v. working, 4/-; 4 mf., 750v. working, 6/-.

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VARLEY H.F. Intervalve Coils, B.P.8, band-pass, complete with instructions, in original cartons, 2/6.

SCREENED H.F. Chokes, by one of the largest manufacturers in the country, 1/6.

PREMIER British-made Meters, moving iron flush mounting, accurate .0-10, .0-15, .0-50m.a., 0-100, 0-250 m.a., 0-1, 0-5 amps.; all at 6/-; read A.C. and D.C.

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U.S.A. Electrolytic Condensers, 550v. peak working, standard tubular metal condenser, 4 mf., 8 mf., 12 mf., a real bargain, 1/9.

BRITISH Radiophone 2-gang 0.00016 Short-wave Variables, all brass with steatite insulation, 5/6.

1,000 Ohm 150 Milliamp, semi-variable resistance, 2/-; 1,000 ohm 250 milliamp., tapped, for any number .18 valves, 3/6; 800 ohms 350 m.a., tapped, 2/-.

RELIABLE Smoothing Condensers, 250v., working, 1 mf., 6d.; 2 mf., 1/-; 4 mf., 2/-; 350v. working, 1 mf., 1/-; 2 mf., 1/6; 4 mf., 3/-.

ALL Premier Mains Transformers have Engraved Panels, terminal connections, all low tension, windings centre tapped, tapped and screened primaries, 200-250 volts.

PREMIER 250-0-250 60 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-4 amps, 10/-.

PREMIER 350-0-350 150 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-4 amps., 12/6.

PREMIER Combined H.T. 8 and H.T.9 Transformer, rectified output 250 or 300 volts 60 milliamps, 4 volts 1-2 amps., 4 volts 3-5 amps., 10/-; or with Westinghouse rectifier, either type, 18/6.

PREMIER H.T.10 Transformer, rectified output 200 volts 100 milliamps, 4 volts 1-2 amps., 4 volts 3-5 amps., 10/-; or with Westinghouse rectifier, 19/6.

PREMIER H.T.11 Transformer, 500 volts, 120 milliamps., rectified output, 4 volts 2 amps., 4 volts 2 amps., 4 volts 3-5 amps., 22/6; with Westinghouse rectifier, 42/6.

THE Following Lines 6d. Each, or 5/- per dozen: 4- or 5-pin baseboard or 4-, 5-, 6- or 7-pin chassis mounting valve holders, American valve holders, 1 watt resistances, wire end, every value; tubular wire end condensers, 1,500 volt, every value up to 0.5, 0.3 amp., 2- or 3-point switches. Cyldon double trimmers, 6 yds. Systoflex, 1, 1.5, 2 or 2.5 mm., 1 yd. 7-way cable, 9ft. resincored solder, 6yds. push-back connecting wire.

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SPEAKERS.—Blue Spot Permanent Magnet Speakers. Universal Transformers for Power, Super-Power, Pentode or Class B. All brand new 1935 series. Type 99 P.M., 24/6; 45 P.M., 20/-.

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CONDENSERS.—Plessy Four-Gang Condensers with Oscillator Section for Superhet. Fully screened with trimmers, 7/3 each, standard full size 0.0005 (not midget). Lotus 3-gang 0.0005, 11/-; 2-Gang 0.0005, 7/3. All Lotus Condensers Brand New. Fully screened with trimmers complete with Dials, escutcheons, etc.

COILS.—Igranic Superhet 4-Coil set (1 osc. 2 I.F. with pig tails and 1 I.F. plain), 9/- per set (List 50/-). Varley Constant Square Peak Coils B.P.5 with all accessories, 2/3. Telsen Twin-matched Coils: Type W.287, screened with switch, 7/9 (List 17/-). Triple-matched Screened Type W.288, with switch, 10/9. Telsen Twin Coil Unit, Type W.478, 12/6. Type W.477, 17/6. All Brand New.

PICK-UPS.—Marconi Model K.25, 21/- (List 32/6).

RECEIVERS.—Burgoyne Class "B" Three-Valve Sets, complete with 3 Mullard Valves. Exide Batteries and accumulator. Magnavox Moving Coil Speaker. In modern cabinet beautifully finished in chromium plate. Brand new, £3/18/6.

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WESTINGHOUSE Rectifiers H.T.8 and 9, 8/9. Transformers for H.T.8, fully shrouded, made by Standard Telephones, with 4 v. 4 a. C.T. at 8/6. Chokes: 30 h. 30 m.a. 3/6. 150 h. 60 m.a. 9/-. Dubilier Electrolytics, dry, 8 mfd. 500v. 2/10. T.C.C. electrolytics 25 mfd. 25 v., 50 mfd. 12 v., 15 mfd. 100 v., 1/3. 6 mfd. 50 v. 6d. 2 mfd. 200 v. working 1/6. Tubulars, .1, .01, .02, 6d. .25 mfd. 9d. Dubilier and Erie resistances 6d. each.

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2/6 DOWN

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Simpson's Turntable, as below, complete with guaranteed N.T.S. Pick-up, Cash or C.O.D. Carriage Paid, £2/10/0, or 2/6 deposit and 12 monthly payments of 4/6.

SIMPSON'S 1935 ELECTRIC TURNTABLE

THE PERFECT GRAMOPHONE MOTOR AT LAST! Low consumption, CONSTANT SPEED, 1-HOLE FIXING. Darwin's Magnets. A.C. Mains only. 100/150 or 200/250 volts, 50 cycles, 12-in. turntable. Send only 2/6, balance in 11 monthly payments of 4/-. Cash or C.O.D. Carriage Paid, £2/2/0.

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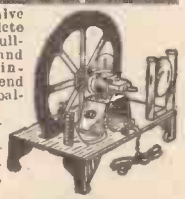
Works from almost any 3-valve Battery or Mains Set. Complete Kit for building, including full-size blueprint, assembly and operating instructions. Send only 10/-; balance in 11 monthly payments of 6/6. Cash or C.O.D. Carriage Paid, £3/15/0.



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Wonderful value; only 55/-. With Stand (as illustrated), 65/-. Special matched Transformer, 7/6.

"T.W." No. 11 TABLE MIKE. This is a splendid Microphone for speech and music. The bakelite case, containing a 2-in. mike and transformer, is on a bronze pedestal. Switch and plug socket are fitted on the case. It stands unrivalled for quality and price 15/-

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A NEW PRACTICAL HOME MICROPHONE for broadcasting at home. It is a general-purpose, robust mike, with solid bakelite body, back terminals, front metal grille. New design, No. 11, finely finished 5/6

No. 11A. Special in solid brass body, unequalled at the price on speech and music 7/6

PEDESTAL MICROPHONES. Lesdix No. 10B Pedestal, 10 in. high, 12/6. Lesdix Superior No. 12BB Ring. 14-in. Pedestal. 18/6. W.E. Type Table Model, 5-in. dia., for lectures, 35/-.

HEADPHONES. 120-ohm Sullivan Headphones, W.D. model, at a tenth of cost. For circuit testing, fault spotting, broadcast listening, microphone experiments. Aluminium body and headbands. Maker's price to-day is 15/-. Our price 2/9 per pair. 3d. postage.

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'Phone: Central 4611.

MAINS Transformers, chokes, etc., to specification, repairs promptly executed. Guaranteed satisfaction. Prices on request. Henry Peace, Ltd., Wednesbury, Staffs.

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HULBERT for Quality Surplus Speakers.

ALL Speakers Listed Below are Brand New and Made by one of the Best Known British Makers of High Grade Moving Coil Speakers. Repeat orders coming in daily.

10/6 Only, original price 30/-.—Energised, 8in. cone, 6,500 ohms field, for direct use on 200-240 volts D.C. mains; also 1,800, 2,000, 2,200 or 2,500 ohms field; price includes power, pentode, or universal transformer as required.

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This coupon is available until May 11, 1935, and must be attached to all letters containing queries.

PRACTICAL AND AMATEUR WIRELESS, 4/5/35.

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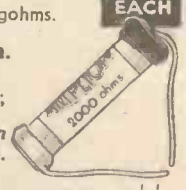

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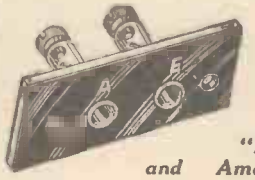

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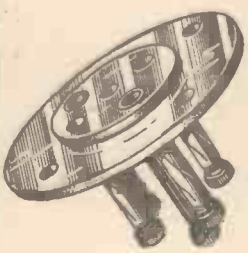

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Television and Short-wave Handbook 12

SOLVING INTERFERENCE PROBLEMS

Practical and Amateur Wireless

3d EVERY WEDNESDAY

Edited by F. J. CAMM

AND AMATEUR TELEVISION

a GEORGE NEWNES Publication

Vol. 6. No. 138.
May 11th, 1935.

BUILDING MR. F. J. CAMM'S A.C. SILVER SOUVENIR

SEE PAGE 242

Practical and Amateur Wireless

Edited by F. J. CAMM

Technical Staff:
W. J. Delaney, H. J. Barton Chapple, Wh.Sch., B.Sc., A.M.I.E.E., Frank Preston.

VOL. VI. No. 138. May 11th, 1935.

ROUND *the* WORLD *of* WIRELESS

French Television on Medium-wave Band

THE French Ministry of Posts and Telegraphs has now opened an experimental television broadcasting station in Paris; the transmissions are being made on 175 metres. Curiously enough these would appear to have been picked up in this country by some short-wave listeners on the 4th harmonic, namely, roughly 44 metres.

Musical Announcements

GERMAN engineers consider that they have discovered a more artistic method of presenting their radio programmes to the public than is usually adopted by other countries. In the Deutschlandsender daily transmissions of gramophone records, broadcast between B.S.T. 2 and 3 p.m., no verbal announcements are made; in lieu of these, preceding the work of a well-known composer, a pianist plays a short improvised overture between items, and in this *extempore* composition introduces a few bars of the main theme of the work to be played.

Radio for Austrian Danube Police

ACCORDING to a report from Vienna, the River Police charged with the patrolling of the Danube have now been equipped with motor speed-boats in which small transmitting and receiving apparatus has been installed. By this means they are able to communicate not only with each other in case of emergency, but remain in touch during the whole of their journeys with Vienna Police Headquarters.

Westernising Turkey

WITH a view to the more modern education of radio listeners, the Turkish authorities have now decided that Oriental music is no longer to be broadcast by the Ankara and Istanbul stations; in its place concerts are given of works by some of the older and more renowned European composers.

The Eavesdropping Microphone

THE headmaster of a school in Holland has installed a microphone in every classroom. As these are connected to a distributing panel and amplifier in his private study, by this means he is enabled at any time of the day to ascertain what is being done in any room during school hours.

Moscow Relays South America

FOLLOWING a series of successful experiments, the Soviet authorities are planning an exchange of radio programmes with stations in Brazil and the Argentine Republic. Although no schedule has been published it is understood that the South American programmes will be rebroadcast through the high-power Moscow station.

A Novel Time Signal

CZECH engineers attached to the Prague broadcasting station have devised a new form of time signal which is believed will be more easily understood by uneducated listeners. In future, the signal will be given in the following manner: At the end of the first quarter . —, second quarter . . —, third quarter . . . —, finishing up at the full hour with . . . . —. Where necessary, the signal will be superimposed on the broadcast. As the tone approximates to that of a clock gong it is expected that it will meet with general approval.

Free Television for Berlin Public

IN order to popularise a television service and thus give the authorities a means of judging to what extent it would be acceptable to the public, the Berlin Central Post Office is opening a special room three days weekly to enable those interested to view the pictures free of charge. For these television broadcasts direct scanning of subjects is to be used, instead of the previous filming of events such as has been hitherto adopted by the Berlin studio.

How to Deal With Pirates

IN Romania, from time to time, the Bucarest studio broadcasts the names and addresses of owners of sets who have omitted to renew their licences. This unpleasant microphone publicity usually results in a next day's rush to the local post offices.

Brussels on 30 Kilowatts

BOTH Brussels No. 1 and No. 2, having suffered by the increased power of neighbouring transmitters, the Belgian Government has decided to reconstruct them with a view to transforming them into 100-kilowatters. It is not likely that this will be carried out before next year, but in the autumn the stations will double their present power.

A Broadcast from the Forth Bridge

AN interesting broadcast will be given on May 15th, when an impression of the Great Viaduct and its traffic will be relayed from the permanent way on the Queensferry Cantilever. The narration will be by George Blake. The viaduct, the construction of which lasted seven years, was built to the design of Sir John Fowler and Sir Benjamin Baker. The maximum number of workmen employed at one time was nearly five thousand, and during the seven years fifty-seven workmen lost their lives. The bridge, which cost over three million pounds sterling, stands nearly a hundred and fifty-eight feet above sea level at high tide, and the steel used in its construction weighs 54,160 tons. Painting the bridge is a job for a lifetime; an average of twenty-six painters work at it continuously, but take three years to cover the 145 acres of steel. They use up seventeen tons of paint a year.

ROUND the WORLD of WIRELESS (Continued)

Jubilee Community Singing Broadcast

THE Jubilee Celebrations will conclude with an open-air service of song and praise in Hyde Park, on Sunday afternoon, May 12th. The well-known Australian musician, Gibson Young, who introduced the community-singing movement into Great Britain in 1925, will conduct the singing. So vast a crowd is expected that the police authorities have advised the choice of a new site in the park in which a crowd of one hundred thousand can safely congregate. Hitherto, community-singing festivals have been held in the Cockpit, hard by the Serpentine and Powder Magazine, with Rima as a background. The new site is much nearer to Bayswater Road, half-way between Marble Arch and Cumberland Gate. The singing will be accompanied by the massed bands of the Coldstream and Welsh Guards, and led by the greatest of all Welsh choirs, the Ystalyfera Choir of two hundred and fifty vocalists.

"Looking to the Air"

ON May 20th a new Midland series of Talks and Discussions will begin. It is called "Looking to the Air," and will deal with civil aviation in the Midlands. W. Lindsay Everard, M.P. for the Melton Division, has taken a leading part in arranging the series, and will discuss the present outlook for civil flying with Air Commodore J. A. Chamier, Secretary-General of the Air League of Great Britain. Mr. Lindsay Everard has a private aerodrome at Ratcliffe, near Leicester.

Concert from Manchester

THE Manchester Midday Society's concert, which is to be relayed to Northern listeners from the Houldsworth Hall, Manchester, on May 14th, will be provided by Irene Kohler (pianoforte) and Bertram Ayrton (baritone).

Variety from Darlington

AN excerpt from the variety bill will be broadcast from the New Hippodrome, Darlington, on May 16th.

"Spot of Colour" Talk

COLOUR as applied to "Public Buildings" will be the subject of a talk which Mr. Isaac Taylor is to contribute to the "Spot of Colour" series on May 16th. Mr. Taylor is a member of a prominent firm of Manchester architects, and has shown his sense of colour in the decoration of many local churches; but in his talk he will also touch on less imposing buildings, such as small parish halls and village clubs.

INTERESTING and TOPICAL PARAGRAPHS

Talk on a Quarryman's Work

THE second in the series of Welsh programmes based on a day's work in various callings will be given for Welsh listeners on May 11th, when the programme deals with incidents in a day in the life of a quarryman. An attempt will be made to convey to the listener the various activities involved in a quarryman's working day; but, in addition to the actual work, there are intervals during which the quarrymen have to take refuge in their special sheds: listeners will then hear the subjects which they discuss. The cast will be composed almost entirely of quarrymen or those who have been quarrymen.

IN A MODERN SETTING

Listening in comfort to the latest Ferranti radiogram.

SOLVE THIS!

PROBLEM No. 138.

Sharpe's three-valve, Class B receiver had given good service for several months, but had now begun to give poor results. The principal trouble was distortion as though overloading were taking place, and Sharpe remembered having read that a meter connected in the output valve anode circuit would indicate distortion due to overloading by the movement of the needle. He therefore purchased a meter and included it in his output circuit, and when he switched on the needle jumped in varying degrees as the signal was received. He spent many hours trying to improve matters but was unable to keep the needle still. Why? Three books will be awarded for the first three correct solutions opened. Envelopes should be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 138 in the bottom left-hand corner, and must be posted to reach this office not later than the first post Monday, May 13th, 1935.

Solution to Problem No. 137.

As Smithers had fitted a wave-trap tuned to the local station, he could not, of course, tune in that station. A short-circuiting switch should have been fitted across the wave-trap so that it could have been cut out of circuit when the local was required.

The following three readers successfully solved Problem No. 136, and books are accordingly being forwarded to them:

A. V. K. Chaffey, 46, Alma Vale Road, Clifton, Bristol 8.

F. W. T. Atkin, 41, Lees Hall Road, Sheffield 8.

R. E. T. Wellman, Myrtle Cottage, Bottlesford, nr. Marlborough, Wilts.

A Tour of King's Lynn

ON May 17th, Owen Reed produces the Microphone at Large tour of King's Lynn. The town was famous as a seaport for hundreds of years and, although but little of its maritime greatness remains, it is still a thriving market town. King John founded the Corporation in 1205. Its treasures include a beautiful mediæval silver cup, and a ceremonial sword, chiefly of sixteenth-century date, but including part of the old iron sword given by King John. The Guildhall dates from 1423. In the fine old church, St. Margaret's, is the famous Peacock Brass, which recalls the peacock feast which Lynn gave to Royal princes in the fourteenth century. In one of the old houses in the borough lived George Vancouver, the explorer who sailed with Captain Cook.

"Hotel" Broadcast

CECIL LEWIS, who was for some years head of the Programme Department of the B.B.C., is working on a programme called "Hotel," which will be broadcast on May 23rd in the National programme. In order that his script shall reflect the tremendous organisation which underlies the luxurious calm of a great hotel, Mr. Lewis has spent ten consecutive days and nights in one of London's great hotels. In his own words, he is attempting to portray orally over the microphone the incredible effort which goes to the smooth working of a giant hotel, where 500 people may sleep in luxury and 1,500 others lunch and dine in an atmosphere of calm and efficiency.

"Quaintesques" Concert Party

LESLIE'S Pavilion—in Rusholme, Manchester—contributes its first broadcast on May 15th, when Northern listeners will hear a show by the famous "Quaintesques" concert party. The Pavilion has been in existence now for thirty years; the present building standing on the site once occupied by a big tent or marquee in which Harry Leslie started the idea of bringing pierrots from the seaside inland. Many famous variety stars, including Leslie Henson, Ronald Frankau, and Leonard Henry, made early appearances at the Pavilion, which has, indeed, always been the home of concert party shows.

Unconventional Cabinet Designs

In this Article the Author Discusses Some Novel but Useful Ideas for Receiver Cabinets and Radiograms

ON reviewing the various home constructors' sets described in this journal during its existence, it must be admitted that only in a few cases has the assembly differed materially from the standard chassis method of building introduced by PRACTICAL AND AMATEUR WIRELESS.

The reason for this is not difficult to see, as it is the only method which gives short leads and compact layout; but nevertheless the "knobs in front" style is tending to get somewhat stereotyped, and the author feels that there is plenty of scope for improvement in this and other directions.

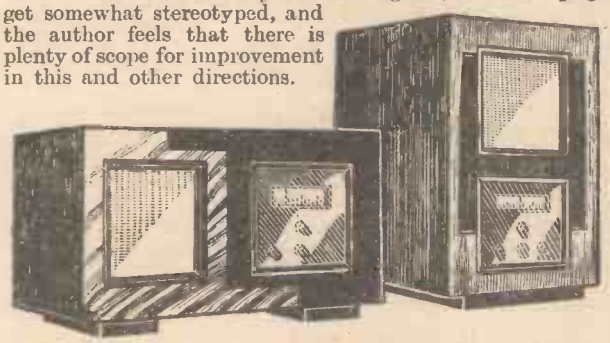


Fig. 4.—Two designs for a cabinet in which the speaker and panel beadings are identical.

Vertical Control Spindles

For instance, why not have the ontrol spindles vertical instead of horizontal, mounting the set in a cabinet with a lift-up lid which, when closed, would completely cover the controls and keep them free from dust? The speaker could be mounted in the same cabinet with the grill in front, and possibly an elongated panel on either side, these panels consisting of doors covering recesses which could hold various odds and ends and, of course, the faithful Encyclopædia if the set happens to be a PRACTICAL AND AMATEUR WIRELESS design.

For accessibility it might be preferable to retain the volume control in its original position, but in any case Fig. 1 gives a good idea of the finished appearance of such a receiver.

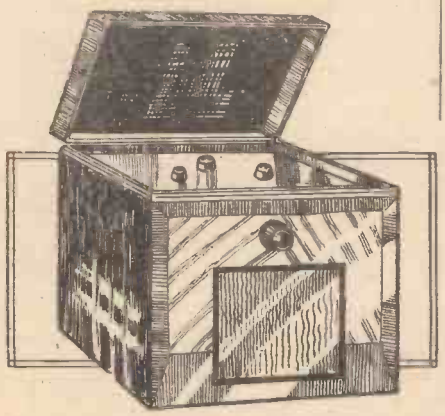


Fig. 1.—A receiver with a horizontal panel mounted in a cabinet with a lift-up lid.

No serious difficulties should be experienced in mounting the controls vertically, and Fig. 2 illustrates various methods of achieving this without lengthening the leads unduly.

Tuning condensers and other baseboard mounting controls can be secured to wooden uprights, whilst volume controls and switches require a small additional piece of three-ply or ebonite. If you prefer working in metal, "U"-shaped brackets can easily be made from 1/16in. aluminium.

Perhaps the easiest and strongest method is illustrated in Fig. 3, the components being mounted on the stout upright panel. For those who wish to go to the least trouble it is easiest to build the set to conventional design, and then to fix it in the cabinet

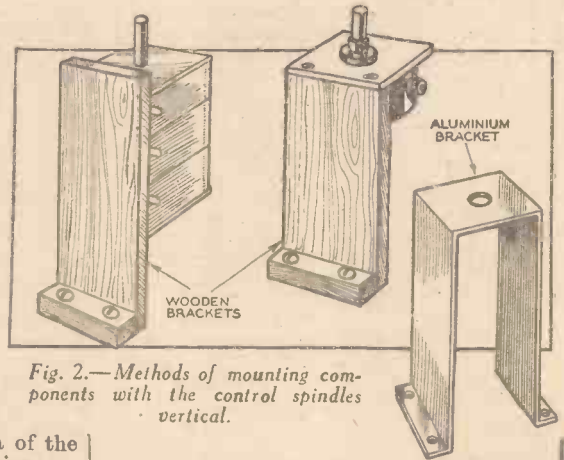


Fig. 2.—Methods of mounting components with the control spindles vertical.

with the spindles vertical; the valves would then be horizontal instead of the more usual vertical position, but this does not matter.

It must not be forgotten that some slight difficulty may be experienced in fitting the chassis in the cabinet unless details are first worked out. It will probably be found that the simplest way is to have a removable top panel so that it can be dropped in after the set has been fixed in position.

If the reader prefers to stick to conventional design, a panel could be fitted to the chassis and the set mounted in a cabinet designed on the lines of Fig. 4. The speaker and set beadings being identical, the layout is extremely symmetrical, and in the event of the set being rebuilt, the fact that the cabinet is not drilled to any special dimensions makes it suitable for any new design. The loud-speaker being

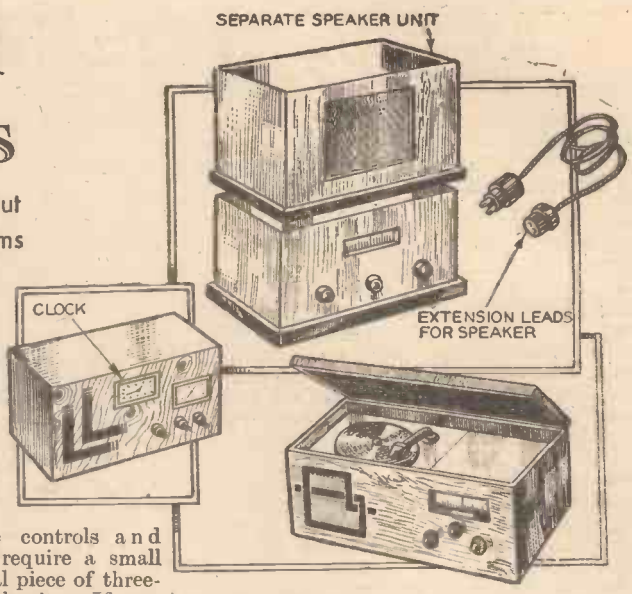


Fig. 5.—Showing a receiver with separate speaker cabinet, and an idea for a table-gram.

permanently in position, considerable time and trouble is saved, apart from the fact of the saving in the cost of a new cabinet.

Sectional Cabinets

In the sectional cabinet illustrated in Fig. 6, each compartment is a separate container, there being containers suitable for gramophone units, single or dual speakers, batteries or mains units, and lockers for books or other items. The advantage in this style of assembly is that it is possible to build up from a crystal set to a superhet radiogram without discarding any cabinets.

Synchronous mains are gradually spreading with the grid system, and electric clocks are slowly but surely gaining in popularity. It is quite conceivable that within the next year or two no house with electric light will be without at least one of these labour-saving Greenwich-timed mechanisms. Those readers who have built, or are building, all-mains sets could quite easily incorporate one of these time-pieces in the cabinet. It should not prove very difficult to arrange it in order

(Continued overleaf)

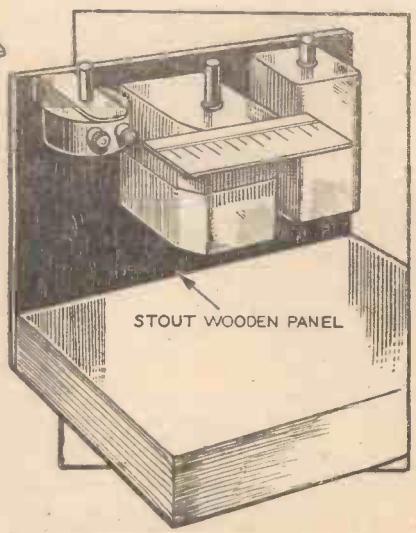


Fig. 3.—Mounting components on a panel so that the spindles are in a vertical position.

UNCONVENTIONAL CABINET DESIGNS

(*Continued from previous page*)

to agree with the symmetry of the present design, and the act of looking in the direction of the radio receiver when wishing to know the hour might possibly remind the listener of some important programme which would otherwise have been missed.

A Table-gram

Amongst the variety of cabinets produced by Messrs. Peto-Scott is one consisting of separate speaker and set cabinets, the speaker cabinet being so designed that it will fit on top of the set cabinet, making what is apparently a single cabinet with an ornamental beading around the centre. In this latter form it is equivalent to the more usual system of receiver design, but the fact that the speaker *can* be moved if required to another location is a distinct advantage, because the majority of receivers use an aerial and earth, and the trouble experienced in fixing aerial and earth wires in any new but temporary position is often sufficient to deter the listener (as distinct from the experimenter) from making any move at all. For maximum convenience the set should be connected to the speaker *via* plugs and sockets and a short length of flex. An additional length of flex can then be fitted with similar plugs and sockets, and used to extend the leads when the speaker is used in any place not adjacent to the receiver.

One of the three suggestions illustrated in Fig. 5 is an idea for a table-gram. The "horizontal" type of cabinet is extremely popular at the moment, and there is no reason why it should not be fitted with a lid and turntable. If one of the exceptionally shallow motors now on the market is used, the additional height to allow for should not exceed 4ins.; in fact it would probably be less than this because there is usually an inch or two to spare in the top of any cabinet, and it should be possible with careful designing to fit one of these motors and pick-ups with an additional height of about 2ins.

Sufficient has been written to show that there are many ways and means of getting away from the conventional, but there are many other ideas which might also be adopted, and it is up to the reader to view his present or intended set from this angle, with the idea of introducing what may possibly be unconventional but nevertheless sound and useful ideas. It will have been noticed, of course, that our own cabinet designs are entirely original.

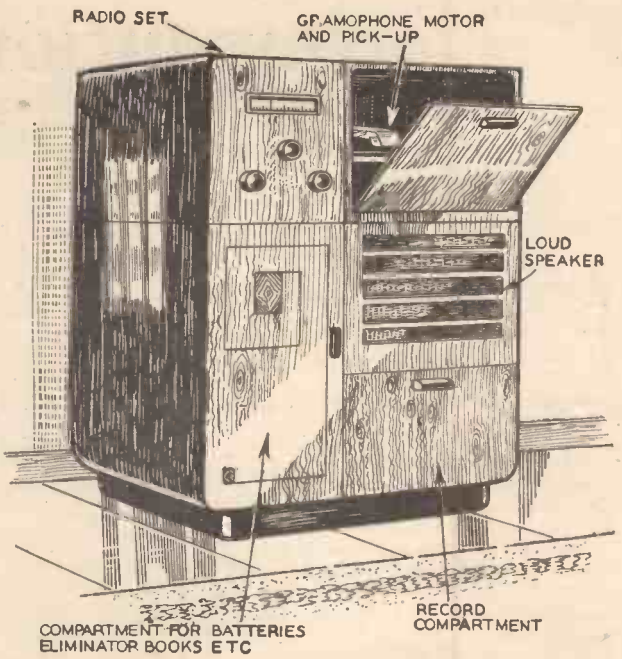


Fig. 6.—A cabinet for a receiver and radiogram built on the sectional principle, with separate compartments for different units.

Technical Topics

A SIGNAL may be absorbed before reaching the first H.F. stage, or before reaching the detector stage in a simple regenerative circuit employing capacity or inductive-aerial coupling. If, however, the signal is damped out or nullified after leaving the aerial, and passing through one or more tuned stages, this is due to cancellation. There are various methods which may be adopted in order to remove dead spots. The addition of an untuned stage of H.F. amplification ahead of the detector is undoubtedly a great help, and in certain instances the fitting of a pre-set .0001 mfd. max. condenser in series with the aerial and the aerial terminal of the set, enables the operator to shift the dead spot to another part of the tuning range. A much better method, however, is to fit a small coil similar to the grid winding of the largest short-wave coil in series with the aerial, and tune it by means of a variable-tuning condenser connected across it.

Joe Termini, the famous somnolent melodist, reaches the final stage in the construction of his Cossor Melody-Maker.

H.F. Chokes

By the use of this method the natural wavelength of the aerial system can be varied within wide limits, and beyond the range covered by the tuning system. Attention is frequently drawn to the vital importance of suitable H.F. chokes. To incorporate a component which resonates around 60 metres in a receiver tuning up to 160 metres is foolish. Attempts to use broadcast type H.F. chokes will also prove to be a mistake. An unsuitable H.F. choke will produce dead spots over various ranges, and it is advisable, therefore, to use specially designed short-wave or all-wave H.F. chokes.

With an all-wave tuner of the tapped coil or separate coil-unit type in which a switch is used to cut each coil or set of coils in and out of circuit, the elimination of dead spots, if experienced, is sometimes difficult. It is, of course, quite possible to design a tuner free from dead spots, but even so this phenomenon is not unknown in commercial receivers and kit sets, especially in the regions of 20 metres and 80 metres.

The best method to adopt in such instances is to remove all coils or sets of coils out of circuit by unsoldering the switch connections, and then resolder one set at a time, and try out until the particular coil combination which is at the root of the trouble is found.

In instances of this nature a definite cure and the application of suitable methods depend greatly upon the general design and tuning system. Series resonance on certain wavelengths, owing to inductance and capacity being balanced out, causes dead spots.

The writer remembers a super dead spot in a commercial short-wave receiver, covering the whole 29 to 50 metres range on the 29 to 58 metres coils. This was due to the use of heavy gauge connecting wire between reaction condenser stator and reaction coil, and shielding at earth potential of this lead. A 28 C.E. insulated and shielded lead replacement completely cured the trouble over the full tuning range.

Detector Sensitivity

This desirable quality in a detector may be improved by experimenting with various grid-leak and condenser values, also combinations of leaks and condensers. A study of by-pass and decoupling methods is also worth while.

A tightly-coupled aerial system will increase volume, but will also cause, in most instances, threshold howl. The happy medium between maximum signal volume and stability should be the basis of experiment when the howl is traced to the detector stage. If the L.F. stages are at fault various resistance values across the L.F. transformer secondary should be tried. The most suitable will cure the trouble, yet reduce the volume very little. H.F. grid stoppers of 100,000 ohms (non-inductive) applied to the L.F. circuits are to be recommended also. For every trouble there is a cure, but in the case of bad design and lay-out re-building is the only cure.

Solving the Selectivity - Quality Problem

Various Methods of Incorporating a Selectivity-quality Switch in Modern Superhets are Outlined in this Interesting Article.

DURING recent years the superheterodyne receiver has definitely re-established itself, and it is now generally accepted that the selectivity of this type of set surpasses that of the straight type. In most cases, however, this high degree of selectivity is obtained at the expense of quality. A few years ago sensitivity and selectivity were the only two qualities required in a radio set, for at that time broadcast transmitters gave so poor a frequency range that high-quality reproduction was impossible. Conditions are now drastically changed, however, and it can safely be said that the frequency range of most receivers is not as good as that of modern transmitters.

The Quality-selectivity Compromise

The reasons for this are not far to seek. Coupled with the average listener's lack of appreciation of really faithful reproduction, we have a very congested ether necessitating a very high degree of selectivity in the receiver. It is not surprising, therefore, that the four-valve superhet, which holds pride of place at the moment, should be a station-getter rather than a quality reproducer. In most cases some selectivity has been sacrificed to give moderately good reproduction, however, so that the set becomes a compromise, it being insufficiently selective for present-day conditions, and providing quality that does not satisfy the musician.

Isolating the I.F. Circuits

The problem has been tackled in some of the more expensive sets by employing a variable coupling in the I.F. circuits; that is, by using tight coupling for quality and loose coupling for selectivity. This method, in some measure, overcomes the difficulty, but surely there is a better and simpler way of obtaining the desired result. Why not cut out the superheterodyne action altogether for local station listening? The signal-frequency portion of the set would provide all the selectivity necessary for this purpose, and by means of simple switching arrangements could be made to feed directly into the second detector. The I.F. circuits could then be designed to provide maximum selectivity for distant station reception, whereas for local station work the signal-frequency circuits could have a fairly wide response, passing a wide enough band of audio frequencies to allow of excellent quality reproduction.

Switching Arrangements

Two circuit diagrams are given, both of four valve A.C. superheterodynes employing circuit arrangements very commonly used at present. Fig. 1 shows a receiver with a stage of high-frequency amplification, coupled to a pentagrid frequency changer by means of a tuned-anode circuit. A double-diode-triode fed from a single I.F. stage performs the usual functions of rectification, A.V.C., and L.F. amplification. By incorporating the two switches A and B (these may be ganged in practice) the I.F. valve and its associated components may be cut out at will. When the switches are both in the downward position the set works as an ordinary superhet and maximum selectivity is obtained, but when they are in the upward position the signal is fed from the first valve direct to the diode, and the set becomes a straight three. The superhet section of the receiver is then entirely isolated, the degree of selectivity drops, and the audio-frequency response is improved.

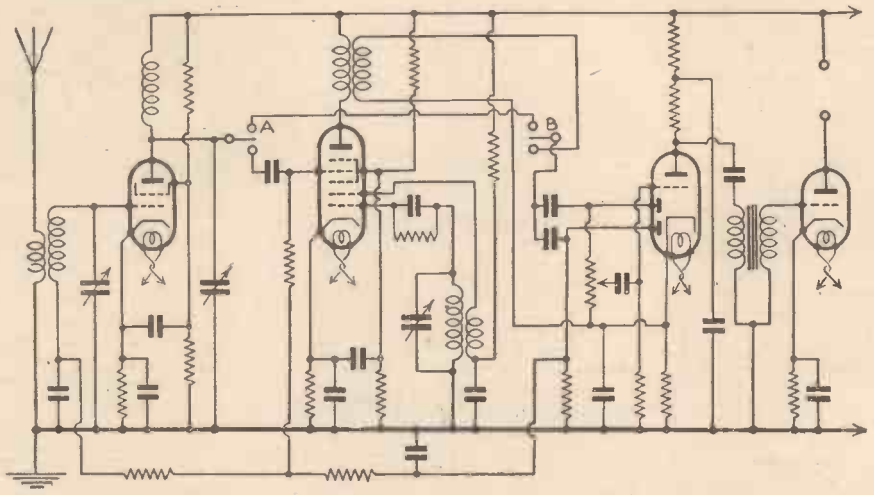


Fig. 1.—Showing the joining of switches in a four-valve superhet with I.F. amplifier and pentagrid frequency-changer.

Using Half of the Triode-pentode

Fig. 2 shows an alternative circuit in which a triode-pentode acts as a frequency changer. This type of valve incorporates a very efficient H.F. pentode section, having a working impedance of approximately one megohm and a mutual conductance of approximately three. This section of the valve is therefore quite suitable for use as a straight H.F. amplifier, followed by the usual tuned-grid or tuned-anode coupler. The oscillator section can easily be put out of action by short-circuiting the coupling coil. Referring to the circuit diagram, it will be noted that a downward movement of the switches will cut out the I.F. stage and, as in the previous case, selectivity will be reduced and quality of reproduction improved. If desired, the degree of coupling in the band-pass filter may be varied to suit local conditions. The A.V.C. remains in action in both positions of the selectivity-quality switch. When all the valves are in circuit it serves its usual purpose of minimising fading, and when the I.F. section is cut out it desensitises the set for local station reception. It is permissible to break the A.V.C. circuit at the diode pin when the straight circuit arrangement is used, however.

If a signal frequency amplifying stage precedes the first detector, it will be advisable to retain this and use the switching arrangement shown in Fig. 1. If an H.F. stage is not incorporated, however, the wiring shown in Fig. 2 should be used, the oscillator valve being removed or its coupling coil short-circuited when the switch is set for quality reproduction.

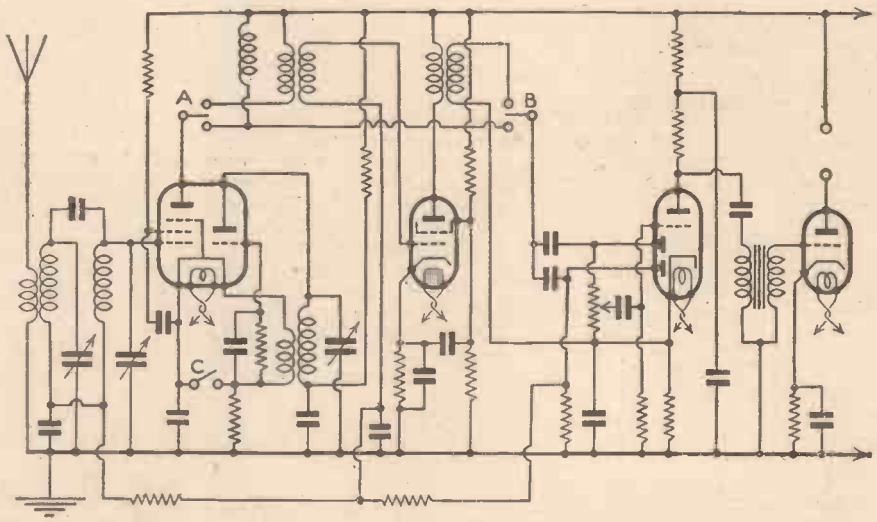
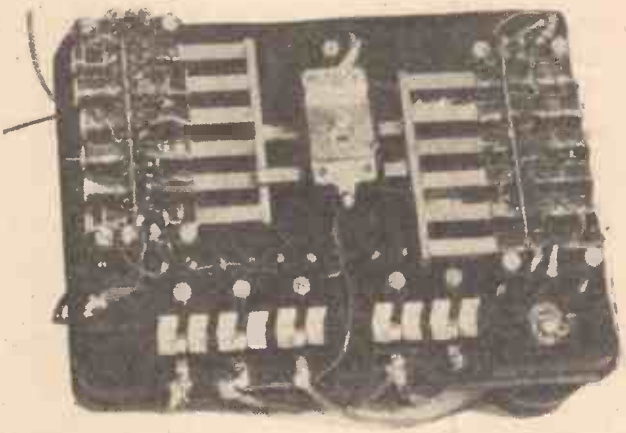


Fig. 2.—Showing switches in a four-valve superhet with triode-pentode frequency changer.

The New Brown Tuning Unit

Interesting Details of a New Permeability Tuner Designed to Cover the Broadcast Bands with Maximum Efficiency. It is a Complete Unit, and Eliminates the Variable Condenser

The complete Brown Tuner, showing the control, trimmer and wave-change switch.



The interior of the tuner. Note the compact arrangement and size of the coils.

THERE have been many interesting schemes put forward for utilising the powder-iron core in tuning coils, and we have seen some interesting types of coil developed as a result of various trains of thought. The permeability tuner, in which the movement of the iron core affects the inductance of the surrounding coil and so carries out tuning without the necessity of a variable condenser, has been developed in several patterns and some of these are still on the market. So far, however, a more or less standard type of coil has been used with the iron core and thus the full advantage has not been taken of the benefits which this core gives to the coil designer.

A Novel Idea

Mr. S. G. Brown, whose name is well known in the radio world, has spent a great deal of time experimenting with this tuning scheme, and as a result of his experiments a new tuner has been developed and is shown in the illustrations on this page. The actual coils used in the unit are incredibly minute, and may be seen in the interior view arranged in two rows of six coils. The complete tuner, by the way, measures about 4½in. long by 3½in. wide and is only an inch or so in depth, yet it incorporates the complete tuning system for an H.F. and detector stage, with wave-change switching, slow-motion drive and also includes an inter-circuit trimmer.

The Actual Coils

The coils used in this tuner measure only ⅜in. in length and are of square section, each side measuring under 3/16ths of an inch. A paper former is employed upon which the coils of enamel-covered wire are wound, and a very special method of winding is employed, in which full advantage is taken of the nodal points of the coils, as this is productive of certain results when incorporated in a receiver. By utilising this arrangement, and winding the coils in a certain manner, it is claimed that a much sharper tuner is obtainable than has hitherto been thought possible, without cutting side bands. The unit gives four times the separation which is at present obtained by other arrangements, and it is claimed that even twenty times the present separation is possible, with the result that instead of requiring a separation between stations of 9 kcs, there will be no need to have a greater separation than 1 kc. The reasons for this will be explained when full details of the coils are released.

The Tuning Arrangements

The control of inductance, or the tuning control, is carried out by sliding the small iron cores in and out of the coils, and for that purpose the cores are attached to small cross-bars which are fitted to small racks. A pinion on the central control spindle imparts to both sets of cores a similar and opposed movement and thus each circuit is tuned. The matching is accurately carried out by the manufacturers, but a small trimmer is fitted for balancing out stray capacities and this is controlled from the front by the small spindle projecting from the centre of the main tuning dial. A slow-motion device is fitted into the side of this dial and is intended for finger operation, and it provides a clean, smooth movement. For wave-change purposes a sliding bar is employed, and five separate contacts are changed in the process of passing from the medium- to the long-wave bands. The ranges covered at present are from 180 to 600 metres and from 800 to 2,000 metres.

To obtain maximum results from the tuner it is necessary to observe certain precautions. The front portion of the unit is of bakelite and it is thus necessary to screen this efficiently to prevent erratic effects, although the rear portion of the unit is of metal and may thus be earthed by any simple method. A metal panel is thus essential for the receiver incorporating one of these tuners. Furthermore, the leads from the tuner (no terminals are at present fitted) must be kept reasonably short, and in certain cases it may be desirable to screen some of them.

Further details concerning the tuner will be given at a later date, when we have had an opportunity of thoroughly examining it and trying it in various circuits.

LEAVES FROM A SHORT-WAVE LOG

HERE are a few alterations it would be wise to note: Rome 12RO, in addition to its usual Monday, Wednesday, and Friday broadcasts on 49.3 metres (B.S.T. 19.00–20.30 and 00.00–01.30), for the purposes of comparison is also testing out daily another channel, namely, 31.13 metres (9,630 kilocycles); these are destined to the United States.

DJE, Zeesen, on 16.89 metres (17,760 kilocycles) also takes the B.S.T. 14.00–17.30 programme broadcast by DJA (31.38 metres) and DJN (31.45 metres). Announcements are made in German, English, and Spanish or Portuguese, as the entertainments are for the benefit of South American listeners.

Although OER2, Vienna, does not appear prominently in our logs, this station relays the programmes from the capital daily, except Sundays, on 49.4 metres (6,072 kilocycles) from B.S.T. 15.00–23.00. The call is, of course, Radio Wien, and the interval signal a metronome. Some little difficulty is experienced at times in separating it from OXY, Skamlebaek, taking the Copenhagen programme on 49.5 metres.

Bogotá (Colombia)

Whilst in this band, bear in mind that a new station has cropped up, namely, HJ3ABH, Bogotá (Colombia), on 49.9 metres (6,012 kilocycles), and that it is trying out a new 1,600 watt transmitter. It has already been heard in the British Isles after midnight and it is reported that the interval signal is a cuckoo call. In its announcements, in which both English and Spanish are used, a call including La Voz de la Victor has been noticed.

Another station frequently logged during the week under observation is W9XF, Chicago, which shares the 49.18 metre or 6,100 kilocycle channel with W3XAL, Boundbrook. It relays WENR, Chicago, and other programmes of the N.B.C. Blue and Red Network daily (Sundays excepted) between B.S.T. 02.00–03.00 and from 06.00–07.00. The power is 10 kilowatts.

COMPONENTS

Their Action, Principle & Purpose

The Components Dealt With in This Fourth Article of the Series are Those Used in the Detector Circuit

IN going through the typical three-valve receiving circuit from the aerial towards the loud-speaker we have now arrived at the detector stage, which is shown in heavy lines in Fig. 1. In this circuit we have the tuning coil and condenser, L2 and C2 (to which reference has already been made), the grid condenser and grid leak, marked C7 and R2, the three-electrode detector valve, and the choke H.F.C2. It will be necessary first of all to gain an insight into the general method of functioning of the detector valve, although it is not proposed to cover this subject very extensively, for that has previously been done in other articles.

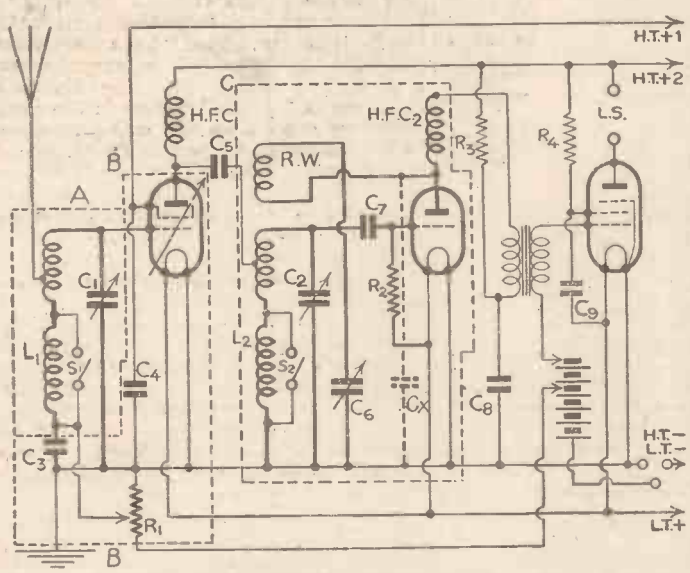


Fig. 1.—In this circuit the components referred to this week are shown in heavy lines inside the box marked C.

Two Sets of Oscillations

It is, however, now necessary to realise that the high-frequency alternating currents which we have been considering all along really consist of two different sets of alternations linked together. There is the set comprising the so-called carrier wave, and also the other set which corresponds with the sound, or modulation, currents. This will more readily be understood by looking at Fig. 2, where the carrier wave, modulation and combination of these two are shown graphically. The carrier wave is of high frequency, and it is to this that the oscillatory circuits have to be tuned; the modulation currents, on the other hand, are of low frequency and are super-imposed upon the carrier wave, the reason for the name of which will now be evident. The frequency of the carrier wave is perfectly constant whilst its *amplitude* (or mean voltage) is also constant. Both the frequency and the amplitude of the modulation currents are constantly varying, however, since they are the exact electrical counterparts of the pitch and intensity (loudness) of the music or speech which is being transmitted.

This rather long explanation has been necessary to show that there are two combined oscillating voltages in the detector circuit, it being the object of the detector stage to separate these. The reason that they must be separated is that the high frequencies of the carrier wave could not be transformed into audible sound by any means, since they would be of a pitch well above audibility. The modulation currents, however, have to be converted into sound in order to obtain a reproduction on the loud-speaker of the sounds being created in the broadcasting studio. What is required of the detector stage, then, is that it shall split up the carrier wave and modulation currents so that they again become as represented by the two upper diagrams in Fig. 2. After that, a means must be found of disposing of the carrier wave and changing the modulation currents and voltages into sound.

The Grid Leak and Condenser

The detector circuit shown in Fig. 1 is of the so-called leaky-grid variety, this name being given because there is a grid leak (a high resistance, which permits a leakage of current) connected between the grid and filament of the valve. There is also a fixed condenser joined between the upper end of the tuning coil L2 and the grid of the valve. Basically, the function of the valve is as briefly described last week—there is a flow of electrons or current from the filament to the anode. Normally the grid is slightly positive with respect to the centre of the filament, because the grid leak is connected to the positive end of the filament. This means that a certain amount of current will flow from the filament to the grid, as well as to the anode. But when current flows through a resistance there is always a voltage drop across that resistance; the voltage may be calculated by using Ohm's Law, which states that the voltage drop is equal to the current in amps multiplied by the resistance in ohms. The voltage drop occurring across the grid leak is dependent upon the current flowing, and thus upon the positive potential applied to the grid. The latter varies according to the strength of the signals passed on to the grid from the tuning circuit, and the variation in voltage is as represented by the broken line in Fig. 3. This diagram also shows how the effect of the carrier wave is cancelled out, and how only the low-frequency, or modulation, portion of the received signal is employed. We are not going to enter into this question more fully here, but any reader who would like to have a more complete understanding is asked to refer back to the issue of PRACTICAL WIRELESS dated September 30th, 1933.

Resistance and Condenser Values

Turning to the more practical side of the question it is now necessary to decide what values should be assigned to C7 and R2, and also to decide what special properties they must possess. Actually, the efficiency of the circuit is governed by the correct choice of ratio between the condenser and leak. The efficiency of the coupling, that is, the ratio of the voltage developed between the grid and filament of the detec-

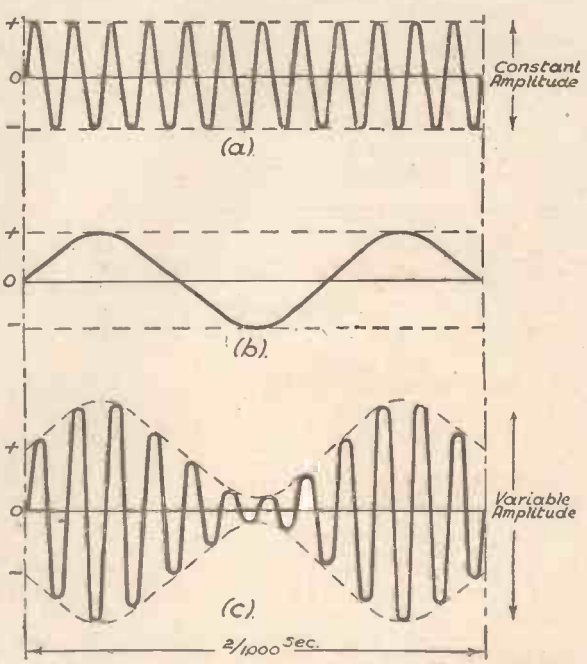


Fig. 2.—The above three diagrams represent (from top to bottom) the carrier wave, the low-frequency or audio-frequency impulses, and the combined carrier and L.F. which comprise the received signal.

tor valve to the voltage across the tuning circuit is given by the expression :

$$\frac{R}{\sqrt{R^2 + Z^2}}$$

where R is the resistance of the leak R2, and Z is the impedance (or reactance) of the condenser C7. It is, of course, possible by means of this equation to choose values of condenser and resistance which provide an efficiency of 90 per cent. or so, but only at one particular frequency—that chosen for determining the impedance of the grid condenser. (The formula for finding condenser reactance has previously been given.)

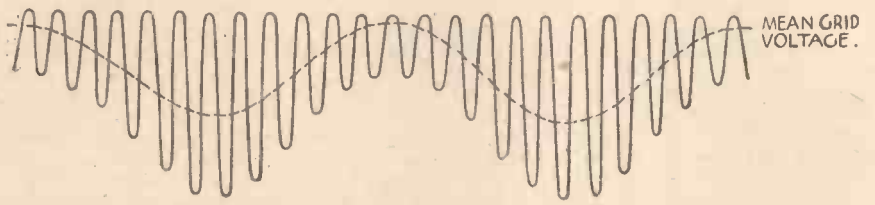


Fig. 3.—This diagram shows clearly the effect of leaky-grid rectification.

The Effect of Changing Grid-leak Resistance

For the average constructor and experimenter it will be sufficient to know that values of condenser and leak of .0002 mfd. and 2 megohms are generally most efficient at average frequencies, and with the average type of detector valve. When better low-note response is required it is sometimes advantageous to reduce the value of the leak to about .5 to 1 megohm, but this does not always follow, and experiment is the best guide. On the other hand, a slightly greater efficiency, but with sacrifice of lower notes, is sometimes to be had by increasing the value of R2 to between 3 and 5 megohms.

In the case of power-grid rectification, the object of which is to provide a greater "handling" capacity for powerful signals passed on by the H.F. stage, it is nearly always advantageous to employ a lower value of leak, so as to have a lower average bias voltage; in order to obtain a high percentage of efficiency the capacity of the condenser must then be reduced in accordance with the working of the equation given above. Usual values for power-grid are .0001 mfd. for C7 and .25 megohm for R2, but, here again, variations are possible.

It will be evident from what has been written in previous articles in this series that both the grid condenser and grid leak must be non-inductive. This means that the condenser should be of the mica or tubular type, and that the leak should not be of the wire-wound variety. As the correct types are standardised in the values required there is little chance of making any mistake.

The Reaction Choke

We briefly discussed the H.F. choke, H.F.C2, last week, but we can now study it rather more thoroughly. It has two main functions to perform; one is to carry the high-tension current to the detector valve, and the other is to prevent high-frequency currents from passing into the H.T. and low-frequency-amplifying circuits. One reason that the choke has to act as a barrier to H.F. currents is that these are required for reaction purposes and have to pass through the reaction winding marked R.W. and the condenser C6. It is necessary to point out that, although the mixture of high- and low-frequency currents was split up, and only the latter portion employed by the detector, there is a certain amount of H.F. which passes through the detector valve into the anode circuit. This may be dealt with in one of two ways : it may be "thrown away" by connecting a fixed condenser of about .0003 mfd. between the anode of the detector valve and earth (Cx in broken lines in Fig. 1), or it may be put to good use by passing it through the reaction circuit.

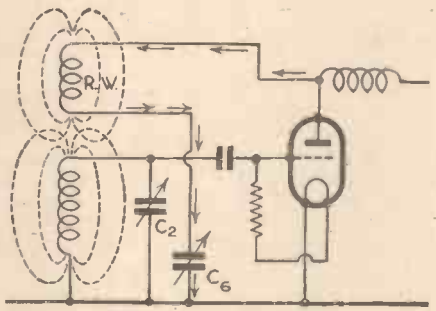


Fig. 4.—Showing the reaction and grid coils with their associated magnetic fields which "link," causing H.F. energy to be fed back from the anode to the grid circuit of the valve. Arrows indicate the path of the H.F. currents through the reaction circuit.

The Advantage of Feed-back

Generally, the latter course is followed, and all constructors know how very much the application of reaction adds to the available signal strength and range of a receiver. The idea is that the H.F. current, being unable to pass through the choke easily, looks for the path of least resistance to earth, this being through the reaction coil and condenser. The winding does offer a certain amount of impedance, but this is comparatively small. The reaction condenser, however, has a comparatively high impedance, the actual value being dependent upon the effective capacity of the component—the amount of overlap between the moving and fixed vanes—and also upon the frequency of the transmission being received. It will be apparent that the current flowing through the reaction circuit can easily be altered by varying the capacity of the condenser, and this system provides one of the simplest and most reliable forms of reaction control. The maximum capacity of the reaction condenser depends upon the size of the reaction winding and its position relative to the tuned winding, but generally a value of .0003 mfd. is most suitable. In practice a value between .00025 and .0005 mfd. can generally be used with success.

But what is reaction? the beginner will ask. A better name for it is feed-back, for the object of reaction is to feed back into the grid circuit some of the amplified H.F. currents from the anode circuit. When this is done the currents again pass through the valve, are amplified, fed back to the grid circuit, passed through the valve again, and so on; the limit is reached only when the valve becomes "saturated" or falls into self-oscillation. The idea of the reaction circuit is that the H.F. currents pass through the winding R.W. (see now Fig. 4), so that a magnetic circuit is set up. This "links" with the magnetic circuit around the tuning windings and, provided that the magnetic fields are in "phase" (acting in the same direction) one assists the other, resulting in the feed-back mentioned above. With regard to the matter of phase it should be mentioned that the windings must be connected as indicated in Fig. 5. When both windings are wound in the same direction (clockwise or anti-clockwise) the top of the tuned winding must go to the grid and the bottom of the reaction winding to the plate. If the direction of winding of one of the coils were reversed, the connections to that winding must also be reversed. Actually, it does not matter whether it is the bottom or top end of the winding which is joined to the grid or anode, so long as the "sense" of the windings is as mentioned.

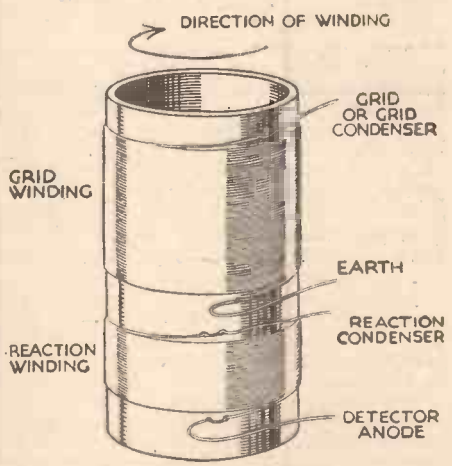


Fig. 5.—This illustration shows how the grid and reaction windings must be connected to obtain feed-back. If the direction of one winding were reversed the connections must also be reversed; if the direction of both were reversed the connections could remain unchanged. This rule applies to any type of coil.

"Jack-in" Wireless Connections

IT is very convenient to construct a wireless set so that it may be easily removed for maintenance purposes, and this may be easily done by making it possible for the set to be "jacked in" to the ebonite terminal strip. Two ebonite blocks are drilled and recessed to receive the plugs and sockets from old plug-in coil formers. One block is fixed to the set baseboard and carries a row of plugs, and the other block is screwed to the shelf carrying the set, and is fitted with sockets in positions to correspond to the plugs on the set terminal block. Permanent connections are made to the block placed upon the shelf and the plugs are simply "jacked-in" *en bloc*. Rapid removal of the set is thus facilitated for overhauling when necessary. It is advisable to add a shield over the shelf terminals to avoid any possibility of a short circuit.—Wm. A. Harrison (Aintree).

SUPPLEMENT TO "PRACTICAL AND AMATEUR WIRELESS"

AMATEUR TELEVISION

ANTI-PHASE TELEVISION SIGNALS

By H. J. BARTON CHAPPLE, B.Sc., A.M.I.E.E.

FROM questions which readers continue to ask, it would appear that considerable confusion still exists on the question of phase changes, and their effects on the television signal or the image seen in the receiver. The greatest difficulty concerns the anti-phase effect, or, what is more generally termed technically, "a phase displacement of 180 degrees." Various reasons have from time to time been given for this, but the simple explanation which follows should help to clarify the situation.

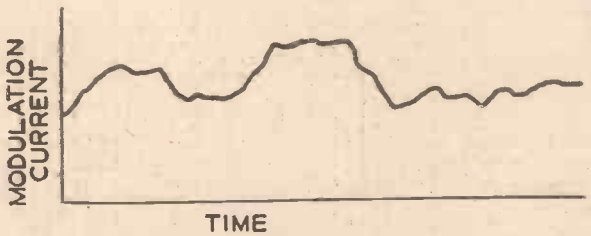


Fig. 1.—Illustrating simply the modulating current produced by a television signal.

Light Changes at the Transmitting End

To grasp the essentials it is necessary, first of all, to consider briefly what happens when the television signal is generated at the transmitting end. In the case of the transmission of a talking film, the individual pictures of that film are projected by means of a brilliant light source and lens system on to a small area near the edge of the disc, so that the minute apertures in the disc can pass across the pictures as the disc revolves at high speed. Depending on the degree of opacity of each section of the picture, varying degrees of light will pass right through the disc to the other side. That is to say, the sections of the picture which we term bright will allow a relatively large amount of light to pass through, while the dark sections will reduce this to a small quantity with corresponding quantities for the intermediary shades.

The photo-electric cell on to which this continuously varying light is focused will, in consequence, convert the high lights to a strong electrical signal, and the dark portions to a signal of low intensity.

A similar state of affairs, as far as the television signal is concerned, exists in the case of a light spot transmitter. Here a minute spot of light of constant intensity passes over the object or scene to be televised so that it explores the whole area. At any one instant, therefore, a certain proportion of the light on the minute area of illumination will be *reflected* and so influence one or more photo electric cells arranged in convenient positions round the scene or object. A bright or highly reflective (relatively speaking) surface will give a correspondingly high signal from the cells, whereas a dull or poorly reflective surface will produce a much fainter signal, and so on for intermediate shades.

In both types of scanners mentioned, therefore, there is a very distinct and proportional relation between the degree of light and shade in the initial signal televised, and the corresponding signal generated by the photo-electric cell, whose function is to convert the light variations to electrical variations.

Inversion

The effect of this is to give a continuously varying signal, or what is better termed a modulating current, which can for the purposes of explanation be shown as a simple undulatory curve as in Fig. 1. The rises and falls will correspond with the light and dark portions of the picture respectively, and as there is present the generated proportionality, it is essential to maintain this throughout the chain of events which occurs before the televised scene is watched as an image in the receiver. The penultimate stage must, however, not only maintain the variation proportions of Fig. 1, but the current direction must be the same.

If a reversal occurs through some effect, then a negative picture will result provided the inversion is complete (generally referred to as a 180 degree phase displacement). Taking the case of a simple neon-lamp disc receiver by way of an example, the effect just stated would give the correct current modulating amplitudes to the lamp, but it would glow darkly for the televised high lights and brightly for the dull sections of the picture. This gives the same result as an ordinary camera plate from which a photographic contact print is being made, and it is therefore essential to know how this reversal of phase can occur and what steps can be taken to counteract it.

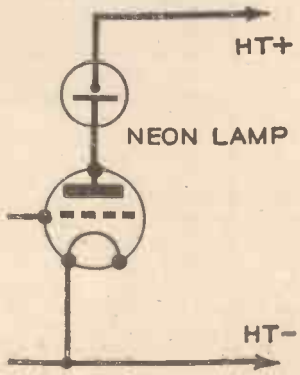


Fig. 4.—Inserting the neon lamp directly in the valve anode circuit.

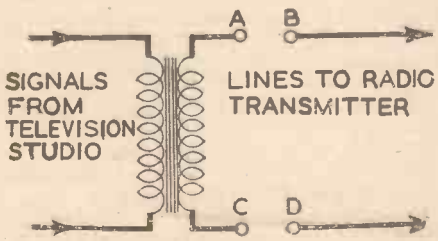


Fig. 2.—Applying the television signal to lines via an output transformer.

Transformer Reversal

Consider then, first of all, the case of a low-frequency transformer. There is no direct electrical connection between the primary and secondary windings, but when an alternating voltage and current is applied to the primary, similar voltage alternations are induced magnetically in the secondary. These are larger or smaller in magnitude, according as to whether the number of turns of wire in the secondary winding exceed or are less than those of the primary, and currents will flow through the secondary winding if the circuit in which it forms a part is closed electrically.

The television signal modulation applied to the primary winding being alternating in character, means that at any one instant one end of the winding is at a higher potential than the other end, and vice versa at another instant. Similar effects are induced in the secondary winding. If, for instance, the line from the studio to the radio transmitter is connected to the secondary as in Fig. 2, that is, A to B and C to D, then the line will have applied to it one type of signal. It will be obvious, however, that if the engineer makes his line connections to the secondary so that A is joined to D and C to B, then the signal will be completely reversed in phase or direction. Here, then, is one way in which signal direction can be reversed, and incidentally it provides the user of any radio set connected to a television receiver with a method for counteracting negative pictures if a low frequency transformer is included in his amplifier. Just reverse the connections to *either* the primary or the secondary windings and matters will be rectified.

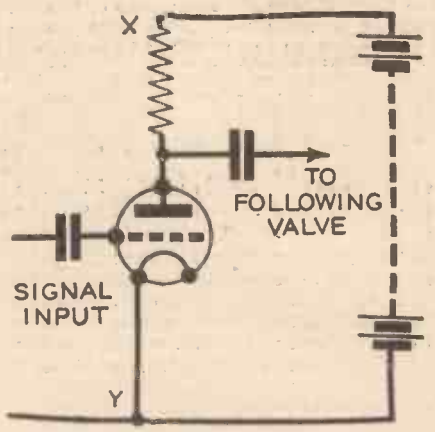


Fig. 3.—The elements of an R.C. coupled stage to show phase reversal effects.

The Case of R.C. Coupling

If we turn to a resistance-capacity coupled low-frequency amplifier (the method which incidentally is by far the best for all television reception work), the voltage and current changes can be traced quite readily. Fig. 3 shows the elementary connections for a single valve stage, and assuming for a moment that the television signal passing through the set at one particular instant causes a positive potential to be applied to the valve grid, then our knowledge of valve working tells us that the plate current through the anode resistance will increase also.

The drop of voltage across this anode impedance will therefore increase and as the total voltage applied between X and Y remains constant there is a drop of potential between the valve anode and Y, which is the earth point. Similar reasoning shows that a decrease in the potential applied to the grid causes an increase in the potential difference between valve anode and earth. Hence the voltage

changes between valve anode and earth are exactly the reverse of those applied between grid and earth. But it is the voltage changes between anode and earth which are passed to the grid of the valve

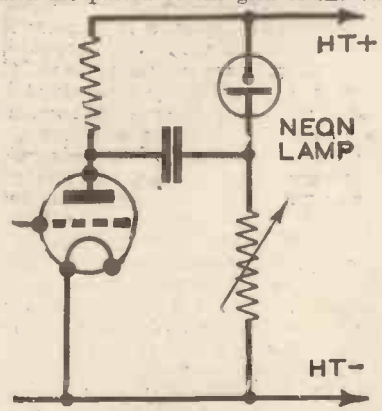


Fig. 5.—Another method of connecting the neon lamp in circuit.

in the following stage, and it is therefore quite plain to see how each stage in a resistance capacity coupled amplifier brings about a complete phase reversal.

Neon Lamp Connections

Having dealt with anti-phase effects "inside" the low-frequency amplifier, the next point that arises is in connection with the methods of joining the source of light modulation to the output valve. Taking the common case of a neon lamp connected directly in the valve anode circuit as in Fig. 4, then an increase in grid volts will cause an increase in current flowing through the lamp, and in consequence an increase in brightness. A decrease in grid volts brings about the opposite effect, so that if the number of preceding amplifier stages is correct the light intensity of the lamp will follow exactly the picture signal undulations.

When the static conditions of the output valve are such that there is insufficient current passing through the neon lamp to make it glow at its correct mean value, and also in those cases where it is desired to vary the current through the neon lamp as required, then the connections of Fig. 5 apply. From the electrical point of view this is the same as Fig. 4, that is, increase in applied grid volts causes an increase in neon lamp current and vice versa.

As far as the neon lamp and variable resistance are concerned, however, they can be interchanged as in Fig. 6 without in any way upsetting efficiency. Now the lamp is to all intents and purposes joined between anode and earth, the whole scheme being really the same as an R.C. coupled stage. Here the neon lamp voltage (and hence the current) variations are antiphase to the grid variations and, in consequence, the arrangement shown is a particularly convenient and simple one for counteracting a negative image when it is impossible, or not desirable, to bring about the change in the low frequency amplifier itself.

A Final Point

In conclusion, it is as well to remind readers that antiphase effects occur as a result of the method of rectification employed in the radio receiver. In the case of grid leak and condenser rectification the average anode current in the detector valve decreases, but with anode bend rectification the average anode current increases. At this stage in the set, therefore, another convenient method of effecting a 180 degrees phase change presents itself when the ideas just propounded are inconvenient. Furthermore, bear in mind that with the present B.B.C. low definition television service an anode bend rectifier followed by an odd number of R.C. coupled stages gives a positive image when the neon lamp is connected directly in the anode circuit of the output valve. In the case of

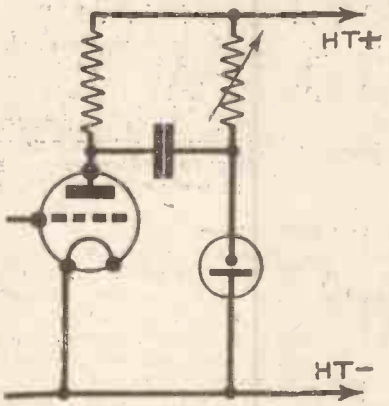


Fig. 6.—Interchanging the neon lamp and variable resistance to reverse the phase.

grid leak and condenser rectification, similar conditions are secured when there is an even number of R.C. coupled stages.

TUNING COILS — HOW MANY TURNS?

Some Convenient "Rule-of-thumb" Methods Described for the Constructor Who Makes His Own Coils

IT frequently happens that the constructor wishes to make a coil suitable for some particular circuit or wavelength, but he is generally in a quandary as to the number of turns required. Unfortunately, the calculation of the number of turns is by no means simple; even when the appropriate formulæ are used, it is necessary to know the diameter of the wire to be used, the spacing between the turns, and the ratio of the length to the diameter of the finished winding. The result of this calculation is not sufficient, however, for the inductance value of the coil in henries has then to be translated in terms of the wavelength over which the coil will tune when joined in parallel with a variable condenser.

Trial and Error

In practice, the average amateur will find it more convenient to work more by simple "rule-of-thumb" methods, and finally to decide the number of turns by trial and error. As a guide, it might be stated that for wavelengths over 200 metres it is a good plan to work on a figure of about one turn per eight metres on a former 2½in. in diameter. This gives the average wavelength of the coil when tuned by a .0005-mfd. variable condenser. Thus, a coil required to tune from, say, 300 to 500 metres (average wavelength, 400 metres) would require to have about 50 turns 2½in. in diameter, while one to cover the range from 1,000 to 2,000 metres (average 1,500 metres) would require about 200 turns, or rather less.

Long-wave and Reaction Windings

With regard to the long-wave range, it must be remembered that, in the case of a dual-range coil, the medium and long-wave windings are in series, so that the number of turns on the so-called long-wave winding will be less than the estimated figure by the number on the medium-wave section. Thus, to cover the two wavelength ranges above mentioned, the medium-wave winding would have 50 turns, and the long-wave winding 150 turns.

This method of estimation is not strictly correct, and it is generally found that rather more than the estimated number is needed on the lower range, and fewer for wavelengths over 2,000 metres. For that reason, it is better to start by winding ten turns too many, and then removing one at a time until the desired result is achieved.

The same reaction winding can nearly always be used for both wavelength ranges, and this should consist of about one-and-a-half times the number of turns on the medium-wave winding; 75 in the case of the hypothetical coil taken as example.

The disposition of the windings is almost as important as the number of turns, and it is best, as a general rule, to place the medium-wave winding at one end of the coil, arranging the turns side by side. The reaction coil can be pile wound in a slot about ⅛in. away from the end of the medium-wave coil, the long-wave section being split up into three pile-wound portions ⅛in. to ¼in. apart, the first one being ¼in. from the reaction winding.

Using a Smaller Former

When a former of smaller diameter is used the same general arrangement holds good, but the number of turns must, of course, be increased. Unfortunately, it is not possible to work from the above figures by increasing the turns in direct proportion to the diameter of the former. Neither is it feasible to calculate the length of wire required for the larger diameter windings and use this for the smaller coil. The reason for this is that self-capacity and other factors come into play. It might be pointed out that for a 1in. diameter former, it is approximately correct to allow one turn for every five metres.

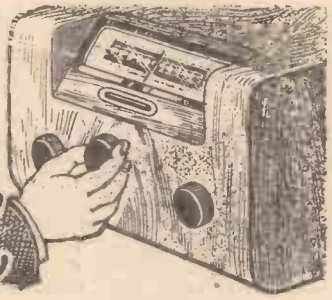
Here again, however, it is best to wind the coil with rather more than the calculated number of turns, and to adjust by trials.

For Short Waves

The position is different on short waves, partly because the turns are usually spaced. For wavelengths between 15 and 60 metres (average again), and using a good .00016-mfd. tuning condenser, allow about one turn for every 4 metres on a former 2½in. in diameter, and space the turns by the thickness of the wire. This applies when using 18-gauge enamelled wire, which is suitable. For a 1¼in. former allow one turn for every three metres.

It is worthy of note that the highest degree of efficiency is generally obtained when the length of the winding approximates to the mean diameter, but this is not a very important point.—F. P.

On Your Wavelength



By Thermion

Wavelength Scales

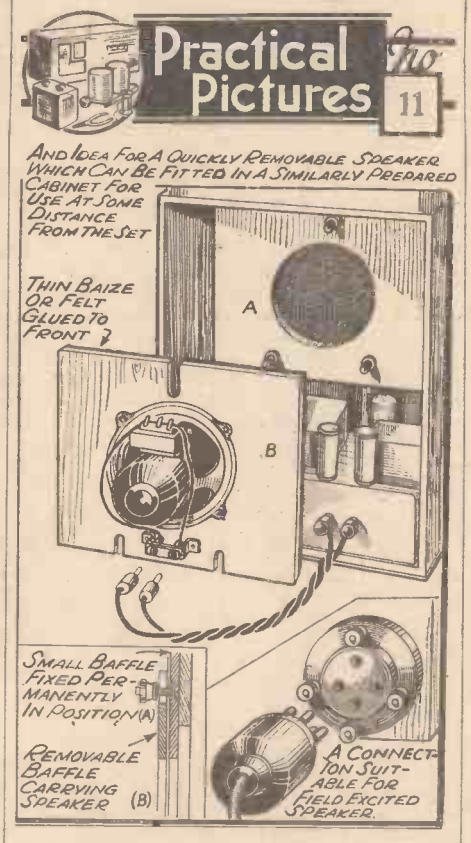
WHILST testing my neighbour's receiver I was alarmed to notice that Luxembourg came in according to the wavelength scale at 1,100 metres instead of 1,304, and that Droitwich wasn't present at 1,500 metres, preferring to come in lower down the scale at 1,300 metres. This indicated something radically wrong, either with the variable condenser or with the tuning coils. Inspection of the scale showed that it was clearly marked to be used with inductances of 157 microhenries on the medium waves, and 2,190 microhenries on the long waves. The condenser and the coils were both of well-known make, but no amount of trimming would cause the scale to track up correctly. The trouble was, of course, in the coils. I mention these points because many readers seem to be under the impression that they can depart from the designer's specification, and having done so proceed to bombard our technical staff with questions as to why their receivers do not come up to expectations. Follow the designer, who has gone to a lot of trouble to sort these things out for you. If you vary the specification you must have sufficient knowledge to know what you are doing, and it is hitting below the belt to depart from instructions and then to cry out in distress.

Short-wave Receivers

I HAVE been interested in the letters published in the correspondence pages of this journal anent short-wave receivers, and I am wondering whether there really are so many people interested in this subject, or whether it is a noisy minority who create a din out of all proportion to their numbers. I can mention many broadcast receivers which have been produced by this and other journals in past years which have been made in their thousands, yet I cannot trace that any short-wave receiver designed by the technical press has really gone over. Take Mr. F. J. Camm's Silver Souvenir; ingenious though this design is, it does not at the moment of going to press appear as if it is being made in the same numbers as his, say, Fury Four or £5 Three-valve Superhet, nor can I trace that any other short-wave receiver of contemporary design is evoking greater interest.

If I am to believe that this colossal demand for short-wave designs is a reality, readers should support and build the designs when published.

Other readers ask for special receivers, and wonder why the Editor does not prepare them. Here, I think, is the explanation: he probably knows the pulse of his readers, and concludes that it takes more than one swallow to make a summer. Quite often a reader who has a heap of components which could be absorbed in, say, a 2 H.F. detector and pentode set will write an enthusiastic letter stating that if we could prepare such a design thousands of readers will build it. Of course, the reader is thinking firstly of himself in such a case, and it would be interesting to know on what he bases his opinion that thousands of others would be interested in a similar circuit.



Lots of readers speak glibly about thousands, and I should like to know whether they are in touch with these other thousands and how they collect their concensus of opinion.

The Wireless Exhibition

IT may seem a far cry to the next Radiolympia, but this is just a reminder that this year it will be held at Olympia from August 14th to August 24th. Having given you these dates, you can mark them in your diaries and have no possible excuse for saying that the dates clash with your holidays. This journal will, of course, be represented there, as well as its associated journals *Practical Mechanics*, *Practical Television*, and the *Wireless Magazine*. For the first time your Thermion will grace the PRACTICAL AND AMATEUR WIRELESS Stand, and I hope to shake you, dear reader, by the hand.

Secrets

WHAT will the show reveal this year? Does the new Brown Tuner open up prospects of permeability tuning at last? Shall we see television apparatus there? Will components be cheaper? As far as I know there is no radical departure from type, but I do know that many firms have startling things up their sleeves (yes, even wireless manufacturers can afford these).

Short-wave Switching

LACK of a thorough understanding of the various principles underlying receiver construction can often lead an amateur to a great amount of trouble. I recently heard of a constructor who had built an "all-wave" set, but who was very disappointed with the results. He was supposed to be a keen wireless fan, and I was told that he had built hundreds of sets, but this one had completely baffled him. Owing to an unfortunate relationship (why do relatives always tell their friends that they have someone in the family who understands wireless?), I was eventually asked if I would mind just having a look at the set. I know how these things can usually lead to hours of intricate searching, but, as usual, I consented to have a look. I was not left in doubt for long, however, on this occasion, as all the trouble was due to the tuning arrangements. The constructor in question had evidently been studying the advertisements of "all-wave tuners," and had endeavoured to build up an ingenious tuner incorporating all the coils he had in his junk box. There were plug-in coils, solenoids, air-spaced coils, and complicated wave-wound coils dating back many years, and he had rigged up a most ingenious switch which brought each coil into use on various wave-bands and at the same time made the necessary circuit modifications demanded by the particular coil arrangement. Whilst admitting that he had tackled the job in a most efficient manner from the point of view of introducing the various coils, I must admit he had completely overlooked the losses introduced not only by the switch capacities, but also by the closeness of adjacent coils. On the 15-metre band, for instance, the set oscillated, but no signals could be obtained. By removing the particular coil, and wiring it direct to the tuning condenser (disconnecting the leads to the switch mechanism) dozens of stations came in at good volume. Great

(*Continued overleaf*)

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care is necessary when introducing switching for short-wave work, and unless you are well acquainted with the subject you should not attempt to employ switching schemes, but rely upon the replaceable coil method of wave-changing.

Hot Valves

HAVE you realised how hot some of the new mains valves run ? I was testing a commercial receiver the other day, complete in its cabinet, and after less than a quarter of an hour my wife entered the room and asked what was burning. I could not smell anything, and a hasty look into the back of the cabinet did not reveal any smoke or anything out of place. I assured her that she was mistaken, but she had just come in from the garden, and she said the smell was quite distinct. I left the set on and went out into the air for a few minutes. On my return I, too, could distinctly scent a sort of scorched twang, although it was not of the kind usually associated with a hot resistance, or any other component which I have before met. I switched off and was going to turn the receiver round in order to make a thorough examination, when I chanced to grip the cabinet on one side and was surprised to find it extremely hot, and, on looking closely, found that the patent polish was steaming slightly. The output valve was three inches away from the inside of the cabinet, and as this was a factory model, probably only finished off a day or so before I received it, the particular polishing medium which this firm used had not thoroughly dried out, and the great heat from the output valve was drying out some chemical in the surface. No blistering took place, and the polish remains perfectly unmarked, and now that the preliminary drying has been completed it does not smell any more, but the cabinet still gets quite hot.

A Peculiar Mains Point

I HAD a rather unusual experience the other evening, and I have not yet been able to find a proper explanation for it. I run my standard "home" receiver from a lighting point which happens to be close to the table which holds the set, using an ordinary lamp plug which fits into the corresponding socket. The set had been removed for a minor overhaul, and on re-connecting I received quite a shock —not physical this time, but mental. After fitting the plug into the socket and switching on the set and the supply, nothing happened for about thirty seconds, and then there was a sudden and minor explosion, smoke issuing from the connectors.

It seemed likely that the mains fuses would have been "blown," but on replacing the connector with a lamp, this was disproved. The fuses in the receiver (a fused connector is fitted to the set) were next examined, but these also were intact. The next step was to remove the lamp plug from the end of the wire from the set. On doing this I found that the inside of the cap, and also the terminals, were covered with a thin film of black soot. It was very evident that the bare wire ends had not shorted, and there was no sign of a fault in the flex. Without making any alterations of any kind the plug was fitted exactly as before and the set behaved normally; I later cleaned away the soot, of course.

The only explanation I can give (and it certainly does not satisfy me) is that the inside of the plug cap was airtight—due to the wire being knotted and so sealing the hole—and that a vapour of some kind was given off by the bakelite, this being ignited by a small spark which might have occurred when switching on. Perhaps readers can offer some other solution—it would please me if they could !

Reducing the Number of Valves

IT is a generally accepted fact that the more valves there are in a receiver the greater is the likelihood of a breakdown. There is another reason why it is desirable to keep the number of valves as low as possible — distortion is often introduced in multi-valve receivers due to interaction between the various stages. The majority of listeners have their receivers tuned to one or other of the local stations ninety per cent. of the time they are listening-in, and therefore in the interests of quality it is suggested that the number of valves be cut down to three or even to two for local station reception, if the transmitting station is within approximately twenty miles of the aerial. Even a moderately efficient indoor aerial will prove satisfactory in conjunction with an efficient two-valver if the distance between transmitter and receiver does not exceed fifteen miles. The proposed modification can easily be effected without altering the internal wiring of the receiver. If the set has two S.G. H.F. stages, the aerial lead should be disconnected from the normal aerial terminal, and then joined via a .0002 fixed condenser or a .0003 pre-set to the cap terminal of the first valve. This procedure will cut out the first S.G. valve, and if volume is still excessive when the volume control is at maximum, the pre-set lead can be transferred to the cap of the second valve in order to cut out both H.F. stages. In the majority of cases this reduction of the number of valves will result in a marked improvement in quality of reproduction and also background noise will be reduced. It is a very easy matter to fit two aerial terminals, one to be used for distant station reception and the other for local reception. Alternatively, a single pole double-throw switch may be used for making the suggested change-over; the aerial should be connected to the centre terminal and the two aerial terminals to the end terminals.

Short-wave Superhets

THE majority of short-wave receivers are of the straight three or S.G. straight four type. This circuit arrangement is undoubtedly very satisfactory for reception of the higher frequencies, but it has one great disadvantage, however, in that the reaction control is very critical, and unless the reaction condenser is fitted with a slow-motion drive and the detector stage is very carefully designed, reception is very difficult. By using a superheterodyne receiver this disadvantage is obviated, as a reaction control is unnecessary in this type of set. The greater part of the amplification is provided in the intermediate frequency stage or stages, and therefore greater efficiency can be obtained as the S.G. or H.F. pentode valve gives a very high degree of amplification at this frequency. Until the introduction of the heptode two valves were necessary for efficient frequency changing, but nowadays it is possible to design a very efficient four-valve-short-wave superhet by using a heptode or pentagrid frequency changer in conjunction with two S.G. I.F. stages.

The Modern Tower of Babel

WHEN is someone going to standardise station names ? Broadcasting has certainly been responsible for the creation of a modern Tower of Babel. We are taught at school during geography lesson to spell the name of our country as ENGLAND, yet the French prefer to call it *Angleterre*. Similarly, Germany is spelt DEUTSCHLAND. Rumania has a number of spellings and appears as Romania, Roumania, Rumania; Milan is Milano Vienna is Wien; Prague is Praha; Rome is Roma. Nuremburg may or may not be Nürnberg, and so on. Who is responsible for this absurd nonsense ? Why should we allow other nations to take liberties with the spelling of our place names ? and why do we take liberties with theirs ? Surely a particular country is entitled to spell a place in the manner it thinks best. The whole thing wants cleaning up so that Nation may speak unto Nation without having an interpreter present.

As it is, you have to unlearn all your school geography and start afresh when you become interested in wireless. It greatly adds to the difficulty of locating and recognising stations, particularly when pronunciations differ vastly from the spelling. With all these conferences abroad which have been talking for nearly fifteen years to no effect about peace, perhaps a little time and money could be spared to hold an international conference and agree on spellings and pronunciations.

Another difficulty is introduced by announcers who, voice-proud and no doubt anxious that their relatives should be really impressed (when indicating to those present at the family tea party) with the enunciation of their cherished ones, start to drawing-room their words and let you really know how truly polyglot they are Some announcers are really aggravatingly pedantic and punctilious. It is true that all they have to do is to read, from script composition prepared by others, and that, they have not much on which to concentrate. I believe in calling a spade a spade and have the strongest objection to having my country labelled as *Angleterre*.

British Industries Fair Broadcast

ON May 22nd there will be in the Midland programme for the first time an electrical recording of a talk broadcast directly to the Empire. The subject and speaker have a special appeal to Birmingham, for the Heavy Section of the British Industries Fair at Castle Bromwich is to be described by the Rt. Hon. Neville Chamberlain, Chancellor of the Exchequer, who has been a Birmingham M.P. since 1918. This year there will be about a thousand stands, and a new feature will be the Exhibition Road, 2,000ft. long and paved with wood, rubber, steel, tarmac, concrete and stone—so that different kinds of road surface may be compared. H.R.H. the Prince of Wales is to be there on May 23rd.

A PAGE OF PRACTICAL HINTS

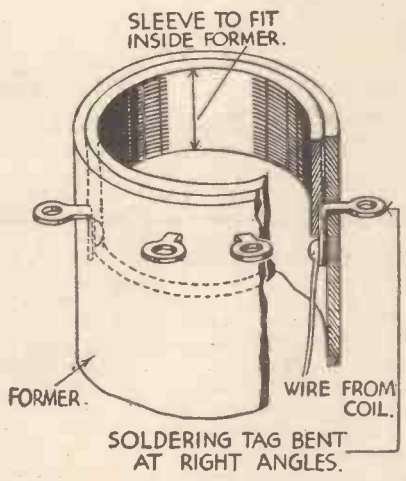
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

Using Soldering Tags for Coil Connections

SLOTS are made in appropriate positions in the top portion of the former and soldering tags are pushed through these slots and the inner ends pressed down at

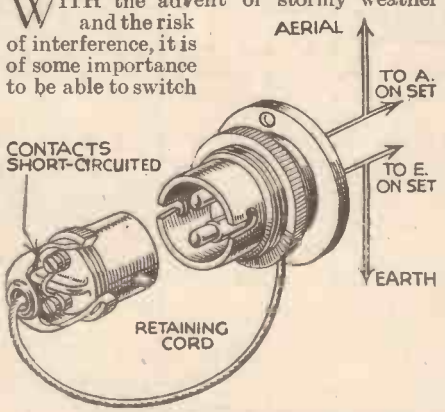


A simple method of using soldering tags for coil connections.

right angles inside, as shown in the sketch, the loops being on the outside. The ends of the coil wires are then soldered to the turned down portions of the tags inside the tube. A short cylindrical piece of tube, of a diameter to fit inside the former, is then taken and placed inside the top of the former. It should just be long enough to pass over the ends of the tags inside. Before insertion, the short tube should be smeared with adhesive and the whole pressed home to fix the tags securely in position. Connections to the set can then be readily made to the loop ends of the tags, which will be found quite rigid and in a readily accessible position.—H. S. (South Norwood).

Simple Lightning Arrester

WITH the advent of stormy weather and the risk of interference, it is of some importance to be able to switch



An inexpensive lightning arrester made with a batten holder and bakelite adapter.

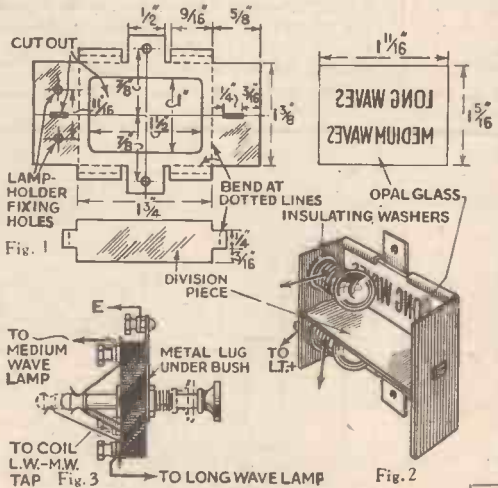
THAT DODGE OF YOURS!

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

the aerial lead quickly and safely to earth. There are many excellent devices for this purpose on the market, but as a simple and inexpensive device the following arrangement has much to commend it. It consists essentially of a bakelite batten holder (screwed to the outside of the window frame) into which is plugged, when closing down, a bakelite adapter having its terminals short-circuited by a piece of stout copper wire. So that the adapter may not be mislaid when not in use, a short length of string or wire may be passed through the hole in the end, and knotted to prevent withdrawal, the other end being held under the head of one of the batten holder screws. The accompanying sketch will make these points clear.—W. F. CLARK (Colchester).

Illuminated Waveband Indicator

THIS simple device, which gives an illuminated indication of the waveband that is switched on, can be made with

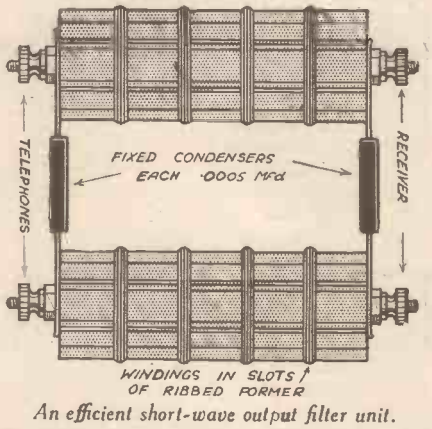


Details of construction of a simple illuminated waveband indicating device.

odd parts taken from the junk box. A piece of sheet aluminium, taken from a screen, is marked out and cut to the dimensions given in Fig. 1, and then bent to the shape shown in Fig. 2. The division piece is a strip of thin sheet brass and is fixed in place by pushing the end lugs through slots in the sides of the indicator and bending them up. The two bulbholders, which were taken from old fuse-holders, are assembled as in Fig. 2, which shows the finished indicator with the piece of opal glass bearing the waveband indications in position. A modified three-point switch, for use in conjunction with this indicator, is shown in Fig. 3. The body of the indicator is connected to L.T.+, while either lamp, according to the waveband, is connected *via* the switch to L.T.—. Other details will be clear from the sketches.—J. MCLELLAND (Liverpool).

An S.W. Output Filter

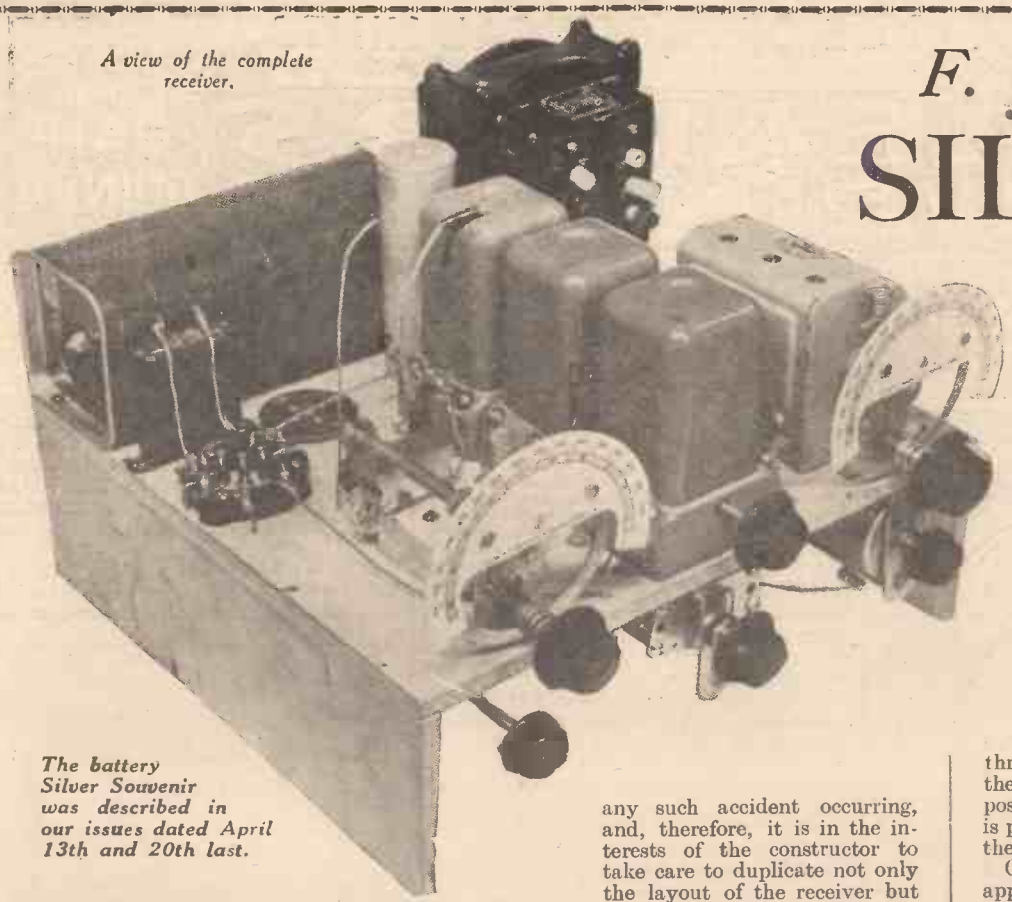
IT is often found when working with a new S.W. receiver that when wearing



An efficient short-wave output filter unit.

headphones the slightest movement of the operator's body throws the receiver out of tune, and so makes it very difficult to listen to a station for any length of time without physical strain.

This is due to stray high-frequency current in the L.F. amplifier, and can be cured by an efficient filter circuit. In the accompanying sketch is shown the constructional details of a simple filter which has proved very effective in overcoming this difficulty. It will be seen that there are two S.W. chokes, which consist of about 150 turns of 36 S.W.G. silk covered wire wound in a series of grooves cut in small ribbed ebonite formers with a triangular file. Across the ends of these chokes are two midget .0005 mfd. fixed condensers, and across one of these is connected the headphones, whilst the other is connected to the output of the receiver.—D. P. TAYLOR (Stroud).



A view of the complete receiver.

The battery Silver Souvenir was described in our issues dated April 13th and 20th last.

F. J. CAMM'S A

SILVER S

Full Constructional Details ar
Version of this Interest

WHEN dealing with receivers designed for use on the electric supply mains, it is to be expected that a little more care and thought must be expended in the construction. This is not only on account of the extra intricacy of the wiring, but it is very essential to guard against short-circuits, or loose connections, which might lead not only to the destruction of one or more components, but might also lead to the user receiving a nasty shock. In all our mains apparatus great care is taken to so arrange the components and the wiring that there is very little risk of any such accident occurring, and, therefore, it is in the interests of the constructor to take care to duplicate not only the layout of the receiver but also the wiring. Do not, therefore, be tempted to improve upon our layout, or modify the position of any part because you think it will be better, as by so doing you may introduce some unforeseen trouble.

A reference to the illustrations and the wiring diagram will show that the receiver is very compact and there is little space to spare on the chassis. Therefore, before the construction is undertaken each part should be placed in its approximate position (as taken from the wiring diagram, which is drawn to scale), and when each part is found to be correct, the screw holes or other points should be clearly indicated with a sharp-pointed instrument.

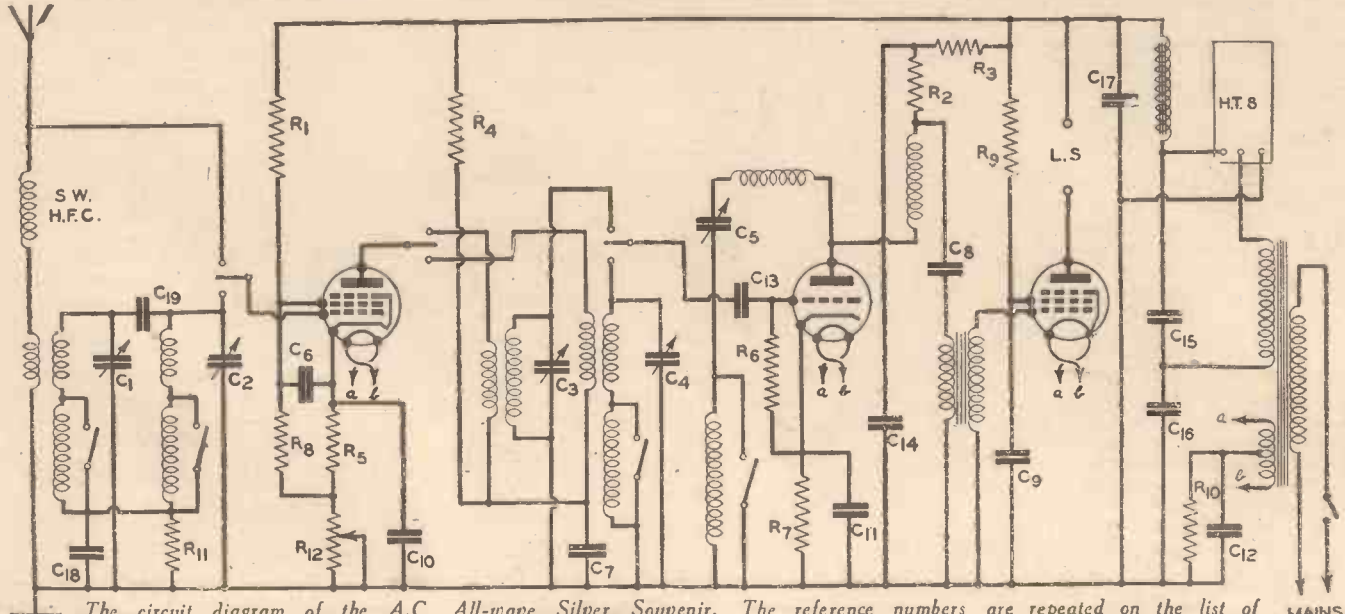
Modifications in the Design

It will be seen that there are several departures from the arrangement which was used in the battery model of this receiver, the chief of which concerns the switching of the coils. In view of the fact that it is desirable to enclose a mains receiver in a cabinet, so that no live wires may be touched whilst it is "On," it was thought necessary to place the wave-change switch on the front of the receiver. To do this without introducing long leads we have employed the Bulgin switch which is operated through a rotary movement, and three of these are arranged in the most convenient position in the circuit, and a length of rod is passed through each and controlled from the front.

Certain readers dislike the straggly appearance which results from placing resistors in their exact position in the circuit, and in this receiver we have used a Bulgin resistance board so that all resistors may be placed in one spot in orderly array, and this both adds to the neatness of the finished receiver and simplifies wiring.

The Mains Section

In the mains supply section a metal rectifier has been used for the H.T. supply, and the mains transformer supplies, in addition to the H.T. voltages, the necessary heater supply for the three valves. A choke



The circuit diagram of the A.C. All-wave Silver Souvenir. The reference numbers are repeated on the list of Components on page 244.

.C. ALL-WAVE
OUVENIR

Here Given for the Mains ing All-Wave Receiver

of ample rating is included for smoothing purposes, and the smoothing circuit is completed by an 8 mfd. electrolytic condenser. Electrolytics are also used for bias by-pass purposes, and thus, from all theoretical points of view, the circuit may be judged complete.

Starting Construction

Before starting the building of the receiver it is essential to get all the parts together, and this is to enable the exact position to be ascertained, although those who can transfer scale measurements may be able to reproduce the position from the scale wiring diagram on page 244. The chassis must first be drilled for the electrolytics, and for this purpose a 1¼in. hole should be drilled through three thicknesses of the plywood from the underside of the chassis, and a ¾in. hole should then be drilled through the centre of this hole from the top of the chassis. This arrangement is adopted in preference to using a metal bracket for the condensers, and it permits the large lock-nut to be screwed tightly on to the thread of the condenser.

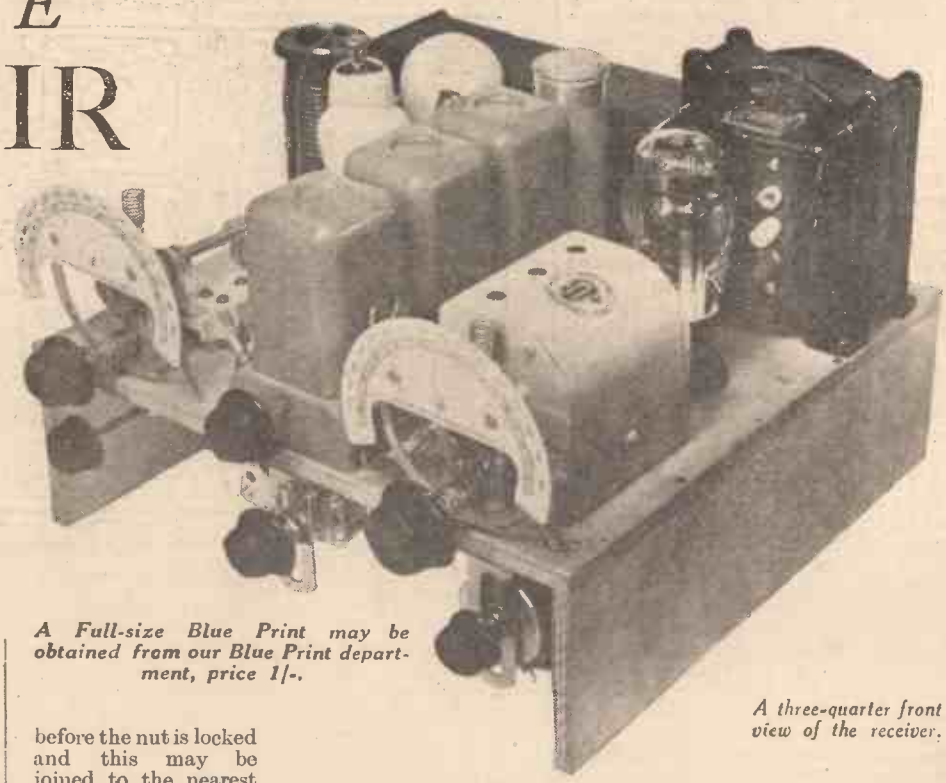
Three ⅜in. holes must also be drilled to accommodate the valveholders, and a slot must be cut on the top of the chassis so that the L.S. pick-up strip may be attached without the metal parts coming into contact with the metallised surface of the chassis. When attaching the valveholders, this point must also receive attention, and in case of doubt it is worth while to scrape away the metal coating for a space slightly larger than the top of the valveholder. This point is mentioned as we have several times had receivers here which readers had failed to get in working order, and had found that the valveholder sockets were in contact with the top of the chassis.

Mounting the Parts

When all holes are drilled, the parts should be screwed down, mounting those on the underside of the chassis first, so that the receiver will rest flat on the bench or table. Before screwing the ganged switches in position the rod should be passed through them and each switch should be locked by means of the small grub-screw on the top of the moving knob. If this is not done you may find it impossible to push the rod through all the switches when they are attached.

Construction will be simplified if all the resistances are attached to the resistance board before it is screwed in position. When attaching the electrolytic condenser, make quite certain that the metallised surface of the chassis is intact round the fixing hole and lock the nut very tightly, as it is essential that the case of the condenser be joined to earth. If preferred, a short bare wire may be placed under the condenser before the nut is locked and this may be joined to the nearest earth point. This should not, however, be necessary if the above method of mounting is employed.

Note that the short-wave tuning condenser is raised slightly above the chassis surface so that the slow-motion drive may be balanced with the dial on the opposite side of the chassis. A piece of wood will serve for the purpose, or small lengths of ebonite tube may be cut as distance pieces. In view of the delicacy of this condenser, it is as well to leave this until all the remaining constructional work has been completed.



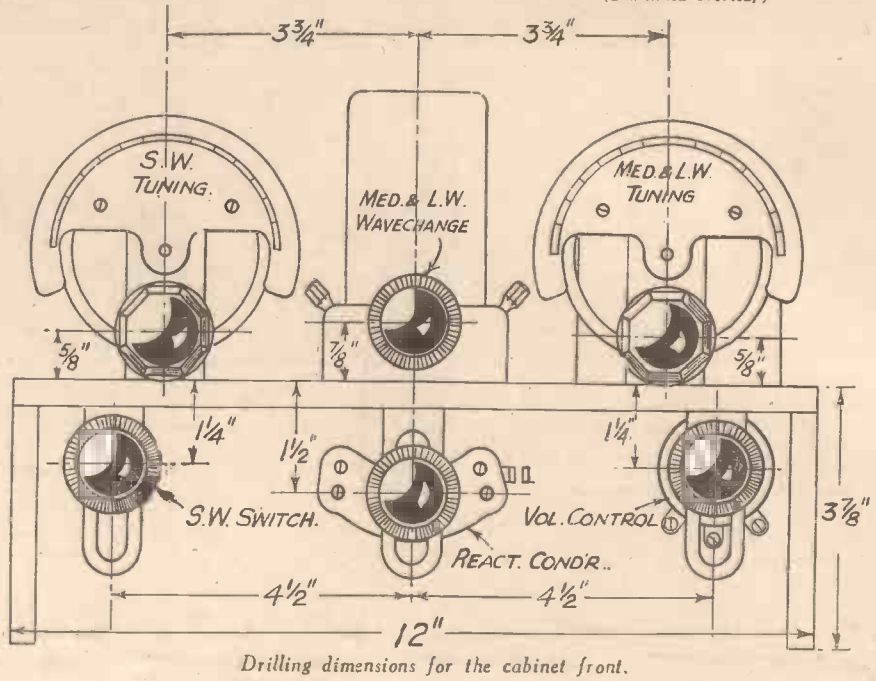
A Full-size Blue Print may be obtained from our Blue Print department, price 1/-.

A three-quarter front view of the receiver.

Wiring

The wiring is not difficult, and if a definite system is adopted it should be found no more difficult than in the case of an ordinary battery receiver. The heater circuit must, however, be wired with twin flex of sufficient thickness to avoid voltage loss. Do not use the cheap flex which is obtainable at certain stores, as this may prove unsatisfactory. You need only a short piece, and it will pay to get a good heavy lead, preferably that known as 70/36, as this will carry up to 8 amps at 4 volts without

(Continued overleaf)



Drilling dimensions for the cabinet front.

SILVER SOUVENIR

(Continued from previous page)

appreciable loss. The remainder of the wiring may be carried out with ordinary connecting wire, soldering where possible and making quite certain that all joints are really sound.

Earth Returns

There are only two other points which need emphasis on the constructional side. These concern the earth-return points which are carried out through the metallised coating of the chassis, and the screening of the reaction circuit. The latter is carried out by utilising the special screened cable sold for the purpose. This is a braided material inside which is a length of systoflex. The ordinary wire as used for wiring the receiver is passed through this systoflex and the screening cut back at the end and wrapped to prevent contact with the wire inside. When the latter is attached to the respective terminals at the ends, a short length of bare wire should be wrapped round the screening and connected to the nearest earth point. Notice carefully that the wire inside the screening lead must not be allowed to come into contact with the braiding or earth connection. The points marked M.B. are firmly attached to the metallised surface of the chassis, preferably by soldering the wire to a tag and attaching this to the chassis with a round-head screw. The points marked M.B. on the underside of the chassis must be connected to bolts the heads of which make good contact with the *upper* surface of the chassis.

LIST OF COMPONENTS FOR THE A.C. SILVER SOUVENIR

COILS

One set Three-gang, type WL-QRT (Wearite).
One Short-wave coil, type SPC with type SPB base (B.T.S.).

CONDENSERS (Variable).

One Three-gang, .0005 mfd. Baby condenser with S.M. dial C1, C2 and C4 (J. B.).
One Single S.W., .00016 mfd. type EJ with S.M. dial (C3) (Polar).
One Reaction .0002 mfd. type QJ, C5 (Polar).

CONDENSERS (Fixed).

Four .5 mfd., type 65 (C6, C7, C8, C9)
One 2 mfd., type 65 (C14)
Three 25 mfd. 25 volt electrolytics (C10, C11, C12)
One .0001 mfd., type M (C13)
One .01 mfd., type M (C18)
Two 4 mfd., type 84 (C15, C16)
One 8 mfd., type 802 electrolytic (C17)
} T.C.C.

RESISTANCES.

Two 50,000 ohms (R1, R2)
One 20,000 ohms (R3)
One 2,000 ohms (R4)
One 250 ohms (R5)
One .5 megohm (R6)
One 750 ohms (R7)
One 25,000 ohms (R8)
One 5,000 ohms (R9)
One 350 ohms (R10)
One 10,000 ohms (R11)
} Amplion 1 watt type.

CHOKES.

Two H.F., type HF3 (Bulgin).
One 40H-60 m-A L.F. (Premier).

VOLUME CONTROL.

One 5,000 ohm wire-wound potentiometer (R12) (B.T.S.).

TRANSFORMERS.

One L.F., type DP21 (Varley).
One Mains transformer, type W31 (Heayberd).

SWITCHES.

One QMB on-off, type S80 (Bulgin).
Four change-over, type S81B (S1,2,3,4) (Bulgin).

RECTIFIER.

One Style H.T.8 (Westinghouse).

CHASSIS.

Metaplex, 12in. by 12in. with 3½in. runners (Peto-Scott).

VALVES.

One MVS-PEN, one 41MHL and one PT41 (Cossor).

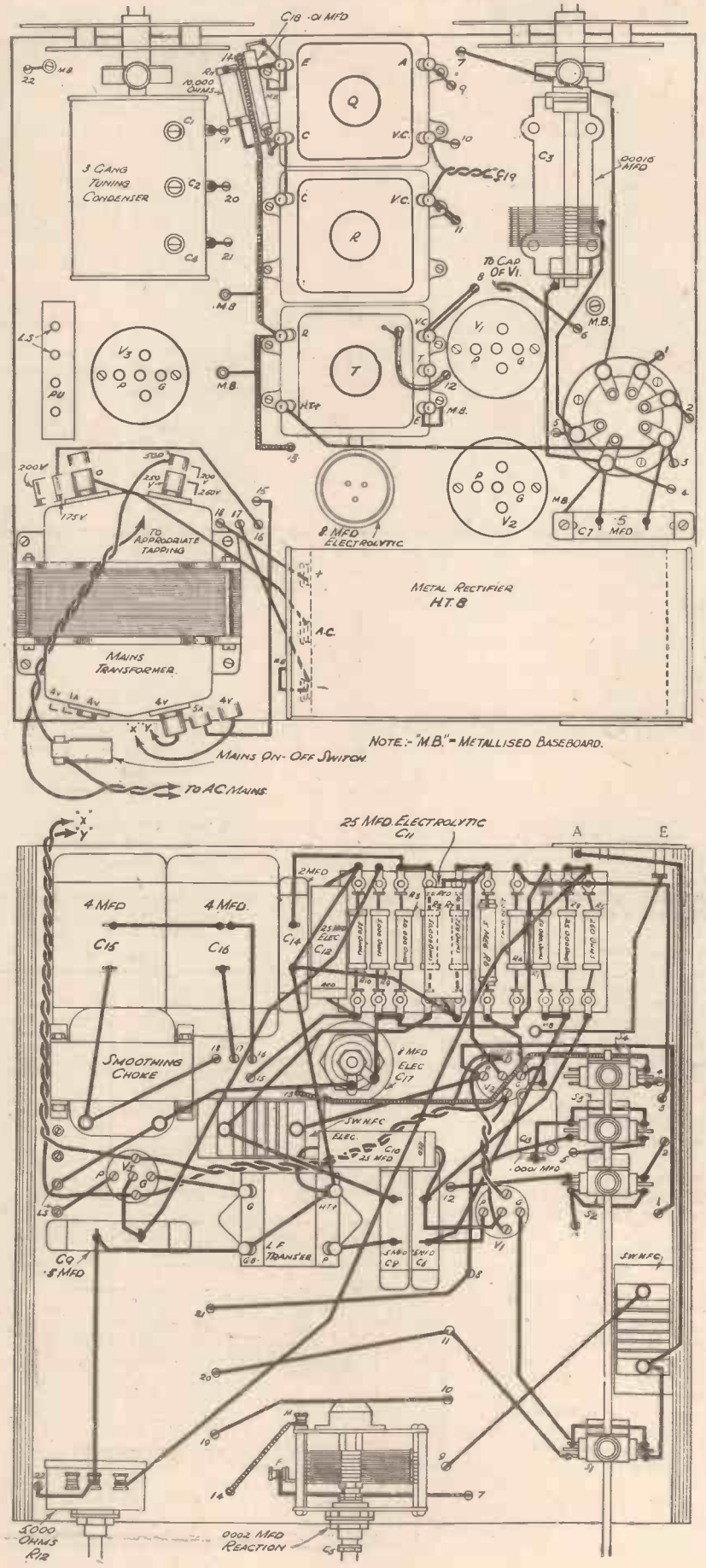
VALVEHOLDERS.

Three five-pin chassis type airsprung (Clix).

ACCESSORIES.

Four component brackets (Peto-Scott).
One ten-way group board (Bulgin).
One 9in. by 5-32in. shaft (Bulgin).
Two terminal strips, L.S.-P.U., A., E. (Clix).
One Stentorian Senior loudspeaker (W. B.).
One Silver Souvenir cabinet (Peto-Scott).

WIRING DIAGRAM OF THE ALL-WAVE A.C. SILVER SOUVENIR



THIS METRE BUSINESS

By J. ABRAHAMS

IT is perhaps understandable why, when broadcasting was introduced, the public was induced to consider wavelengths in metres when reference was made to channels on which the transmitters operated. The question of technicalities at that early period was not a vital one, as it was only the actual "listening-in" which mattered. We might equally well have been asked to think in feet: in fact, our official listening licences, when determining the permissible length of the aerial, still limit us to 100 *feet*!

Unfortunately, with the exception of the more technical-minded workers, we are still in the habit of avoiding any reference to frequencies. The average possessor of a wireless receiver is somewhat averse to any changes, and is satisfied to continue the use of a term which is totally misleading. Let it be understood that a wavelength expressed in metres signifies the distance from the crest of one oscillation to the crest of the next, or the measurement in metres between the crests of two successive waves. The frequency of an alternating current or, in this case, of the ether wave, is the number of complete cycles it passes through in one second. As the velocity of the ether wave is 300,000,000 metres per second, the wavelength of a transmission in metres will be that number (300,000,000) divided by its frequency in cycles per second. In order to make the figures less complicated it is usual to quote kilocycles (*i.e.*, 1,000 cycles) for long and medium waves, and megacycles (*i.e.*, 1,000,000 cycles) for the short waves.

To-day, however, in view of the considerable development which has taken place in the radio networks, and, consequently, the large number of stations included in all bands, it is essential that the experimental listener, or any kind of dabbler in radio, should think in frequencies; the "metre" convention should have expired with the crystal set. All official publications regularly quote kilocycles, and where an equivalent is thought to be needed merely give the approximate wavelength in metres. It is not the other way about; *the exact measurement is always in kilocycles.* To the average lay mind this may not be considered of any importance, but it is evident that if it is desired to understand any question, such as interference between stations, harmonics, or anything directly relating to radio, we must break ourselves of the habit of thinking in metres and adopt definitely without delay the kilocycle or megacycle system.

Not a Fixed Unit

The main point to be noted is that we have been led to understand from our early schooldays that the metre is a fixed and invariable unit of measurement. Perfectly true, to a degree, but hopelessly wrong in reference to wireless matters. An example will prove this easily: between, say, the channels of Belfast and Genoa on, respectively, 307.1 and 304.3 metres, we find a difference of 2.8 metres, representing 9 kilocycles. This means that one metre equals roughly 3.21 kilocycles. Lower in the waveband we notice that the difference between 200 and 201.1 metres equals 8 kilocycles, or nearly 7.3 kilocycles for 1 metre, and, again, when reverting to the "long" waves we may be surprised to notice that although Motala on 1,389 metres and Warsaw (1,339 metres) have a 50-metre separation, there are only 8 kilocycles dividing their channels? If we consider the short waves, one illustration alone suffices, namely, 12,500 kilocycles are translatable as 24 metres and 12,000 kilocycles as 25 metres, thus demonstrating that in that band 1 metre equals 500 kc/s.

Some Examples

A few examples will show clearly why it is necessary to popularise the term kilocycles and to throw metres in the discard. The newcomer to wireless and the non-technical listener, unless this is done, will never be able to understand the underlying reason, why although a specified metre separation between channels is practicable in a certain portion of the waveband, it may prove hopelessly inadequate in others. It will make such arrangements as the *Lucerne Plan* perfectly clear to him. Where it is considered that for the possible working of a scheme of this kind it is essential that there should be a minimum separation of 9 kilocycles between channels, it is only the consideration of kilocycles which will show why it is impossible to allow usurpers in the "long"-wave band following a judicious allocation of channels.

Based on a separation of 9 kilocycles, it would only be possible to work three separate transmitters in a waveband comprised between 100,000 and 10,000 metres, *i.e.*, 3–30 kilocycles; between 10,000 and 1,000 metres (30–300 kilocycles), it would be practicable to house thirty stations. It comes to this, that if all channels are to be clear we can squeeze 150 stations between 2,000–200 metres (150–1,500 kilocycles), thirty-nine between 600–200 metres (500–1,500 kilocycles). But, if it were feasible to utilise for broadcasting stations the 100–10-metre band (3,000–30,000 kilocycles), we could comfortably allocate channels with the same 9 kilocycle separation and include 3,000 *transmitters.*

SHORT WAVE SECTION

IMPROVING RECEPTION

Practical Points for the Experimenter are Dealt With in this Article.

SHORT-WAVE enthusiasts, especially beginners, soon realise that in short-wave work, in addition to financial limitations, there are technical ones, and by far the wisest course is to try to improve the apparatus on hand.

One may have a good receiver, but there is always scope for improvement, and the suggestions outlined in this article will appeal to the experimentally inclined reader who, whilst satisfied with the results obtained, wishes if at all possible to obtain the last ounce of efficiency consistent with circuit and design limitations. The short-wave aerial system used in conjunction with any type of short-wave receiver usually governs the results obtained: any old aerial will produce results, but a good aerial will produce much better results.

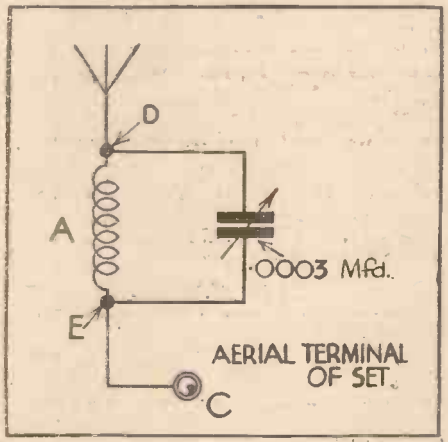


Fig. 1.—Circuit diagram for a simple tuned-aerial system.

The majority of short-wave listeners, it is safe to assume, live in built-up areas, and definite space limitations are the deciding factors so far as short-wave aerials are concerned. The most common types at present in use are the single horizontal type and the single-wire vertical type. Under these circumstance the scope for aerial improvement would appear to be non-existent.

Tuned Aerial Systems

Reference to Fig. 1 will show that there is at least one method which has possibilities, and which if adopted will increase the efficiency of the most common types of short-wave aerial. The components required are a .0003 mfd. tuning condenser, a coil, coil mounting, and two terminals, or plugs and sockets.

The complete unit, as theoretically outlined, may be assembled on a small baseboard and panel external to the receiver. The aerial proper is connected to terminal D and a lead taken from terminal E to the aerial terminal of the receiver, C. Coil A is in series with the aerial, and the variable condenser is in parallel with coil A. It follows therefore that the aerial may be tuned by the .0003 mfd. variable condenser. To be able to tune the aerial system is undoubtedly an advantage, and in effect enables the operator to shorten or lengthen it within limits, at will.

Readers who care to experiment with tuned aerial systems should make separate coils for the unit. Definite coil data, however, is not advisable, as confusion might result owing to variants in circuits and receivers. The writer suggests that duplicates of the coils and tuning condensers as used in the receiver are the most suitable for incorporating in the aerial tuning unit experimentally.

The operation of the unit is as follows. Tune in a transmission on the receiver, then tune the aerial system until signal is tuned out; re-tune the receiver, and repeat this sequence until the point of maximum comparative signal volume is found, due to the aerial and tuned circuits being in resonance. Follow this procedure on all signals heard, and note the dial readings of both tuning unit and receiver for future reference. Patience is, of course, necessary, but is well worth while.

Curing Instability

One of the most popular short-wave receivers is the simple regenerative detector followed by one or two stages of L.F. amplification. A receiver of this type, unless properly designed, is prone to headphone capacity effects, so called because the act of moving the head away from the set causes instability, and the headphones and cords are alive with stray H.F. currents due to induction between circuits. Unless H.F. and L.F. currents are kept apart, instability will result, and if effects of this nature are experienced, ways and means of curing the trouble must be found for best results.

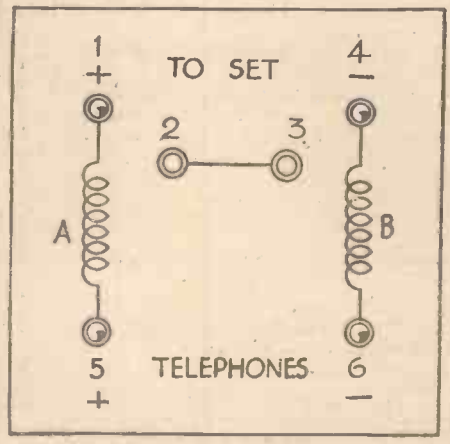


Fig. 2.—Theoretical diagram of a choke unit for eliminating headphone capacity effects.

If an L.F. output choke is incorporated in the receiver, headphone capacity will not be experienced, other things being equal. The writer has recollections of receivers in which the trouble was experienced even though an L.F. output choke was incorporated. Additional by-passing, however, cured the trouble in all cases, but faulty lay-out caused it in the first place.

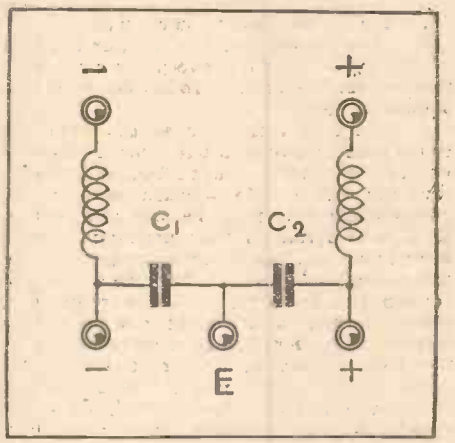


Fig. 3.—An alternative series-choke arrangement.

Readers who experience headphone capacity effects, and have not an L.F. output choke on hand, will find the choke unit shown theoretically in Fig. 2 to be a simple yet effective means of curing the trouble. This device may be built as a separate unit, or incorporated in the receiver. Chokes consisting of 20-100 turns of 30 D.C.C. wire wound on 1in. diameter ebonite tubes and six plugs and sockets are all that is required. Sockets 5 and 6 are coupled to the output of the receiver, and the headphones are coupled to sockets 1 and 4. Two pairs of headphones may be used by coupling them as follows: One pair to sockets 1 and 2, and the other pair to 3 and 4. Sockets 2 and 3 are coupled together, and the headphones are therefore coupled in series.

Series-choke Unit

Fig. 3 shows an alternative series choke arrangement, the choke construction data being as stated in the previous example. The by-pass condensers C1-C2 are of .001 mfd. capacity with centre point E earthed.

Sometimes, when trying out a new receiver it is noticed that reproduction is shrill and high pitched. There exists a mistaken impression that reproduction

of this kind is common to short-wave transmission and reception. A .002 mfd., .006 mfd., or .01 mfd. fixed condenser across the output terminals will be found to improve the tone and reduce the background. The particular value must be found by experiment, bearing in mind that if too high a value is used, high-note response will suffer due to the cutting off of the higher frequencies. A stopper choke between the anode of the output valve and 'phones negative, together with a by-pass condenser between anode and earth *viâ* H.T. — (.002 mfd. is a suitable value), is well worth trying.

It should not be forgotten that whilst the application of one method may cure a certain trouble, to attempt two arrangements at one and the same time may cause the original trouble to return, therefore do not add condensers, chokes, etc., indiscriminately merely for the sake of doing so.

Reaction Pointers

A few remarks about reaction may prove helpful. Smooth reaction may be a feature of your receiver, yet the H.T. battery sockets be so arranged that the voltage applied to the detector is either much too high or rather low. A well-made variable resistance in series with the detector anode lead will enable the H.T. voltage to be adjusted within fine limits.

Resistance controlled reaction in place of capacity control may appear to be worthy of consideration. If a perfectly smooth working variable resistance is available, well and good. The method outlined above whilst retaining all the advantages of variable voltage regulation is, due to the inclusion of the reaction condenser, silent in operation at all times as, whilst the variable resistance is set so that a suitable plate voltage is obtained, the actual control of reaction is carried out with the variable condenser. Readers are also recommended to study the various articles on reaction systems, which have been published in past issues of PRACTICAL AND AMATEUR WIRELESS.

DX Reception Reports and Verifications—By A. W. Mann

THERE are many new short-wave transmitters on the air nowadays, most of whom request listeners to send in reports on the reception of their transmissions.

In return for useful reports the listener usually receives verification of his reception by card or letter. Verification cards are the most popular type amongst short-wave listeners, and may take the form of a post-card, with details of the transmitting and associated apparatus, over-printed with the station call sign in large type. In certain instances actual photographs of the station, a map of the country where it is located, or a view of the locality, respectively, form the make up of these cards.

There are, undoubtedly, many new short-wave listeners who derive the utmost satisfaction and pleasure from their receivers, and the various transmissions heard, and would willingly send reports to station authorities if they knew the nature of the information required. There are other difficulties also. For example, certain European, South American, and Central American stations make station announcements including their address in English, whilst others do not. Announcements in broken English are also a problem, and one must listen consistently in order to definitely verify transmissions. The address announcement often defies one's efforts.

> The Purpose of this Article is to Place Before Readers Data and Definite Information Relative to a Number of DX Transmissions to Enable Them to Compile Accurate Reports

Preparing Reports

Reports should be informative and include the following :—Time, wavelength, signal strength, fading, audibility, latitude and longitude of your location, details of receiver and aerial system used, items heard, and the exact time at which each item was received. Do not forget to state the date of reception also. Signal strength and audibility data may be given, using the R1 to R9, and QSA1 to QSA5 systems, respectively. Short-wave stations working to a regular schedule receive thousands of reports on individual transmissions, and cannot be expected to pay return postage, and listeners should enclose an international postal reply coupon which costs sixpence for countries outside the British Empire, and threepence for the Imperial Coupon, both of which are obtainable at the local general Post Office, and in some instances at sub Post Offices.

It should be noted that whilst the majority of stations verify, there are a number which do not, or for that matter do not want reports on their transmissions.

The above applies to the following stations :—The RCA Rocky Point group located at Long Island, New York, including WQP (21.58 metres) testing with Moscow.

The Kaukuku Hawaii Commercial Phones, KIO, KEQ and KKP, etc., also VRT-ZFA Bermuda.

The American Phones working the trans-Atlantic traffic apply this rule, also the German Phones. As these stations work traffic with other fixed stations using beam arrays, reception reports from the contact station and consistent traffic channels between them is all they require.

This applies also to KAY and the Manila commercial telephone group. KAY is a point-to-point communication station of the RCA Communications Inc. Reports addressed to this and other RCA stations will not be verified, and the listener's attention will be drawn to the fact that such communication is correspondence of a private nature of which the unauthorised reception, the unauthorised divulging of the contents, the existence or unauthorised publication or use, is in violation of the secrecy provisions of the international Radio Convention. A letter on the above lines is known in the U.S.A. as a frightener, but the fact remains that commercial authorities must conform to the law, and whilst listeners cannot avoid tuning in unscrambled transmissions it will be understood that reports are not desired by commercial interests, and verification will not be received. If, however, communication companies operate a recognised short-wave broadcast station which carries out test transmissions, or works to a published schedule, reports will be welcomed and acknowledged.

Stations that Verify Reception

JAPAN.

Japanese stations now verify reception of their transmissions. Until quite recently the government regulations were very strict and included a definite clause that log books containing reception records must be forwarded for official examination each month. JY and JV are the prefixes now in use. Address reports to :—

The Government of Japan, Kemikawa-Cho Chiba Ken, Japan, and Government of Japan, Nagasaki, Japan, respectively.

AFRICA.

VQ7LO, P.O. Box, Nairobi, Kenya Colony, Africa.

CNR, Radio Rabat, Director-General des postes Rabat, Morocco, Africa.

SOUTH AMERICA, etc.

HJ2BA ("La Voz Paiz Tunja"), Boyaca, Colombia.

PRADO, Apartado 715, Barranquilla, Colombia.

YV2RC, Apartado 290, Caracas, Venezuela.

PPQ, Compania Radiotelegraphica Brassileira, Caixa Postal 500, Rio de Janeiro, Brazil.

HJB, Marconi Wireless Telegraph Company, Limited, Aparto 1591, Bogota, Colombia.

HJ3ABD, Colombia Broadcasting Company, Calle 16, No. 5-40 Bogota, Colombia.

MEXICO.

XEBT, Radio Station XEBT, El Buen Tona, S.A. Mexico DF.

XDA-XDC, Estacion Secretaria de Communicaciones, Mexico DF.

AUSTRALIA.

VK3ME, G.P.O. Box 1272L, Melbourne, Australia.

VK2ME, 47 York Street, Sydney, New South Wales, Australia.

VE9DN, Canadian Marconi Company, Box 1690 Montreal, Quebec, Canada. Also VE9DR.

VE9GW, Rural Route 4, Bowmanville, Ontario, Canada.

CJRX, Royal Alexander Hotel, Winnipeg, Manitoba, Canada.

VE9BJ, Capitol Theatre, St. Johns, N.B., Canada.

UNITED STATES.

W2XE, 485 Madison Avenue, New York, N.Y.

W8XK, William Penn Hotel, Pittsburg, Pa.

DUTCH EAST INDIES.

PK1WK, J. T. W. de Kort, Bandoeng, Java, Dutch East Indies.

Javanese Phones, Government Posts and Telegraphs, Bandoeng, Java, Dutch East Indies. Verify, record transmissions and occasional broadcasts.

CHINA.

XGW, Radio Administration, Sassoon House, Shanghai, China.

INDIA.

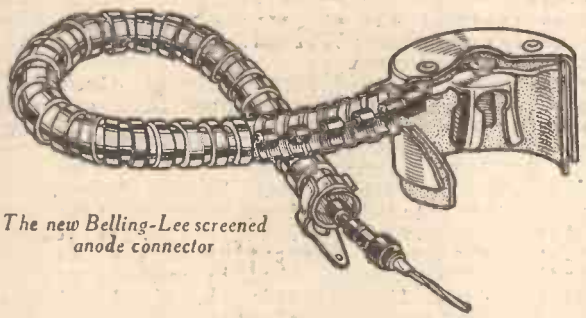
VUC, Indian State Broadcasting Service, Calcutta, India.

Facts & Figures

COMPONENTS TESTED IN OUR LABORATORY

Belling-Lee Screened Connector

WE have already pointed out in these pages that certain forms of instability may arise from coupling with the screened anode lead of an H.F. valve, or even with the actual terminal fitted to the top of this type of valve. Certain commercial receivers totally enclose the H.F. valves for this reason, and the new Belling-Lee product illustrated below forms a ready method of avoiding the trouble in a home-constructed receiver. As may be seen from the sketch, a large metal screen is provided round the connector which is designed for the new "plug top" valves. This screen is provided on its inside with a circular insulating ring which prevents accidental contact with the metallised coating of the valve and the possibility of short circuits where a cathode bias resistor is fitted. The actual lead passes through a number of glass beads, and is of ample gauge, whilst the protective covering is jointed and permits of perfect flexibility in all directions without the possibility of the wire being uncovered. A neat clip is attached and is a loose fit so that it may be anchored at any desired position to complete the earth connection and thus effectively screen the entire lead and cap. The provision of a large bead at the lower end of the lead prevents it from being drawn into the screening cable, and the device will be found worth while fitting to every H.F. stage in the interests of stability. The price is 1s. 6d.



The new Belling-Lee screened anode connector

Philco Signal Generator Price Cut

AS a result of improved methods of manufacture, and greatly increased demands for the useful signal generator (Model 024) manufactured by the Philco Radio and Television Company, the makers have been enabled to reduce the price from £6 to £4 4s. The actual specification of this device remains unaltered, and service engineers and others who are interested in this type of apparatus should make a point of inspecting one at the earliest opportunity. The range of the generator is from 105 to 2,000 kc/s (2,855.7 to 150 metres), or up to 12,000 kc/s by using the harmonics, and the dial is of the direct reading type calibrated in kc/s. A single-cell L.T. battery is fitted and this is easily replaced when discharged.

Morse Keys for Beginner and Expert

THE experimenter who is desirous of obtaining greater interest from his reception by picking up amateur transmitters from all parts of the world must learn the morse code and a key is imperative if real speed is to be developed. Similarly, the amateur transmitter must fit his apparatus with a good key, and for either purpose a model may be selected from the Electradix range. For the beginner, the Type TX at 4s. 6d. will provide perfect training. This is fitted to a moulded base, and has a nicely balanced movement with adjustable back contact. A better model is obtainable at 5s. 6d., and this has tungsten contacts, is of the balanced type, and is mounted on a bakelite panel on metal base. An aluminium cover may be obtained for this model for 9d. For 30s. one can obtain the G.P.O. type key having eight platinum double-arm four-contact points, with a side send-receive switch, brass and bevel glass cover, and an ebonite and teak base. This is a precision instrument, and is normally listed at 7 guineas, and Messrs. Electradix Radios, of Upper Thames Street, have only a few more left at this price.

New Mullard Output Valve

A NEW triode capable of giving an undistorted output of some 30 watts is now added to the Mullard range, and finds application in the powerful amplifiers used for relay systems, public address equipments and talkie film apparatus. Known as Type MZ1-100, the valve has the following electrical characteristics :—

Filament Voltage	..	6.0 V.
Filament Current	..	2.7 A.
Total Emission ..	..	1.5 A.
Max. Anode Voltage	..	1,200 V.
Continuous Anode Dissipation	..	100 W.
Amplification Factor	..	5.6
Mutual Conductance	..	4.0 mA./V.
Anode Impedance	..	1,400 ohms.

Working into an optimum load of approximately 7,000 ohms, and operated at the normal anode voltage of 1,000 V. and anode current 100 mA., the MZ1-100 gives an undistorted output of approximately 30 W. for a peak grid excitation of approximately 150 V. R.M.S.

The valve is fitted with the standard four-pin transmitting type base, type D.O.S.T.1, as used in the well-known Mullard D.O.60 valve. The list price of the MZ1-100 has been fixed at £10.10.0.

TONAL QUALITY

BEGINNER'S SUPPLEMENT

In this article the Author Discusses the Various Points to be Considered in Designing a Receiver for Quality Reproduction, With a View to a Saving in Cost.

KNOWING that it is impossible to obtain something for nothing, it follows that whatever service you demand from your radio set, be it home constructed or factory made, you must be prepared to pay a reasonable price. It is admitted generally that the tonal quality obtained from the *average* set is not perfect, and many people realise that considerable improvements can be made without encountering any severe difficulties of a technical nature, but there seems to be a general impression that the cost of doing so is unduly high. This need not be so, for although tonal quality involves expense in certain directions, there are savings in others which go a long way to off-set the cost of better quality.

Desirable Capabilities

First of all, set down the desirable capabilities of a radio receiver and see to what extent each of these capabilities affects price. In the first place, a set ought to be able to receive a certain number of different programmes. This is a function of the sensitivity and selectivity of the receiver, and the extent to which it can fulfil this condition is reflected in the first cost of the apparatus. Next in order can be placed simplicity of operation, for the normal listener requires his receiver for entertainment, and not as a means of exercising his patience and skill in operating controls. Thirdly, cost of operation is an important factor, and it is necessary to see whether high fidelity means extra expenditure in this direction. Finally, the question of the size and attractive appearance of the equipment must be studied.

The better class commercial receiver attempts to effect the best possible compromise between the conflicting interests of all the factors just mentioned, and if a high standard of overall performance is aimed at, the price of the set will be high in proportion. Fifteen to twenty guineas would not be an unreasonable price for a good modern set giving a wide choice of programmes, and very good reproduction combined with ease of control and pleasing appearance. The tonal quality will be enjoyable but not perfect, for reasons which will appear later. A home-built receiver giving a comparable performance would be much cheaper to make, but it is likely that some of the finer points in adjustment and operation would suffer by comparison and the appearance may not be quite so good.

If, however, tonal quality be considered of greater importance than range, some of the features of the all-round set can be dispensed with or modified so that the cost will not be prohibitive. On the other hand, high fidelity does involve expenditure in other directions, so that savings in one direction are partly cancelled by extra cost in others. Still, some net saving might be expected, while it is certain that a home-built quality set will be cheaper than a high-class general purpose commercial set.

A typical high-quality loud-speaker.

Practical Considerations

Coming now to practical details, the ability to receive many stations is a function of the radio-frequency side of a set, and it is in this section of the apparatus that a large proportion of the expense occurs. A highly selective set capable of bringing in fifty or sixty stations calls for either two radio-frequency amplifier stages or one or another of the superhet arrangements, and involves from four to eight tuned circuits (considering each intermediate-frequency transformer as two tuned circuits). It also means two, or sometimes three, valves prior to the detector stage. All this represents a big cost, to which must be added the value of the time spent in trimming and ganging the various circuits.

But if a large part of this high sensitivity and selectivity were voluntarily sacrificed and the listener were content with fewer stations, the cost of the set would be reduced considerably—as witness the fact that commercial sets of the simpler type can be bought for a few pounds only, and can be made at home for still less. Now it so happens that the easiest, almost the only way, to ensure the finest tonal quality is to make just this sacrifice, because high selectivity can be obtained only by cutting the sidebands which represent the higher notes, and thus depriving the programme of its quality reproduction. One of the essentials of a high quality set is that the tuning shall be comparatively flat—just sufficiently sharp to avoid mutual interference between the limited number of stations which must comprise the limited range of the receiver—and this degree of selectivity should be achieved anywhere in the country with the aid of two tuned circuits. Here, then, a really substantial saving can be made, as may be demonstrated quite easily by comparing the list prices of a two-gang and three-gang condenser; a set of two and a set of three coils; a single H.F. valve with a frequency-changer plus an intermediate frequency-amplifier, and so forth.

Operating Questions

Now consider the question of simplicity of operation. Controls operate various components in the set, and each of these costs money. Wave-change switch and tuner, and also the volume control are essential, but reaction is mainly an additional aid to selectivity and must be swept away in the quality set because it also spoils reproduction, from the connoisseur's point of view, by further cutting the "top" and, if employed to excess, causing still worse distortion. Again, much money is represented in the modern set by automatic volume-control devices which are principally intended to counteract certain types of fading. With the restricted range of a quality set, A.V.C. with its measure of attendant complications and extra cost can be dispensed with.

So far, it has been possible to show that in designing a set for good tonal quality certain savings can be made. But the debit side of the account must now be examined. First of all, a quality set will definitely be more expensive to operate than a general purpose set. It is true that one to two valves will be saved in the radio-frequency side, but there can be few readers of PRACTICAL AND AMATEUR WIRELESS who by now do not realise that for high tonal quality it is essential

(*Continued overleaf*)

A three-quarter front view of the All-Wave Silver Souvenir.

(Continued from previous page)

to employ an output stage capable of giving a very large *maximum* undistorted output. A valve drawing 12 watts from the high-tension supply is none too large for quality work, and two such valves in push-pull would be better still. A maximum undistorted output of 5 watts should be aimed at, and this most decidedly means a fifty per cent. increase in working expenses. Listeners should not, however, be alarmed at this, for it should still be possible to produce a quality mains set which will operate for ten hours at the price of one unit of electricity.

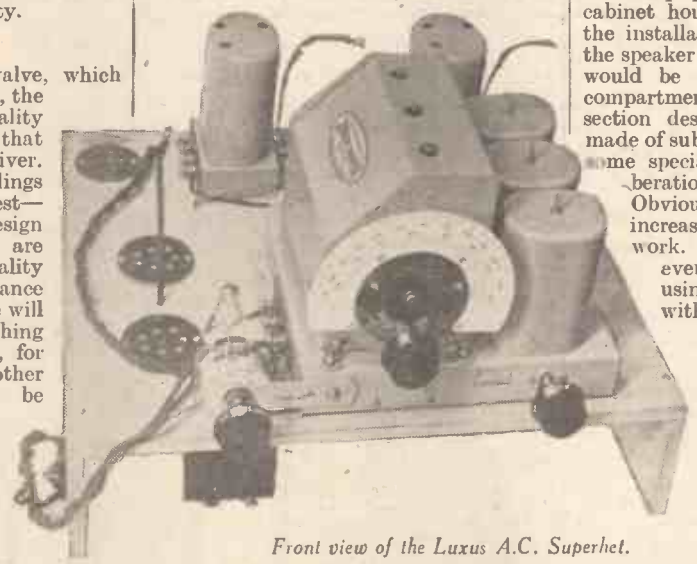
On the L.F. Side

Apart from the output valve, which mainly affects operating costs, the audio-frequency side of a quality set will be more costly than that of a general-purpose receiver. All L.F. intervalve couplings must be of the very best—transformers of generous design are somewhat costly, but are quite as good from the quality point of view as a resistance coupling. Incidentally there will be need of better smoothing and decoupling everywhere, for a small residual hum or other background which may be tolerable in an ordinary set cannot be accepted in a receiver built to be the last word in quality reproduction. Then, due to the use of a bigger output stage, a larger power transformer will be required, and, if a high-voltage triode is used instead of a push-pull arrangement, the transformer smoothing chokes and condensers will have to be of high insulation resistance (1,000-volt test), which adds further to the cost.

The Loud-speaker

Now we must turn our attention to the last piece of apparatus—namely, the loud-speaker, the component which for a variety of reasons often becomes the weakest link in the chain. However well designed the remainder of the set may be, it counts for nothing unless the best possible speaker is used. There are many high-fidelity speakers available, both in the permanent magnet and mains-energised types, and the only advice which can be given is—buy the best which you can afford, even if it means spending all you have saved in the simplification of the radio portion of your set. On balance, therefore, it looks as if the price of tonal fidelity will work out at some considerable sacrifice in the number of programmes receivable, and little or no saving in the cost of the equipment.

We have, however, not yet finished with the comparison of costs between general purpose and quality sets. We have to consider the question of appearance. It is generally conceded that no small self-contained set, with the speaker built into the cabinet, can ever hope to be a really high-quality receiver. In order to produce a wide range of audio frequencies—upon which tonal fidelity depends—the speaker must not only be of the highest quality, but it must be mounted on a baffle of large area, or its equivalent. The speaker has to set the air in the room in vibration by the movement of its cone. At the moment that the air in front of the cone is being compressed, a corresponding low pressure is created at the back of the speaker. There is a tendency for the compressed air in front to slip round to the back to neutralise this partial vacuum, with corresponding loss of power, particularly in the bass notes.



Front view of the Luxus A.C. Superhet.

It is estimated that the ideal size of the baffle is five feet square, but as this is seldom convenient in domestic apartments, some form of box baffle is suggested as an alternative. This means that the ideal equipment would consist of a cabinet housing only the radio part of the installation, and a large baffle with the speaker in the centre. The alternative would be a large cabinet having one compartment for the set and a larger section designed as a box baffle and made of substantial timber with, possibly, some special treatment to avoid reverberation or "cabinet resonance." Obviously, this would mean some increase in the cost of the cabinet work. Excellent results have, however, been obtained by amateurs using a radio-gram cabinet with the speaker compartment specially treated. This arrangement has the additional advantage that radio set and speaker can be installed at first, and a gramophone section added at a later date.

To sum up the position, it would appear that a receiver specially designed for good tonal quality would be little, if at all, more expensive than a modern receiver of the normal type employing all the latest circuit improvements. It would not, however, give so wide a choice of programmes, would be rather more costly to operate, although not unreasonably so, and would definitely take up more room. Its appearance, however, need not be any less attractive than that of the ordinary set, this depending mainly upon the ingenuity of the constructor and upon the price he is prepared to pay for the cabinet work.

ORGANISING A RADIO SOCIETY

(Concluded from page 216, May 4th issue)

THE treasurer is responsible for the safe custody of the society's funds, the proper disbursement of the same, and for the rendering of an account of his stewardship at the end of the season.

It is unwise to make the Committee too unwieldy, and three or four members in addition to the officers are ample. Their job is mainly to look after the interests of the members in a general sort of way, particularly in connection with the organisation of meetings, arranging a programme of interesting lectures and so forth.

Electing Members

To return to our inaugural meeting; after having passed the rules, the next business is to elect the officers and committee. In all probability you will find yourself nominated and elected chairman before you know what is happening. If you are not keen on the job, or have no knowledge of the rules of procedure at public meetings, you had better excuse yourself, in which case you will probably be roped in as Honorary Secretary, which, I assure you, is no sinecure.

The election of members of the committee comes next, and this may be left to look after itself, although you will be lucky if one or two members having special technical qualifications are forthcoming. Such are invaluable in preparing programmes, and can often fill a gap if a promised lecturer fails to materialise.

The question of subscription comes next for discussion. For a small society, say, up to thirty members, an annual subscription of five shillings should be fixed—and it will be a tight fit to do all that you want to do with even that amount. If the society is very much bigger, a slightly smaller subscription may be possible, but it is not advisable to keep finances low because it does cramp the style and make it difficult to provide a good programme.

Having settled this point, the main business of the meeting is completed, but the Committee should be instructed to proceed with negotiations for a suitable meeting-place, with the organisation of a programme for the season, and with any other duties which seem desirable. The secretary should obtain the names and addresses of all the members present so that he can notify them of the time and place of the first real meeting. He should also try to collect as many subscriptions as possible "on the nail."

If you have been wise, you will have arranged for some little form of entertainment with which to conclude the meeting. A good radio-gram might be borrowed for the occasion, or possibly a short and not-too-dry lecture on some radio topic arranged. This will put the newly-formed society in a good mood and start the ball rolling.

REPLIES IN BRIEF

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

J. W. (Cowes). Incorrect operating conditions are responsible. Try a potentiometer across the L.T. supply, with the grid leak returned to the arm of the potr. This may then be adjusted to obtain smooth reaction. Don't try to press this control too far in order to bring in a station which is actually out of range of the receiver.

R. O. H. (Exeter). Six turns of wire, spaced roughly 1-16in. would be quite in order. Extension rods may be necessary for tuning controls if hand-capacity effects are experienced. It depends upon the make of condenser, type of tuning dial, etc.

S. B. (Tipton). Regret we have no knowledge of the receiver and would suggest you get into touch with the manufacturers, as it would appear that it is faulty.

C. C. 2176. We have no blue prints of receivers designed for use on long waves only.

R. W. C. (S.W.4). You could use the wire in question, but it is doubtful whether the gain would be noticeable in a circuit of this nature. Your home-made transformer could be employed.

L. O'L. (Oldham). Vertical screen is unnecessary, but make certain that chokes, etc., are each screened or arranged so that there is no inter-coupling. Another L.F. stage should be unnecessary.

A. G. (Glasgow). Would advise you to use the correct coil, which may be obtained from Messrs. Peto-Scott. Your five-pin pentode is quite in order, and your mains unit should prove quite satisfactory with the receiver.

R. C. T. (Abertillery). The Family Two, WM.278 Blue Print, would probably be the most suitable for you.

E. A. H. (Edinburgh). As yours is a commercial receiver we would suggest you communicate with the makers concerning the poor performance.

H. L. (Lancaster). The diagram you sent shows the wrong type of transformer feeding the Class B valve. You show an output-matching transformer. This may be the cause of your trouble.

M. M. (W.11). Regret we cannot identify your coil. We would suggest you communicate with Messrs. Colvern concerning it.

J. H. (Ruthergien). There is no book on the lines you mention, of which we are aware. The "Handbook of Technical Instruction for Wireless Telegraphists," by H. M. Dowsett, might prove of use to you. This costs 15s., and may be obtained through your local newsagent.

M. O'C. (Tarbert). Regret we cannot understand your query. Can you set it out more clearly, when we will endeavour to advise you.

A. L. (Moss Side). We regret we have no blue print incorporating the parts you list.

H. B. (W.11). The circuit is substantially correct, but we cannot give working details without trying it out. We do not know of any firm who sells the tuning unit you refer to.

G. R. T. (Devon). Connect the H.T. x lead on the Plus One Unit to H.T. maximum on the receiver. You do not mention G.B. but presume that battery bias is employed.

O. H. (Manchester). The Plus One Unit could be used with your receiver, and it should be plugged into the output stage.

J. C. (Cheshire). The Class B valve could be used, but there would be no material advantage over the two separate valves.

T. R. (Belfast). We regret that we have no circuit details of your receiver and cannot therefore give you the desired advice. We would suggest that you communicate with the designer.

R. J. (Ilfheston). Your wiring diagram is incorrect. Can you confirm that the connections to the coil are as you state? The first coil is not in circuit as you show it.

C. S. (Acton). We have no circuit in which the battery double-diode triode is employed.

C. C. 2174 (Tunbridge Wells). Any good make of eliminator which will deliver the required current may be used. Your local dealer will be able to assist you in making a selection.

A. C. (Tring). Full constructional details for a tuning coil for use with a push-pull detector circuit were given in PRACTICAL WIRELESS, dated March 4th, 1933.

O. G. K. (Wellingborough). We are sorry that we cannot trace your trouble from the remarks given. L.F. oscillation may be causing it and we would suggest that you decouple the L.F. circuits, or if decoupling is already fitted, increase the capacity of the decoupling condenser.

A. H. O. (Hitchin). The resistance in the trickle charger may have become damaged. We would suggest that you take it to a good dealer or service man for examination.

E. B. (S.E.16.) All the parts for the disc visor may be obtained from Messrs. Peto-Scott, Ltd. This firm can also supply a suitable neon lamp. The voltage of your H.T. battery does not affect the question of the type of lamp, and if you obtain the B.T.S. lamp from the above firm you will find that it is quite satisfactory for your receiver.

H. A. W. (Brighton). The condenser may be wrongly connected. The moving vanes, to which the control is attached, should be joined to earth. Alternatively an earth return is missing from the receiver, but we cannot help you without knowing the receiver details.

M. S. H. S. (Okara). "Wireless, the Magic Carpet," or the "Elements of Wireless" will be most useful to you. They are both published by this House at 3s. 6d. (3s. 11d. by post.).

J. B. (Durham). The coils may be faulty, or the wave-change switch may be incorrectly wired. Check all connections from this point of view.

G. D. (E.14). Any good make of eliminator delivering 30 mA. will prove suitable for your use. No alterations should be necessary unless you wish to make the receiver all-mains, when, of course, it will need to be completely rebuilt.

E. A. (Nottingham). The coils in question could not be used in this particular receiver. You need I.F. transformers, not H.F. transformers. The Westector should be of the WX type.

F. B. We cannot give you any advice from your complaint, except to say that the H.T. consumption is low. For this particular receiver it should be in the neighbourhood of 20 mA and therefore a valve may be defective or a resistance of the wrong value. Careful checking is necessary to trace the fault.

J. O. B. (S.W.11). Much valuable information may be obtained by using the apparatus on the present 30-line transmissions. No definite information is available as to when these will cease, and it is almost certain that they will continue even after the high definition service is commenced.

R. D. (Lowestoft). We cannot supply complete circuit diagrams, and we have not used the coil in question in a one-valve set. The makers supply an instructional leaflet with the coil and this should assist you in constructing a simple circuit.

H. C. (Westcliff). The grid leak may be used without affecting results. The actual components you name are not on sale, but alternatives could be purchased from any local radio dealer.

H. G. P. (Jersey). The tuning condenser should be .0005 mfd, and the reaction condenser .0003 mfd. The grid condenser may be .0002 or .0003 mfd. and the grid leak 2 megohms. The grid coil should have 120 turns tapped at the 50th turn from the earthed end, and the reaction coil 50 turns separated by a space of half an inch from the earthed end of the tuning coil.

E. A. S. (Rochdale). Aluminium and lead electrodes in ammonium phosphate may be used, and a series resistance may be fitted to drop the voltage to the desired value. Full-wave rectification is desirable, although you do not state your current requirements We would refer you to the "Wireless Constructors' Encyclopaedia," or "Accumulators," published by us.

W. J. W. (Holyhead). The circuit is obviously unstable, although it is not possible to state the reason from your remarks. Carefully check connections and voltages in each stage.

C. E. P. (Chorlton-c-Hardy). Your eliminator may be suitable without alteration, but we have no details of its output. The A.C. Hall-Mark Four would be the most suitable circuit for conversion.

A. H. (Hendon), A by-pass condenser may be faulty, and the noise may indicate that internal arcing is taking place. The condenser in question should be replaced immediately, or you may damage the rectifier. By listening carefully you should easily be able to locate the exact component causing the noise.

W. A. B. (Woodford Green). Your test indicates that the H.F. stage is faulty and your examination is therefore limited to this part of the circuit. In addition to examining the separate components, check for oscillation, as this can prevent the reception of signals.

H. C. (Whitley Bay). We regret we have no blue print of a circuit employing the parts you wish to use.

J. B. (Pontypool). As the firm in question have not advertised through our pages, and the receiver in question is not of our design, we regret that we are powerless to do anything to assist you.

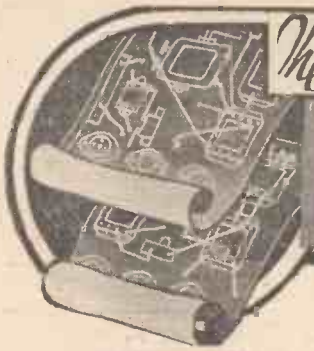
RADIO CLUBS AND SOCIETIES

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

THE GOLDERS GREEN AND HENDON RADIO SCIENTIFIC SOCIETY

AT the Annual General Meeting Mr. D. N. Corfield, G5CD, was elected president. A very favourable balance sheet was presented by the Hon. Treasurer, Mr. A. J. Bremner. The new joint Hon. Secretaries are Messrs. A. C. Griffiths and W. L. Pattullo. The meeting terminated by an exhibition of amateur-made apparatus, and Mr. E. J. Hubbard, A.M.I.E.E., exhibited and explained a multi-range A. C. voltmeter using a Mazda double-diode valve and a Weston milliameter. Mr. Royer showed a home-made microphine and recording apparatus.

At a recent meeting Mr. R. D. C. Pedlar gave an interesting lecture on low-frequency amplification. He dealt most clearly with the disadvantages in the use of chokes, transformers and condensers, and after describing a direct coupled circuit specially developed by himself gave a demonstration which was voted by those present as one of the best exhibitions of quality reproduction given before the society. The reproduction of transients was remarkably clear.—H. Ashley Scarlett, 60, Pattison Road, London, N.W.2.



The PRACTICAL AND AMATEUR WIRELESS Blueprint Service

These blueprints are full-size. Copies of appropriate issues of "Practical Wireless," "Amateur Wireless" and of "Wireless Magazine" containing descriptions of these sets can in most cases be obtained at 4d. and 1s. 3d. each, respectively, post paid. Index letters "P.W." refer to "Practical Wireless" sets, "A.W." refer to "Amateur Wireless" sets, and "W.M." to "Wireless Magazine" sets. Send, preferably, a postal order (stamps over sixpence unacceptable) to "Practical and Amateur Wireless" Blueprint Dept., Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

PRACTICAL WIRELESS.

Blueprints, 1s. each.

Long-Range Express Three	24.9.32	PW2
Mains Express Three	8.10.32	PW3
Sonotone Four	15.10.32	PW4
Bijou Three	29.10.32	PW5
Argus Three	12.11.32	PW6
Empire Short-Wave Three	3.12.32	PW7
Solo Knob Three	10.12.32	PW8
Midget Two	17.12.32	PW9
Selectone Battery Three	14.1.33	PW10
Fury Four	—	PW11
Featherweight Portable Four	6.5.33	PW12
Q.P.P. Three-Four	4.3.33	PW13
Alpha Q.P.P. Three	25.3.33	PW14
Ferrocart Q.P.P. Hi-Mag. Three	25.3.33 and 1.4.33	PW15
Supersonic Six	8.4.33	PW16
Beta Universal Four	15.4.33	PW17
A.C. Twin	22.4.33	PW18
Selectone A.C. Radiogram Two	29.4.33	PW19
A.C. Fury Four	25.2.33	PW20
Radiopax Class B Four	27.5.33	PW21
Three-Valve Push-Pull Detector Set	4.3.33	PW22
Double-Diode Triode Three	10.6.33	PW23
Three-Star Nicore	24.6.33	PW24
D.C. Ace	15.7.33	PW25
Superset	19.8.33	PW26
Auto-B Three	19.8.33	PW27
All-Wave Two	19.8.33	PW28
A.C. Three	16.9.33	PW29
Premier Super	23.9.33	PW30
Experimenter's Short-Wave Three	23.9.33	PW30A
A.C.-D.C. Two	7.10.33	PW31
All-Wave Unipen	14.10.33	PW31A
F.J.C. 3-valve A.V.C. (Transfer Print)	4.11.33	PW32
Luxus A.C. Superhet	14.10.33	PW33
A.C. Quadpak	2.12.33	PW34
Sixty-Shilling Three	2.12.33	PW34A
Nucleon Class B. Four	6.1.34	PW34B
Fury Four Super	27.1.34	PW34C
A.C. Fury Four Super	10.2.34	PW34D
Leader Three	10.3.34	PW35
D.C. Premier	31.3.34	PW35B
A.C. Leader	7.4.34	PW35C
Atom Lightweight Portable	2.6.34	PW36
Ublque	28.7.34	PW36A
Four-Range Super-Mag. Two	11.8.34	PW36B
Summit Three	18.8.34	PW37
Armada Mains Three	18.8.34	PW38
Midget Short-Wave Two	15.9.34	PW38A
All-Pentode Three	22.9.34	PW39
£5 Superhet Three	27.10.34	PW40
A.C. £5 Superhet Three	24.11.34	PW43
D.C. £5 Superhet Three	1.12.34	PW42
Hall-Mark Three	8.12.34	PW41
F. J. Camm's Universal £5 Superhet	15.12.34	PW44
A.C. Hall-Mark	26.1.35	PW45
Battery Hall-Mark 4	2.2.35	PW46
Universal Hall-Mark	9.2.35	PW47
Hall-Mark Cadet	23.3.35	PW48
F. J. Camm's Silver Souvenir (All-Wave Three)	13.4.35	PW49
F. J. Camm's A.C. All-Wave Silver Souvenir Three	—	PW50

AMATEUR WIRELESS AND WIRELESS MAGAZINE.

CRYSTAL SETS.

Blueprints, 6d. each.

Four-station Crystal Set	—	AW427
1934 Crystal Set	4.8.34	AW444
150-mile Crystal Set	—	AW450

STRAIGHT SETS. Battery Operated.

One-valvers: Blueprints, 1s. each.

B.B.C. One-valver	—	AW344
B.B.C. Special One-valver	—	AW387
Twenty-station Loud-speaker One-valver (Class B)	—	AW449

Two-valvers: Blueprints, 1s. each.

Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG.-Det. Pen)	17.6.33	AW392
Iron-core Two (D, Trans)	—	AW395
Iron core Two (D, QPP)	12.8.33	AW396
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	—	AW338A
Lucerne Minor (D. Pen)	—	AW426
Family Two (D, Trans)	—	WM278

Three-valvers: Blueprints, 1s. each.

£8 Radiogram (D, RC, Trans)	—	AW343
New Regional Three (D, RC, Trans)	25.6.32	AW349
Class-B Three (D, Trans, Class B)	22.4.33	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	14.10.33	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	20.1.34	AW417
1934 Ether Searcher, Chassis Model (SG, D, Pen)	3.2.34	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
P.W.H. Mascot with Lucerne Coils (Det. R.C. Trans)	17.3.34	AW337A
Mullard Master Three with Lucerne Coils	—	AW424
Pentaquester (HF, Pen, D, Pen)	14.4.34	AW431
£5 5s. Three: De-luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.1.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
Multi-Mag Three (D, 2 Trans)	—	WM288
Percy Harris Radiogram (HF, D, Trans)	*Aug.* '32	WM294
£6 6s. Radiogram (D, RC, Trans)	*Apr.* '33	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Tyers Iron-core Three (SG, D, Pen)	*July* '33	WM330
C.-B Three (D, LF, Class B)	—	WM333
Economy-pentode Three (SG, D, Pen)	*Oct.* '33	WM337
All-wave Three (D, 2LF)	*Jan.* '34	WM348
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	*Oct.* '34	WM371
Graduating to a Low-frequency Stage (D, 2LF)	*Jan.* '35	WM378

Four-valvers: Blueprints, 1s. 6d. each.

65/-Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2 H.F., D, QP21)	18.8.34	AW445
(Pentode and Class-B outputs for above: blueprints 6d. each)	25.8.34	AW445A
Quadradyne (2SG, D, Pen)	—	WM273
Calibrator (SG, D, RC, Trans)	*Oct.* '32	WM300
Table Quad (SG, D, RC, Trans)	—	WM303
Calibrator de Luxe (SG, D, RC, Trans)	*Apr.* '33	WM316
Self-contained Four (SG, D, LF, Class-B)	*Aug.* '33	WM331
Lucerne-Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (H.F., D, 2LF)	*Feb.* '35	WM381
Standard Four-valve Short-waver	*Mar.* '35	WM383
The H.K. Four	*Mar.* '25	WM384

Five-valvers: Blueprints, 1s. 6d. each.

Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
New Class-B Five (SG, D, LF, Class-B)	*Nov.* '33	WM340
Class-B Quadradyne (2 SG, D, LF, Class-B)	*Dec.* '33	WM344
1935 Super Five (Battery Superhet)	*Jan.* '35	WM379

Mains Operated.

Two-valvers: Blueprints, 1s. each.

Consoelectric Two (D. Pen) A.C.	23.9.33	AW403
Economy A.C. Two (D. Trans) A.C.	—	WM286

Three-valvers: Blueprints, 1s. each.

Home-lover's New All-electric Three (SG, D, Trans) A.C.	25.3.33	AW383
S.G. Three (SG, D, Pen) A.C.	3.6.33	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen) A.C.	23.6.34	AW439
D.C. Calibrator (SG, D, Push-pull, Pen) D.C.	*July* '33	WM328
Simplicity A.C. Radiogram (SG, D, Pen) A.C.	*Oct.* '33	WM333
Six-guinea AC/DC Three (HF Pen, D, Trans) A.C./D.C.	*July* '34	WM364
Mantovani A.C. Three (HF, Pen, D, Pen) A.C.	*Nov.* '34	WM374

Four-valvers: Blueprints, 1s. 6d. each.

A.C. Melody Ranger (SG, DC, RC Trans) A.C.	—	AW380
AC/DC Straight A.V.C.4 (2 HF, D, Pen) A.C./D.C.	8.9.34	AW446
A.C. Quadradyne (2SG, D, Trans) A.C.	—	WM279
All Metal Four (2SG, D, Pen) A.C.	*July* '33	WM329
"W.M." A.C./D.C. Super Four	*Feb.* '35	WM382
Harris Jubilee Radiogram	*May* '35	WM386

SUPERHETS.

Battery Sets: Blueprints, 1s. 6d. each.

1934 Century Super	9.12.33	AW413
Super Senior	—	WM256
1932 Super 60	—	WM269
Q.P.P. Super 60	*Apr.* '33	WM319
"W.M." Stenode	*Oct.* '34	WM373
Modern Super Senior	*Nov.* '34	WM375

Mains Sets: Blueprints, 1s. 6d. each.

1934 A.C. Century Super, A.C.	10.3.34	AW425
1932 A.C. Super 60, A.C.	—	WM272
Seventy-seven Super A.C.	—	WM305
"W.M." D.C. Super D.C.	*May* '33	WM321
Merrymaker Super A.C.	*Dec.* '33	WM345
Heptode Super Three, A.C.	*May* '34	WM359
"W.M." Radiogram Super, A.C.	*July* '34	WM366
"W.M." Stenode, A.C.	*Sep.* '34	WM370
1935 A.C. Stenode	*Apr.* '35	WM385

PORTABLES.

Four-valvers: Blueprints, 1s. 6d. each.

General-purpose Portable (SG, D, R.C., Trans)	—	AW351
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22 9.34	AW447
Town and Country Four (SG, D, RC, Trans)	*May* '32	WM282
Two H.F. Portable (2 SG, D, QP21)	*June* '34	WM363
Tyers Portable (SG, D, 2 Trans)	*Aug.* '34	WM367

SHORT-WAVERS. Battery Operated.

One-valvers: Blueprints, 1s. each.

S.W. One-valve	—	AW329
S.W. One-valve for America	—	AW429
Roma Short-waver	10.11.34	AW452

Two-valvers: Blueprints, 1s. each.

Home-made Coil Two (D, Pen)	14.7.34	AW440

Three-valvers: Blueprints, 1s. each.

World-ranger Short-wave 3 (D, R.C, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-waver	*Jan.* 19, '35	AW463
Short-wave Adapter	*Dec.* 1, '34	AW456
Superhet. Converter	*Dec.* 1, '34	AW457

Four-valvers: Blueprints, 1s. 6d. each.

"A.W." Short-wave World Beater (HF Pen, D, RC, Trans)	2.6.34	AW436
Empire Short-waver (SG, D, RC, Trans)	*Mar.* '33	WM318

Mains Operated.

Two-valvers: Blueprints, 1s. each.

Two-valve Mains Short-waver (D, Pen) A.C.	10.11.34	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	*Aug.* '34	WM368
"W.M." Long-wave Converter	*Jan.* '35	WM380

Three-valvers: Blueprints, 1s. each.

Emigrator (SG, D, Pen), A.C.	—	WM352

Four-valvers: Blueprints, 1s. 6d. each.

Gold Coaster (SG, D, RC, Trans) A.C.	*Aug.* '32	WM292
Trickle Charger	*Jan.* 5'35	AW462

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).

"Whom the Gods Wish to Destroy . . ."

SIR,—My sympathies go out to Thermion in this matter, and, though perhaps he had better stick to technicalities rather than generalities (as being safer ground) I am certainly with him, and anyone else who deplores the time given to jazz with its accompanying maddening crooning. One must suppose that there are some folk who appreciate this sort of thing—though it is difficult to appraise the mentality of those who do—but I know of only one person who does, and she (yes, it's a woman) is of a type that one would wish were not in existence. Everyone else I know switches off as soon as this sort of thing comes on, whilst one friend declares that its effect on him is to make him want to rush off and murder the person who is responsible for the idiotic, cacophonous, tuneless "tripe"; and whilst perhaps I am not prepared to go with him to help I should certainly refrain from putting any hindrance in his way.

Whom the gods wish to destroy they first deprive of reason; and if England wants this kind of thing, then, "God save England."—H. C. E. (Reading).

New U.S.A. Station

DEAR "THERMION,"—You are not quite correct in saying that WOR is a new station. It has been one of New York's "big four" for some time now, although emanating from Newark, N.J., "owned and operated by L. Bamberger and Co., one of America's great stores," as its announcers inform all and sundry. Doubtless the present transmitter, at Cartaret, N.J., likewise its present power, are new, but WOR is as much a landmark in the U.S.A., as regards radio history, as KDKA.—L. JOYCE (Forest Gate).

Flat Baseboard Construction

SIR,—May I add my support to those of your readers who favour flat baseboard construction. For the amateur, flat baseboard type of construction affords a greater scope for those who revel in experimenting. Though not so professional-looking, it is more easily accessible for trying various components.

Just a suggestion of how to lay out the components to get maximum results would be sufficient, as it could be wired from the theoretical diagrams, which, incidentally, would settle the argument of pictorial *versus* theoretical circuits.

I should also like to see published in the near future a receiver on the lines that your reader, F. Bird, suggests, covering similar wavebands, if possible, to your "Silver Jubilee" and also designed for flat type baseboard construction.—J. H. LIGHT (Plymouth).

Interference Problems

SIR,—As a regular reader of PRACTICAL AND AMATEUR WIRELESS, I am taking advantage of your request for suggestions by asking for an article on mains interference as caused by electric fans in the tropics.

As you are aware, short-wave sets are very susceptible to interference from mains such as lifts, trams, neon signs, etc., but the cause of most of the trouble is the electric fan. The majority of short-wave "fans" live in the mofussil where lifts, etc., are conspicuous by their absence but hundreds of homes are lit electrically, and where there is an electric light there is usually a fan—thanks to our white-hot summers—and though these selfsame fans are a boon, they are the cause of much heartburning from the "Blighty" listeners. I have tried listening in May and June without a fan, and I can assure you it is far from pleasant.

The common remedy of two condensers across the brushes, with the centre point earthed, is not always feasible, for two main reasons.

1. It is difficult to get to the brushes in an entirely closed fan and next to impossible to get the condensers inside.

2. Most fans hang on insulated hooks, with the result that the earthing wire goes half-way round the room and averages 20 to 30ft.

I am sure an article—not too highly technical—on this subject, together with suggested remedies, will be greatly appreciated.—A. F. TAYLOR (Lillooah, Bengal, India.

[*A practical article dealing with this subject was published in our issue for March 9th*, 1935.—ED.]

A Jubilee Four-valver

SIR,—The receiver suggested by your correspondent, Mr. F. Bird (Harrogate), is exactly what I require, and I hope sufficient support is forthcoming to prompt you to publish a suitable design.—A. LAWSON (Camberwell).

CUT THIS OUT EACH WEEK

Do you know

—THAT a .0005 mfd. variable condenser may be used for short-wave tuning by adopting the band-spread system.

—THAT for the above system a small variable condenser is connected in parallel with the large one, in series with it or across a portion of the coil.

—THAT a choke may be wound to act efficiently on short and normal broadcast bands, but tapering the ends and using the sectional-winding scheme.

—THAT an output filter may be constructed as a separate unit for connection to a receiver when desired.

—THAT all switches for breaking circuits where current is flowing should preferably be of the quick make-and-break type.

—THAT in mains apparatus the current of the circuit should be borne in mind when selecting a switch.

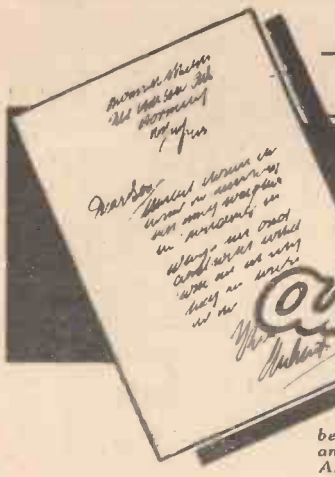
—THAT grub screws on control knobs should be well sunk and afterwards covered with sealing wax or similar material on mains apparatus.

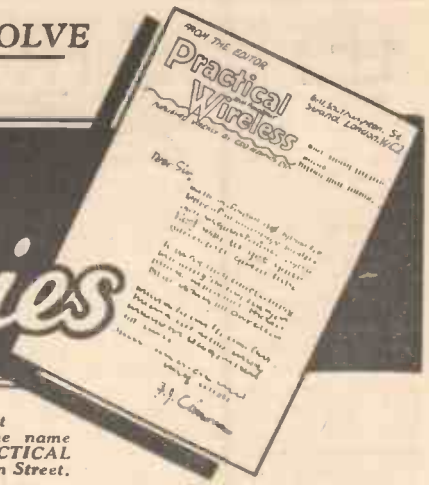
The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL AND AMATEUR WIRELESS. *Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible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

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

Queries and Enquiries





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 AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, 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 of receivers described in our contemporaries.
(3) Suggest alterations or modifications to commercial receivers.
(4) Answer queries over the telephone.
(5) Grant interviews to querists.

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

Input Signal Strength

"Is a Q.P.-P. output circuit less easily overloaded than a single pentode? Also, how should I connect a pick-up to its volume control and to a set with a jack provided for gramophone?"—D. A. B. (Northam, Devon).

As the valves used in a Q.P.-P. circuit require about twice the bias that a single valve would need, the signal voltage across the secondary of the transformer is *four* times that required for one similar valve in a single circuit. Thus the Q.P.-P. stage will handle a much greater signal than a single similar valve. The two leads from the pick-up should be joined to the outside terminals of the volume control, and the centre terminal of the latter, together with one of the remaining terminals, should then be joined to the jack for connection to your receiver.

Improvising an Oscillator Circuit

"I should like to know whether an oscillator coil in a superhet, designed for use with a triple gang condenser with an oscillator section, could be used with an ordinary three-gang condenser and padding condensers, as I do not wish to spend any more on a new 3-gang condenser."—R. Y. (Manchester).

A padding condenser could be inserted in series with the section of the variable having plates of the normal shape. The value of this condenser would, however, have to be chosen with some care, and if you are using commercial coils you should approach the makers with regard to the value of the condenser. It is customary to use a .0025 mfd. fixed condenser, but probably a pre-set will be found most useful so that the best value can be found by trial.

What is a Tank Condenser?

"In your short-wave diagram of January 12th you refer to a tank condenser. Would you be so kind as to inform me what this is, as I have tried in the dealers in Liverpool and cannot obtain one."—W. T. C. (Liverpool).

In short-wave work a method of tuning which has proved very useful is that known as "band-spread." For this two separate condensers are employed, one of moderately large capacity and one of very small capacity. Generally, these are connected in parallel. A rough selection of the tuning point is made with the larger capacity, and final selection with the smaller. The larger condenser is known as the "tank" condenser, and is any ordinary type of variable. For efficient short-wave results you would, of course, get a good short-wave condenser. We would refer you to the article on band-spread tuning in our issue, dated December 8th, 1934.

Complicating Matters

"I have just completed the building of your £5 Superhet Three, but fail to get any stations, although I get a hum. When the pentode output valve is removed nothing comes through at all. The transformer I am using is a Telsen with a ratio of 1-5, but all the other components are as specified by you. I have constructed the chassis myself and covered the top with copper foil. It is worked off a D.C. mains eliminator at present. Also will you tell me how to connect a gramophone pick-up to this set?"—J. W. H. (Bexhill).

The fact that no signals can be heard indicates that some serious fault exists, but it is not possible to state where without further information. The removal of the output valve will naturally stop all sounds issuing from the loud-speaker in this particular receiver, and therefore this does not help you much. We notice that you have used an alternative transformer and have made your own chassis, but these points should not affect results unless the chassis is faulty from the earth-return point of view. As you are using a mains eliminator there may be some fault with this, and we would therefore suggest that you try the receiver with dry batteries in order to ascertain definitely whether the receiver or the unit is faulty. Ganging must be very carefully carried out and the various instructions which we have given on the subject should be rigidly followed. The connections for a pick-up were fully described on page 323 of our issue dated November 17th, 1934.

Pick-up and Hum

"I have built the A.C. Hall-Mark Four, which is O.K. on radio, but when I change over to gramophone a very loud hum is experienced. This does not alter when volume control on pick-up is operated. Leads are screened and all connections are in order."—R. J. (Felixstowe).

It is obvious from your remarks that the pick-up and its associated leads are responsible for the trouble, and we can only refer you to the recent article "The Pick-up and Instability," which appeared in our issue dated March 16th, 1935. By reading this and carrying out the various tests therein described you should soon be able to locate the cause of the hum.

Transmitting Circuit Wanted

"Would you let me know if you have a blue-print for an ultra-short-wave (battery) transmitter for round about 1 to 2 metres?"—T. B. (Hull).

We regret that we have no blue-prints of transmitting circuits and cannot give advice regarding the construction of such apparatus unless you hold the P.M.G. transmitting licence. We would draw your attention to the recent article containing details of this licence, which appeared in our issue dated April 27th, 1935.

The coupon on page 256 must be attached to every query.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face type and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. Radio components advertised at below list price do not carry manufacturers' guarantee. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.

PREMIER SUPPLY STORES

ANNOUNCE a City Branch at 165 and 165a, Fleet Street, E.C. (next door to Anderton's Hotel), for the convenience of callers; post orders and callers to High Street, Clapham.

OFFER the Following Manufacturer's New Surplus Goods at a Fraction of the Original Cost; all goods guaranteed perfect; carriage paid over 5/-, under 5/- postage 6d. extra; I.F.S. and abroad carriage extra; orders under 5/- cannot be sent C.O.D.; please send for illustrated catalogue, post free.

PREMIER SUPPLY STORES Announce the Purchase of the Complete Stock of a World-Famous Continental Valve Manufacturer, all the following standard mains types, fully guaranteed, 4/6 each. HL, L, Power. High, Medium and Low Magnification Screen Grid. Variable-mu Screen Grid; 1, 3 and 4 watt A.C. output, directly heated Pentodes; 250-volt 60 ma. Full Wave Rectifiers; A.C./D.C. types, 20 volts .18 amp. Filaments; Screen Grid; Variable-mu Screen Grid; H, HL, Power and Pentodes.

THE following types 5/6 each; 350v., 120 ma. full-wave Rectifiers; 500v., 120 ma. full-wave Rectifiers, 2½-watt indirectly-heated Pentodes.

2-VOLT Valves, detector, H.F., L.F., 2/3; power, low consumption power, super power, 2/9; screened grid, variable-mu screened grid 5- or 4-pin Pentodes, Class B D.D. Triodes, 5/-.

THE Following American Types, 4/6; 250, 210, 245, 226, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 27, 77, 78, 2A5.

THE Following Types, 6/6 each: 42, 25Z5, 36, 38, 83, 39, 44, 53, 6B7, 2A6, 2B7, 5Z3, 6C6, 6A4, 6D6, 6F7, 43, 59, 1A6, 1C6, 1V, 12AS, 12Z3, 19, 30, 31, 32, 33, 34, 41, 49, 56, 57, 75, 76, 79, 82, 84, 6Z4, 85, 89.

LISSEN 3-gang Superhet Coils, with switching; listed 30/-, with circuit, 6/-.

LOTUS 3-gang Band-pass Coils; 12/6 per set; with switching.

BEST British make Bakelite cased 0-1 m.c. Milliamp-metres, 2⅜ inch outside diameter 18/6, 3¼ inch outside diameter 22/6.

12 TO 2,000 metres. Huge Purchase of All-Band 2 gang Coils from prominent British manufacturer. Fully Screened with switching for S.G. Det. type receivers, 4 Separate Bands, 12 to 2,000 metres. 12/6 with circuit.

SPECIAL Offer B.T.H. Moving Coil Speakers, matched pairs, specially manufactured for McMichael Supervox; 8in. diameter, 1,500 ohms-7,500 ohms (1,500 speaker as choke, 7,500 ohms speaker in parallel with H.T. supply); complete with special dual output transformer for pentode, 15/6 per pair; A.C. kit for above pair, 12/6.

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, 16/6; 9in. cone, 22/6.

A LARGE Selection of Pedestal, table and radio-gram cabinets by best manufacturers at a fraction of original cost; send for list.

T.C.C. Electrolytic Condensers, 15 mf., 50v. working, 1/-; 50 mf., 12v. working, 1/-; 15 mf., 100v. working, 1/-; 25 mf., 25v. working, 1/-.

CONDENSER blocks, H.M.V., 400v. working, 4+2+1+1+1+0.5, 3/9; 2+2+1+1+1+0.5, 3/-.

ALL-ELECTRIC 3-stage Amplifiers, 200-250v., 40-60 cycles, 10 watts undistorted output, complete with 5 valves, and Magnavox Super 66 energised speaker, £12/10/-.

ELIMINATOR Kits, including transformer, chokes, Westinghouse metal rectifier, condensers, resistances, and diagrams, 120v. 20 m.a., 20/-; trickle charger, 8/- extra; 150v. 30 milliamps, with 4 v. 2-4 amp., 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., 37/6; 200v. 50 m.a., with 4v. 3-5 amps., L.T., 27/6.

PREMIER Chokes, 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; 25 milliamps., 20 hys., 2/9.

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

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

B.T.H. Truspeed Induction Type A.C. only, Electric Gramophone Motors, 100-250v., 30/- complete; ditto, D.C., 42/6.

COLLARO Gramophone Unit, consisting of A.C. motor, 200-250v. high quality, pick-up and volume control, 49/-; without volume control, 46/-.

(*Continued at top of column three*)

(*Continued from foot of column one*)

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

SPECIAL Offer of Wire-wound Resistances, 4 watts, any value up to 50,000 ohms, 1/-; 8 watts, any value up to 100,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

WHITELEY Boneham Energised M/c Speakers, 2,000 or 2,500 ohms. 8 inch diameter, 9/11. Please state which type transformer required.

COSSOR Permanent Magnet M/c speakers, large Darwin Cobalt Steel Magnet, 8 inch diameter, please state transformer required, 13/6.

LISSEN 2-Gang Condensers, Uniknob Trimmer, Disc Drive, .0005 each section, 5/6.

POLAR STAR, manufacturers' model, 3-gang condensers, fully screened, 7/6, with trimmer; unscreened, 5/-.

WIRE End One Watt Resistors, our assortment, 2/- per dozen.

ORMOND No. 4 Variable Condensers, 0.00025, 1/6. O.K. for Short Waves.

SPECIAL Offer Western Electric Mains Transformers, input 200-250 volts, output 350-0-350 volts, 120 milliamps, screened primary, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-5 amps., 9/6; iuput 100-250 volts, 300-0-300 volts 60 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 6/6; input 200-250 volts, screened primary, output 500-0-500 volts 150 milliamps, 4 volts 3-5 amps., 4 volts 2-3 amps., 4 volts 2-3 amps, 4 volts 1 amp., 4 volts 1 amp., 19/6.

MAINS Transformer, with Westinghouse rectifier, output 200v. 30 milliamps, and 4 volts 3 amps., L.T., 15/- the pair.

U.S.A. 3-gang Condenser, .0005, with trimmers, 3/11; a really solid job; Utility disc drive, 1/6.

SPECIAL Offer.—0.00015 brass short wave tuning condensers, with slow motion and complete dial, 3/9; short-wave chokes, 10-200 metres, 9d.

DUBILIER Electrolytic Condensers, 12 microfarads, 20 volts, 6d.; 8 plus 4 microfarads, 500 volts, 4/-; 50 mf., 50 v., 1/9; 8 mf., 500 v., 3/-.

RELIABLE Intervalve Transformers, 2/-; M.C. Multi-ratio output transformers, 2/6; 2-1 or 1-1 output transformers, 2/6; microphone transformers, 50 and 100-1, 2/6; 3 henry chokes, 2/6. 100 henry chokes, 2/6.

KOLSTER BRANDES Model 301 Pick-up with Arm; list price, 35/-; our price, 10/6.

RELIABLE Canned Coils, with Circuit, accurately matched, dual range, iron core, 2/11.

UTILITY 3-gang Condenser, 0.0005, fully screened, with trimmers, ball bearing, straight or superhet, 6/9; complete with disc drive, 7/6; the best 3-gang available.

T.C.C. Condensers, 4 mf., 450v. working, 4/-; 4 mf., 750v. working, 6/-.

VARLEY Constant Square Peak Coils, band-pass, type B.P.7, brand new in makers' cartons, with instruction and diagram, 2/4.

VARLEY H.F. Intervalve Coils, B.P.8, band-pass, complete with instructions, in original cartons, 2/6.

SCREENED H.F. Chokes, by one of the largest manufacturers in the country, 1/6.

PREMIER British-made Meters, moving iron flush mounting, accurate .0-10, .0-15, .0-50m.a., 0-100, 0-250 m.a., 0-1, 0-5 amps.; all at 6/-; read A.C. and D.C.

POTENTIOMETERS by Best Manufacturers, 200, 350, 500, 1,000, 2,500, 5,000, 8,000, 10,000, 15,000, 25,000, 50,000, 100,000, 250,000, 500,000, 1 meg. 2/-; 5,000, 10,000, 15,000, 100,000, 250,000, with mains switch, 2/-.

U.S.A. Electrolytic Condensers, 550v. peak working, standard tubular metal condenser, 4 mf., 8 mf., 12 mf., a real bargain, 1/9.

BRITISH Radiophone 2-gang 0.00016 Short-wave Variables, all brass with steatite insulation, 5/6.

1,000 Ohm 150 Milliamp, semi-variable resistance, 2/-; 1,000 ohm 250 milliamp., tapped, for any number .18 valves, 3/6; 800 ohms 350 m.a., tapped, 2/-.

RELIABLE Smoothing Condensers, 250v., working, 1 mf., 6d.; 2 mf., 1/-; 4 mf., 2/-; 350v. working, 1 mf., 1/-; 2 mf., 1/6; 4 mf., 3/-.

ALL Premier Mains Transformers have Engraved Panels, terminal connections, all low tension, windings centre tapped, tapped and screened primaries, 200-250 volts.

PREMIER 250-0-250 60 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-4 amps, 10/-.

PREMIER 350-0-350 150 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-4 amps., 12/6.

PREMIER Combined H.T. 8 and H.T.9 Transformer, rectified output 250 or 300 volts 60 milliamps, 4 volts 1-2 amps., 4 volts 3-5 amps., 10/-; or with Westinghouse rectifier, either type, 18/6.

PREMIER H.T.10 Transformer, rectified output 200 volts 100 milliamps, 4 volts 1-2 amps., 4 volts 3-5 amps., 10/-; or with Westinghouse rectifier, 19/6.

PREMIER H.T.11 Transformer, 500 volts, 120 milliamps., rectified output, 4 volts 2 amps., 4 volts 2 amps., 4 volts 3-5 amps., 22/6; with Westinghouse rectifier, 42/6.

THE Following Lines 6d. Each, or 5/- per dozen: 4- or 5-pin baseboard or 4-, 5-, 6- or 7-pin chassis mounting valve holders, American valve holders, 1 watt resistances, wire end, every value; tubular wire end condensers, 1,500 volt, every value up to 0.5, 0.3 amp., 2- or 3-point switches. Cyldon double trimmers, 6 yds. Systoflex, 1, 1.5, 2 or 2.5 mm., 1 yd. 7-way cable, 9ft. resincored solder, 6yds. push-back connecting wire.

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SOUTHERN RADIO'S WIRELESS BARGAINS. Every Article Guaranteed New, Perfect and Sent Post Paid.

RECEIVERS. TELSEN RADIOGRAMS. Model 3550/R.G.A. Latest 1935 6 Valves, Superhet, A.C. This receiver embodies the very latest in Radio. Complete with 6 Valves, Mains Energised Speaker, contained in exquisite cabinet with GARRARD ELECTRIC RECORD CHANGER. In Original Sealed Cases, £18/10/0. (List 32 Guineas.)

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BURGOYNE CLASS "B" THREE-VALVE SETS. —Complete with 3 Mullard Valves, Exide Batteries, and Accumulator. Magnavox Moving Coil Speaker. In magnificent cabinet, finished in chromium, £3/9/6.

SPEAKERS. BLUESPOT PERMANENT MAGNET SPEAKERS, WITH UNIVERSAL TRANSFORMERS TO SUIT ANY CIRCUIT.—1935 Series, 99 P.M., 24/6. 45 P.M., 20/-. Celestion P.P.M.W., 16/6. Celestion Soundex, 11/-. All in sealed Cartons.

ELIMINATORS. REGENTONE 1935 Series New and Boxed for A.C. Mains 200/250 Volts, TYPE W.5a Complete with Trickle Charger, 39/6. Type W1a (less Trickle Charger), to carry 30 Milliamps, 37/-. WIC (less Trickle Charger), 30/-.

CONDENSERS. PLESSY 4-Gang Superhet Condensers, .0005 Fully Screened, with Trimmers, 7/3.

LOTUS 0.0005 Condensers, Fully Screened, with Trimmers. Complete with Escutcheons, Dials, Knobs. 3-Gang, 11/-. 2-Gang, 7/3.

COILS.—Igranic Superhet 4-Coil set (1 osc. 2 I.F. with pig tails and 1 L.F. plain), 9/- per set (List 50/-). Varley Constant Square Peak Coils B.P.5, with all accessories, 2/3. Telsen Twin-matched Coils: Type W.287, screened with switch, 7/9 (List 17/-). Triple-matched Screened Type W.288, with switch, 10/9. Telsen Twin Coil Unit, Type W.478, 12/6. Type W.477, 17/6. All Brand New and Boxed.

MISCELLANEOUS.—Bifio Static Cut-outs, definitely eliminate all interference, 2/-. Lewcos Spaghetti Resistances, all capacities, new and boxed, 1/6 per dozen assorted. Telsen Binocular H.F. Chokes, 2/-. Telsen ACE L.F. Transformers, 3-1 and 5-1, 2/9.

STOCKTAKING BARGAIN PARCELS.—After our Recent Stocktaking, we gathered at our Head Office a large number of odd lines from our Various Branches. We are offering these in parcel lots as UNDER:—

5/- PARCEL Contains Components to the value of at least 20/-. Including Condensers, Coils, wire, resistances, etc.; 10 different Telsen and Ready Radio Circuits included with each Parcel.

10/- PARCEL contains Components to the value of at least 45/-. Includes Transformers, Variable Condensers, etc., etc. Also Circuits as above.

20/- PARCEL. This is the "Small Traders" Parcel and contains a marvellous selection of components valued at 85/-. We have supplied this parcel to hundreds of dealers for re-sale at a profit. Every article contained in these parcels is up to date, new and boxed.

THOUSANDS OF BARGAINS AT OUR VARIOUS BRANCHES.—All Goods guaranteed and sent post paid. Branches at 46, Lisle Street, W.C.2; 271-275, High Road, Willesden Green, N.W.10. All Mail Orders to: 323, Euston Road, London, N.W.1.

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THE following unused set manufacturers' Surplus; all goods guaranteed perfect; immediate delivery.

MAGNAVOX speakers, complete with hum-bucking coil, output transformers., etc. DC152 (9in. coue), 22/6. DC154 (7in. cone), 16/-. All with 2,500 or 6,500 ohms fields.

WESTINGHOUSE rectifiers, HT8, 9/6. HT9, 10/-, HT10, LT5, LT4, 10/9. Regentone transformers for HT8 or HT9, with 4v. 4 amp. LT winding, 7/-. Eliminators, first-class make. Outputs 150v. 25ma, SG and Detector. AC type with Westinghouse rectifier, 25/-. AC type with .5 amp. trickle-charger, 30/-. DC type, 12/6.

DUBILIER or TCC dry electrolytic condensers 8mfds. or 4mfds., 500v. working, 50mfds., 50v 200mfds., 10v., 3/3, 50mfds, 15v., and 15mfds., 100v. 2/3. 50mfds., 12v., 2/-. TCC type "M" condensers, any value up to .001 mfds., 6d. Erie resistances, 1 watt type, 7d., 2 watt, 1/2, 3 watt, 1/9. Send for comprehensive list.

WARD, 45, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

MAINS Transformers, chokes, etc., to specification, repairs promptly executed. Guaranteed satisfaction. Prices on request. Henry Peace, Ltd., Wednesbury, Staffs.

CLARION VALVES.—All brand new; battery types, 2-volt, HF.2, LF.2, LP.2, 1/9. Super power, PP.2, 2/6; screens and pentodes, 3/9; A.C. Mains, 4-volt, 1 amp., general purpose, 3/3; power, 4/-; screens and pentodes, 4/6; full wave rectifiers, 3/6; postage paid, cash with order, or C.O.D. over 10/-. Clarion Valves, Dept. 2, 885, Tyburn Road, Erdington, Birmingham.

BANKRUPT Bargains. List free. 3v. kit, 15/-. Large stock of mains and battery sets, M.C. speakers, eliminators. Triotron valves, 2/6, power 3/6. All components. Write for quotes. Part exchange.—Butlin, 113b, Preston Road, Brighton. Preston 4030.

FOR SETS THAT ARE BUILT TO LAST.

When Reliability is of prior importance the set designer specifies resistances with ample margin of safety.

Therefore in the "*A.C. Silver Souvenir*" *Mr. F. J. Camm* has used the following

AMPLION 1-WATT RESISTANCES.

250 ohms.	10,000 ohms.
350 ohms.	20,000 ohms.
750 ohms.	25,000 ohms.
2,000 ohms.	2/50,000 ohms.
5,000 ohms.	.5 megohms.

1/- EACH

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Protect your "A.C. Silver Souvenir" with an Amplion 1-Amp. Fuse, 6d.

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MAINS TRANSFORMER

SOLELY SPECIFIED *for the—*

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MODEL W.31 Immediate delivery from stock. PRICE 29/-

Send NOW with 3d. in stamps for 1935 Handbook "Mains Power for your Radio."

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WOBURN Radio Offer following New Stock.

ALL Kits as last week.

BURGOYNE Class B three, new and in maker's sealed cartons, including Mullard valves, Drydex and Exide batteries, Magnavox 7" P.M. Speaker, 69/6, carriage extra. Telsen Model 474 A.C. Bandpass Three in sealed cartons arrive next week, price will be announced next issue.

WESTINGHOUSE Rectifiers H.T.8 and 9, 8/9. Transformers for H.T.8, fully shrouded, made by Standard Telephones, with 4 v. 4 a. C.T. at 8/6. Chokes: 30 h. 30 m.a. 3/6. 150 h. 60 m.a. 9/-. Dubilier Electrolytics, dry, 8 mfd. 500v. 2/10. T.C.C. electrolytics 25 mfd. 25 v., 50 mfd. 12 v., 15 mfd. 100 v., 1/3. 6 mfd. 50 v. 6d. 2 mfd. 200 v. working 1/6. Tubulars, .1, .01, .02, 6d. .25 mfd. 9d. Dubilier and Erie resistances 6d. each.

BRITISH Radiophone semi-curved dials, with twin dial lights, and bronze escutcheon, 3/9. Slow motion condensers with slow motion dial, 0005, 0003, 2/11. Short Wave slow condensers, 0001, 00015, 00016, 0002, 00025, with dial, 3/-, without, 2/-. Bakelite reaction condensers, 0001, 0003, 0005, 1/-. Differentials, all sizes, 1/2. Popular Iron cored canned coils, 2/6. Popular Air cored coils, canned, 1/10, without can, 1/6.

HIVAC Valves now stocked.

WESTERN Electric Microphones, 2/3. Mike transformers ratio 100/1, 2/3. Electric Soldering irons, complete with flex adaptor and rest, 1/11, plus 6d. postage—fresh stock of these irons arriving April 28th, place order now.

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SILVER SOUVENIR.—Complete Specified Kit. No alternatives. 79/6 cash. Host of other bargains. Kits, Accessories, etc. Lowest prices always.—Write now for free lists, Melfo-Rad, Queen's Place, Hove. (Trade Supplied.)

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

L. ORMOND SPARKS the CONSTRUCTOR'S CONSULTANT wishes to inform all users of the A.W. LUCERNE CIRCUITS that he has now completed his 'Jubilee' LUCERNE COILS. Specially designed for GREATER SELECTIVITY, NO BREAK THROUGH and INCREASED EFFICIENCY. Each Coil individually aerial tested. No mass production. Prices, Aerial 3/6, H.F. with reaction, 4/-, plus 3d. postage. Full instructions and wiring diagrams.—9, Phoebeth Road, Brockley, S.E.4.

HULBERT.

HULBERT for Quality Surplus Speakers.

ALL Speakers Listed Below are Brand New and Made by one of the Best Known British Makers of High Grade Moving Coil Speakers. Repeat orders coming in daily.

10/6 Only, original price 30/-.—Energised, 8in. cone, 6,500 ohms field, for direct use on 200-240 volts D.C. mains; also 1,800, 2,000, 2,200 or 2,500 ohms field; price includes power, pentode, or universal transformer as required.

14/- Only, usual price 45/-.—As above, but with 10in. cone, a very powerful quality speaker capable of handling large outputs.

15/6 Only, usual price 35/-.—Permanent magnet model with cobalt steel magnet of high efficiency, 8in. cone, power, pentode, or universal transformer.

18/6 Only, usual price 39/6.—As above, but with 10in. cone, powerful quality speaker giving large output with given input.

19/6 Only, usual price 41/-.—Permanent magnet model with the new Alni magnet, high flux density and wide frequency response, 8in. cone, power, pentode or universal transformer.

24/- Only, usual price 70/-.—As above but with 10in. cone, ideal for use with quality receivers.

2/9 Only.—Brand new cabinets, suitable for any of above.

SECURE One of These Bargains Now. Repeat orders coming in Daily.

CASH With Order or C.o.d.—Hulbert, 6, Conduit St., W.1.

HULBERT for Surplus Speaker Bargains.

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Printed in Great Britain by NEWNES & PEARSON PRINTING CO., LTD., Exmoor Street, Ladbroke Grove, W.10, and published by GEORGE NEWNES, LTD., 8-11, Southampton Street, Strand, W.C.2. Sole agents for Australia and New Zealand: GORDON & GOTCH, LTD. South Africa: CENTRAL NEWS AGENCY, LTD. *Practical and Amateur Wireless* can be sent to any part of the world, post free, for 17/4 per annum; six months, 8/8. Registered at the General Post Office for Transmission by Canadian Magazine Post.

CHECKING GANGED COILS!

Practical and Amateur Wireless

3D EVERY WEDNESDAY

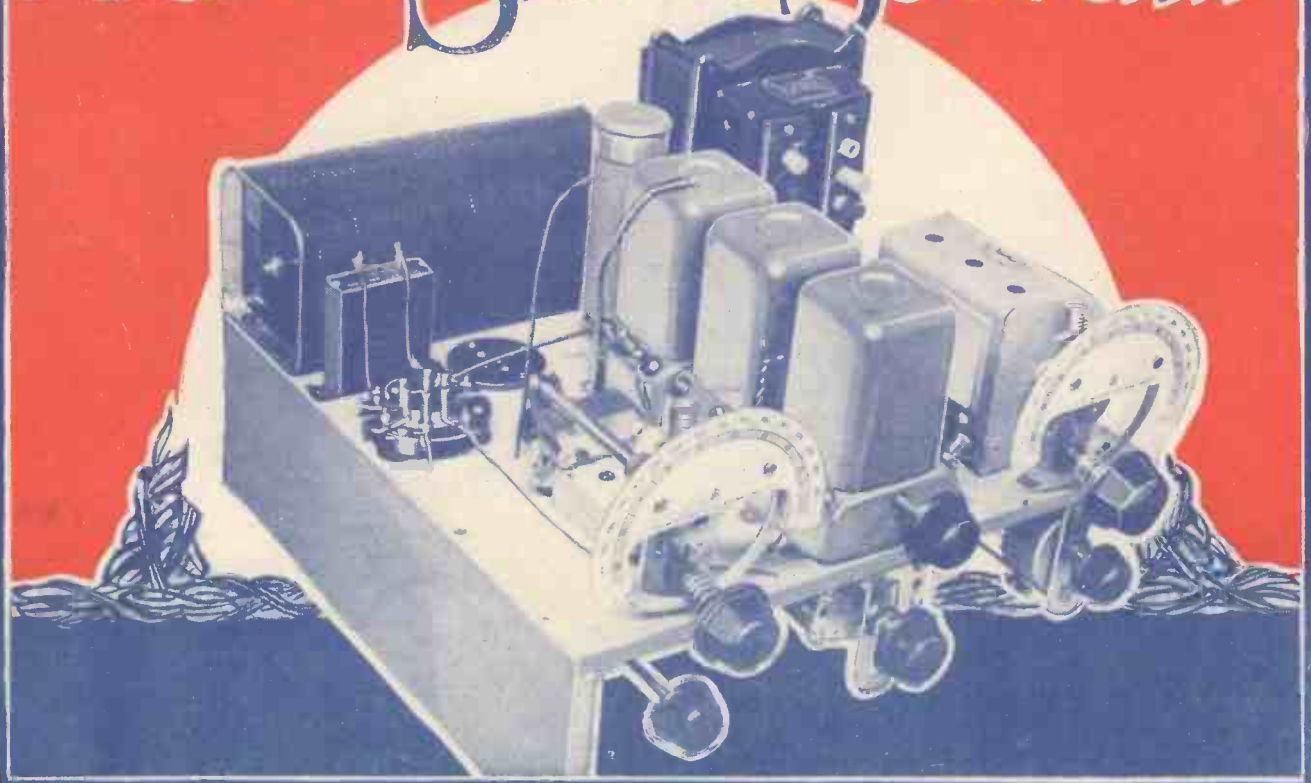
Edited by F. J. CAMM

a GEORGE NEWNES *Publication*

Vol. 6. No. 139. May 18th, 1935.

AND AMATEUR TELEVISION

Operating F. J. CAMM'S A.C. ALL-WAVE Silver Souvenir



CIRCUITS AND SETS FOR ALL.—SEE PAGE 266

ROUND *the* WORLD *of* WIRELESS

A Free Gift Road Map of England

A LARGE wall map of Great Britain, measuring no less than 29ins. by 20ins. and printed in two colours, is presented FREE with every copy of the current issue of THE PRACTICAL MOTORIST. Whether hung in the garage or office or your wireless den, or carried in the car or in the pannier of your motor-cycle it will prove of the utmost value in locating British places and in tracking routes. Although specially prepared as a road map, it will be found of equal use to readers of "Practical and Amateur Wireless," and we recommend every reader to purchase a copy of to-day's issue of THE PRACTICAL MOTORIST (3d. every Wednesday) containing this unique and valuable gift.

"Practical Television and Short-wave Review"

THE abounding interest in short waves and ultra-short-wave reception and transmission is reflected in the June issue of our companion journal, the title of which has been amended so as to embrace the co-relative sciences of short-wave and ultra-short-wave reception. Please ask, therefore, for PRACTICAL TELEVISION AND SHORT-WAVE REVIEW, on sale May 16th at 6d. The journal has been enlarged to accommodate the many short-wave features and to allow the proportion of television articles to remain unchanged. Readers interested in building short-wave receivers will be glad to know that in the June issue of "Practical Television and Short-wave Review" appear full constructional details, wiring diagrams and photographs of Mr. F. J. Camm's Short-wave Three-valve Superhet, which receives all programmes radiated on wavelengths from 13 to 96 metres. Its receptivity is world wide and it lacks all of the shortcomings of the usual short-wave receiver. Those readers who have asked for a simple short-wave superhet should make a point of purchasing the June issue of the leading television and short-wave journal—"Practical Television and Short-wave Review," 6d. monthly.

Proposed New Spanish Station

RADIO CATALUNYA, EAJ15 (Barcelona), has been authorised by the Spanish Government to install a 5-kilowatt transmitter, which will be brought into operation in January, 1936. The wavelength is 292.9 metres (1,024 kc/s).

Television in Paris

IN France, following a series of experiments, the Ministry of Posts and Telegraphs has officially stated that it is hoped to broadcast regular programmes from August next on a wavelength of 175 metres. The apparatus chosen for the purpose will be the Barthelemy system which, of course, is of French origin. In a statement made to the Press the French authorities stated that receivers for these programmes would not cost less than £50 each. At the outset a high-definition service could not be hoped for, and the P.T.T. will experiment on 60-line pictures, to be raised later to 90 lines.

ON OTHER PAGES

Heston's French Colleague

IT is reported that the Poste Parisien has instituted a daily service of weather forecasts, news bulletins, and other information destined to travellers in aircraft. The broadcasts are carried out on 1,119 metres (268 kc/s) between B.S.T. 14.05-14.15 and 16.50-17.00.

New Czech Transmitter

THE new Slovak high-power broadcasting station now in course of construction at Banska-Bystrica will shortly be carrying out its initial tests. In honour of the President of the Czech Republic it is to be called the Masaryk station. For further development of the network it is also planned to construct two regional transmitters, one at Budweis (Bohemia) and the other at Karlsbad. It is more than probable that in the latter case the broadcasts will include a number of transmissions in the German language.

Moscow's Flying Radio Squad

THE Soviet Posts and Telegraphs Administration has ordered the construction of 5,000 mobile radio receiving units in order that they may be sent, when desired, to different parts of the country for the reception of transmissions from Moscow, and especially in districts such as holiday resorts where the inhabitants are not well provided with wireless sets.

Carrier Pigeons and Wireless

FOLLOWING complaints made by pigeon fanciers in France regarding the effects of wireless transmissions on the birds, an experiment was recently carried out by which it was proved that 200 homing pigeons released in the neighbourhood of an active wireless transmitter were unable, during the transmission, to leave its magnetic field. The tests, utilising different wavelengths at varying power, proved that this was not merely superstition on the part of the owners, and further experiments are to be carried out. It may be stated that the birds were none the worse for their experience, and recovered their sense of direction within three minutes of the carrier wave being cut off.

Holland's Proposed New Régime

SO far, since wireless was introduced into Holland, the service has been a free one and the stations have been supported by voluntary contributions. The question of a tax, however, is now on the tapis, and it is proposed that with a view to a more extended supervision, the authorities may require the registration of all wireless receivers and the payment by owners of an annual licence fee.

ROUND the WORLD of WIRELESS (Continued)

Ridgeway "Parade"

PHILIP RIDGEWAY and his "Parade" return to Broadcasting House at 8 p.m. in the National programme on May 20th, and at 7 p.m. in the Regional programme on May 21st. This broadcast marks the twenty-fifth anniversary of Philip Ridgeway's début on the stage, so that it is somewhat of a Jubilee occasion. To celebrate this he is proposing to give a special luncheon party to twenty-five of the leading figures of the theatre.

INTERESTING and TOPICAL PARAGRAPHS

THE CHILDREN'S HOUR

A young listener trying out one of the first new "His Master's Voice" "Console Superhet Five" receivers. This instrument, incorporating QAVC, and having a figured walnut cabinet, costs only 17 guineas.

"Entertainers in Embryo"

LISTENERS will remember a programme by David Kean, entitled "Concert in Camera," broadcast in February: he has prepared another programme reminiscent of the '90's entitled "Entertainers in Embryo," which will be given for Western listeners on May 22nd, and repeated in the Regional programme on May 23rd.

"Other Harvests"

THERE is an interesting talk on May 15th in the series "Other Harvests," this time describing the olive harvest in Turkey. Those who have travelled in the Balkans will know its rugged surfaces and the welcome shade given in the summer by the large wild olive trees, but the olive is also a cultivated delicacy and there are many olive groves which are tended with as much care as our first-class orchards at home.

"The Line of Kings"

SCOTLAND'S main contribution to the Silver Jubilee celebrations will be broadcast on May 23rd. Described as "The Line of Kings," this programme will be a procession in sound of royalty from the time of Margaret and Malcolm until the present day. The starting-point of the programme will actually be the coronation of Alexander III, at which the lineage of the Scottish kings is recited, and this will be reproduced in the programme as a flash-back to the time of Malcolm Canmore. The programme is intended to show the continuity in sovereignty and will consist of proclamation, narration, and quotation from contemporary sources with, occasionally, a background of music and fanfare. J. D. Mackie, Professor of Scottish History and Literature in the University of Glasgow, has provided the material for the broadcast which John Gough has adapted for microphone purposes. This programme will be produced by Gordon Gildard. A real Scottish evening!

Scottish New Light Orchestra

THE New Light Orchestra, led by Harry Carpenter and conducted by Stewart Deas, will broadcast to Scottish listeners on May 23rd. The programme will include the Overture "Alfonso and Estrella," by Schubert; Symphony in D, by Mozart; "Danza Piemontese," Op. 31, No. 1, by Sinigaglia, and the Overture to "The Barber of Seville," by Rossini.

"You Pays Your Money"

THIS interesting broadcast will be taken from Exeter on May 17th. The programme will include three of the successful candidates for the auditions lately held in Exeter, a relay from the Gaumont Theatre, a talk by the Dean of Exeter on the Cathedral, and an interlude by a street musician.

Birmingham Philharmonic Orchestra

IN the programme to be given by the Birmingham Philharmonic String Orchestra on May 23rd Johan Hock, the conductor, will include the first performance of a Scherzo for Strings by J. D. Davies, the Birmingham composer and pianist.

Schools' Musical Festival

A RELAY will be taken for Western listeners from the Chepstow and District Countryside Schools' Musical Festival, at the Public Hall, Chepstow, on May 22nd. This is the seventh Annual Festival and it is run under the auspices of the Monmouthshire Rural Community Council. The choir consists of nearly 500 schoolchildren. The orchestra is drawn from the Three Valleys Festival Orchestra, conducted by Bumford Griffiths, of the National Council of Music.

Mandolin Orchestral Concert

A RELAY will be taken from Fred Winslow's Serenaders' Mandolin Orchestra for Western listeners on May 21st. Fred Winslow has personally constructed all the instruments of the mandolin and guitar family used in his show.

"Travesties and Trifles"

THREE or four early works of Jane Austen have been adapted by M. H. Allen and will be produced by her on May 24th, under the title "Travesties and Trifles." The programme includes "Love and Friendship," which is described as a rattling burlesque, and three sketches from A Collection of Letters.

For Western Farmers

J. A. GARTON will give a talk on the Bath and West Agricultural Show, to be held at Taunton on May 23rd, in the feature "For Western Farmers in Particular."

Military Band Concert

CONDUCTED by Mr. H. Wilcocks, the Military Band of the 2nd Battalion the South Wales Borderers (stationed at Catterick Camp) will make their first broadcast to Northern listeners from a Leeds studio on May 19th.

SOLVE THIS!

PROBLEM No. 139.

Jarrold built the £5 Superhet Three, but when switched on it failed to give any signals. After some experiment with trimmers, etc., he decided that perhaps one of the valves was defective and accordingly borrowed a good milliammeter. He removed the leads from the tops of the valves and connected the meter between the leads and the caps on each valve in turn. The I.F. valve gave a normal reading and he rightly decided that this valve was in order. When the meter was joined to the first valve, however, no deflection of the needle was obtained and he concluded that the valve was defective. Where was he wrong? Three books will be awarded for the first three correct solutions opened. Envelopes should be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes should be marked Problem No. 139 in the bottom left-hand corner, and must be posted to reach this office not later than the first post, Monday, May 20th, 1935.

Solution to Problem No. 138.

When using the meter Sharpe had overlooked the fact that the Class B valve operates on a different principle from a normal triode and that the anode current varies with the strength of the signal. A special type of meter is, therefore, required to indicate the normal steady (or mean) current of this type of valve.

The following three readers successfully solved problem No. 137, and books are accordingly being forwarded to them:

A. Stephenson, The Bungalow, Brancaster Staith, King's Lynn, Norfolk; P. G. Redgment, "Faraway," Brundall, Norwich; I. Dodd, Grimeford Farm, Anderton, Nr. Chorley, Lancs.

The Experimenters Explain—

UNIVERSAL MAINS WORKING

by The Experimenters

THE convenience of having a receiver which can be operated equally well from either A.C. or D.C. mains supplies, without any alteration to the wiring or connections being necessary, has been fully appreciated by manufacturers during the last couple of years, with a result that many popular types of receiver are available in two slightly different models—one for A.C. and the other for universal use. Most manufacturers are careful to point out that the universal model must not be expected to give quite the same results as the A.C. version, since it is rather in the nature of a compromise. Despite this, however, the difference in efficiency is, especially in the case of medium-power receivers, comparatively slight.

H.T. Voltage Limitations

The reason for the universal receiver being slightly less effective than the average A.C. one is that the available high-tension voltage is generally limited to rather less than that of the mains supply; the loss in voltage is occasioned by the smoothing choke and feed resistances. This slight disadvantage has in many cases been compensated for by the improvements which have taken place in the design and construction of universal valves, and can often be offset by the use of a push-pull output stage in place of the single pentode more often used in A.C. sets. It must, however, be taken into consideration when planning an A.C.-D.C. receiver.

There is another minor objection to the universal receiver which makes it necessary to take particular care in its design; this is the fact that the receiver is in direct connection with the mains supply, so that it is always "alive." Provided that the matter of insulation—particularly of the controls—is given careful attention, this point need not be considered as a serious disadvantage.

We have commenced this article by pointing out the "cons," rather than the "pros," not with the idea of deprecating the use of the universal receiver, but rather with a view to answering a number of queries which frequently arise. We do not wish to decry the advantages of universal working, for these are very real to the person whose house is supplied with D.C., especially when the supply will soon be changed to A.C. Universal working is also particularly valuable in the case of a transportable type of set which may be carried from one house to another. The difference between a normal D.C. receiver and an A.C.-D.C. instrument is so small, and the extra cost of the latter so low, that we would not recommend the prospective builder of a new receiver to make a D.C. model. Actually, the only real difference between the two is that the universal circuit includes a rectifying valve; this acts simply as a low-value series resistance when the set is run from D.C., although serving its intended function on A.C.

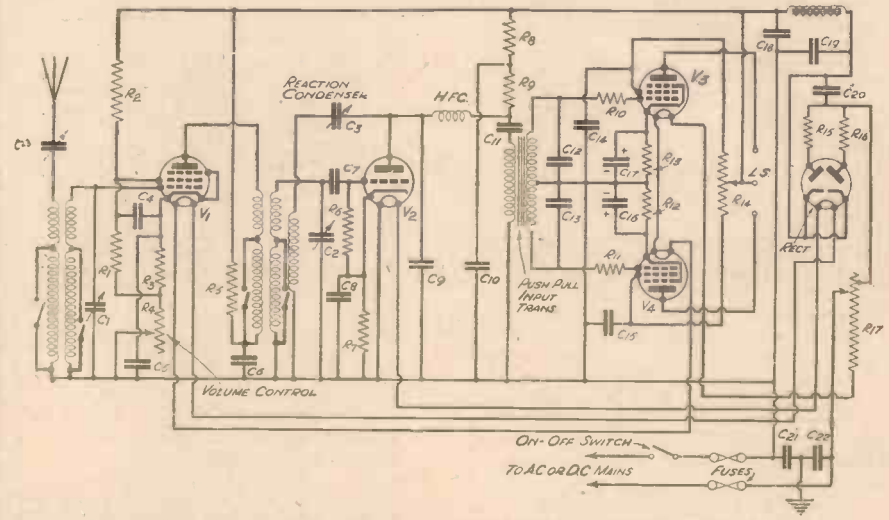


Fig. 1.—This is the circuit of the "Universal Hall-Mark," which was fully described in the issues dated Feb. 2nd and 9th. It is referred to on this page.

Alternative Valves

There are essentially two different types of universal valve, both of which have indirectly-heated cathodes, although in one case the heater operates at a voltage of between 13 and 40, and in the other from the full mains voltage of 200-250. The difference in performance of the two types is not noticeable, and the choice is a matter of individual preference. Two typical circuits in which the two types of valve are used are shown in Figs. 1 and 2, from which it can be seen that the difference in wiring is small. In the first circuit the first two valves have heaters which require a current of .18 amp. at 20 volts, whilst the two output valves take a similar current at 40 volts; the voltage-doubler rectifying valve takes .18 amp. at 30 volts. It is significant that the heaters all require the same current, because they are wired in series, and the circuit would be complicated if valves requiring different values of

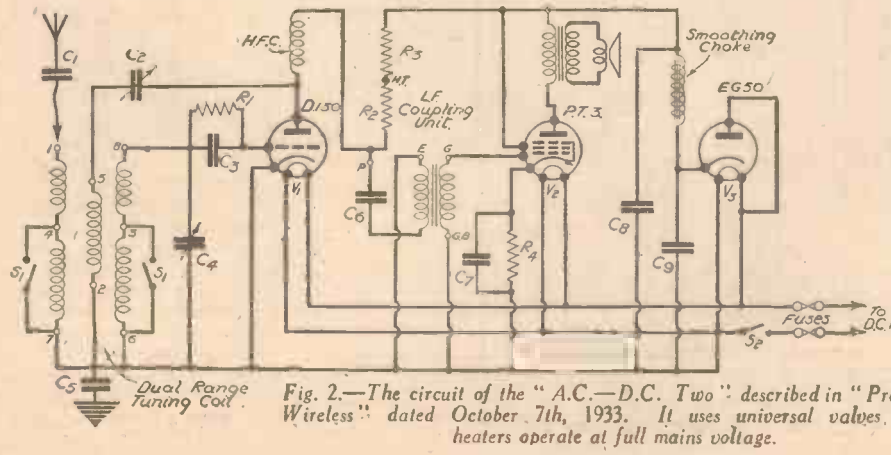


Fig. 2.—The circuit of the "A.C.—D.C. Two" described in "Practical Wireless" dated October 7th, 1933. It uses universal valves, whose heaters operate at full mains voltage.

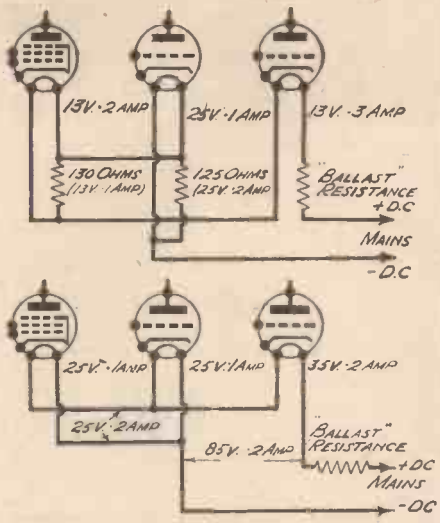


Fig. 3.—Two methods of connecting heaters of dissimilar current ratings are illustrated here and are referred to in the text. The rectifier is omitted for simplicity.

current were chosen, for it would become necessary to connect fixed resistances in parallel with those heaters which required less than the maximum.

Different Current Ratings

It is sometimes an advantage to employ valves of different ratings together in the same circuit, and when this is done the heater connections become as shown in Fig. 3. Two different arrangements are shown, and in the first it is assumed that the valves are of three different ratings, whilst in the second the assumption is that two valves are rated at 25 volts, .1 amp., and a third at 35 volts, .2 amp. The heaters of the first two valves are wired in parallel, and in series with the heater of the third.

In addition to the heaters being in series they are also in series with a ballast resistance, which serves to "break down" the mains voltage. The voltage to be dropped by this resistance is the difference between the mains supply voltage and the *total voltage* across the heaters when they are in series. The latter figure is obtained by adding together the heater voltages, as indicated in Fig. 3.

When valves fitted with mains-voltage heaters (as in Fig. 2) are used the heaters are simply wired in parallel, and taken to the mains supply; this obviates the need for a series resistance, but makes it necessary to choose valves rated at the voltage of the mains installed. A number of voltage ratings are available, but there is no objection to using valves requiring a somewhat lower voltage than that of the mains, and including a series resistance; this is often an advantage, because the resistance can then be adjusted to suit any particular mains voltage between, say, 200 and 250.

The Series Connections

At this point it becomes interesting to observe the method of connecting the heaters in the Fig. 1 circuit in series. It may be seen that the series connections do not simply follow on from the first to the last valves, but that, from the negative supply lead to the ballast resistance in the positive circuit, the sequence is: detector (V.2), rectifier (Rect.), H.F. pentode (V.1), output pentodes (V.3 and V.4). There is good reason for this method of connection, and the object is to reduce to the greatest possible extent the voltage existing between the heater and cathode of each valve. The rule does not apply to the rectifier, but this valve may be ignored for present purposes. The valves are thus wired (from the negative lead) according to an ascending order of G.B. voltages, the output pentodes being biased most heavily. As with all indirectly-heated valves, bias is obtained by making the cathode positive with respect to the grid, and so the object is to make the heaters of the positively-cathode-biased valves also positive with respect to the "earth line."

Let us now take a look at the voltage-dropping resistance marked R.17 in Fig. 1—and see how the required value can be determined. First of all we must consider the total voltage "absorbed" by the heaters, which is 20 plus 20 plus 40 plus 40, plus 30, or 150. Assuming a mains voltage of 200 this leaves 50 volts to be dropped by R.17, when the current passing is .18 amp. Here we have to apply Ohm's Law, which tells us that the resistance in ohms is equal to the voltage to be dropped divided by the current in amps. This gives us the fraction 50/.18, or 5,000/18, which works out at about 280 ohms. This is the resistance required between the

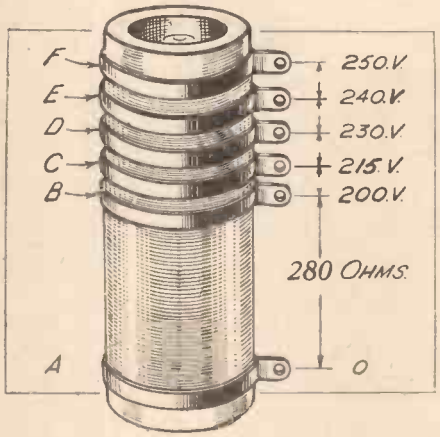


Fig. 4.—Showing the arrangement of tappings on the "ballast" resistance.

points marked A and B in Fig. 4, but if the receiver is to be used on other mains voltages up to 250, extra resistance must be included and tappings taken at points which are appropriate to, say, 215, 230, 240 and 250 volts (otherwise tappings C, D, E and F in Fig. 4). The values of resistance required between these tappings can be found in the same manner as before by dividing .18 amp. into 15, 30, 40 and 50 volts respectively.

Resistance Details

Suitable voltage-dropping resistances with correctly-positioned taps can be obtained from several manufacturers, whilst, when the total value of resistance is known, a resistance with tapping clips can be obtained, and these tappings moved according to the exact requirements of the circuit. There may be some constructors who would prefer to make the resistance themselves, and this can be done by winding nickel-chrome resistance wire on an asbestos or other heat-resisting former. The gauge of wire must be chosen according to the current it has to carry, and the following figures may prove useful:—

Gauge of wire	Current-carrying capacity	Ohms per yard (60° F.)
40	.2 amp.	81
36	.3 amp.	32.5
32	.5 amp.	16

Although these brief particulars are given for guidance it should be added that it will generally be found better and more economical to buy the component ready made.

A very useful alternative to the tapped resistance is a barretter, which was used in the "Ubique" Universal All-Mains receiver described in PRACTICAL WIRELESS, dated July 21st, 1934. The barretter is similar to an electric lamp in construction, but the filament is so constructed that its resistance varies according to the current passing through it. The result of this is that the voltage-drop across the resistance varies inversely with the current passing, and that (for a given current) the voltage output from the barretter remains practically constant over an appreciable range of input voltages. To take a single example, an Osram type 303 barretter passes .3 amp. and drops between 86 and 129 volts according to the applied voltage. Thus, assuming that it was required to drop, say, 90 volts (at .3 amp.) when the mains voltage was 200, the barretter would drop approximately 130 volts if the input were increased to 240. Other barretters are available having voltages ranges from 120-240 to 30-80; it is therefore possible to choose a suitable instrument for any receiver or circuit, although in some instances it may be necessary to use a fixed resistance in addition to the barretter.

In order to avoid the possibility of damage to smoothing condensers used in a universal receiver it is always wise to choose electrolytics of the reversible type, or otherwise to use "paper" condensers.

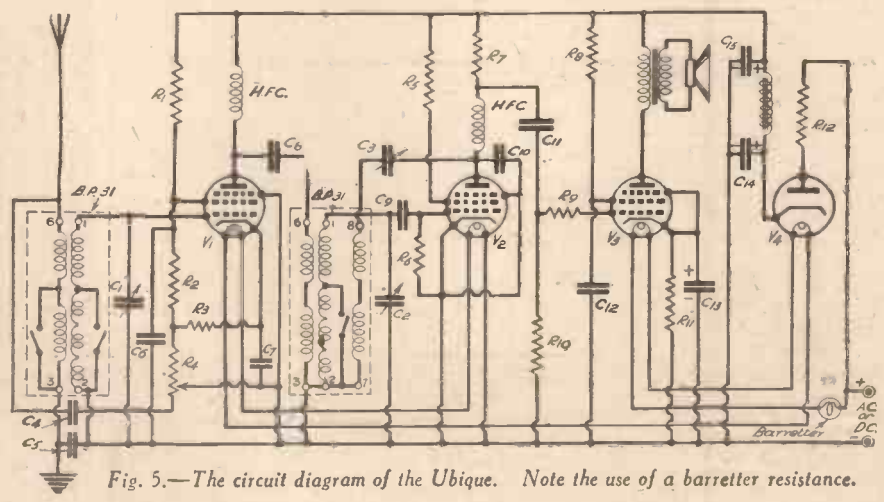


Fig. 5.—The circuit diagram of the Ubique. Note the use of a barretter resistance.

Checking Ganged Coils and Condensers

Failure to Obtain Good Results with Receivers Employing Ganged Tuning Circuits may often be Traced to Incorrectly Matched Coils and Condensers. This Article Tells You how to Check These Components without Elaborate Apparatus. By W. J. DELANEY

MANY of the queries which we receive from readers who are disappointed with the results in their receivers are due to the fact that the ganged tuning circuits are not matched. There are several reasons for this—carelessness in handling the components and lack of knowledge as to the correct method of use being the principal ones. With regard to the first-mentioned cause, the majority of ganged condenser units on the market to-day are furnished with an end plate or vane which is slotted in four or five places. When you purchase such a condenser you will see that the metal between these slots has been bent in certain places, and the various portions do not line up. There is a reason for this, and unfortunately we have heard of constructors who have thought that the pieces had been bent inadvertently and had straightened them. When the condenser leaves the factory, each section is matched, and the matching is carried out by this bending of the end vane, and provided that the condenser is of reputable make it may be taken for granted that throughout the entire tuning range each section has the same capacity. Do not, therefore, touch the plates or you may modify the capacity, and if a dust cover is attached to the complete unit, leave it in position and you will have no need to doubt the condenser if a receiver incorporating it fails to gang correctly.

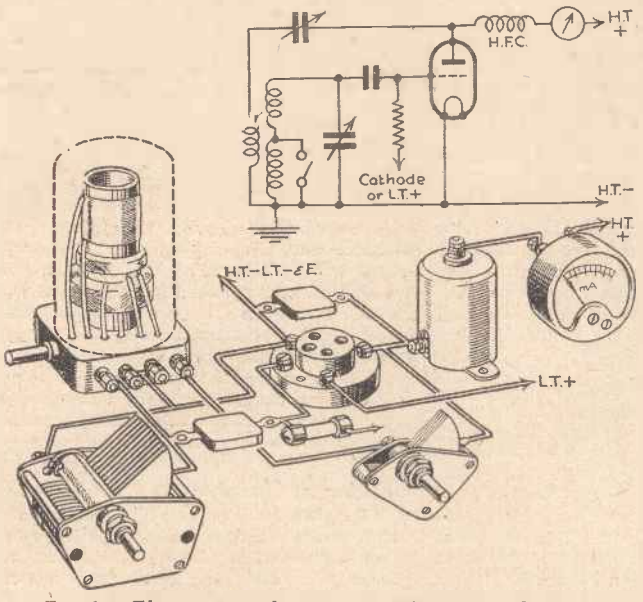


Fig. 1.—The circuit and components of a standard detector.

Ganged Coils

The same state of affairs exists with ganged coil units. Various methods are adopted for matching individual coils, and in some cases the end turn or two is pulled away from the adjacent turn and held in position by a touch of shellac or similar material. Again, unless the terminals are covered by the screening can, do not remove this. Where it is necessary to do so, do not handle the actual coil winding, but rely upon the solid base or the actual former for any handling which must be done.

Unmatched Units

Where doubt exists, due to coils or condensers having been dropped or badly handled, the constructor may test the individual units by employing an oscillating detector circuit as previously described in these pages. It has been shown that if a milliammeter (or a galvanometer) is included in the anode circuit of a detector valve, a deflection of the needle will be obtained when a signal is received. If the detector is connected to function as an anode-bend rectifier, then the needle will rise as a signal is tuned in, whilst if a grid-leak rectifier is employed, the needle will pass to a lower reading when a signal is tuned. In Fig. 1 is shown the detector portion of a normal-broadcast receiver with a meter in circuit, and from this the reader will see that the normal coupling component (L.F. transformer primary or resistance) is removed from its normal position and a meter joined in its place. No other alterations are necessary.

Checking the Coils

To check the coils a slight modification of the detector grid coil must be made, and as will be seen in Fig. 3 it is necessary to couple a small coil of two or three turns to this coil. Remove the can and wind a long narrow strip of paper round the medium-wave winding on the coil, putting a slight dab of adhesive at the end to hold the paper in position. Round this, in the same direction as the grid winding, put

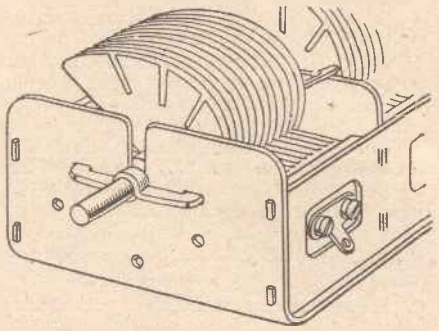


Fig. 2.—A slotted end-vane on a modern ganged condenser.

two or three turns of fairly thick wire—say 24 or 22 D.C.C. A dab of adhesive or sealing wax will hold the ends in position, and one end is joined to the terminal on the coil base which is connected to earth, whilst the other end is left sufficiently long to reach to the coil farthest from it. Alternatively, a small cardboard or paxolin former having an internal diameter large enough to permit it to pass over the coil may be used, and the necessary turns wound on this. Now remove all the connections from the terminals on the other coils, with the exception of the earth connection. This must be left in place.

Now adjust the reaction until the receiver is just oscillating (as indicated by a slight deflection of the needle of the meter),

(Continued overleaf)

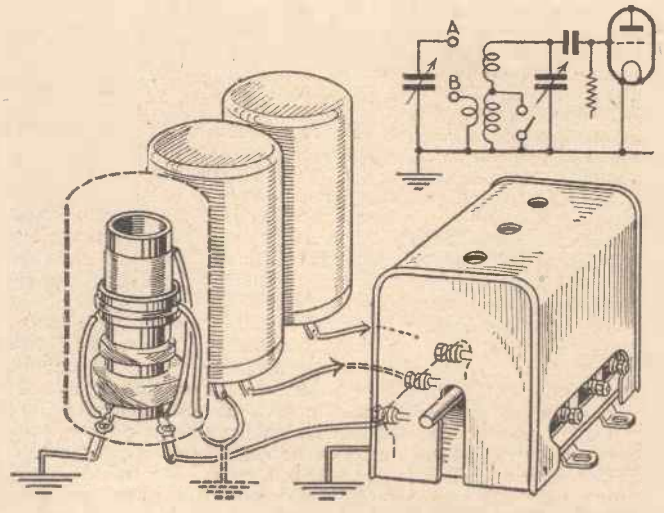


Fig. 3.—The necessary scheme for checking "matched" coils.

(*Continued from previous page*)

and connect the free end of the small coupling coil to each of the remaining coils in turn. The lead must, of course, be joined to the end of the coil which is normally joined to the variable condenser. As the condenser is turned to various positions on the dial a note should be made of the various needle variations, and in this manner each coil may be compared. Obviously, great care is necessary to avoid movement of the position of the coupling coil and as the movement of the needle will be quite small, very careful examination will be required. It should also be emphasised that this method of checking is not perfect, but it will show whether a coil is seriously at fault and will save many hours of searching for a fault which might exist in the coils. Remember that the needle deflection at any point on the scale should be the same for any coil connected to the extra (or test) coil if the coils are correctly matched.

Checking the Condenser

To check a ganged condenser, a similar scheme is adopted, although an additional variable will be required. This is joined, as shown in Fig. 4, to the extra coil in place of the coils under test shown in Fig. 3. (It may also be necessary to add a few turns to obtain sufficient needle deflection). The leads to the ganged condenser are now removed and a flexible lead joined to the "top" of the detector coil. Again, the reaction condenser must be adjusted until the valve is just oscillating and the flexible lead must be joined to each section of the ganged condenser in turn. When connected to a section, the additional variable must be slowly turned, and when the resonant point is reached the needle will be seen to kick. The dial or knob controlling this additional condenser must be carefully marked at the resonant point, and then as each section of the ganged condenser is connected the needle should kick at the same point. If it does not, then the section under test is not matched and the slotted end vane should be very carefully adjusted to provide the necessary matching. Remember that the position of the trimmers will affect the capacity of each section, and, therefore, for this test it is preferable to screw these right out so that they are at a minimum.

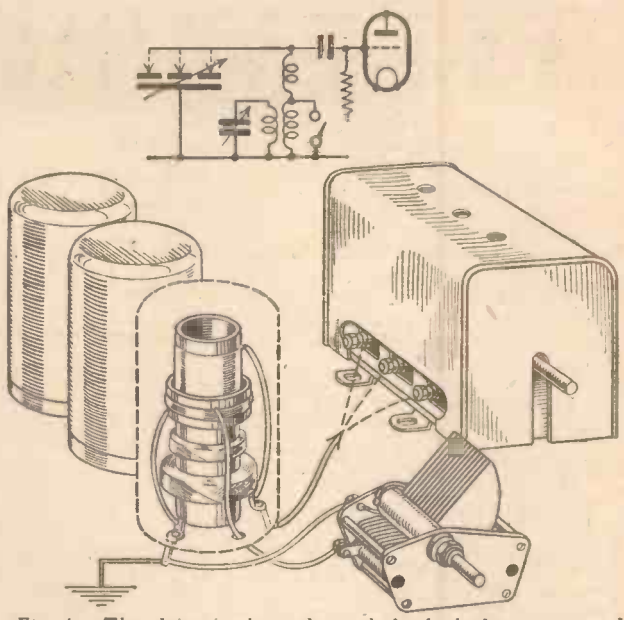


Fig. 4.—This diagram shows the method of checking a ganged condenser.

When any doubt exists as to the matching of coils or condensers after the above tests and a receiver employing those components is failing to gang throughout the tuning range, the coils should be sent to the makers for test, with a short report concerning the fault which is found to exist.

Do Sets "Age"?

In this Article the Author Gives Some Interesting Facts and Explanations

By PERCY W. HARRIS, M.I.R.E.

IN conversation the other day a friend said to me, "My set is no use now. I shall have to build another."

"What's wrong with it?" I asked. "You used to be very pleased with it, and frankly there has not been enough technical progress since you built it to make it out of date. You have replaced the valves, of course?"

"No, it is not the valves. The whole set seems to have gone off and I suppose it is worn out. Anyway, it is good fun building a new one, and I am going to start right away!"

This set me thinking. I have heard remarks of this kind on several occasions from people who are not likely to overlook such an elementary cure as replacing the valves. I went over my friend's set in great detail, and the result of the enquiry into its poor working may be of interest.

Defective Soldering

Nine-tenths of the trouble came from hurried soldering. There is always a great temptation to use some of the fluxes which make the solder flow easily but are by no means free from corrosive action. Certain kinds of "killed" spirit make soldering a delight (temporarily!) for the solder flows perfectly on both wire and tab, producing those nice, round, smooth, shiny little blobs which are the delight of those who like good soldering. But look at that set after six months. The shininess will have gone from the joints, they will be a dull whitish grey, or even greenish, and the tabs and wires round about the points which have been soldered will be found to be coated with corrosion which very likely has crept underneath the tab where it is screwed down. I went over the joints of this set one by one, and particularly those where the wire had been soldered to a tab screwed underneath a terminal nut. The amount of dirt, mess and corrosion was surprising, and a good clean up and re-soldering with a resin-cored solder worked miracles.

Deterioration of Resistances

The second trouble was a deterioration of a number of coupling and decoupling resistances. When I asked my friend where he got these from he did not remember, but said "he had them about" at the time of building the set, and as they were nameless I could get no further information. A few years ago there were a number of very bad resistors on the market. Their value in ohms was fairly accurate at the time they were sold, but some kinds broke down very quickly (some of the earlier wire-wound types were very bad in this regard), others made of composition deteriorated with age and became higher and higher in resistance, while others developed crackles. One rarely hears of resistor trouble in these days, for most of the problems of resistance making have been overcome, but those my friend was using were of a bad type.

It is surprising what enormous variations in a resistance are possible while still permitting a set to work. This gradual "going off" is rarely noticed immediately, for the change from day to day is not marked, but after some months when the efficiency of the set has dropped far below the original the owner starts to notice something. Most people think that when the valves have been changed this is all that can be done, and if there is no improvement they scrap the set. Some unscrupulous wireless dealers have profited by this attitude and have prescribed a "new set of valves" as the only cure. When a new set of valves has not done the trick they have tried to sell a complete new receiver.

While on the subject of valves, it may be said that "new *sets* of valves" are rarely called for, for they have a very long life and one seldom hears of several valves losing their efficiency at the same time. Usually it is just one that fails.

Condenser Trouble

With the joints scraped, the resistors changed and a general clean up, there was a big improvement, but still the set was not just right. The final cure came when a gang condenser was found to be badly out of gang and in fact "ungangable." In this the trimming was done by small compression condensers, and one of these had lost the springiness of the metal; this was due to its having been screwed down too tightly by my friend in one of his experiments, and no matter how much he turned the adjusting screw nothing happened.

This last incident leads me to my final point. Once a set has been ganged you have every reason in the world for leaving it alone. Just as some motorists cannot resist the temptation of cleaning out the carburetter every few days in spite of the fact they have a first-class petrol filter and they never find any dirt, so some wireless experimenters must be for ever re-ganging their sets as if coils and condensers changed over night! The trimming condensers on most ganged sets are not made to be changed every five minutes, but serve their purpose well enough if they are intelligently used when the set is built.

TELEVISION FOR ALL

Avoiding Television Flicker

By H. J. BARTON CHAPPLE, B.Sc., A.M.I.E.E.

WITH low-definition television transmissions one of the biggest objections levelled at the received picture is the unpleasant flicker arising from the picture repetition speed of 12½ per second. It has been felt all along that by doubling this speed every trace of flicker would vanish, it being argued that at the cinema the rate of picture projection is 24 per second, and no flicker can be noticed. One point seems to have been overlooked however, for in cinema projector work there is incorporated in the machine a shutter mechanism which cuts off the light, and so in reality masks the picture from the screen during the short time interval that the sprocket wheels jerk the film forward, one picture at a time, with a definite intermittent motion.

If this was all that happened, flicker would certainly be noticed in the modern cinema with its large bright screen, but to counteract it the geared shutter is double-acting, and cuts off the light while the picture is actually on the screen for a period of time equal to that taken to jerk the film forward and re-register it in its "gate." The light beam from the projector arc is therefore interrupted 48 times per second, with the result that all trace of flicker is removed.

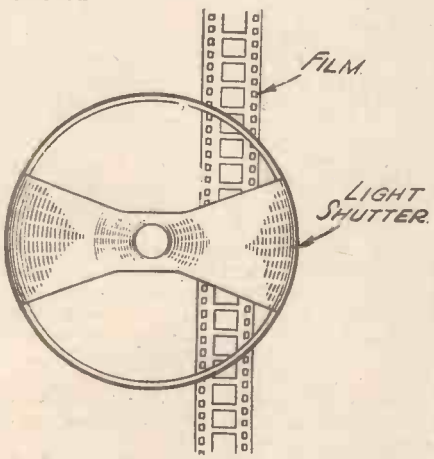


Fig. 1.—A double light shutter is used to remove flicker in modern talking films.

A Special Projector

The simple shutter arrangement used for this purpose is shown in Fig. 1, and its use in all modern film projectors has certainly solved one of the cinema's early problems. Another method in connection with the same question was the use of an "Arcadia" film projector. A large cylindrical drum housed a series of ingeniously-arranged mirrors operated by a cam mechanism. These, in conjunction with an optical system, projected the film pictures on to a screen so that the movement seen on the screen was a completely harmonious and uninterrupted one, and not a series of still pictures. This supersession of the pictures occurred irrespective of the rate at which the film was run through the mechanism. For some reason (no doubt one associated with expense) this machine did not become popular; but it was admirably adapted to television purposes when it was desired to transmit films. In Fig. 2 is shown an illustration of one of these machines working in conjunction with a low-definition scanning disc for the first telecine experiments and demonstrations, which were given as far back as 1929. Both in this country and on the Continent and in America, the Arcadia projectors were used for these initial television experiments, but the modern television method is to use a standard projector with its intermittent motion and shutter removed.

A Special Case

With the proposed high-definition television speed of 25 pictures per second, it was stated quite categorically that flicker would not be apparent in the received picture, a fact which has been substantiated by recent demonstrations. When the picture brightness is made *very intense*, however, a trace of flicker does become noticeable at this speed, and many suggestions have been put forward with the idea of overcoming the effect for these extremely bright images. Since we are not dealing with the presentation of a series of still pictures at a given rate, as in the cinema, owing to the continual building up of the picture brought about by the rapid scanning motion between each picture frame, it is not possible to incorporate a shutter scheme as has been done in the cinema.

In some quarters it has been stated that interlaced (also known as intercolated, interphased, interlocked, interdigited) scanning provides one solution. In the more usual straight scanning methods the picture is traced out by a series of lines in juxtaposition one to the other, the lines following in an ordered sequence of 1, 2, 3, 4, 5, 6, etc., up to the scansion limit of 180, 240, or whichever number is being used. This is the scheme shown in Fig. 3, where a total scanning area limit of the rectangle ABCD is shown partly traced by a number of lines starting in the top left-hand corner and continuing in order, so that the scan is completed finally in the bottom right-hand corner of the area.

Interlacing

When we come to the suggested interlaced scanning this line order is changed. First of all, the odd lines are traced, that is 1, 3, 5, 7, etc., and then the spot goes back almost to the starting-point to fill up the spaces by traversing lines 2, 4, 6, 8, etc. This arrangement is shown in Fig. 4 where the diagram is drawn with the odd scansions completed, and the even traverses in the process of being traced. Only a few lines are drawn for illustrative purpose, these being indicated horizontal, whereas in actual practice, at least with cathode-ray tube work, readers know that the lines traced on the screen incline very *slightly* downwards in the direction of traverse. There are thus two half-traced pictures interleaved with one another through the medium of the alternate lines, each double trace of odd and even lines constituting one complete picture frame.

Whether this is going to furnish a

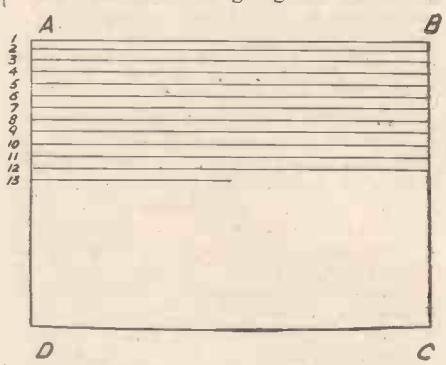


Fig. 3.—Tracing out the picture area by the "straight" method of scanning.

satisfactory solution only a long series of tests will prove, but it is known that the method has been tried both in this country and abroad by the firms engaged in television development. In the case of the scanners themselves it is quite a simple matter to construct the scanning disc with two separate spiral hole traces to give the required interleaving. Also in the case of wholly electrical scanners at both the transmitting and receiving ends, where time bases provide the pulsating electro-

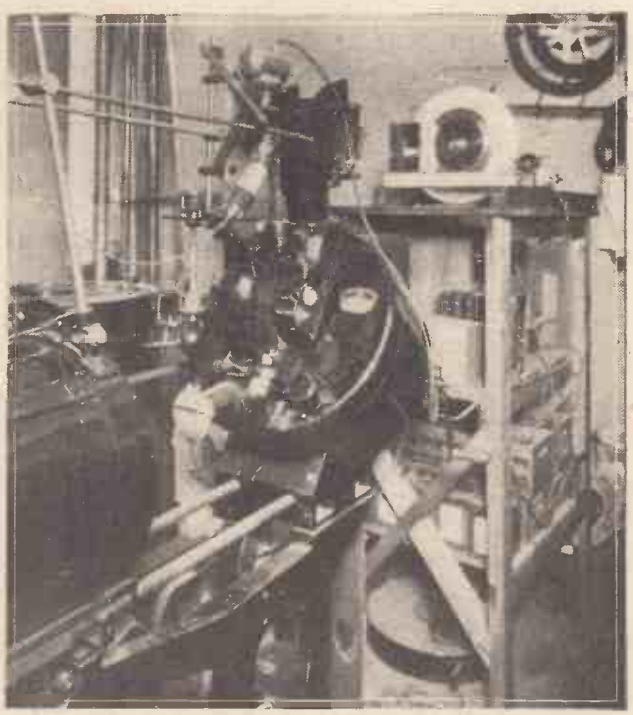


Fig. 2.—Showing the ingenious Arcadia film projector used in conjunction with the televising of films for low-definition signals.

magnetic or electro-static fields which govern the scanning movement of the electron beam, the circuits can be adapted in a relatively straightforward manner to bring about the odd and even line traces in their correct order.

It is with the same object in view, that is the complete elimination of all trace of flicker at any degree of screen brightness, that some inventors have pinned their faith in more complicated methods of scanning. Instead of interlaced straight lines the principle has been applied to spirodial scanning or other "scrambled" schemes which by "dodging" about on the screen have lent evidence to the impression of no flicker. As a general rule, however, these ideas have failed when the problem of maintaining proper synchronism between the transmitting and receiving ends under proper service conditions has arisen.

An Early Method

Yet another idea was put forward and demonstrated in the very early days of television development. It arose with big screen working, particularly the large Baird lamp screen arrangement where although the number of pictures per second employed in all the demonstrations was only 12½ per second, flicker was not so pronounced as in the case of a simple home receiver of either the disc or mirror drum type. The essentials of this lamp screen equipment are shown in Fig. 5, and consisted of a single pocket torch type lamp accommodated in each square division of a honeycomb assembly with thirty horizontal rows and seventy vertical rows, giving a total of 2,100 lamps.

Each one of the lamps screwed into the frame was joined by a separate cable to a single copper bar of a large 2,100 segmented commutator, seen at the rear of the screen in Fig. 5. A brush swept round the commutator at a speed of 750 revolutions per minute, and so lit each lamp in turn with a degree of brilliance dependent upon the incoming television signal at that moment in vertical strip order. There were thus 26,250 lamp contacts made and broken for elemental area incandescence during the course of every second of the screen's use. The honeycomb frame was covered at the front by a thin ground glass screen so as to diffuse the light somewhat, and the apparent reduction in picture flicker arose from the persistence of illumination of each lamp supplementing the phenomena of persistence of vision which is possessed by every normal person. Each lamp was not extinguished instantly the illuminating current was cut off by the commutator mechanism. A small but definite lapse of time occurred while the minute but brilliant intensity of illumination decayed, and this elemental retentivity of some measure of brilliance spread over the whole screen was sufficient to make the apparent flicker much less pronounced.

Persistence of Fluorescence

Any screen, either large or small, which can be built up on the same principles of illumination persistence will bring about the desired flickerless quality, especially if the rate of picture repetition is raised above the original one of 12½ per second. It is

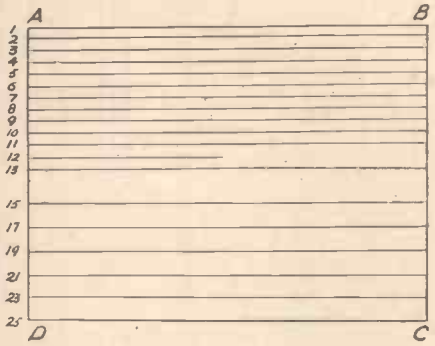


Fig. 4.—An incomplete interlaced scan.

here that the fluorescent screens of cathode-ray tubes play such an important part. The chemical composition of the screen varies according to the specific purpose for which the tube is required. For example, in certain photographic work the prime

Fig. 5.—The original lamp screen equipment in which flicker was reduced because of the persistence of illumination.

requirement is a high actinic brilliance and no after-glow (persistence of fluorescence).

It should be mentioned here that what is, strictly speaking, the electronic exertation of fluorescence must not be looked upon as essentially different in kind from the production of fluorescence under the influence of visible or ultra-violet radiation. G. P. Thomson and others have shown that a moving electron behaves in many respects as if it comprised, or was closely associated with, a train of electro-magnetic waves of very short wavelength. There are quite a number of substances which, when exposed to ultra-violet or electron beams, exhibit the rather peculiar phenomenon of emitting light in the visible spectrum, that is fluorescing. Examples of these are barium platino cyanide, zinc sulphide, cadmium sulphide, and uranium oxide, while in the liquid class we have paraffin, pischine, and solutions of chlorophyll and quinine sulphate.

Television Criteria

It must be borne in mind that when it comes to television, two important criteria of a good cathode-ray tube screen substance are that it should be brightly fluorescent for a given degree of excitation, while it should be capable of reproducing a picture of pleasant colour. Greens and blues, although quite common, are really not the best in this connection, and recently a screen has been developed which makes the observed picture almost black and white, while another has a sepia gradation.

Very often the screen is fixed in place on the inner wall of the large glass face by either potassium or sodium water glass, while an air spray is employed to distribute the grain quite evenly over the whole active surface.

Coming once more to our problem of flicker suppression, it is quite obvious from the remarks made in connection with the large lamp screen, that the efficiency of the tube for television picture reproduction purposes will be enhanced (and its apparent brightness sometimes increased) by mixing with the fluorescent material a phosphorescent one. That is to say, the screen will have the property of emitting light after the excitation which produced it originally has ceased. This after-glow or persistence of fluorescence acts as a form of picture memorising (something like the principles of an [iconoscope) and research is being conducted into this question as a solution of the elimination of the slight trace of flicker which is alleged to be seen at a picture repetition speed of 25 per second when the resultant pictures are extremely bright.

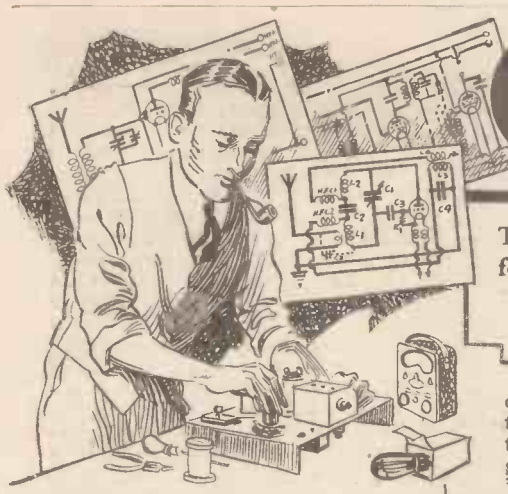
In normal circumstances the small area of glow dies away in brilliance very rapidly at first to an almost unobservable degree, and then rather slowly (these terms of time are, of course, meant only in relative sense for the period involved is only a small fraction of a second) until completely extinguished. If there was an after-glow approaching the order of one twenty-fifth of a second in the screen substance, then matters would be satisfactory, and it will be interesting to watch the developments which are made in such screens for television purposes.

A POSITIONING MAGNET

ON making the first acquaintance with a cathode-ray tube for reproducing television pictures, it is natural that many effects may occur which do not appear to be in conformity with the theoretical principles of normal working. The beam of electrons which acts as the "tracing pencil" for rapidly "drawing" the image on the fluorescent screen is very sensitive to the influence of any external electro-static or electro-magnetic fields. This is because the beam is really a rapidly moving stream of infinitely small electrons or negatively charged particles of electricity.

Every precaution must therefore be taken to ensure that no neighbouring component or equipment produces stray fields or, alternatively, if they do, then proper screening precautions must be taken in order to neutralise or remove the source of offence. Even under these circumstances, however, it is possible for the beam of electrons not to pass centrally through the holes in the accelerator electrodes or, alternatively, be diverted slightly from the correct static position it should occupy on the screen before the scanning operations start.

When this happens, conditions of normality may be restored by adjusting the position of a weakly magnetised piece of steel with reference to the cylindrical end of the tube's glass envelope. This magnet should be mounted on a stand so that it can be turned in any direction, and with a little careful manipulation a position will be found where the magnet's field effectively neutralises the disturbing stray field, with the result that the electron beam impinges correctly on the fluorescent screen, giving the proper focus and light intensity.



CIRCUITS AND SETS FOR ALL

The Circuit Described Below is for a Two-valve Reflex Receiver for Short-wave Reception.

By FRANK PRESTON

REFLEX circuits, in which one valve is used for both high- and low-frequency amplification, are not used to any great extent at the present time, although they were very popular a number of years ago. Nevertheless, there is to-day no good reason why a reflex circuit should not be used, particularly when high-quality reproduction is not required, and when reception is normally carried out with 'phones, a speaker only being used occasionally. Such a circuit is, in fact, very valuable for short-wave work when cost is a consideration and when the experimenter becomes rather tired of using the standard valve combinations. Regular readers will be well aware that, in these pages, we have frequently emphasised the desirability of preceding the short-wave detector by an untuned H.F. stage, and the usual and greatest objection to this arrangement is that an extra valve is used which normally provides very little real amplification, although it does improve reaction control and remove dead-spots on the tuning range. By using a reflex circuit, however, an H.F. stage can be incorporated without the need for an extra valve, and for a negligible cost.

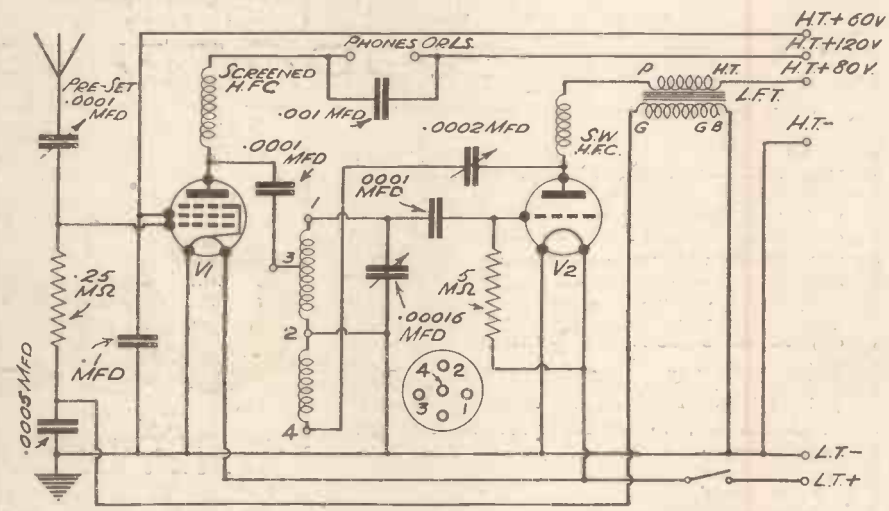
A Two-three Valver

A circuit of the type under discussion is shown on this page, and the simplicity of the connections is at once apparent. Two valves only are employed, but the receiver actually functions as a three-valver, because the H.F. pentode acts, first as a "buffer" H.F. stage, and later, as a normal low-frequency amplifier. The reason for this will be seen when the circuit is examined a little more closely, for it is evident that the anode circuit of the second valve (the leaky-grid detector) contains the primary winding of a low-frequency transformer of which the secondary winding is returned to the aerial circuit or, in other words, the grid circuit of the first valve. The 'phone or speaker terminals, instead of being in the detector anode circuit, are in the anode circuit of the dual-purpose pentode, and are by-passed by a .001-mfd. fixed condenser.

Apart from the points just referred to the circuit is not unlike other H.F. short-wavers which have been described in PRACTICAL AND AMATEUR WIRELESS. For the sake of simplicity the circuit has been reduced to its most straightforward form, but those experimenters who have pet "fads" concerning the method of reaction control, of connecting the grid leak or of tuning the detector circuit can readily fit them into the general scheme without difficulty.

PRINCIPAL COMPONENTS REQUIRED.

One Peto-Scott Metaplex chassis, 10in. by 8in. with 3in. runners.
Two Clix four-pin chassis-mounting valve holders.
One Eddystone five-pin valve holder (for coil).
One set Eddystone five-pin S.W. coils (according to wavelength ranges required).
One Formo .0001mfd. (pre-set condenser).
One Dubilier .25 megohm grid leak.
One Dubilier 5-megohm grid leak.
One T.M.C. .0005mfd. tubular condenser.
One T.M.C. .0001mfd. tubular condenser.
One T.M.C. .1mfd. tubular condenser.
One T.M.C. .001mfd. tubular condenser.
One Eddystone screened S.W. H.F. choke.
One Bulgin S.W. H.F. choke.
One Eddystone "Scientific" .00016mfd. tuning condenser.
One Eddystone slow-motion condenser drive.
One J.B. .0002mfd. midget condenser.
One Varley 3½ : 1 "Niclet" L.F. transformer.
One Cossor 210 S.P.T. valve (V.1).
One Cossor 210 det. valve (V.2).
Connecting wire, terminals, screws, etc.



The circuit described. Connections to the coil holder (looking down on it) are shown inset, and it will be seen that one terminal is not used.

The Choice of Parts

A list of the principal components required is given elsewhere, and from this it will be seen that all the parts are of perfectly standard type. For this reason most constructors will find that they can substitute components which are available and, perhaps, which are already in use in another set. With regard to the aerial circuit, this is, of course, aperiodic and a .25-megohm fixed resistance is shown connected between the aerial lead-in and the earth line (the transformer secondary is by-passed by a .0005-mfd. fixed condenser). This resistance should be non-inductive, and a wire wound one is useless, since it would probably resonate at some frequency to which the receiver tunes. A good short-wave choke could be used in place of the resistance, many short-wave experimenters favouring this form of coupling.

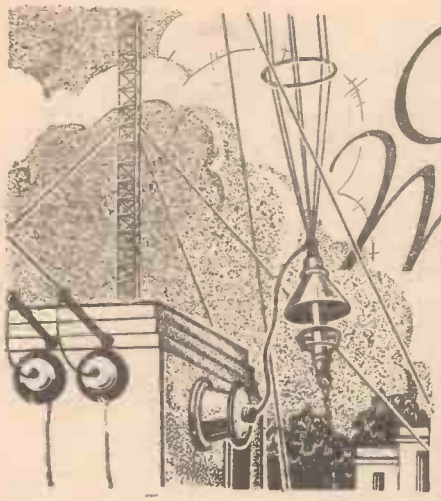
The H.F. choke used in the anode circuit of the H.F. pentode must be a really good component, and preferably of the screened type such as that specified; if an alternative is used it must be of a reliable type, fully screened and designed expressly for below-100-metre reception. Six-pin plug-in coils are specified for tuning since these are generally more convenient than a two-range tuner, but the latter may safely be used if preferred. The grid circuit is tuned by means of a .00016-mfd. condenser with slow-motion drive, but here again, the constructor may use a band-spreading arrangement, if desired. The reaction choke must also be of the short-wave type, but it may be unscreened provided that it is placed a reasonable distance away from the tuner and at right-angles to it. In any case, it is desirable that the choke should be different from that used in the H.F. stage; if it were of the same type there would be a danger of instability.

The L.F. transformer may be of any type, since the exact characteristics are not at all critical. It is, perhaps, better to employ a ratio of not more than 1 : 3 to avoid the possibility of overloading the H.F. pentode, but even this is not very important.

Chassis Construction

With regard to the component layout, this may be similar to that of any normal short-wave two-valver with H.F. amplification. The parts can well be accommodated on a metallised chassis measuring approximately 10in. long by 8in. deep, and with 3in. side runners. The tuning condenser can then be mounted in the centre with the coil immediately behind it. This will allow ample space on each side for the H.F. and detector valve holders. The reaction condenser can be mounted on either the left or right of the tuning condenser as preferred; some experimenters prefer to tune with the right hand, whilst others prefer to use the left. No matter on which side the reaction

(Continued on page 275)



On Your Wavelength

By Thermion

Which is the Favourite Broadcast Band?

I HAVE had my say about jazz bands. I now invite you to have yours. Which do you consider is the best band on the air? In order to settle this point once and for all, I shall be glad if you will drop me your opinion on a postcard, so that I can analyse the result and judge what readers think by applying the law of average. To me they all sound alike, which is, I suppose, the reason why signature tunes are employed—you would never know which band was which unless they came on and went off the air with their triumphal anthems.

Too Much Radio?

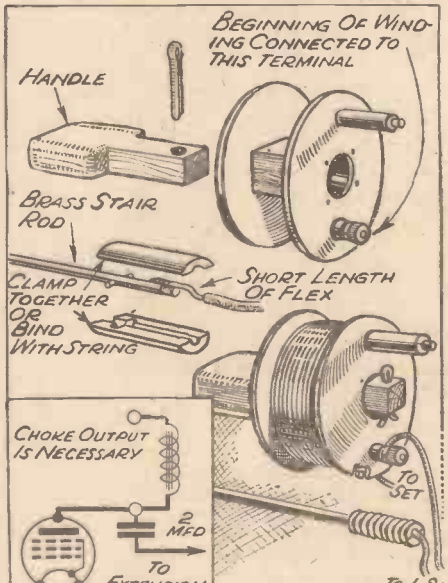
ARE we all sated with radio? Do we develop a critical complex, on the principle that they are as sick who surfeit with too much as those who starve with nothing? Familiarity breeds contempt perhaps! If we heard those programmes about which we complain so bitterly only once a week, we might learn to like them. As it is you can tune in a programme at any hour of the day or night. We should probably be just as critical of the theatre if we had two or three hours of it daily. Some like Sunday programmes and others do not; some abhor dance music, while others cannot have too much of it. The B.B.C. does remarkably well in its efforts to please the majority.

Flat-dwellers' Aerials

THE modern tendency to erect magnificent (?) blocks of flats may lead to a greatly increased efficiency in the design of the aerial-earth system. At present, with the greatly extended use of electrical apparatus it is becoming difficult to receive wireless signals without a distressing background of crackles and hisses—unless, of course, the users of such apparatus fit noise suppressing devices. In time, no doubt, this difficulty will be removed by the manufacturers of such apparatus, who will only supply their commodities when it is in an interference-free condition. In the modern flats it is becoming customary to build an aerial into the walls and fit a simple aerial-earth point somewhat after the fashion of electric power points. By using a screened cable for the aerial and an impedance matching device, it is possible to cut down the interference to a very small value. No doubt, as experience is gained in erecting this type of aerial system, improvements will be made and in time a really efficient aerial will result in which it will actually be possible to eliminate atmospherics. Can you imagine tuning to foreign stations without a crackle or other sound in the background?

Remote Control

I AM still experimenting with a view to finding the ideal remote control. I have several speakers in cabinets and a really good set in the form of a radio-gram. In this respect I am, no doubt, in the same position as many other listeners. The radio-gram stands in the drawing-room, but I often wish to listen in other rooms in the house, and I already have points in each room of the two-pin type with extension leads taken from a simple output filter in the radio-gram. The speaker in the latter has a silencing switch, and thus I can plug a speaker into the plug in any room and hear a desired programme. At the moment, I must return to the drawing-room to change the station, or control the receiver, that is, switch on or off. I have spent many hours trying, *without increasing the number of the extension wires*, to control station selection and on-off switching, but so far have not been successful. Some ingenious schemes have been suggested by various people, but without so far producing the desired results. Has any experimenter a suggestion to offer?



A Universal L.S. Extension Kit For Out-Door Use. The Free End Of The Single Flex Is Connected To The 2 Mfd Cond. The Speaker Being Connected To The Inside End Via The Terminal And To The Stair-Rod Which Is Pushed Into The Ground At Any Convenient Spot.

Mains Set Ventilation

SOME weeks ago I mentioned the question of ventilation and the heat which is generated in a mains receiver. I was very interested this week to examine a Marconiphone receiver in which this question has obviously received attention. The back of the cabinet is not of wood, but a fireproof and heatproof material having holes cut for avoiding resonance. In addition, the upper part of this back is supplied with holes arranged in a very definite fashion—and obviously not entirely made from the point of view of "letting out the sound." In the bottom of the cabinet a rectangular aperture has been cut and across this is fixed a piece of perforated metal. The combination of this opening and those at the upper part of the back form a perfect ventilation system, as hot air rises and will thus find its way normally to the top of the cabinet. Cold air to take the place of the rising air must come in at the lower part of the cabinet, and thus a constant flow of air will be found inside the cabinet, keeping components cool and also preventing damage to the cabinet. Simple, but very sound!

The Jubilee Broadcast

DID you listen to the many special broadcasts on Jubilee day? If you did you must, like me, have noticed their extremely high degree of technical excellence. Not only the relay from St. Paul's, nor the running commentaries which were made from various points along the route of the procession, nor merely the relays from various parts of the country during the evening, but the whole transmission—not forgetting the short speech by His Majesty—was the best I have ever heard. The engineers, programme directors, and the full staff of the B.B.C. deserve the highest praise for this excellent effort.

Permanent Magnet or Energised?

I OFTEN wonder why it is that so many constructors of mains receivers use permanent-magnet moving-coil speakers instead of those of the energised type. I realise that the P.M. speaker is somewhat more convenient when it is to be used as an extension some distance away from the receiver, but it certainly does not show to advantage when built into the receiver cabinet. In fact, the very reverse is the case, for this type of unit is less sensitive than the average mains-energised model and invariably costs more. This point was specially brought to my attention a few days ago when I was trying out a superhet that had been made by a very proficient

(*Continued overleaf*)

(*Continued from previous page*)

home constructor-experimenter. The set certainly functioned extremely well, but I had a feeling that it was not being operated at maximum efficiency. I had seen similar cases before and suggested that we should try the effect of changing the P.M. speaker for an energised one, which I happened to have by me. This was fitted in the cabinet, and the field terminals connected in place of the smoothing choke in the set; immediately the change had been made not only was the volume increased, but quality was much better. The bass register, which had previously been only moderately good, was brought out beautifully, not in the form of "boom," but as really lifelike reproduction of such instruments as drums and percussion instruments.

In the case in question the mains-supply portion of the receiver delivered only 250 volts at 60 milliamps, so that a 2,500-ohm speaker field would have been useless, due to the fact that it would have cut down the H.T. voltage to a considerable extent. But by using a 1,500-ohm field the voltage drop was only 75 (at 50 milliamps) so that the anodes received very nearly their maximum voltage. It is admitted that the energising wattage was only about 4, whereas it should have been nearer 7, but it proved ample for the volume being handled. If you have a mains set with permanent-magnet speaker, just try the effect of replacing this with an energised model; in nearly every case you will observe a wonderful improvement.

A Souvenir Record

H.R.H. THE PRINCE OF WALES has honoured Messrs. Synchrophone, Ltd., by recording exclusively at their studios his Jubilee Trust speech. This is being issued on a 10in. record, and is for sale at 2s. 6d. throughout the Empire to benefit the Trust. No doubt every reader will obtain one of these records in order to assist a good cause, and at the same time to acquire a permanent memento of the Jubilee period.

That Television Name

CONSIDERABLE controversy still persists in connection with the name which will prove acceptable to experimenter and public alike for the purpose of describing the act of looking in at received television pictures. To my mind the bulk of the suggestions which have been made in various quarters seems to have overlooked the simple fact that every television service embodies two things. Not only shall we observe the pictures on the screen but at the same time we shall listen to the accompanying sound.

Anyone who has watched television images alone and omitted to make provision for the sound realises that although this is satisfactory for test purposes it robs the whole action of much of its pleasure. Quite unconsciously we keep straining our ears to hear what is being said by the artist, and the self-imposed deafness, after a time, becomes quite annoying. Ingenuity should therefore be directed towards the coining of a word which is capable of illustrating the use of both our senses of sight and hearing at the same time. The expressions which came to my mind recently were "audiovising" for the double action; "audiovision" for the dual service; and if a term is needed to describe the instrument, then what better than "audiovisor?" I claim no originality for the suggestions; it is quite possible they have been made before or may even be the registered names of some company with an eye to the future, but they certainly satisfy the conditions originally imposed and are quite self-explanatory.

Notes from the Test Bench

Using Metal Rectifiers

A FEW days ago we were asked by a reader to test his A.C. receiver, which he claimed had been built exactly to specification but could not be made to function satisfactorily. We submitted the receiver to a systematic test and discovered that one of the smoothing condensers in the mains unit had broken down. On making a detailed examination of this component, however, we found that although it had the specified capacity of 4 mfd. it had not the correct voltage rating. In this particular receiver an indirectly-heated output valve was used in conjunction with an H.T.8 metal rectifier. As the normal maximum anode voltage was approximately 220 volts the reader had chosen a smoothing condenser having a working voltage rating of 300 volts, thinking that this had a sufficient margin of safety.

He had, however, overlooked the fact that during the heating-up process the current taken by the valves was much lower than the normal 50 m.a., and, therefore, the voltage output of the rectifier was much higher than 220 volts. In fact, when no current is being taken, the output voltage of the H.T.8 rises to approximately 500 volts, and therefore the smoothing condensers should have a working voltage rating of 500 volts or higher, otherwise they are likely to break down when the receiver is switched on. If a directly-heated output valve is used, of course, this rise in voltage does not occur.

Testing Superhets

OUR experience with home-constructed superhets tends to indicate that constructors experience a certain amount of difficulty in correctly adjusting this type of set. I.F. transformers marketed by the best-known firms are dispatched with their trimmers correctly adjusted for the marked frequency—*e.g.*, 110 kc/s or 465 kc/s as the case may be—and need very little adjusting when fitted in a receiver. When the transformers have not been given a preliminary adjustment, however, trimming becomes rather a difficult procedure, and some form of signal generator becomes practically essential if correct alignment is to be expected.

These instruments can be bought for approximately £5 and are very easy to manipulate. When using them to line up a superhet the control should be set to the required intermediate frequency and the output leads connected *via* fixed condensers of approximately .001 mfd. to the primary terminals of the second I.F. transformer. The trimmers of this component should then be adjusted until maximum signal strength is obtained from the speaker. After the second transformer has been adjusted the signal generator leads should then be transferred to the primary terminals of the first transformer, and the same procedure effected for maximum volume. The I.F. stages will then be correctly adjusted and the generator leads can be connected to the aerial and earth terminals, and the gang-condenser trimmers adjusted.

DXX Reception Report

WHEN reporting amateur transmissions and technical findings to station officials, use the international abbreviations. Do not, however, fall into the too common habit of writing letters to stations and individuals in Radionese. This practice is an affectation seemingly to denote familiarity with amateur work, but is regarded by many old hands as childish enthusiasm which, if encouraged, wastes valuable time, quite apart from the fact that to address a person unknown to you as OM—old man, old boy, etc., is bad form. Many reports which, had they been written in plain language, would have been appreciated, are thrown aside unanswered.

This Metre Business

IF and when in practice radio entertainments can be transmitted on micro-waves, 300,000 stations would work without the risk of mutual interference on wavelengths between 1 metre and 1 decimetre (0.1), representing 300,000–3,000,000 kilocycles in frequency.

It is not the number of metres which must interest the man who desires to learn something regarding the working of his wireless receiver, but what the metres represent, and unless the kilocycle system is made clear he will remain irretrievably fogged.

Eindhoven

PCJ, Eindhoven, 19.71 metres (15,220 kc/s), one of the old stagers, seeing that it was first opened in 1927, has not been heard much recently, as it has only been relaying the PHI, Huizen, programmes every Sunday afternoon; it is now on the air with its own entertainments every Tuesday from B.S.T. 08.00–12.00, and on the following afternoon from B.S.T. 13.00–17.00.

Egyptian Relic Found Under Radio Factory

AN interesting story lies behind the news that the Trustees of the British Museum have just accepted a 2,000-year-old Egyptian statue. The statue had been dug up when a certain section of the "His Master's Voice" works were being extended a short time ago to cope with the increased manufacturing requirements for H.M.V. radio instruments. Its value was not at first appreciated by the builders who, for a short time, used it as a door-stop. Some time afterwards two young employees of "His Master's Voice" at Hayes, Middlesex—Mr. A. C. Wilberforce and Mr. H. R. Humphreys, when passing through a section of the radio factories, noticed the somewhat unusual door-stop, and, being interested in archæology, recognised it as belonging to the Egyptian period. Investigation by the British Museum authorities brought to light the fact that it was definitely an authentic relic of ancient Egypt belonging to the Ptolemaic period, *i.e.*, third or second century B.C., being, therefore, more than two thousand years old.

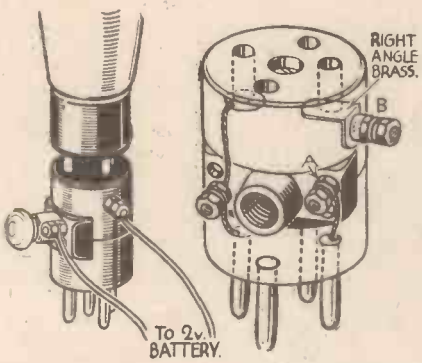
Archæological experts believe that this Egyptian relic is the largest and heaviest that has ever been discovered in English soil. It is 20in. high. They consider it may have been brought over to Britain by some Roman legionary who had previously served in Egypt and adopted the worship of the Egyptian gods. It portrays a priest bearing in his hands a shrine containing the image of Isis, or another of the Egyptian gods. Investigations have shown that it was dug up from about nine feet below the surface.

A PAGE OF PRACTICAL HINTS

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

A Filament Tester

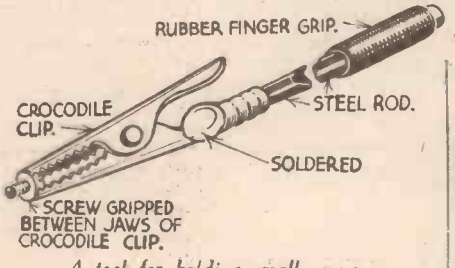
THE accompanying sketches show a useful device for testing valve filaments or L.T. current supply. Two old valve bases are fixed together, as shown, with a small round block of wood between. Holes are drilled in the wood for the connecting wires, and a piece is cut away to take a small brass angle-piece which is connected to the side terminal B. A portion of each valveholder is also cut away to take a fuseholder. Each terminal of the fuseholder is connected to a filament pin, and one terminal is also connected to a small brass disc which fits under the hole for one of the filament valve pins, as shown in the sketch. For testing a filament a 2-volt battery is connected between terminal A, on the fuseholder, and terminal B on the small brass angle-piece with which the other filament valve pin makes contact.—P. TAYLOR (Leith).



A useful tester for valve filaments and L.T. supply.

A Handy Holder for Small Screws

IT sometimes happens that a small screw has to be replaced in a position extremely awkward to get at, but the difficulty can be overcome with the simple tool illustrated. To one arm of a crocodile clip a wander-plug socket from a discarded H.T. battery is soldered, the socket being fitted with a piece of steel rod upon which a scrap of rubber tube is placed for a finger grip. Incidentally, the crocodile clip is still available for its original purpose even though it is advisable to flatten one (or both) of the arms before soldering on the wander-plug socket. It is also desirable to flatten out, lengthwise, the teeth at the "business" end to enable it to get a better grip of the screw head, and to file away the projections from the extreme end.



A tool for holding small screws.

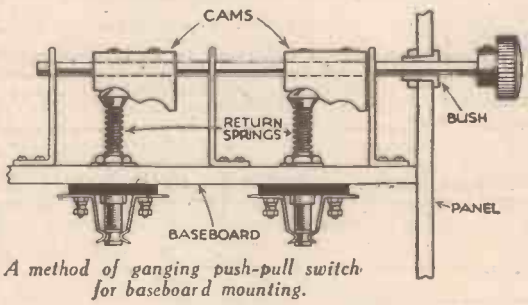
If desired, a piece of steel or brass rod can be soldered direct to the clip, but if a socket is used it is then possible to accommodate "handles" of different lengths according to requirements.—H. C. E. (Reading).

THAT DODGE OF YOURS!

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

Ganging Push-pull Switches for Baseboard Mounting

WHILST set rebuilding and adding an additional stage of H.F. amplification, I decided to embody sub-baseboard wiring, and had to adopt the following method of ganging two ordinary push-pull switches for wave-changing. The switches are mounted as shown in the sketch, so that their operating plungers are pressed against two cams carried upon a horizontal shaft so that they can be controlled from the panel.



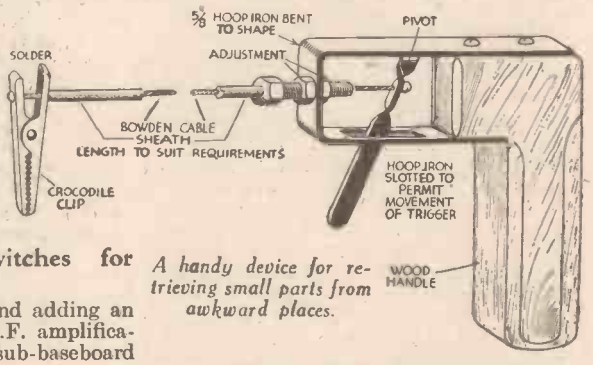
A method of ganging push-pull switch for baseboard mounting.

A neat screening box for a wavemeter

It will be noted that the cams depress the plungers upon pushing in the operating shaft, and upon withdrawing it the switches resume their short-circuiting position by virtue of the restoring springs. Two locking slots are provided in the cams and provide a very efficient "snap" action.—WM. A. HARRISON (Liverpool).

A "Pick-up" Device

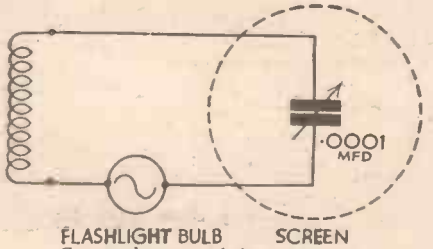
NUTS, screws, and other small objects, which have been inadvertently dropped into awkward places in a set, can be retrieved by the use of the "pick-up" device shown in the accompanying sketch. The control cable is the same as that used with cycle brakes. The cable works freely in one limb (the one which originally held the terminal) of the crocodile clip, and is anchored in a small hole, drilled in the other limb. The trigger is pulled, to open the jaws, and is released to close them. The free hand holds the cable sheath, and guides the clip to the desired point.—STEENSON RAINEY (Wishaw).



A handy device for retrieving small parts from awkward places.

Screening Box for a Wavemeter

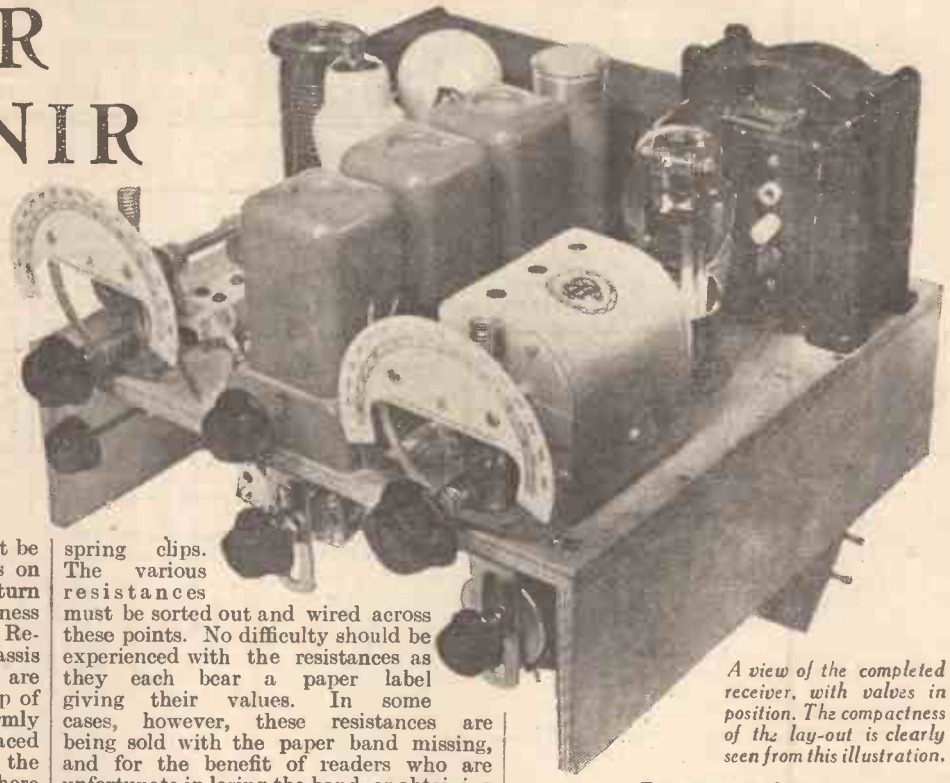
IT is often found when building an absorbtion wavemeter for a transmitter or receiver, that great difficulty is experienced in making a neat aluminium screening box. A simple way of solving this problem is to use a small aluminium saucepan, minus the handle. A wooden rim is fitted inside the pan and secured by means of wood screws. This rim provides a mounting for the ebonite disc which is about ¼in. larger in diameter than the rim. The bulb may be omitted when not using a transmitter.—E. ROBINSON (Newport, Middlesbrough).



Circuit diagram of the wavemeter.

OPERATING the A.C. ALL-WAVE SILVER SOUVENIR

Some Additional Constructional Hints and Complete Operating Conditions are Given in This Article, which also Contains Some Interesting Short-Wave Tuning Points



A view of the completed receiver, with valves in position. The compactness of the lay-out is clearly seen from this illustration.

IN last week's issue the principal constructional details were given, together with some of the smaller points which might give rise to trouble if not carefully attended to. It might be mentioned again that the M.B. points on both sides of the chassis are earth return connections, and thus absolute cleanliness is essential at these junction points. Remember that the lower side of the chassis is not metallised, and therefore bolts are necessary to make contact with the top of the chassis. So long as the bolts are firmly tightened, and a large washer is placed immediately next to the surface of the chassis, this should be sufficient, and there is no necessity for schemes to improve on the contact surface. A recent receiver which was received by us for examination, owing to failure to give good results, was found to be faulty simply because the constructor had endeavoured to improve on results by painting the bolt-head and surrounding surface with aluminium paint. The bolt had not been properly locked beforehand, and the medium used in making the paint had thus run between the various wire loops, washer, and chassis surface and effectively insulated them.

The Resistance Board

The wiring diagram on page 244 of last week's issue should assist you in making up the resistance board. When this is obtained it consists simply of a square of paxolin with soldering tags and small spring clips. The various resistances must be sorted out and wired across these points. No difficulty should be experienced with the resistances as they each bear a paper label giving their values. In some cases, however, these resistances are being sold with the paper band missing, and for the benefit of readers who are unfortunate in losing the band, or obtaining resistances without identification, the colour code is repeated. In reading this code the body of the resistance is taken as the first figure, and this is followed by the figure represented by the coloured tip of the resistance. Finally, the number of noughts designated by the dot on the centre of the resistance is added to these two figures. If no dot appears on the resistance it is an indication that the dot has the same colour as the body.

A powerful mains receiver, self-contained, and covering the short waves and the broadcast (medium and long) waves without coil changing. Simple to construct and simple to operate.

RESISTANCE CODE.

Colour	Body	Tip	Dot
Black	0	0	.0
Brown	1	1	0
Red	2	2	00
Orange	3	3	000
Yellow	4	4	0000
Green	5	5	00000
Blue	6	6	000000
Violet	7	7	—
Grey	8	8	—
White	9	9	—

An example will make the matter perfectly clear. In the resistances specified is one of .5 megohms (500,000-ohms). There are also two of 50,000 ohms. These resistances will all be coloured green and have a black tip. The single resistance of 500,000 ohms will have a yellow dot on the centre, whilst the 50,000-ohm resistances will have orange dots on their centres.

Connecting the Receiver

The leads from the mains plug should be joined to the terminals on the mains transformer which bear markings corresponding to your mains supply. In the event of the latter having a value in between those marked on the transformer use the nearest value above your mains marking. Thus those constructors with 240-volt mains will use the 250-volt tapping, and so on. Plug the valves into their correct sockets, the MVS/Pen. being inserted into the holder nearest the short-wave tuning condenser, and the 41MHL being inserted into the holder immediately next to the metal rectifier. The PT41 is then plugged into the remaining holder. The speaker leads should be plugged into the appropriate sockets on the socket strip and the aerial and earth joined to the rear strip.

The Controls

The control lay-out is very similar to that of the battery model. The left-hand

LIST OF COMPONENTS FOR THE A.C. SILVER SOUVENIR

COILS
One set Three-gang, type WL-QRT (Wearite).
One Short-wave coil, type SPC with type SPB base (B.T.S.).

CONDENSERS (Variable).
One Three-gang, .0005 mfd. Baby condenser with S.M. dial C1, C2 and C4 (J. B.).
One Single S.W., .00016 mfd. type EJ with S.M. dial (C3) (Polar).
One Reaction .0002 mfd. type QJ, C5 (Polar).

CONDENSERS (Fixed).
Four .5 mfd., type 65 (C6, C7, C8, C9)
One 2 mfd., type 65 (C14)
Three 25 mfd. 25 volt electrolytics (C10 C11, C12)
One .0001 mfd., type M (C13)
One .01 mfd., type M (C15)
Two 4 mfd., type 84 (C15, C16)
One 8 mfd., type 802 electrolytic (C17)
} T.C.C.

RESISTANCES.
Two 50,000 ohms (R1, R2)
One 20,000 ohms (R3)
One 2,000 ohms (R4)
One 250 ohms (R5)
One .5 megohm (R6)
One 750 ohms (R7)
One 25,000 ohms (R8)
One 5,000 ohms (R9)
One 350 ohms (R10)
One 10,000 ohms (R11)
} Amplion 1 watt type.

CHOKES.
Two H.F., type HF3 (Bulgin).
One 40 H-60 m-A L.F. (Premier).

VOLUME CONTROL.
One 5,000 ohm wire-wound potentiometer (R12) (B.T.S.).

TRANSFORMERS.
One L.F., type DP21 (Varley).
One Mains transformer, type W31 (Heayberd).

SWITCHES.
One QMB on-off, type S80 (Bulgin).
Four change-over, type S81B (S1,2,3,4) (Bulgin).

RECTIFIER.
One Style H.T.8 (Westinghouse).

CHASSIS.
Metaplex, 12in. by 12in. with 3½in. runners (Peto-Scott).

VALVES.
One MVS-PEN, one 41MHL and one PT41 (Cossor).

VALVEHOLDERS.
Three five-pin chassis type airsprung (Clix).

ACCESSORIES.
Four component brackets (Peto-Scott).
One ten-way group board (Bulgin).
One 9in. by 5-32in. shaft (Bulgin).
Two terminal strips, L.S.-P.U., A., E. (Clix).
One Stentorian Senior loudspeaker (W. B.).
One Silver Souvenir cabinet (Peto-Scott).

dial controlling the short-wave tuning circuit, and the right-hand controlling the normal broadcast circuits. In the centre is the wave-change switch for the broadcast band, and immediately below is the reaction condenser. The right-hand lower control is the potentiometer which regulates the bias to the first two valves and thus controls the volume, and for preliminary testing this should be set to maximum. On the lower left is the short broadcast wavechange switch, and this should be rotated in a clockwise direction for short waves and anti-clockwise for broadcast wavelengths.

One tuning control for each waveband. Single reaction condenser operating on each band. Perfectly smooth volume control. Simple standard circuit arrangements without "freak" schemes.

For preliminary testing set to the broadcast band and turn the central coil switch to medium waves and switch on. Allow a few seconds for the valves to heat up, after which a faint hum will be heard from the speaker. Should this hum rise to a high level, switch off as you may be certain that some connection is faulty. There should only be the slightest purr from the speaker, unless reaction is pushed too far. For initial tests use about 2in. of wire for the coupling condenser C19, and twist this for its entire length. Advance the reaction condenser until a rushing sound becomes audible in the speaker, and then slowly turn the right-hand tuning dial. As soon as a station is heard reduce reaction and thus find the exact tuning point. It will now be necessary to trim the band-pass circuits and to gang the condenser, and this is carried out as follows.

Ganging Adjustments

Slacken off the volume control until the signal is barely audible. Adjust the trimmers C1, C2, and C3, and as an improvement is obtained, further reduce signal strength by means of the volume control. Remember always to keep the signal at such a level that it can only just be heard, and then the slightest change in strength will be readily noticed. Next turn to the upper end of the tuning scale and ascertain whether any further adjustment is required. Obtain a setting which holds more or less throughout the entire range, and finally adjust the twisted leads (C19) to give the desired reproduction and selectivity for your particular locality. In general about 1½in. to 2in. will be found satisfactory. When good results are obtained on the broadcast band you may turn to the short waves.

Short-wave Tuning

Plug in a suitable coil (the specified coil is suitable for the 24- to 52-metre band) and turn the left-hand switch clockwise. Now, with the reaction advanced as before, so that the rushing noise is audible, slowly turn the left-hand tuning control. Although a slow-motion dial is fitted and the condenser is of very small capacity, the tuning must be carried out in a very slow and deliberate manner. As soon as a chirp or other noise is heard, slowly reduce reaction and retune the dial. It will be found, unlike broadcast tuning, that the sharpness of the tuning circuits is so marked that many stations will be missed until you have mastered the peculiarities of short-wave work. Several stations are sufficiently powerful on this band to be receivable without very delicate adjustments, and these will enable you to obtain a working acquaintance with short-wave work.

In the event of reaction being difficult to obtain on short waves, reduce the aerial coupling, either by fitting a small variable condenser in the aerial lead or by using a smaller aerial. A vertical wire will often prove of greater utility than the customary horizontal wire, and it will prove worth while to carry out a few experiments with the aerial as well as the earth, in order to find an arrangement which will be productive of maximum results on both the normal broadcast and the short wavelengths. When the receiver is finally adjusted and in working order, various short-wave coils may be used on the short-wave side in order to cover different bands, and there are various sections which may be covered according to the time of year and the type of broadcast which it is desired to receive.

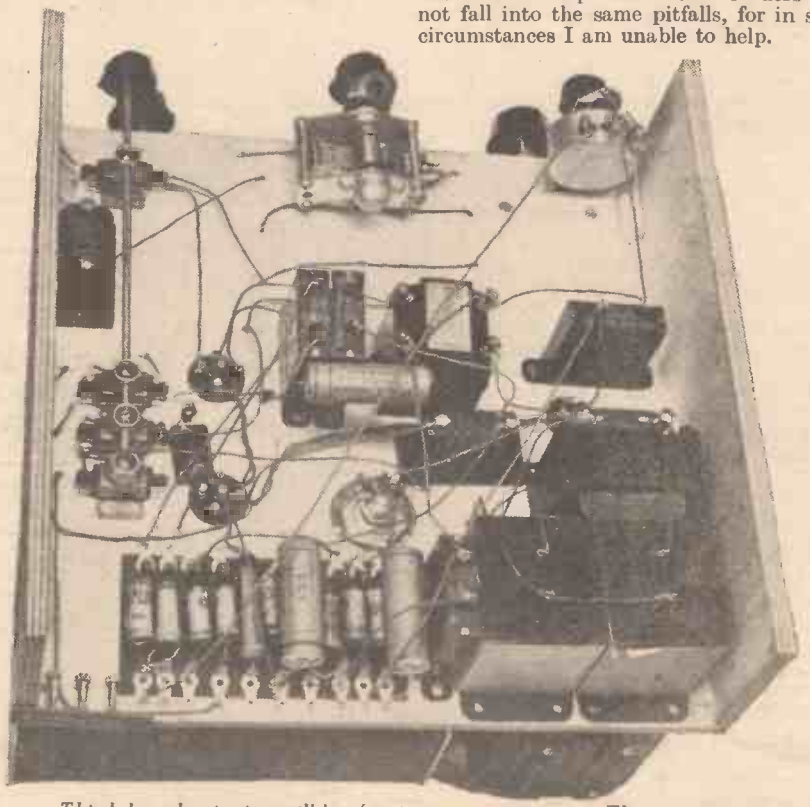
This completes the description of the battery and A.C. All-Wave models of the Silver Souvenir. I do not plan to produce Universal models nor D.C. models, since I am persuaded by those competent to judge that there is practically no interest in D.C. receivers. Readers will recollect that I asked those interested in building D.C. receivers to get into touch with me concerning my £5 Superhet. Many readers wrote saying they would build such a design if such were published in these pages. I went to a considerable amount of trouble to produce such a model and with all modesty I can claim that it was one of the most efficient D.C. receivers, commercial or otherwise, ever placed before the public. Notwithstanding the assurances from many hundreds of readers living in districts still supplied with D.C. current, I do not think fifty of my D.C. £5 Superhets have been made. I am anxious to place before my readers designs of popular appeal. I cannot afford to devote time and space to the description of receivers of such a special nature unless such are built. If I find a sufficient interest in a universal all-wave receiver I am prepared to go ahead with the work. Perhaps, if you are so interested, you will get into touch with me.

TUNING RANGE	Metres
Short Wave	13-96.
Medium Wave	200-550
Long Wave	900-2,000

As with all my designs, my guarantee applies with the Souvenir series, but only on the understanding that my layout is adhered to and my specification followed. I have stressed this point many times before, but I still find readers who think that they can ignore my instructions and use any old junk components which they have by them.

Three valves delivering maximum efficiency. H.F. variable-mu pentode; high-gain three electrode rectifier and high-efficiency output pentode, Maximum undistorted output 1 watt.

This is fallacious and likely to cause them endless trouble and dissatisfaction. My solus specification was introduced in the best interests of the home constructor who, in the past, when a variety of components was specified for each unit of the set, found that by certain combinations of them it was impossible to make a receiver work. A Welsh reader, for example, a few weeks ago sent me a frightful contraption which he said was one of my £5 Three-valve Superhets. I have examined a few monstrosities in my time, but I award all the medals and various brands of biscuits to this misguided reader who had slung together in any sort of order a miscellaneous collection of utter junk which could not have worked even in a simple straight circuit. Naturally, it failed to function, and he applied under my guarantee to have it serviced. The mere sight of it appalled me, and I wrote to say that I could not have such a receiver advanced as an example of my design, since it did not resemble the receiver in any one particular. There was not one single item according to specification, and the layout was entirely different. I hope that other readers will not fall into the same pitfalls, for in such circumstances I am unable to help.



This below-chassis view will be of assistance in wiring up. The resistances on the group board may be seen in the foreground.

SHORT WAVE SECTION

At the Short-waver's Bench—4

Amongst the Items Dealt with in This Article are a Superhet Converter and Mains Voltage Valves

An Easily Arranged All-wave Set

IT may not have occurred to readers who prefer a separate set for short waves instead of a set usually used for the broadcast bands, but adapted for short-wave work, that the only parts which need differ are the H.F. and detector sections. The L.F. side, being exactly similar in both a broadcast and a short-wave receiver, may be made common to both, and a switch arranged to throw over from one detector valve for one waveband to another detector for the other range. The idea is shown in Fig. 1, the only disadvantage appears to be that quite a large amount of cabinet room is required. The idea could probably be extended further so that ultra-short waves could also be switched in, for, owing to the fact that all switching is on the L.F. side, after the detector, no loss of efficiency should result.

The Superheterodyne Converter

The usual type of superhet converter consists of a single oscillating valve which acts as both oscillator and first detector, an arrangement which seems to have become regarded as standard. A much better idea, however, is to use a two-valve circuit, preceding the first detector valve with an H.F. stage. This will improve the efficiency of the arrangement enormously, and will have the added advantage of overcoming any trouble due to the use of a short-wave set on a standard broadcast band aerial, as, of course, is usual in ninety-nine per cent. of the cases where a converter or adapter is used. Furthermore, it will prevent any radiation to neighbouring enthusiasts' aerials, for the first detector is worked in a state of oscillation the whole time and is very liable to cause interference. There is no necessity for the grid circuit of the H.F. valve to be tuned, the usual choke-coupled aperiodic arrangement being quite satisfactory. A diagram of a converter on these lines is given in Fig. 2.

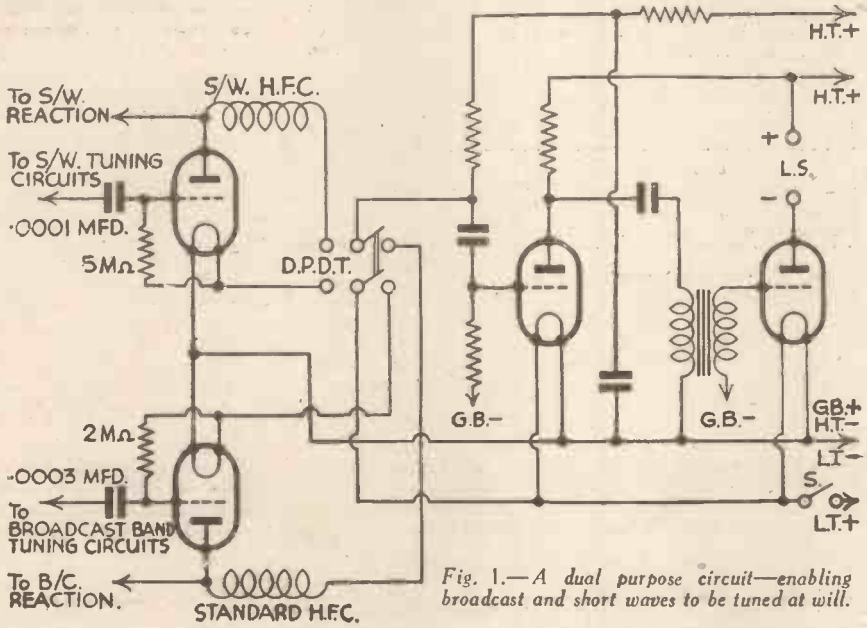


Fig. 1.—A dual purpose circuit—enabling broadcast and short waves to be tuned at will.

Valve-capacity Condensers

It very frequently happens in short-wave work that quite small capacity condensers are required for such uses as aerial and intervalve coupling and other purposes. It has occurred to me that great usefulness in this respect can be made by the experimenter, of old valves discarded as quite unusable. The inter-electrode capacities are quite small, but may often be found useful, and as a guide a list is appended giving the capacity values of three types of Mazda valves. The figures refer to micro-micro-farads.

	AC/S2		AC/HL		AC/2HL	
	Clear	*Met.*	*Clear*	*Met.*	*Clear*	*Met.*
Anode to Grid	.002	.001	4.5	4.5	3.5	3.5
Anode to Cathode	9	10	4.5	6.5	8.0	8.0
Grid to Cathode	12	12	5.5	5.5	8.0	8.5

Ostar-Ganz Valves on Short Waves

These figures merely serve to give a rough idea of the values which will be met with, and it is best to decide a suitable valve to use by trial and error. If a valve-holder is used it must be a good one to avoid losses, and it must be remembered that it will add a small amount of self-capacity of its own to that already in circuit. The best way, where old valves are being used for the purpose, is to solder a short length of wire on to each leg, and so make "wire-ended condensers."

Most readers will have heard of the Ostar-Ganz valves, which take the full mains voltage on their filaments, so dis-

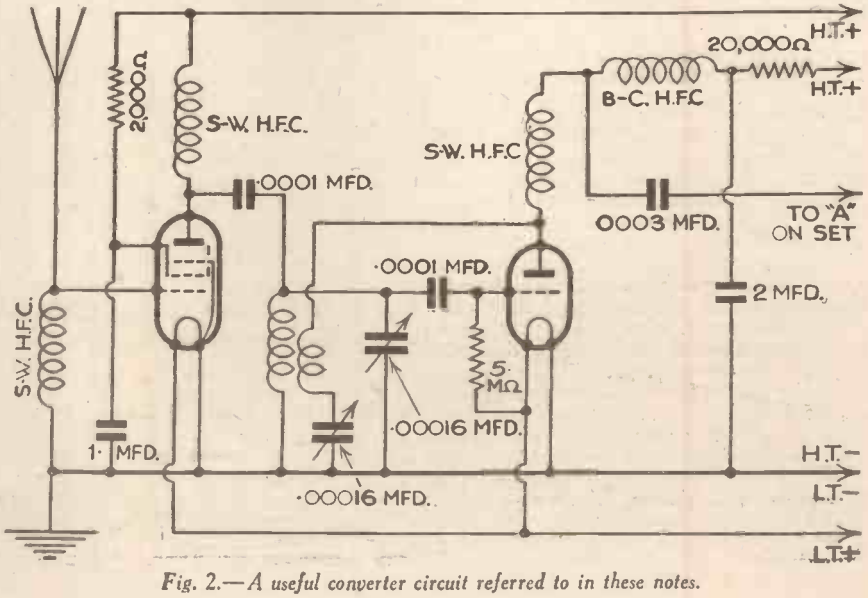


Fig. 2.—A useful converter circuit referred to in these notes.

pensing with the need for mains transformers or voltage-dropping resistances. These valves are very efficient and should thus be of considerable use to short-wave "fans." Many, however, do not like the idea of a mains set on short waves owing to the difficulty of eradicating hum, and the consequent necessity for using the loud-speaker rather than 'phones. The following idea, therefore, is suggested for those possessing H.T. accumulators or Milnes units, and which will enable them to obtain the advantage of the highly efficient Ostar-Ganz valves. It is simply to make use of these valves, dispensing with the L.T. accumulator; connecting the filaments directly in parallel with the H.T. supply. These valves can be obtained for filament supplies of about 120 up to 250 volts, and they take an L.T. current of 24 milliamps at this voltage, so that their usefulness will be readily appreciated. The idea certainly seems to be a preferable one for obtaining mains-valve efficiency on batteries, to the somewhat cumbersome one of running 4-volt 1 amp. valves off large L.T. accumulators.

The question of "man-made" static seems to be becoming an increasingly important one, not only on broadcast bands, but on the short waves as well.

The International and Amateur Codes

To Avoid the Sending of Long Messages, Certain Agreed Abbreviations are Employed by Commercial and Amateur Transmitters, and these are Given in the Following Article, Together with an Explanation of Their Use

MANY constructors who have recently built the Silver Souvenir have made their first contact with the amateur transmitters, and have been rather puzzled by the peculiar forms of question which are often used by these transmitters. Those who are able to read morse have also been intrigued by the groups of letters which are sent, and which appear to have no meaning, yet which are obviously recognisable by those for whom the message is intended. In response to many requests, we are therefore giving the principal signals of the International "Q" code, many of the signals which are only used by commercial stations or by service operators being omitted.

In addition to this code, however, amateurs have a language of their own, which consists, for the most part, of abbreviations of ordinary words, or of the initial letters of everyday sentences. Thus OM means "old man"—a familiar form of address between amateurs. CUL means "See you later" or "Call you later"; TNS or TKS means "Thanks", and so on. Instead of saying "Best Regards" to a friend, the term "73" is employed, and for more intimate friends, "Love and Kisses" is translated into "88."

It is not possible to give all the recognised amateur abbreviations, but many are clearly recognisable from the context of a message, or from the fact that they are the first and last letters of a word, or the consonants with the vowels omitted.

Indicating Signal Strength

To convey an indication of signal strength the "R" code is employed, and this consists of the letter R followed by the numerals from 1 to 9. R1 means that the signal is very faint—in fact, only just audible; R2 means that the signal is very weak—barely audible, but, obviously, slightly better than R1. R3 indicates that the signal is weak and can be heard fairly well provided there is no interference. R4 means that the signal is just comfortable or fair. R5 is a moderately strong signal. R6 is a strong signal, and R7 is a signal of sufficient strength to be readable through moderate interference. R8 is a very strong signal—sufficient to be heard several feet from the 'phones, and R9 is a good, powerful signal. These references obviously refer to code signals and headphone reception, although the references may also be applied to loud-speaker signals (telephony or code) by arrangement.

International "Q" Code

The second column gives the meaning of the code in the form of a question, and thus the letters are followed by "query." The same group of letters, but without the query, is sent for the answer, shown in the third column.

In addition to the signals named there are numerous groups used by commercial transmitters relating to radio-telegrams, etc., and also questions relative to the position of ships, compass bearings, weather reports, etc., but these will not interest the amateur listener.

Signal	*Question*	*Answer*
QRA	What is the name (address) of your station ?	The name (address) of my station is .....
QRB	How far are you from my station approximately ?	I am approximately ..... from you.
QRD	Where are you going ?	I am going to .....
QRE	What is your nationality ?	My nationality is .....
QRF	Where do you come from ?	I come from .....
QRG	Will you give me my exact frequency in kc/s ?	Your exact frequency is ..... kc/s.
QRH	Does my frequency vary ?	Your frequency varies.
QRI	Is my note steady ?	Your note varies.
QRJ	Are you receiving me badly ?	I cannot receive you.
	Are my signals weak ?	Your signals are too weak.
QRK	Are you receiving me well ?	I receive you well.
	Are my signals good ?	Your signals are good.
QRL	Are you busy ?	I am busy. Please do not interfere.
QRM	Are you being interfered with ?	I am being interfered with.
QRN	Are you troubled by atmospherics ?	I am troubled by atmospherics.
QRO	Must I increase power ?	Increase power.
QRP	Must I decrease power ?	Decrease power.
QRQ	Must I send faster ?	Send faster.
QRS	Must I send slower ?	Send slower.
QRT	Must I stop sending ?	Stop sending.
QRU	Have you anything for me ?	I have nothing for you.
QRV	Are you ready ?	I am ready—go ahead.
QRW	Must I advise ..... that you are calling him ?	Please advise ..... that I am calling him.
QRX	Must I wait ? When will you call me again ?	Wait until I have finished with .... I will call you at .....
QRZ	Who is calling me ?	You are being called by .....
QSA	What is the strength of my signals ?	Your signals are .....
QSB	Does the strength of my signals vary ?	The strength of your signals varies.
QSD	Is my keying correct ?	Your keying is incorrect.
	Are my signals distinct ?	Your signals are bad.
QSL	Can you acknowledge receipt of my signals ?	I acknowledge receipt.
QSO	Can you communicate with ..... direct or through ..... ?	I can communicate with ..... direct or through .....
QSQ	Must I send each word or group once only ?	Send each word or group once only.
QSV	Must I send a series of V's ?	Send a series of V's.
QSW	Will you send on ..... kc/s waves of ..... ?	I will send on .... kc/s waves of .....
QSX	Will you listen for ..... on ..... kc/s ?	I will listen for ..... on ..... kc/s.
QSY	Must I send on ..... kc/s without changing type of wave ?	Send on ..... kc/s without changing type of wave.
QSZ	Must I send each word or group twice?	Send each word or group twice.
QTR	What is the exact time ?	The exact time is .....
QWX	How is the weather there ?	Weather here is .....

Facts & Figures

COMPONENTS TESTED IN OUR LABORATORY

A New Double-diode Screened Pentode

FROM the Osram works comes news of a new type of H.F. valve, incorporating a double diode with a pentode combination of electrodes designed for use on the H.F. side of a receiver, as distinct from the L.F. double-diode pentode which is already obtainable. The principal use of this valve is in the I.F. stage of a superhet receiver, where I.F. amplification, detection, and A.V.C. may be carried out in the one valve. It may, of course, also be used as a second detector with A.V.C. and the low-frequency output applied to the pentode section for L.F. amplification, when high gain and complete stability will be obtained. In this position it will give sufficient output from a gramophone pick-up fully to load an efficient pentode output valve. The main characteristics are as follow :—

Heater volts ..	4.0 approx.
Heater current ..	1.0 amp. approx.
Anode volts ..	200
Screen volts ..	100
Control grid volts	—1
Anode current ..	7.7 mA.
Screen current ..	4.7 mA.
Anode impedance	700,000 ohms.
Mutual conductance	2.6 mA/volts.
Mutual conductance at 30 volts ..	0.03 mA/volt.

The valve, type W.D. 40, is fitted with a 9-pin base having the control grid taken to a metal cap on the top of the dome-shaped bulb.

The list price is 20s.

Goltone G.I.C.4 Chassis

A USEFUL pair of iron-cored coils, incorporating the circuit used in our Hall-Mark receivers, has been received from Messrs. Ward and Goldstone. As may be seen from the illustration on this page, the minimum of dielectric material is used in the construction of these coils, and the medium and long-wave windings are arranged at right angles. The coils are very compact and every modern improvement is incorporated in them. Readers who are desirous of constructing receivers on the lines of the Hall-Mark series, but wish to employ iron-core coils, will find these admirable for the purpose. The two coils are obtainable, mounted on a metal base with wave-change switch, for 20s.

Goltone ganged iron-core coil assembly, type G.I.C.4.

New Marconi N.41 Valve

MARCONIPHONE announce the release of a new Marconi valve. This will be known as the Marconi N.41 and will be priced at 18s. 6d.

The N.41 is a power amplifier pentode with an indirectly heated cathode for use in the output stage of radio receivers and audio amplifiers. It develops a large power output and, owing to its high mutual conductance figure, is very sensitive.

As a result of this high sensitivity it can be fed directly from a diode detector. This has the advantage of eliminating the inevitable slight distortion of the intermediate stage and, in addition, as the diode operates with a much larger input voltage, there is a closer approach to distortionless rectification.

Characteristics :

Filament volts ..	4.0
Filament current ..	2.0 amps.
Anode volts (max.) ..	250
Screen volts (max.) ..	250
Anode dissipation ..	8 watts.
Mutual conductance ..	10.0 mA/volts.
Grid-anode capacity	2.0 m.mfd.
Anode-earth capacity	12.5 ,,
Grid-earth capacity ..	19.5 ,,

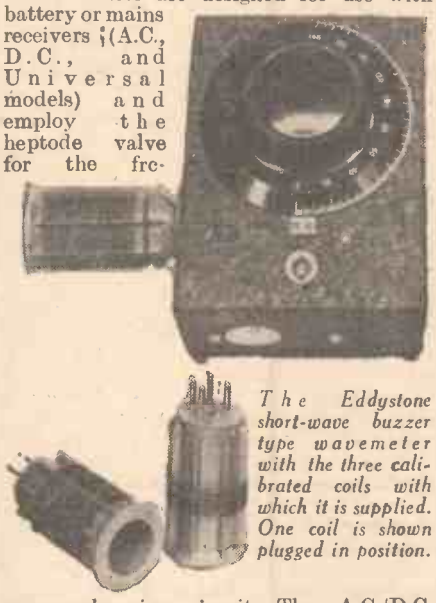
To avoid parasitic oscillation, capacity between output and input circuits should be kept at a minimum and grid or anode stoppers of value 1,000 ohms and 100 ohms respectively, mounted on the valve-holders, may be used. The total resistance in the grid circuit should never exceed 500,000 ohms and full automatic bias should always be used. A standard 7-pin base is fitted.

Bulgin Suppressor Adaptor

A NEW interference eliminator has been received from Messrs. Bulgin. This is the type A.49 Suppressor Adaptor and costs 2s. 6d. It is intended to provide a by-pass for mains-borne interference and is incorporated in a neat bakelite moulding with clearly indicated terminals. These are insulated and coloured red and black, the latter being the earthing point of the component. The condensers are rated for working up to 250 volts continuously. The device may be fitted in any convenient position according to the particular interference which is experienced, and it should be noted, as with all apparatus of this nature, that a separate earth connection (distinct from that used for the wireless receiver) should be employed if possible. In addition to the normal types of interference which are often experienced with mains receivers, this little device will often cure "modulation hum," a trouble which sometimes arises in commercially-built receivers in which it is not possible to obtain access to the secondary winding of the mains transformer.

Unit Converters

DETAILS have been received of some interesting converters manufactured by Unit Radio, of 347, City Road, London, E.C.1. These are designed for use with battery or mains receivers (A.C., D.C., and Universal models) and employ the heptode valve for the frequency-changing circuit. The A.C./D.C. model costs £6 15s. complete with valve, and the battery model £4 5s. with valve. A pressed metal chassis is employed and a full-vision scale is fitted. The actual wave-range covered is from 13 to 100 metres. A short-wave receiver is also manufactured by this firm and employs a 4-valve circuit. The price is £5 19s. 6d. without valves. Details of these receivers and units may be obtained by writing to the firm in question for an appropriate list.



The Eddystone short-wave buzzer type wavemeter with the three calibrated coils with which it is supplied. One coil is shown plugged in position.

G.E.C. Superhet

OVERSEAS readers will be interested in the G.E.C. superhet designed for battery operation on the short and medium wave bands. This is the Overseas B.7 model, covering a band from 12 to 550 metres, the actual range being selected by a 5-position switch. A single tuning control is provided, and the receiver is complete with seven valves and a P.M. moving-coil loud-speaker. Refinement such as delayed A.V.C., class "B" output arrangements, diode detection, R.C. L.F. coupling, etc., will give some indication of the type of results which might be obtained with this receiver. In addition, a gramophone switch is provided so that reproduction from gramophone records may be obtained. A tone control is fitted for varying the tone when desired, and when an extension speaker is required the internal speaker may be silenced by means of a special switch. The normal current consumption is 14 mA, which rises on loud signals to 17 or 18 mA. The receiver costs £23 2s. complete, or £21 without cabinet. Reader who are interested in further details of this receiver should write for a copy of the G.E.C. publication describing it.

CIRCUITS AND SETS FOR ALL

(Continued from page 266)

condenser is situated the on-off switch can be arranged to " balance " with it, so as to obtain a symmetrical frontal appearance.

It is best to mount the screened H.F. choke as near as convenient to the H.F. valve-holder and on top of the chassis, whilst the second choke should be placed below the chassis and near to the anode terminal of the detector valve-holder. The L.F. transformer should also be mounted on the under-side near to the choke, the leads from the secondary winding to the aerial circuit being screened with metal braid, this being effectively earth connected at some point. By following the general arrangement suggested, the connecting leads will all be kept reasonably short, and there should be little trouble due to body-capacity effects.

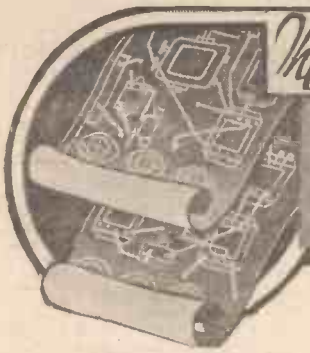
Results do vary to a certain extent according to the particular L.F. transformer employed, and, therefore, if one or two transformers are available, it will be found worth while to try the effect of using them in turn, so that the most suitable can be chosen. It will probably be found that a small one is best, due to the fact that the capacity between primary and secondary windings is comparatively low. It will be noticed that a " stopper " resistance is included in the grid lead from the transformer secondary, this being to prevent the possibility of interaction, but in certain instances it might be found that a screened S.W. H.F. choke is more effective.

BOOKS RECEIVED

Radio Amateur's Handbook

THIS valuable handbook, which is published by the American Radio Relay League, should be in the hands of every amateur. In addition to Electrical and Radio Fundamentals, and full details of transmitting and receiving apparatus, it also includes chapters on Operating a Station, Power Supply, Message Handling, Monitors and Frequency Meters, The Story of Amateur Radio, Getting Started, Keying and Interference Elimination, etc. The appendix contains valuable technical data which is invaluable to the constructor, and also extracts from various Laws and Regulations. The Handbook may be obtained in this country from L. Postlethwaite, of 79, Kinfauns Road, Goodmayes, Essex, price 4s. 6d. post free.

The Amateur Call Book Magazine is also obtainable from the same source, and this contains a full list of the amateur stations in America, Canada, Gt. Britain, Germany, France, Italy, and many of the smaller countries such as Abyssinia, Lithuania, Malaya, etc. This book is brought up to date periodically, and gives the call signs and letters in strict order under each country. A list of certain commercial stations is also included, and, therefore, this is a most valuable publication. It contains 320 pages, 9ins. by 12ins., and is half an inch thick. The price is 6s., post free.



The PRACTICAL AND AMATEUR WIRELESS Blueprint Service

These blueprints are full-size. Copies of appropriate issues of "Practical Wireless," "Amateur Wireless" and of "Wireless Magazine" containing descriptions of these sets can in most cases be obtained at 4d. and 1s. 3d. each, respectively, post paid. Index letters "P.W." refer to "Practical Wireless" sets, "A.W." refer to "Amateur Wireless" sets, and "W.M." to "Wireless Magazine" sets. Send, preferably, a postal order (stamps over sixpence unacceptable) to "Practical and Amateur Wireless" Blueprint Dept., Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

PRACTICAL WIRELESS.

Blueprints, 1s. each.

Long-Range Express Three	24.9.32	PW2
Mains Express Three	8.10.32	PW3
Sonotone Four	15.10.32	PW4
Bijou Three	29.10.32	PW5
Argus Three	12.11.32	PW6
Empire Short-Wave Three	3.12.32	PW7
Solo Knob Three	10.12.32	PW8
Midget Two	17.12.32	PW9
Selectone Battery Three	14.1.33	PW10
Fury Four	—	PW11
Featherweight Portable Four	6.5.33	PW12
Q.P.P. Three-Four	4.3.33	PW13
Alpha Q.P.P. Three	25.3.33	PW14
Ferrocart Q.P.P. Hi-Mag. Three	25.3.33 and 1.4.33	PW15
Supersonic Six	8.4.33	PW16
Beta Universal Four	15.4.33	PW17
A.C. Twin	22.4.33	PW18
Selectone A.C. Radiogram Two	29.4.33	PW19
A.C. Fury Four	25.2.33	PW20
Radiopax Class B Four	27.5.33	PW21
Three-Valve Push-Pull Detector Set	4.3.33	PW22
Double-Diode Triode Three	10.6.33	PW23
Three-Star Nicore	24.6.33	PW24
D.C. Ace	15.7.33	PW25
Superset	19.8.33	PW26
Auto-B Three	19.8.33	PW27
All-Wave Two	19.8.33	PW28
A.C. Three	16.9.33	PW29
Premier Super	23.9.33	PW30
Experimenter's Short-Wave Three	23.9.33	PW30A
A.C.-D.C. Two	7.10.33	PW31
All-Wave Unipen	14.10.33	PW31A
F.J.C. 3-valve A.V.C. (Transfer Print)	4.11.33	PW32
Luxus A.C. Superhet	14.10.33	PW33
A.C. Quadpak	2.12.33	PW34
Sixty-Shilling Three	2.12.33	PW34A
Nucleon Class B. Four	6.1.34	PW34B
Fury Four Super	27.1.34	PW34C
A.C. Fury Four Super	10.2.34	PW34D
Leader Three	10.3.34	PW35
D.C. Premier	31.3.34	PW35B
A.C. Leader	7.4.34	PW35C
Atom Lightweight Portable	2.6.34	PW36
Ubique	28.7.34	PW36A
Four-Range Super-Mag. Two	11.8.34	PW36B
Summit Three	18.8.34	PW37
Armada Mains Three	18.8.34	PW38
Midget Short-Wave Two	15.9.34	PW38A
All-Pentode Three	22.9.34	PW39
£5 Superhet Three	27.10.34	PW40
A.C. £5 Superhet Three	24.11.34	PW43
D.C. £5 Superhet Three	1.12.34	PW42
Hall-Mark Three	8.12.34	PW41
F. J. Camm's Universal £5 Superhet	15.12.34	PW44
A.C. Hall-Mark	26.1.35	PW45
Battery Hall-Mark 4	2.2.35	PW46
Universal Hall-Mark	9.2.35	PW47
Hall-Mark Cadet	23.3.35	PW48
F. J. Camm's Silver Souvenir (All-Wave Three)	13.4.35	PW49
F. J. Camm's A.C. All-Wave Silver Souvenir Three	—	PW50

AMATEUR WIRELESS AND WIRELESS MAGAZINE.

CRYSTAL SETS.

Blueprints, 6d. each.

Four-station Crystal Set	—	AW427
1934 Crystal Set	4.8.34	AW444
150-mile Crystal Set	—	AW450

STRAIGHT SETS. Battery Operated.

One-valvers: Blueprints, 1s. each.

B.B.C. One-valver	—	AW344
B.B.C. Special One-valver	—	AW387
Twenty-station Loud-speaker One-valver (Class B)	—	AW449

Two-valvers: Blueprints, 1s. each.

Melody Ranger Two (D, Trans.)	—	AW388
Full-volume Two (SG.-Det. Pen.)	17.6.33	AW392
Iron-core Two (D, Trans.)	—	AW395
Iron-core Two (D, QPP)	12.8.33	AW396
B.B.C. National Two with Lucerne Coil (D, Trans.)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG., Trans.)	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
Family Two (D, Trans)	—	WM278

Three-valvers: Blueprints, 1s. each.

£8 Radiogram (D, RC, Trans)	—	AW343
New Regional Three (D, RC, Trans)	25.6.32	AW349
Class-B Three (D, Trans, Class B)	22.4.33	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	14.10.33	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	20.1.34	AW417
1934 Ether Searcher, Chassis Model (SG, D, Pen)	3.2.34	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
P.W.H. Mascot with Lucerne Coils (Det. R.C. Trans)	17.3.34	AW337A
Mullard Master Three with Lucerne Coils	—	AW424
Pentaquester (HF, Pen, D, Pen)	14.4.34	AW431
£5 5s. Three: De-luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.1.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
Multi-Mag Three (D, 2 Trans)	—	WM288
Percy Harris Radiogram (HF, D, Trans)	*Aug.* '32	WM294
£6 6s. Radiogram (D, RC, Trans)	*Apr.* '33	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Tyers Iron-core Three (SG, D, Pen)	*July* '33	WM330
C.-B Three (D, LF, Class B)	—	WM333
Economy-pentode Three (SG, D, Pen)	*Oct.* '33	WM337
All-wave Three (D, 2LF)	*Jan.* '34	WM348
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans.)	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	*Oct.* '34	WM371
Graduating to a Low-frequency Stage (D, 2LF)	*Jan.* '35	WM378

Four-valvers: Blueprints, 1s. 6d. each.

65/-Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2 H.F., D, QP21)	18.8.34	AW445
(Pentode and Class-B Outputs for above: blueprints 6d. each)	25.8.34	AW445A
Quadradyne (2SG, D, Pen)	—	WM273
Calibrator (SG, D, RC, Trans)	*Oct.* '32	WM300
Table Quad (SG, D, RC, Trans)	—	WM303
Calibrator de Luxe (SG, D, RC, Trans)	*Apr.* '33	WM316
Self-contained Four (SG, D, LF, Class-B)	*Aug.* '33	WM331
Lucerne-Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (H.F., D, 2LF)	*Feb.* '35	WM381
Standard Four-valve Short-waver	*Mar.* '35	WM383
The H.K. Four	*Mar.* '35	WM384

Five-valvers: Blueprints, 1s. 6d. each.

Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
New Class-B Five (SG, D, LF, Class-B)	*Nov.* '33	WM340
Class-B Quadradyne (2 SG, D, LF, Class-B)	*Dec.* '33	WM344
1935 Super Five (Battery Superhet)	*Jan.* '35	WM379

Mains Operated

Two-valvers: Blueprints, 1s. each.

Consoelectric Two (D, Pen) A.C.	23.9.33	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286

Three-valvers: Blueprints, 1s. each.

Home-lover's New All-electric Three (SG, D, Trans) A.C.	25.3.33	AW385
S.G. Three (SG, D, Pen) A.C.	3.6.33	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen) A.C.	23.6.34	AW439
D.C. Calibrator (SG, D, Push-pull, Pen) D.C.	*July* '33	WM328
Simplicity A.C. Radiogram (SG, D, Pen) A.C.	*Oct.* '33	WM338
Six-guinea A.C./D.C. Three (HF Pen, D, Trans) A.C./D.C.	*July* '34	WM364
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	*Nov.* '34	WM374

Four-valvers: Blueprints, 1s. 6d. each.

A.C. Melody Ranger (SG, DC, RC Trans) A.C.	—	AW380
AC/DC Straight A.V.C.4 (2 HF, D, Pen) A.C./D.C.	8.9.34	AW446
A.C. Quadradyne (2SG, D, Trans) A.C.	—	WM279
All Metal Four (2SG, D, Pen)	*July* '33	WM329
"W.M." A.C./D.C. Super Four	*Feb.* '35	WM382
Harris Jubilee Radiogram	*May* '35	WM386

SUPERHETS.

Battery Sets: Blueprints, 1s. 6d. each.

1934 Century Super	9.12.33	AW413
Super Senior	—	WM256
1932 Super 60	—	WM260
Q.P.P. Super 60	*Apr.* '33	WM310
"W.M." Stenode	*Oct.* '34	WM373
Modern Super Senior	*Nov.* '34	WM375

Mains Sets: Blueprints, 1s. 6d. each.

1934 A.C. Century Super, A.C.	10.3.34	AW425
1932 A.C. Super 60, A.C.	—	WM272
Seventy-seven Super, A.C.	—	WM305
"W.M." D.C. Super, D.C.	*May* '33	WM321
Merrymaker Super, A.C.	*Dec.* '33	WM345
Heptode Super Three, A.C.	*May* '34	WM359
"W.M." Radiogram Super, A.C.	*July* '34	WM366
"W.M." Stenode, A.C.	*Sep.* '34	WM370
1935 A.C. Stenode	*Apr.* '35	WM385

PORTABLES.

Four-valvers: Blueprints, 1s. 6d. each.

General-purpose Portable (SG, D, R.C., Trans)	—	AW351
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Town and Country Four (SG, D, RC, Trans)	*May* '32	WM282
Two H.F. Portable (2 SG, D, QP21)	*June* '34	WM363
Tyers Portable (SG, D, 2 Trans)	*Aug.* '34	WM367

SHORT-WAVERS. Battery Operated.

One-valvers: Blueprints, 1s. each.

S.W. One-valve	—	AW329
S.W. One-valve for America	—	AW429
Roma Short-waver	10.11.34	AW452

Two-valvers: Blueprints, 1s. each.

Home-made Coil Two (D, Pen)	14.7.34	AW440

Three-valvers: Blueprints, 1s. each.

World-ranger Short-wave 3 (D, R.C. Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-waver	*Jan.* 19, '35	AW463
Short-wave Adapter	*Dec.* 1, '34	AW450
Superhet, Converter	*Dec.* 1, '34	AW457

Four-valvers: Blueprints, 1s. 6d. each.

"A.W." Short-wave World Beater (HF Pen, D, RC, Trans)	2.6.34	AW436
Empire Short-waver (SG, D, RC, Trans)	*Mar.* '33	WM313

Mains Operated.

Two-valvers: Blueprints, 1s. each.

Two-valve Mains Short-waver (D, Pen) A.C.	10.11.34	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	*Aug.* '34	WM368
"W.M." Long-wave Converter	*Jan.* '35	WM380

Three-valvers: Blueprints, 1s. each.

Emigrator (SG, D, Pen), A.C.	—	WM352

Four-valvers: Blueprints, 1s. 6d. each.

Gold Coaster (SG, D, RC, Trans) A.C.	*Aug.* '32	WM292
Trickle Charger	*Jan.* 5 '35	AW462

COMPONENTS

Their Action, Principle & Purpose

The Functions of the L.F. Transformer and Decoupling Components are Simply Explained in this Fifth Article of the Series.

IN the last article we considered the leaky-grid detector and the components associated with its grid circuit. Following the sequence of the circuit we now come to the L.F. transformer (see Fig. 1), the decoupling resistance R.3 and the decoupling condenser C.8; all of these components can be considered as comprising the intervalve circuit between the detector and pentode L.F. amplifier. The transformer is the most important of the three items, and consists of two windings of wire on a core of iron-alloy stampings. Fig. 2 shows the main constructional features of the transformer, although the actual disposition of the windings, the shape of the core and the disposition of the terminals vary with different makes.

Voltage Step-up

All readers are probably aware that the object of the transformer is to *step-up* or increase the voltage of the signal impulses appearing in the anode circuit of the detector valve. These impulses or oscillations are of low frequency only, and correspond with the sounds which are reproduced by the loud-speaker. Briefly, the low-frequency currents flow, backward and forward, through the primary winding, and so cause a variable magnetic field to be set up, similar to that appearing round the tuning coils. This field is concentrated by the iron core, and so localised, as it were. The field is said to consist of (imaginary) *lines of force* similar in shape to those shown diagrammatically in Fig. 3. As these lines are "cut" by the secondary winding a voltage similar to that in the primary winding is developed across the ends of the secondary. When we say that the voltage is similar we mean that it follows the same variations, but it is generally of greater magnitude. This is provided for by using a greater number of turns on the secondary winding, the principle being that the ratio of the voltages across the primary and secondary is the same as the ratio between the numbers of turns on the two windings. For example, if there were, say, 2,000 turns on the primary and 10,000 on the secondary, the theoretical voltage step-up would be five times. In other words, if the voltage across the primary were 2, that across the secondary would be 10.

A point which it is interesting to note is that the secondary voltage must be in the same phase as that in the primary, so that the ends of the two windings must be connected in a particular manner. This point is made clear by Fig. 3, where it will be seen that the beginning of the primary winding is joined to the anode of the detector valve, while the end of the secondary winding is joined to the grid of the pentode. At first glance it might appear that this is wrong, because the anode and grid are both the high-potential points in their own circuits. It should be explained, however, that *induced* voltages are opposite in polarity to the originals, and that the secondary voltages are induced from the primary.

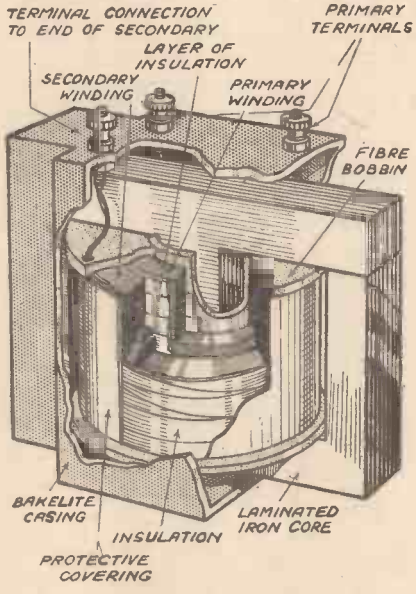


Fig. 2.—This sketch illustrates the construction of a typical low-frequency transformer.

Primary Impedance and Inductance

Despite what has been written above, it must not be thought that the relative numbers of turns on the primary and secondary windings are the only points to consider, for the impedance of the primary winding is of even greater importance; this is why better signal strength can often be obtained by using a low-ratio transformer having a comparatively large primary winding than by using a high-ratio component with a comparatively small primary. The important point is that the impedance of the primary should be at least twice as great as the impedance of the detector valve at average audio (low) frequencies. As example we might consider an average 2-volt detector valve whose impedance (often referred to as A.C. resistance) is about 12,000 ohms. The impedance of the transformer primary at, say, 1,000 cycles should then be about 25,000 ohms; this would be provided if the primary had an inductance of 40 henries. We cannot here enter into the complete design of the L.F. transformer, but it might be mentioned that an approximately suitable inductance would be provided by winding about 2,000 turns on a Stalloy core having a cross-sectional area of ½ sq. in.

Self-capacity

Even when the primary is correctly designed, bearing in mind the requirements just enumerated, it is not possible to obtain any desired step-up ratio, because the windings have a certain amount of self-capacity, this increasing with the number of turns. Thus, if the secondary turns were increased beyond a certain limit the capacity across them would act as a "leakage path" to the L.F. currents, the effective resistance of the condenser being determined by using the formula given in preceding articles. In practice it is seldom possible to have a useful ratio in excess of 1 : 5, although good transformers are made with ratios up to 1 : 7. In these cases,

(*Continued overleaf*)

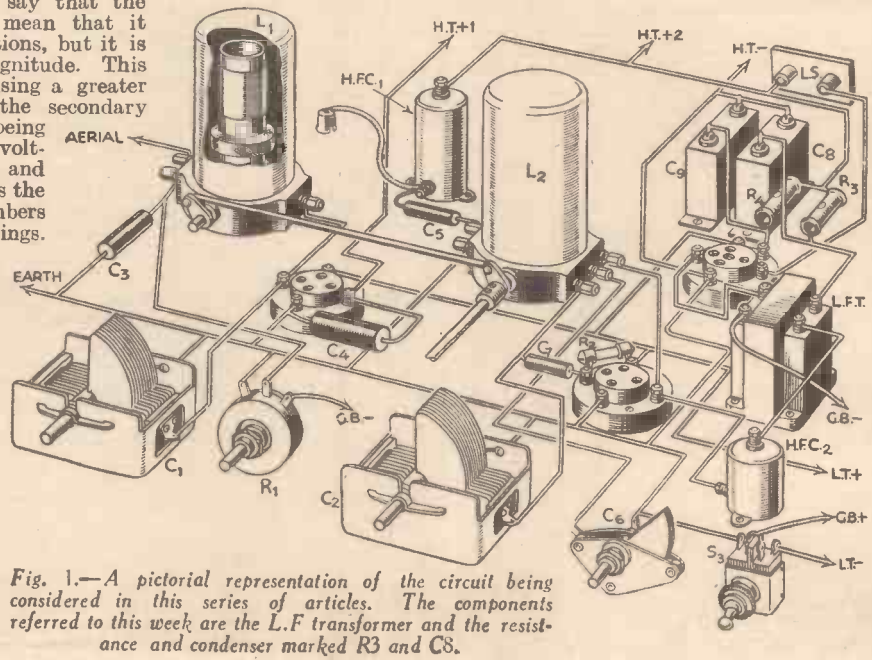


Fig. 1.—A pictorial representation of the circuit being considered in this series of articles. The components referred to this week are the L.F transformer and the resistance and condenser marked R3 and C8.

(Continued from previous page)

however, it is usual to employ a special form of winding spool so that the turns are sectionalised and spaced. Fig. 4 shows a patented spool used by Ferranti with this object in mind.

Although referred to rather out of sequence, there is another item which is often misunderstood with regard to L.F. transformers. It is sometimes thought that a transformer increases the amount of *power* in the circuit, but it cannot do this. But what it can, and does, do is to increase the voltage at the expense of the current. This means that although the voltage from the secondary is greater than that to the primary the (L.F.) current is smaller. If the transformer were 100-per-cent. efficient the product of voltage and current in the two windings would be the same; as such an efficiency cannot be obtained, the power output from the secondary is actually less than the input to the primary. But this is of little consequence because, as we have seen before, the valve is a voltage-operated device.

Decoupling Components

Let us now pass on to the decoupling circuit. The resistance really serves two purposes—one is to prevent "motor boating" and L.F. oscillation, and the other is to reduce the voltage of the main H.T. supply to a suitable figure for the anode of the detector valve. The first is the more important function, but to explain it we must first describe what motor-boating is, and how it is caused. Most of those readers who have been building receivers for some time will have noticed a peculiar noise which starts as soon as a strong signal is tuned in, and which sounds not unlike the noise made by the exhaust of a motor boat—a kind of bubbling sound. This is experienced when the decoupling arrangements are inadequate, and is due to the variable L.F. voltages being superimposed on the steady H.T. voltage to the L.F. valve or valves. What happens is that the L.F. voltages in the detector anode circuit, varying from negative to positive, increase or decrease the H.T. voltage fed to the L.F. amplifier. The fluctuating voltage causes the current passed by the L.F. amplifier to vary so that a corresponding sound is heard in the speaker.

The effect of the decoupling resistance R.3 is to prevent the L.F. voltages from reaching the H.T. oircuit, but it can only be effective if the condenser C.8 has a comparatively low resistance and allows the L.F. impulses to leak away to earth. The decoupling condenser is generally

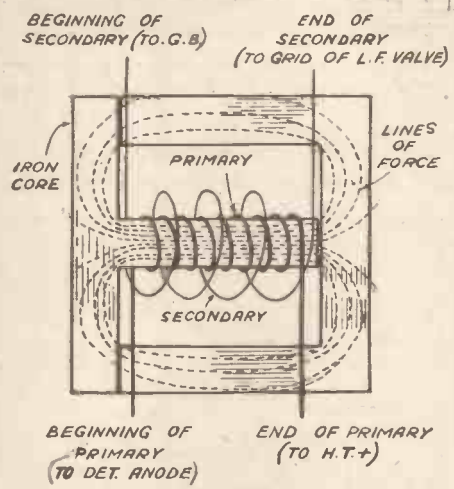


Fig. 3.—Showing the directions and connections of the primary and secondary windings and also the imaginary lines of force.

chosen so that its resistance is negligible, and between 1 and 2 mfds. is a suitable capacity. The effective resistance of a 2-mfd. condenser to the lowest audio frequencies (say 50 cycles) is only about 1,500 ohms, and thus if the resistance has a higher value than this it will have effect. In practice it is desirable that the resistance should be about five times the value of the condenser at, say, 50 cycles; it will then offer about one-hundred times as much resistance as the condenser at average audio-frequencies.

Value of Decoupling Resistance

Taking the figures used above, it will be seen that R.3 should have a resistance of not less than 7,500 ohms, but it may be as much above this figure as we like. Its correct value can now be determined by applying Ohm's Law, bearing in mind that the resistance has to "drop" or "absorb" the difference in voltage between that of the tapping H.T.+2 and that required by the detector valve. Average figures for the battery voltage and anode voltage of the valve are 120 and 60, so we see that in this particular case the resistance has to drop 60 volts. Next we must know the anode current consumption of the detector valve when the anode voltage is 60. This can be determined by measurement, or the figure can be obtained from the valve makers, but for the average detector valve it will be about 1 milliamp. Taking this figure we find that the value of R.3 should be 60,000 ohms (60 divided by 1 and multiplied by 1,000). In point of fact the anode voltage is not generally critical, so that a resistance between 50,000 and 75,000 ohms would be satisfactory. When rather greater volume is desired the anode voltage may be increased by using a smaller resistance, and when long-distance reception is the chief requirement and perfectly smooth reaction control is essential a lower voltage might prove rather better. It does not matter very much whether the resistance is non-inductive or wire-wound, for it is unlikely that (in the latter case) it would resonate at an audio-frequency.

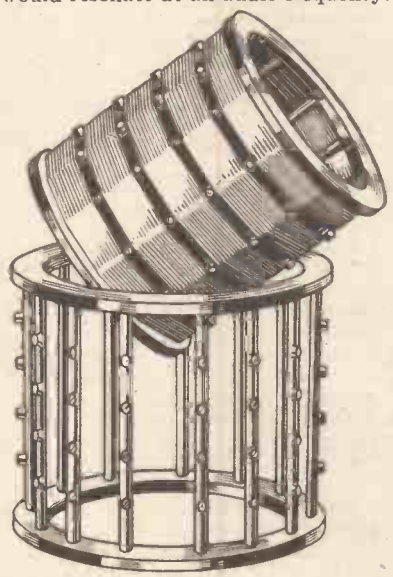


Fig. 4.—This sketch shows a form of winding spool used by Ferranti with the object of reducing the self-capacity of the windings.

NOTES AND NEWS

Budapest's Multi-lingual Good Night

THE main Hungarian station has four announcers and each, in turn, gives out the last greetings in a different manner. At the end of the programme you may hear a cheery English good night or a French Bonne nuit, Mesdames et Messieurs, or alternatively, in Magyar, invariably followed by a French translation; the closing down signal is also given in German and Italian.

Vienna's Long-wave Station

ALTHOUGH seldom mentioned, readers must bear in mind that on the long-wave band they may occasionally pick up the broadcast of the Vienna programmes on 1,255 metres (239 kc/s) which is experimentally carried out with a 3-kilowatt transmitter on Mondays, Wednesdays, and Saturdays from B.S.T. 8 p.m. For the purposes of identification, it will be found that the call is identical with that of the 506.8 metre station, of which it is a relay.

Radio Maribor (Jugo-Slavia)

WITH a view of counteracting the broadcasts of the Austrian station at Graz, the Jugo-Slavian authorities have decided to erect a small transmitter in the Slovene town of Maribor, which in pre-War maps will be found as Marburg.

Wireless in the Faeroe Islands

COPENHAGEN'S old 1-kilowatt transmitter which, so far, has been kept as a stand-by in the event of a breakdown of the new 10-kilowatt Herstedvester station, is to be dismantled and re-erected at Thorshavn in the Faeroe Islands, where it will relay the Danish programmes.

Scottish Variety Programme

A VARIETY programme, in which Ellis Drake and Jack Fraser (in comedy), Wullie Lindsay (comedian), Ike Freedman (light comedian), Janette Sclanders (soprano), Ian Smith (tenor), Sylvia Watt (comedienne), Mackenzie Reid and his accordion, Harry Carmichael and his Band, and Barbara Laing at the piano will take part, will be broadcast on May 24th in the Scottish programme.

The Microphone at Play

AN interesting point about Midland plans for the summer months is that "The Microphone at Large," after visiting King's Lynn in May, and Ashbourne in June, will become "The Microphone at Play" and will represent various summer-time pursuits and festivals. Thus the call of the river will be reflected by a visit to Evesham at Regatta time; one of the oldest of English sports—archery—by the meeting of the Woodmen of Arden at Meriden, in the very centre of England; cricket in its happiest and most traditional form—the match on the village green; and golf. Another actuality programme will be taken from the common room of one of the Midland chain of Youth Hostels.

Barrow Shipyard Silver Band

THIS well-known band, which was heard playing during the recent broadcast of the launching of the P. and O. liner *Strathmore*, is to give a concert to Northern listeners from the Manchester studios on May 25th. The band is now run in connection with Vickers-Armstrongs' Works at Barrow.

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).

S.W. International Time Signals

SIR,—As a reader of *Amateur Wireless* for a number of years I welcome the amalgamation of that paper with PRACTICAL WIRELESS, and I am very glad to see that you devote considerable space to short-wave matters.

There must be many of your readers, ship's officers, yachtsmen, surveyors, etc., who are interested in the reception of the short-wave international rhythmic time signals for longitude determinations, and I think that if you published a list of these signals from time to time it would be very welcome and prove of considerable assistance to navigators.

I have been interested to read the correspondence with regard to an overseas short-waver, and if you bring out such a design please give us a battery version, as there are many places where mains are not available; I have in use here a most satisfactory set of commercial make—a four-valve battery driven superhet—and I think that a similar type of set would take a lot of beating.—C. L. WILLIAMS, F.R.G.S. (Gusau, N. Nigeria).

"A Fine Volume"

SIR,—I have great pleasure in acknowledging the receipt of "The Wireless Constructor's Encyclopædia." It is a fine volume, and judging from the dips I have had into it for information, it will be very useful. The part on television is welcome, too, as before reading it I had only a hazy idea of the subject.—THOMAS O'DEA (Limerick).

Excellent Results with a 3-valve S.W. Set

SIR,—I have been a reader of your paper, PRACTICAL WIRELESS, since the start and find it the most interesting of all wireless papers. I would like to compliment you on the two presentation books, "The Everyman's Wireless Book," and the "Television and Short-Wave Handbook." I have both of them and find them very interesting indeed. I have built the 3-valve A.C. short-wave set described in the March 9th issue of PRACTICAL AND AMATEUR WIRELESS, and have received marvellous results; all the amateurs and three American stations, and all at splendid loud-speaker strength.—F. KITCHING (Sheffield).

The "Q. R. S." Code

DEAR "THERMION," — I read with interest the letter you received from H. A. Hall, of Yeovil, asking for an explanation of the "Q" code, etc., in use on the short waves. May I advise him to buy the "General Post Office Handbook for Wireless Telegraph Operators," published by H.M. Stationery Office at 9d. net, and obtainable through W. H. Smith and Son? He will find the "Q" code in Appendix II; strength of signals code, Appendix III. Both of these are, of course, officially recognised versions.—E. HASTINGS SMITH (Maidenhead).

A Receiver for Alternate Outputs

SIR,—I am in agreement with many of your readers who desire a larger set. May I add that I should like to see published a 4 or 5-valve superhet with alternative outputs, the output stage of the circuit being built on a chassis with the mains pack? It could be power, pentode, and push-pull, and AVC using a separate valve (this could then be optional to the builder of the set), variable tone control, thermal delay switch, and radiogram switch incorporated with the wave-change switch. The set should tune from 200 to 550 and 1,000 to 2,000 metres. I believe this would suit many other readers because of the alternative outputs.—P. B. (Thornton Heath).

From an Overseas Reader

SIR,—I quite agree with your many short-wave enthusiasts, who wish for designs, simple or complex, for S.W. receivers. Also I would like to see a larger S.W. section. My present short-wave receiver is a mains-operated four valve, consisting of an S.G. tuned H.F. stage, S.G. detector-triode, 1st L.F., and pentode output. The low-frequency stages are choke-capacity coupled. I pick up Daventry nearly every day on GSB1 and GSC4, these being the two best wavelengths in my district at the present time. The strength is often sufficient to overload the receiver, and I almost invariably notice that the Daventry signal is the strongest on the 30-metre band.

The following information concerning the two Amalgamated Wireless A/asia transmitters may be of interest to other readers. VK2ME Sydney is, at the present time, transmitting on Sundays from 6.30–8.30 a.m., 10.0 a.m.–2.0 p.m., 2.30–4.30 p.m. G.M.T. I do not know how long this schedule will be adhered to. VK3ME Melbourne has increased its number of transmissions, which are now given on four days a week, viz., Wednesday, Thursday, Friday, and Saturday, from 10.0 a.m.–12 noon G.M.T. This station used to transmit on Saturdays only.

The suggestion of H. W. (Cardiff), to bring more mathematics into radio articles is a very good one. I have greatly appreciated articles of this type, by F. W. Lanchester and E. G. Rowe.—D. J. COLE (Melbourne, Australia).

Rectification Without a Detector!

SIR,—Several receivers which I have constructed, I find, function in a perfectly normal manner without any form of detection. I have definitely established that this is not due to accidental grid leakage of the detector valve-holder or to anode bend biasing. I have been given to understand that there is a certain degree of self-rectification in all sets of to-day, from which I gather that without any special detection device the signals would still be audible but at greatly reduced volume. Actually, however, I find that there is no loss of volume, although the tuning is altered slightly, which is the only difference it makes.

In view of these facts, is it not possible that the generally accepted theories regarding the nature of wireless waves are erroneous?

If you would be kind enough to publish my letter it may induce other experimenters to try working their sets without their usual detection arrangements. It would be interesting to note their results.—M. SHULMAN (Forest Gate).

"Flat Baseboard versus Chassis"

SIR,—With reference to a correspondent's letter under the heading Flat Baseboard versus "Chassis" in a recent issue, I, for one, fully agree with the remarks made by Mr. E. F. West. In my opinion, there is certainly more to recommend the flat baseboard, which has, shall I say, a valuable advantage over the "chassis" type.

There are many view-points which go to favour the "return" of the flat baseboard. The latter certainly makes fault-finding very easy, and it affords the experimenter the same ease. The fact that the whole of the components are visible gives even the unskilled amateur every opportunity to learn and increase his knowledge. He feels satisfied that he has something which is "get-at-able."

Regarding the theoretical circuit, that, too, is a big obstacle to the majority of wireless fans. Granted, a good many can read them all right, but I wonder how many could build up a set from a theoretical circuit, with anything like correct spacing? So far, I have only come across one amateur who attempted it—and, "Ye Gods," Mr. Editor, it was a wonderful illustration of how *not* to space components. And I need not remind you of the value of correct spacing.

Another point is that of the cabinet. I know quite a few who, like myself, have had expensive cabinets built up to house the flat baseboard.

For myself, I have heard five of your sets, and the results have been so good that my fingers have simply "itched" to build one up, but like others, I do not feel disposed to scrap an expensive solid mahogany cabinet, simply because of the "chassis" board.

And the type of set—H.F., det., L.F., and Power, as suggested by Mr. West, is, I feel sure, the type that the average amateur would delight in.—JOHN B. RAFFO (Manchester).

CUT THIS OUT EACH WEEK.

Do you know

—THAT by connecting the earth lead to the aerial terminal it is often possible to improve upon reception results.
—THAT the possibility of coupling with an unscreened H.F. choke should not be overlooked when searching for the causes of instability.
—THAT in calculating winding data for mains transformers it should be remembered that the frequency of the supply has a big effect upon the number of turns per volt which are required.
—THAT all chokes for smoothing purposes, as well as output filter chokes should be of the constant inductance type.
—THAT the above requirement is obtained by making the cores with an air gap.
—THAT metallic paints are useless for screening purposes owing to the fact that the individual particles of metal are insulated by the medium used in compounding the paint.

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

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

REPLIES IN BRIEF

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

D. F. (Blundells). Your query is not clear. Do you wish to modify the output from the mains unit, or the input. If the latter it is only necessary to obtain a suitably tapped mains transformer. If the former, resistances may be used for voltage dropping.

J. W. (Anfield). You should follow the constructional details of the receiver and adhere to the instructions given regarding the tuned circuits.

T. E. L. (Plymouth). Is your trouble due to the wavelength of the local station? Perhaps the receiver in question does not tune to this station.

W. L. J. (Kilmarnock). The grid windings will be 6, 12 and 24 turns, with reaction of 2, 5 and 11 turns interwound. The grid winding should be of 24 enamel and reaction of 28 D.S.C.

K. N. G. (Stafford). We do not know how you intend to combine the battery circuit and mains unit with the mains valves. The Long Range Express Three or the Mains Express Three are the nearest circuits which we have published.

A. J. (Widford). We regret that we know of no firm who could supply you with the parts in question. The Wet H.T. Battery Company supply zincs and sacs as well as glass containers for these parts. We do not think your peroxide will prove of much use, but a lot depends upon its condition.

E. C. D. (Canterbury). So far as we can trace the firm in question is no longer in existence.

D. C. (Cambridge). It would appear that the tuning circuits are at fault, but sufficient details are not given to enable us to say in what manner the fault has arisen.

F. B. H. (Chesterfield). The omission of the rectifier may have caused the trouble, although we cannot state definitely without further details.

R. V. M. (Ruislip). A suitable amplifier is described in "50 Tested Wireless Circuits," obtainable from this office, price 2/6.

R. M. (Gateshead). It is impossible to identify your tuning coil from the drawing. The whole trouble may be in the coil. We would suggest that you purchase a modern dual-range coil and substitute this in your receiver.

G. A. C. (Stepney). We regret that we cannot give you all the coil winding data you require. This has been published from time to time in our pages.

D. T. (Edinburgh). The fitting of modern valves might lead to instability. However we would suggest that you write to Messrs. Cossor, Mullard or other firms from whom you desire to purchase new valves, giving them the references of the existing valves and asking what types are recommended for replacement.

F. P. (Hackney). Messrs. Peto Scott can supply the complete Kit. We would advise you to purchase the back number of the issue describing the construction of the receiver as well as the operating details.

K. R. L. (S.W.17). Messrs. Electradix Radios, of Upper Thames Street, can supply the detector in question.

J. D. (Hapton). Your circuit is quite correct but your trouble is probably due to insufficient H.T. on the detector valve. You should, therefore, increase the initial H.T. to allow of the drop through your coupling resistance.

J. F. J. (Blakenhall). Improve the circuit by fitting a modern dual-range coil. It might also prove worth while to fit a good H.F. stage.

R. S. (Norwich). The noise may be caused by a faulty valve or faulty resistance. If it ceases entirely when aerial and earth are removed it is being received through either aerial or earth. From your test we would suspect (if it ceases when both are removed) that it is interference received through your earth lead and an alternative should be tried.

P. R. (Johannesburg). We have no such ambitious circuit as you describe. It is not customary in this country to employ 10 valves to-day and the largest receiver we could offer would utilise 7 valves. It would not, however, cover the short-waves you mention, but would be designed for medium and long waves.

A. L. H. (Bristol). Your troubles are probably due to the signal strength. Lack of detail will cause the eyes to appear as you describe, and a too powerful signal will also give the excessive contrast. Motor interference would not give the spots you mention, and this is probably due to receiver instability.

C. C. (Leyton, E.10). We regret we have no blue print of a receiver of the type you mention.

F. W. W. (Sutton Coldfield). Your receiver is not powerful enough to bring in the stations and you are trying to force reaction too far. You need an H.F. stage to give greater range, when you will find that the stations will be tunable without so much reaction and thus will be heard more comfortably. We have no blue print of a portable of the type you describe, but may give details of such a receiver during the summer months.

A. G. S. (Burton-on-Trent). We regret that we have no details of the particular French transformer you refer to.

C. L. (Sunderland). The issue in question is now out of print.

IMPRESSIONS ON THE WAX

By T. Onearm

THIS month there is an impressive "cavalcade" of Jubilee Memories on "His Master's Voice." In the "Cavalcade of Famous Artists," including such famous names as Paderewski, McCormack, Melba, Caruso, Kreisler, Cortot, and Elgar, the world can indeed feel proud of having produced such a famous array of musicians during the last twenty-five years, *DB*2454-*DB*2455. "Jubilee Music-Hall Parade," *C*2739 and *C*2740, and "Jubilee Dance Memories," *C*2738, show how tastes have changed in music-hall and ballroom. These records contain such favourites as "I do like to be beside the seaside," "Pack up your troubles," "Ours is a nice 'ouse, ours is," "A wee Deoch and Doris" (sung by Sir Harry Lauder), and "Sally" (sung by Gracie Fields). Dance tunes include "Charmaine," "Broadway Melody," "Stormy Weather," and "Let's have a Jubilee." The Coldstream Guards Band play "Accession Memories" in their usual impeccable style. "The Nation's Loyalty" is an "His Master's Voice" record which attempts to show how loyalty to the Throne forms a part of all branches of the National life; in the home, in the tavern, on the parade ground, in the fortress, in the Law Courts, at the show.

The record includes excerpts from the "Ceremony of the Keys" at the Tower of London, and old loyal chorus songs—"Here's a health unto his Majesty" and "Down among the Dead Men"—The Oath of Allegiance taken by a Justice of the Peace, the Trooping of the Colour on Horse Guards Parade on the King's Birthday, the Armistice Day Festival of Remembrance at the Albert Hall, and the Finale of the Aldershot Tattoo, *C*2733.

The Light Symphony Orchestra plays "Homage March," a fine new composition by Haydn Wood, which ends with the National Anthem, *C*2734. Finally, there is a most impressive record of Elgar's "Coronation March," composed for the Coronation of His Majesty the King, and German's "Coronation March and Hymn," which was performed in Westminster Abbey during the Coronation Service. These are wonderfully played by the London Philharmonic Orchestra, conducted by Sir Landon Ronald, *DB*2437 and *DB*2438.

Light Orchestral Gems

The Light Symphony Orchestra plays "May Day" overture by Haydn Wood, composed on the popular "A Brown Bird Singing," *B*8310, and two melodious tunes come from Alfredo and his Orchestra, who play "Old Bohemian Town" and "Cara Mia" in their usual alternately dashing and languorous style, *B*8313.

Following on the issue of the Mozart and Schuman Sonatas played by Yehudi and his fourteen-year-old sister, Hepzibah Menuhin, "His Master's Voice" have done well in issuing Beethoven's greatest Violin and Piano Sonata, "The Kreutzer," played in a most musicianly manner by this perfect partnership (*DB*2409-12).

Rubinstein's Superb Performance

This is perhaps the best of all records on this month's list. It is a revelation of the truly grand style of pianoforte playing. Since Busoni first astonished musicians with his masterly pianoforte arrangements of Bach's organ toccatas, preludes and fugues, most programmes by the greatest performers contain one of these monumental works. Rubinstein obtains a sonority from his instrument which is almost unbelievable, and, in spite of tremendous difficulties which it contains, preserves a complete control which is truly great. Everyone must possess this "Toccata in C Major" (Bach-Busoni), *DB*2421-2.

Superb playing characterises Cortot's performances of Chopin's Studies, Op. 25. Each one has not only important technical meaning, but also a wealth of poetic significance that is so characteristic of Chopin. Cortot plays these gems superbly, *DB*2308-10.

Virtually unknown in this country, Chausson's Symphony in B Flat, Op. 20, is one of the best works of its kind to come out of France, and will be at once welcomed and treasured by music lovers as a means of enjoying and learning this neglected masterpiece. It is beautifully played by the Orchestre du Conservatoire under Piero Coppola, *DB*4953-56.

Dance Hits to Suit All Tastes

Two more records from Jack Hylton will undoubtedly be popular. "If the moon turns green," "So red the rose," *BD*149. "Far Away in Shanty Town," "My Dance," *BD*150, are all foxtrots played with that vitality and rhythm which make Jack and his boys so popular. Other good numbers include "Marie Louise," a waltz, and "There won't be any spring," a foxtrot very well played by Jack Jackson and his Orchestra, BD153. "Love was a song" and "Prairie Schooner," both good foxtrots, played by Teddy Joyce and his Orchestra, *BD*144. Ray Noble and his Orchestra is making a tremendous hit in America and has made excellent foxtrots with Al Bowlly singing the refrain, "Soon" and "Down by the River," *BD*140, from the film "Mississippi." The hot dance record for this month is "Your feet's too big" and "Swinging on the strings." You must hear this. Note the vocal quartet in the refrain, *BD*146.

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.

KILMARNOCK AND DISTRICT SHORT-WAVE RADIO CLUB

A MEETING of enthusiastic amateurs was held recently in the Y.M.C.A., Howard Street, Kilmarnock, when it was unanimously agreed that a club should be formed in the district. It was decided to name the club The Kilmarnock and District Short-wave Radio Club. The office holders were elected as follows: Hon. president, Mr. Randall Wyllie; president, Mr. Jack Kirkpatrick; secretary, Mr. James Y. M'Kinnon; treasurer, Mr. John Harper, and a committee of six members. All interested readers in the district who wish to become members should apply in writing to the secretary, Mr. James Y. M'Kinnon, 15, Mount Avenue, Kilmarnock, or to Mr. Jack Kirkpatrick, 40, Henrietta Street, Kilmarnock, who will be glad to give particulars.

ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY

AT the last meeting of the West Middlesex and East Buckinghamshire Branch Mr. P. Branton, of Wembley, was elected (by a majority vote) as being the member with the best microphone voice. Before this decision was made all members had read and spoken before a microphone in a room adjoining the clubroom, and had gradually been thinned out until the winner remained. Following the competition a musical programme (over the microphone) was arranged, and Mr. Turner (banjo), Mr. Newman (harmonica), and Mr. Haskell were the artists. Mr. A. Elphick, jr., lent the instruments. Ultra-short-wave and short-wave experiments were also conducted. The next meeting of this branch will be held on May 22nd, and everyone is welcome. There are no charges, and particulars may be obtained from Mr. Leslie W. Orton, "Kingsthorpe," Willowbank, Uxbridge.

INTERNATIONAL SHORT-WAVE CLUB (MANCHESTER CHAPTER)

AT the kind invitation of the directors of the British School of Radio, the Manchester Chapter of the above club held a meeting in the lecture room of the British School of Radio, 12a, Withy Grove, Manchester, on Tuesday evening, April 23rd, at 7.30 p.m. The meeting opened with a talk by the chairman, Mr. H. Wild, on the aims and objects of the International Short-wave Club and its various chapters. He also spoke about short-wave receivers. After various questions, the subject was changed, and a short lecture on servicing was given by one of the school's representatives, and this was followed by a short talk by Mr. F. Fielding, who spoke briefly on both subjects. Any reader desiring further information about this organisation should write to the secretary, Mr. R. Lawton, 10, Dalton Avenue, Thatch Leach Lane, Whitefield, near Manchester.

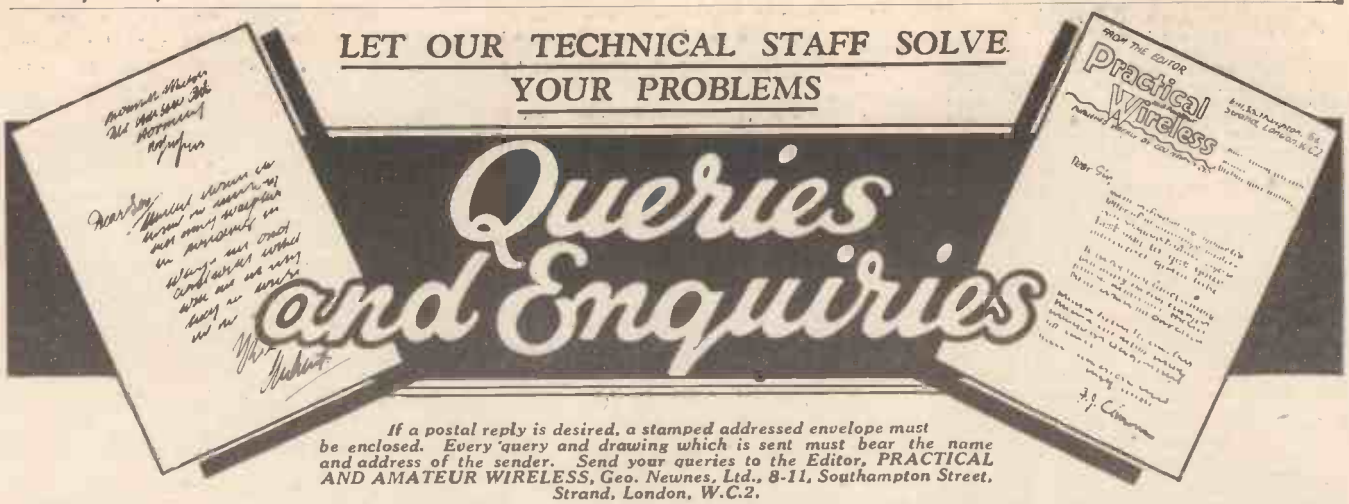
SOUTHGATE TELEVISION SOCIETY

THE second meeting of the society was held on Wednesday, April 17th, 1935, when a very interesting demonstration and lecture was given by one of the society members on the superheterodyne circuit, and the quality necessary for good television reception. The lecturer brought with him his set which was a receiver of the superhet type constructed by himself. After a brief description of the circuit arrangements, the ways in which a superhet was superior to a so-called "straight set" were demonstrated. The selectivity, sensitivity, and stability showed the marked improvement which can be obtained. It was mentioned that the need of the superhet for the reception of high-definition television was practically a necessity on account of the very high quality demanded on extremely short waves. Applications for membership and full particulars of the society will be gladly furnished by the hon. sec., M. T. Battersby, 20, Palmerston Crescent, Palmer's Green, N.13, while visitors to meetings are always welcome.

CROYDON WIRELESS AND PHYSICAL SOCIETY

AT the last meeting of the above society, Mr. Douglas M. Corke gave a lecture on "The Historical Development and Manufacture of Electric Lamps." In his brief historical sketch, Mr. Corke mentioned that in 1810 Sir Humphrey Davy made an electric "arc" using a battery of 2,000 cells; in 1841 De Moylens, of Cheltenham, patented a lamp using an incandescent platinum wire in a glass vessel; in 1844 Foucalt, in Paris, exhibited a hand-adjusted carbon arc-lamp. In 1845, Thomas Wright, of London, produced magnetically-regulated automatic arc lamps, and Starr, of Cincinnati, made a carbon filament lamp, using the vacuum at the top of a mercury barometer thirty years before Swan and Edison. Up till 1870 the question of obtaining sufficient power and of getting a good enough vacuum paralysed the development of any electric lamp. The progress made from that date up to 1905 was then dealt with. Mr. Corke also referred to the use, in street lighting, of gas-discharge and incandescent filament lamps used at the same time to compensate for each other's defects in colour. Visitors are welcome at any of the meetings, and particulars regarding membership, etc., may be obtained from the hon. sec., Mr. H. T. P. Gee, 51/52, Chancery Lane, London, W.C.2.

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS



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 AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, 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 of receivers described in our contemporaries.
(3) Suggest alterations or modifications to commercial receivers.
(4) Answer queries over the telephone.
(5) Grant interviews to querists.

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

Adding Another Stage

"I enclose a diagram of my three-valve set, and should be glad if you would tell me what other parts I need to turn this into a four-valve set."—T. O'B. (Pontefract).

The circuit is of a detector and two L.F. stages, and therefore we should hesitate to recommend a further L.F. stage. An H.F. stage could be added and this would increase the range of reception, although the locals would not be very much louder, and in the case of certain high-powered stations no improvement in strength at all would be obtained. Alternatively, if only increased signal strength is desired, a pentode could be substituted for the output valve. A five-pin valve-holder would be required, and the fifth pin should be joined to H.T. positive, the remaining four pins being connected in the same manner as those on the present holder.

If you decide to include the H.F. stage, constructional details of a suitable H.F. unit were given in PRACTICAL WIRELESS No. 20, dated February 4th, 1933.

Heterodyne Whistle

"I have a three-valve all-mains radiogram, and when I tune to a certain long-wave station I get a nasty high-pitched whistle with the programme. This whistle does not tune out, and also it is very irritating. Is this a heterodyne whistle and is there a cure for it?"—D. G. (W.3).

In view of your situation, it is quite possible that the whistle is caused by your local station, and in that case a wave-trap in the aerial circuit will cure it. On the other hand, the whistle may be received with the station, in which case you cannot prevent it by the use of any type of input filter. In such a case one of the whistle filters designed for inclusion in the L.F. circuits would cut it out, although, of course, certain of the higher musical frequencies would also be removed. As the receiver is a commercial model we would not advise you to tamper with the wiring to include such a filter, and would suggest that you try the aerial wave-trap scheme, and if this fails to remove the trouble you will either have to do without that particular station, or put up with the whistle. A top-note cut-off circuit or tone-control across the loud-speaker could be used, but quality would suffer.

Modernising Tuning Circuits

"I would like advice concerning a three-valve battery set using two old-fashioned plug-in coils. Could you tell me how to modernise these coils, or, better still, give me details of a blue print of an inexpensive three- or four-valve battery set?"—E. P. (Watford).

Practically any standard modern dual-range coil could be used in place of your present two coils. It might also be necessary to purchase a reaction condenser if your present reaction arrangements do not include such a device. We cannot give you anything more definite than this without a circuit diagram. Most makers supply a diagram of connections with the coil and you should not find it difficult to convert your receiver. The Hall-Mark Three, or the Hall-Mark Four should meet your requirements for a modern battery receiver.

Signal Strength Codes

"Will you please tell me how the 'R' strength of a signal is defined? Also, what is the ideal outside aerial for 13- to 80-metre reception—space and height is no object?"—A. R. (Welton).

The "R" method of recording signal strength is described in an article in this issue entitled "The International and Amateur Codes." You will probably find that a vertical wire or rod, 20ft. in length, will give you best results on the band you mention. Doublet aerials and other schemes may be tried if you wish, but a vertical arrangement built from reducing sections of copper tubing to form the above length, and held 18in. to 2ft. from the walls of the house by well-insulated supports will probably be productive of the best all-round results.

Prospective Radiogram

"Would you be good enough to give me information regarding a circuit suitable for gramophone reproduction only, as I do not wish to incorporate same in the set I am building at the moment, namely the Hall-Mark 4? This may be an unusual request, but a good record requires faithful reproduction."—J. H. (Brixton Hill, S.W.2).

We cannot quite understand your point regarding faithful reproduction. Surely radio also requires faithful reproduction? The amplifier section of the receiver in question may be relied upon to produce high-quality signals from either radio or records and if you have some reason for wishing to build a completely separate piece of apparatus we would recommend the Hall-Mark 4 without the tuning arrangements. The pick-up may then be permanently joined to the points indicated in the constructional article on this receiver.

Improving Selectivity

"I have an all-electric two-valve set and also a battery two-valve set which I use alternately, both on the A.C. mains (the battery set having an eliminator). Both sets bring in foreign stations very well in numbers, but I am troubled with too much overlap of stations, i.e. if I bring in, say, a British station I get a background of the adjacent foreign stations, etc. Would any form of wave-trap or, say, the addition of band-pass cure this? If this is not possible, could you suggest a way out for clearer reception? I am quite willing to build, say, a three-valve set (either battery or electric) according to your advice."—A. Y. (C. C. 2,339) (Troon).

As the receivers employ only two valves, the arrangement is obviously a detector and L.F. circuit, and thus you have to rely quite a lot upon reaction in order to obtain good volume. Owing to the nature of the tuned circuit, the tuning is flat and thus you get background on every station. A band-pass would improve sharpness of tuning, but the loss would probably not be tolerated on such simple sets. A wave-trap could be fitted to eliminate a local station, but you would probably find it of little use in removing all backgrounds. The most practical way out of your difficulty is to build a three-valve receiver—that is, by adding an H.F. stage to the present arrangement, and fitting a band-pass circuit to the H.F. stage. This will sharpen tuning and the addition of the H.F. stage will give greater range.

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

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face type and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. Radio components advertised at below list price do not carry manufacturers' guarantee. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.

PREMIER SUPPLY STORES

ANNOUNCE a City Branch at 165 and 165a, Fleet Street, E.C. (next door to Anderton's Hotel), for the convenience of callers; post orders and callers to High Street, Clapham.

OFFER the Following Manufacturer's New Surplus Goods at a Fraction of the Original Cost; all goods guaranteed perfect; carriage paid over 5/-, under 5/- postage 6d. extra: I.F.S. and abroad carriage extra; orders under 5/- cannot be sent C.O.D.; please send for illustrated catalogue, post free.

PREMIER SUPPLY STORES Announce the Purchase of the Complete Stock of a World-Famous Continental Valve Manufacturer, all the following standard mains types, fully guaranteed, 4/6 each. HL, L, Power. High, Medium and Low Magnification Screen Grid. Variable-mu Screen Grid; 1, 3 and 4 watt A.C. output, directly heated Pentodes; 250-volt 60 m.a. Full Wave Rectifiers; A.C./D.C. types, 20 volts .18 amp. Filaments; Screen Grid; Variable-mu Screen Grid; H, HL, Power and Pentodes.

THE following types 5/6 each; 350v., 120 ma. full-wave Rectifiers; 500v., 120 ma. full-wave Rectifiers, 2½-watt indirectly-heated Pentodes.

2-VOLT Valves, detector, H.F., L.F., 2/3; power, low consumption power, super power, 2/9; screened grid, variable-mu screened grid 5- or 4-pin Pentodes, Class B D.D. Triodes, 5/-.

THE Following American Types, 4/6; 250, 210, 245, 226, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 27, 77, 78, 2A5.

THE Following Types, 6/6 each: 42, 25Z5, 36, 38, 83, 39, 44, 53, 6B7, 2A6, 2B7, 5Z3, 6C6, 6A4, 6D6, 6F7, 43, 59, 1A6, 1C6, 1V, 12AS, 12Z3, 19, 30, 31, 32, 33, 34, 41, 49, 56, 57, 75, 76, 79, 82, 84, 6Z4, 85, 89.

LISSEN 3-gang Superhet Coils, with switching; listed 30/-, with circuit, 6/-.

LOTUS 3-gang Band-pass Coils; 12/6 per set; with switching.

BEST British make Bakelite cased 0-1 m.c. Milliamp-metres, 2½ inch outside diameter 18/6, 3½ inch outside diameter 22/6.

12 TO 2,000 metres. Huge Purchase of All-Band 2 gang Coils from prominent British manufacturer. Fully Screened with switching for S.G. Det. type receivers, 4 Separate Bands, 12 to 2,000 metres. 12/6 with circuit.

SPECIAL Offer B.T.H. Moving Coil Speakers, matched pairs, specially manufactured for McMichael Supervox; 8in. diameter, 1,500 ohms-7,500 ohms (1,500 speaker as choke, 7,500 ohms speaker in parallel with H.T. supply); complete with special dual output transformer for pentode, 15/6 per pair; A.C. kit for above pair, 12/6.

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, 16/6; 9in. cone, 22/6.

A LARGE Selection of Pedestal, table and radio-gram cabinets by best manufacturers at a fraction of original cost; send for list.

T.C.C. Electrolytic Condensers, 15 mf., 50v. working, 1/-; 50 mf., 12v. working, 1/-; 15 mf., 100v. working, 1/-; 25 mf., 25v. working, 1/-.

CONDENSER blocks, H.M.V., 400v. working, 4+2+1+1+1+0.5, 3/9; 2+2+1+1+1+1+0.5,3/-.

ALL-ELECTRIC 3-stage Amplifiers, 200-250v., 40-60 cycles, 10 watts undistorted output, complete with 5 valves, and Magnavox Super 66 energised speaker, £12/10/-.

ELIMINATOR Kits, including transformer, chokes, Westinghouse metal rectifier, condensers, resistances, and diagrams, 120v. 20 m.a., 20/-; trickle charger, 8/- extra; 150v. 30 milliamps, with 4 v. 2-4 amp., C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v. 60 milliamps with 4v. 3-5 amps., C.T., L.T., 30/-; 300 v. 60 m.a., with 4 volts 3-5 amps., 37/6; 200v. 50 m.a., with 4v. 3-5 amps., L.T., 27/6.

PREMIER Chokes, 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; 25 milliamps., 20 hys., 2/9.

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

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

B.T.H. Truspeed Induction Type A.C. only, Electric Gramophone Motors, 100-250v., 30/- complete; ditto, D.C., 42/6.

COLLARO Gramophone Uult, consisting of A.C. motor, 200-250v. high quality, pick-up and volume control, 49/-; without volume control, 46/-.

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

SPECIAL Offer of Wire-wound Resistances, 4 watts, any value up to 50,000 ohms, 1/-; 8 watts, any value up to 100,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

WHITELEY Boneham Energised M/c Speakers, 2,000 or 2,500 ohms, 8 inch diameter, 9/11. Please state which type transformer required.

COSSOR Permanent Magnet M/c speakers, large Darwin Cobalt Steel Magnet, 8 inch diameter, please state transformer required, 13/6.

LISSEN 2-Gang Condensers, Uniknob Trimmer, Disc Drive, .0005 each section, 5/6.

POLAR STAR, manufacturers' model, 3-gang condensers, fully screened, 7/6, with trimmer; unscreened, 5/-.

WIRE End One Watt Resistors, our assortment, 2/- per dozen.

ORMOND No. 4 Variable Condensers, 0.00025, 1/6. O.K. for Short Waves.

SPECIAL Offer Western Electric Mains Transformers, Input 200-250 volts, output 350-0-350 volts, 120 milliamps, screened primary, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-5 amps., 9/6; input 100-250 volts, 300-0-300 volts 60 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 6/6; input 200-250 volts, screened primary, output 500-0-500 volts 150 milliamps, 4 volts 3-5 amps., 4 volts 2-3 amps., 4 volts 2-3 amps, 4 volts 1 amp., 4 volts 1 amp., 19/6.

MAINS Transformer, with Westinghouse rectifier, output 200v. 30 milliamps, and 4 volts 3 amps., L.T., 15/- the pair.

U.S.A. 3-gang Condenser, .0005, with trimmers, 3/11; a really solid job; Utility disc drive, 1/6.

SPECIAL Offer.—0.00015 brass short wave tuning condensers, with slow motion and completo dial, 3/9; short-wave chokes, 10-200 metres, 9d.

DUBILIER Electrolytic Condensers, 12 microfarads, 20 volts, 6d.; 8 plus 4 microfarads, 500 volts, 4/-; 50 mf., 50 v., 1/9; 8 mf., 500 v., 3/-.

RELIABLE Intervalve Transformers, 2/-; M.C. Multi-ratio output transformers, 2/6; 2-1 or 1-1 output transformers, 2/6; microphone transformers, 50 and 100-1, 2/6; 3 henry chokes, 2/6. 100 henry chokes, 2/6.

KOLSTER BRANDES Model 301 Pick-up with Arm; list price, 35/-; our price, 10/6.

RELIABLE Canned Coils, with Circuit, accurately matched, dual range, iron core, 2/11.

UTILITY 3-gang Condenser, 0.0005, fully screened, with trimmers, ball bearing, straight or superhet, 6/9; complete with disc drive, 7/6; the best 3-gang available.

T.C.C. Condensers, 4 mf., 450 v. working, 4/-; 4 mf., 750v. working, 6/-.

VARLEY Constant Square Peak Coils, band-pass, type B.P.7, brand new in makers' cartons, with instruction and diagram, 2/4.

VARLEY H.F. Intervalve Coils, B.P.8, band-pass, complete with instructions, in original cartons, 2/6.

SCREENED H.F. Chokes, by one of the largest manufacturers in the country, 1/6.

PREMIER British-made Meters, moving iron flush mounting, accurate .0-10, .0-15, .0-50m.a., 0-100, 0-250m.a., 0-1, 0-5amps.; all at 6/-; read A.C. and D.C.

POTENTIOMETERS by Best Manufacturers, 200, 350, 500, 1,000, 2,500, 5,000, 8,000, 10,000, 15,000, 25,000, 50,000, 100,000, 250,000, 500,000, 1 meg. 2/-; 5,000, 10,000, 15,000, 100,000, 250,000, with mains switch, 2/-.

U.S.A. Electrolytic Condensers. 550v. penk working, standard tubular metal condenser, 4 mf., 8 mf., 12 mf., a real bargain, 1/9.

BRITISH Radiophone 2-gang 0.00016 Short-wave Variables, all brass with steatite insulation, 5/6.

1,000 OHM 150 Milliamp, semi-variable resistance, 2/-; 1,000 ohm 250 milliamp., tapped, for any number .18 valves, 3/6; 800 ohms 350 m.a., tapped, 2/-.

RELIABLE Smoothing Condensers, 250v., working, 1 mf., 6d.; 2 mf., 1/-; 4 mf., 2/-; 350v. working, 1 mf., 1/-; 2 mf., 1/6; 4 mf., 3/-.

ALL Premier Mains Transformers have Engraved Panels, terminal connections, all low tension, windings centre tapped, tapped and screened primaries, 200-250 volts.

PREMIER 250-0-250 60 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-4 amps, 10/-.

PREMIER 350-0-350 150 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-4 amps., 12/6.

PREMIER Combined H.T.8 and H.T.9 Transformer, rectified output 250 or 300 volts 60 milliamps, 4 volts 1-2 amps., 4 volts 3-5 amps., 10/-; or with Westinghouse rectifier, either type, 18/6.

PREMIER H.T.10 Transformer, rectified output 200 volts 100 milliamps, 4 volts 1-2 amps., 4 volts 3-5 amps., 10/-; or with Westinghouse rectifier, 19/6.

PREMIER H.T.11 Transformer, 500 volts, 120 milliamps., rectified output, 4 volts 2 amps., 4 volts 2 amps., 4 volts 3-5 amps., 22/6; with Westinghouse rectifier, 42/6.

THE Following Lines 6d. Each, or 5/- per dozen; 4- or 5-pin baseboard or 4-, 5-, 6- or 7-pin chassis mounting valve holders, American valve holders, 1 watt resistances, wire end, every value; tubular wire end condensers, 1,500 volt, every value up to 0.5, 0.3 amp., 2- or 3-point switches. Cyldon double trimmers, 6 yds. Systoflex, 1, 1.5, 2 or 2.5 mm., 1 yd. 7-way cable, 9ft. resincored solder, 6yds. push-back connecting wire.

PREMIER SUPPLY STORES

(Dept. G.N.), 20-22, High St., Clapham, S.W.4. 'Phone: Macaulay 2188. Nearest Station: Clapham North Underground.

SOUTHERN RADIO'S WIRELESS BARGAINS. Every Article Guaranteed New, Perfect and Sent Post Paid.

RECEIVERS. • TELSEN RADIOGRAMS. Model 3550/R.G.A. Latest 1935 6 Valves, Superhet, A.C. This receiver embodies the very latest in Radio. Complete with 6 Valves, Mains Energised Speaker, contained in exquisite cabinet with GARRARD ELECTRIC RECORD CHANGER. In Original Sealed Cases, £18/10/0. (List 32 Guineas.)

TELSEN THREE-VALVE BATTERY SETS. Model S93. Complete with 3 Mazda Valves, in attractive bakelite cabinet, 30/-. (List, 75/-.)

TELSEN "AIRMARSHAL 3."—Three-valve Battery Sets. Complete with 3 Mazda Valves, Speaker. In attractive Walnut cabinet, 47/6. (List, 98/6.)

BURGOYNE CLASS "B" THREE-VALVE SETS. —Complete with 3 Mullard Valves, Exide Batteries, and Accumulator. Magnavox Moving Coil Speaker. In magnificent cabinet, finished in chromium, £3/9/6.

SPEAKERS. BLUE SPOT PERMANENT MAGNET SPEAKERS, WITH UNIVERSAL TRANSFORMERS TO SUIT ANY CIRCUIT.—1935 Series, 99 P.M., 24/6. 45 P.M., 20/-. Celestion P.P.M.W., 16/6. Celestion Soundex, 11/-. All in sealed Cartons.

ELIMINATORS. REGENTONE 1935 Series New and Boxed for A.C. Mains 200/250 Volts, TYPE W.5a Complete with Trickle Charger, 39/6. Type WIa (less Trickle Charger), to carry 30 Milliamps, 33/-. WIC (less Trickle Charger), 30/-.

CONDENSERS. PLESSY 4-Gang Superhet Condensers, .0005 Fully Screened, with Trimmers, 7/3. LOTUS 0.0005 Condensers, Fully Screened, with Trimmers. Complete with Escutcheons, Dials, Knobs. 3-Gang, 11/-. 2-Gang, 7/3.

COILS.—Igranic Superhet 4-Coil set (1 osc. 2 I.F. with pig tails and 1 L.F. plain), 9/- per set (List 50/-). Varley Constant Square Peak Coils B.P.5, with all accessories, 2/3. Telsen Twin-matched Coils: Type W.287, screened with switch, 7/0 (List 17/-). Triple-matched Screened Type W.288, with switch, 10/9. Telsen Twin Coil Unit, Type W.478, 12/6. Type W.477, 17/6. All Brand New and Boxed.

MISCELLANEOUS.—Bifio Static Cut-outs, definitely eliminate all interference, 2/-. Lewcos Spaghetti Resistances, all capacities, new and boxed, 1/6 per dozen assorted. Telsen Binocular H.F. Chokes, 2/-. Telsen ACE L.F. Transformers, 3-1 and 5-1, 2/9.

STOCKTAKING BARGAIN PARCELS.—After our Recent Stocktaking, we gathered at our Head Office a large number of odd lines from our Various Branches. We are offering these in parcel lots as UNDER:—

5/- PARCEL Contains Components to the value of at least 20/-. Including Condensers, Coils, wire, resistances, etc.; 10 different Telsen and Ready Radio Circuits included with each Parcel.

10/- PARCEL contains Components to the value of at least 45/-. Includes Transformers, Variable Condensers, etc., etc. Also Circuits as above.

20/- PARCEL. This is the "Small Traders" Parcel and contains a marvellous selection of components valued at 85/-. We have supplied this parcel to hundreds of dealers for re-sale at a profit. Every article contained in these parcels is up to date, new and boxed.

THOUSANDS OF BARGAINS AT OUR VARIOUS BRANCHES.—All Goods guaranteed and sent post paid. Branches at 46, Lisle Street, W.C.2; 271-275, High Road, Willesden Green, N.W.10. All Mail Orders to: 323, Euston Road, London, N.W.1.

SOUTHERN RADIO, 323, EUSTON ROAD, LONDON, N.W.1. Near Warren Street Tube. 'Phone: Museum 6324.

PEARL & PEARL,

190, Bishopsgate, London, E.C.2. All the following Bargains, guaranteed new goods. Cash or C.O.D. Carriage Paid in British Isles.

TELSEN Receivers (1935 Models), guaranteed new, in original cartons. 6-Valve Super-het., A.C. Model. List 14 gns., our price 9 gns. Battery Model with batteries complete. List 14 gns., our price 9 gns.

BURGOYNE Receivers, 3-Valve Class B Models. Complete with Mullard valves; Exide H.T. and L.T. batteries. M/c speaker. Artistic cabinet of highly polished walnut. Chromium fittings. Brand new in original cartons: 1935 Model. List £6/10/-. Our price £3/18/6. Carr. Paid.

CROMWELL Cabinets (for set and speaker combined). Horizontal type 23in. wide, 8in. deep, 11½in. high. Polished walnut veneer, additional baffle behind speaker grille. Only 4/11 each, carr. fwd.

SPECIAL. Telsen Radiomag (Latest Edition) 64 pages. 4 Full-size Blue Prints for the "Economy Three." "Short-Wave Three."
"Super Four" Battery receivers, and a "Quality 3-valve Amplifier." Full constructional details, many other articles of interest, sent Post Paid for 6d.

TELSEN Chokes, Coils, Condensers, etc., all at Special Reduced Prices. List "N.T." on request.

HUNDREDS of Bargains in Free List "N."

All Mail Orders Direct to
PEARL & PEARL,
190, Bishopsgate, London, E.C.2.
Telephone: Bishopsgate 1212.

CASH allowances made on your old wireless goods in part-exchange for any new receiver on easy terms. After deducting deposit we pay you balance of allowance in spot cash. Components and Peto-Scott kits supplied for cash, or part exchange. Highest allowances.—R. Wigfield, Furlong Road, Goldthorpe, Yorks.

THIS WEEK'S CLEARANCE SPECIALS ! !

The following offers are special limited clearance lines, not contained in our monthly catalogue and lists. The supplies are strictly limited. All the lines below are offered at a fraction of their normal price and represent unprecedented value. BUY NOW WHILE SUCH SUMMER PRICES ARE AVAILABLE.

SHOP-SOILED BARGAINS IN CHASSIS. A limited number of each of the following chassis for immediate clearance (all British made) at fraction of usual price. Guaranteed new and perfect. 1935 models. Metal chassis construction. Finest components. Aerial tested and complete with valves. Battery or A.C. Require only fitting in cabinet with speaker. Worth treble.

A.C. MAINS CHASSIS.

79/6 **A.C. ALL-WAVE 4-VALVE CHASSIS.** 15-2,000 metres. 3 wave-bands, no coil changing (100-250v.).

67/6 **A.C. ALL-WAVE 3-VALVE CHASSIS.** 3-wavebands, 15-2,000 metres.

62/6 **A.C. 4-VALVE CHASSIS.** 180-2,000 metres. Gramo-sockets (A.C. 100-250v.).

52/6 **A.C. SHORT WAVE 3-VALVE CHASSIS.** 15-80 metres. World-wide speaker reception.

49/6 **A.C. 3-VALVE CHASSIS.** 180-2,000 metres. Gramo. Utility 2-gang concentric trimmer (100-250v.).

45/- **A.C. SHORT-WAVE 2-VALVE CHASSIS.** 15-80 metres (100-250v.). World-wide reception.

22/6 **A.C. EMPIRE SUPERHET SHORT-WAVE ADAPTOR,** converts dry battery or mains set.

BATTERY CHASSIS.

40/- **ALL WAVE BATTERY FOUR.** 16-2,000 metres. Single 3 position w-change switch.

32/6 **ALL-WAVE THREE.** 16-2,000 metres. 3-wave bands. World-wide reception.

27/6 **SUPER SHORT-WAVE THREE.** 16-80 metres. Super power output. Low-loss construction.

22/6 **SUPER BATTERY THREE.** 180-2,000 metres. Super power output.

20/- **SUPER SHORT-WAVE TWO.** 16-80 metres. World-wide headphone reception.

17/6 **SUPER TWO.** 180-2,000 metres. Large power output stage.

12/6 **SHORT-WAVE ADAPTOR.** Det. valve of present set is employed. 16-80 metres approx.

——**AND RECEIVERS**—a few only. Absolutely unscratched and guaranteed perfect, complete with valves.

110/- **EMPIRE ALL-WAVE A.C. MAINS 4-VALVE.** Beautiful cabinet. W.B. speaker. 12-2,000 metres.

95/- **EMPIRE ALL-WAVE A.C. MAINS 3-VALVE.** Modern horizontal type cabinet. 180-2,000 metres.

55/- **BURGOYNE.** Class B 3-valve receivers. P.M. Speaker. Large output.

——**CONSTRUCTORS' KITS.** Complete with diagrams and all sundries in sealed cartons. To clear at less than cost while stocks last.

59/6 **SUPERHET ALL-WAVE FIVE.** 13-2,000 metres. Radiophone coils, etc. Valves, 20/-. A.C. model, 70/6. Valves, 33/6.

27/6 **ALL PENTODE THREE.** 180-2,000 metres. Valves 15/-. A.C. model, 37/6. Valves, 20/-.

19/6 **PENTODE SUPER-TWO.** Good speaker reception. Valves, 10/-.

15/6 **SHORT-WAVE THREE.** Highly efficient low-loss circuit. Valves, 7/6.

12/6 **SCREEN GRID THREE.** Dual-tuned circuit. Highly selective. Valves, 9/6.

8/6 **SHORT-WAVE ONE-VALVER.** Valve, 2/6. Short-Wave Adaptor (using present det. valve).

SPECIALS IN COMPONENTS.

24/6 **A.C. ELIMINATORS.** 30ma. 150v. 4 tappings (Worth 40/-.)

17/6 **ROLA P.M. SPEAKERS** (list 35/-). Energised 2,000, 6,000 ohms, 16/6.

15/6 **W.B. STENTORIAN SPEAKERS** (list 35/-). Bal. Armature units, 4/11.

7/11 **H.T.7 RECTIFIERS.** H.T 8, 9, 10, 8/11.

6/11 **H.T.8 MAINS TRANSFORMERS.** By Standard Telephones (list 15/-).

4/11 **UTILITY 2 × .0005 GANG CONDENSERS.** Complete drive, escutcheon, panel light, concentric trimmer.

2/11 **200-250v. ELECTRIC SOLDERING IRONS.** Non-spill 15ah. accumulators.

2/6 **SLOW MOTION AIR-SPACED CONDENSERS.** .0001, 2, 3, 5 mfd. Direct drive, 1/11. 8 mfd., 4mfd. electrolytics, 2/3.

1/11 **SHORT-WAVE COILS** with reaction (3 windings), iron cored D.R. coils, L.T chokes, 30 hen. Radiophone L.T. Transformers 6 : 1. Western Electric Microphones (list 21/-). Volume Controls, 20,000, 50,000, ½ meg. 2v. valves det. L.F. P. A.C. types 5/11.

1/6 **CADMIUM STEEL CHASSIS.** Mounted 5 valve holders and term. strips, 2/6.

1/3 **RADIOPHONE SUPERHET COILS** with bases. Oscillator, B pass and aerial, or 3/6 set. Volt meters, 1/4.

11d. **T.C.C. ELECTROLYTICS.** Tubular, 5, 10, 15, 20 mfd. Mansbridge 1 mfd. 10d., 2 mfd. 2/3, 4 mfd. 2/11.

9d. **REACTION CONDENSERS.** Ready Radio .0003, .0005 mfd. Differentials .0001 .0003, 11d.

6d. **DUAL RANGE COILS WITH REACTION.** Fixed condensers all sizes .0001-.0005 mfd. 3½d. Wire wound resistances all sizes (watt 2½d.)

3d. stamps secures by return our big Jubilee Bargain Catalogue. 20 pages, fully illustrated. Secure your copy to-day.

POST YOUR ORDER TO-DAY. These lines once cleared cannot ever be repeated. Therefore may we advise your very earliest application.

LONDON EAST CENTRAL TRADING CO., 23, Bartholomew Close, London, E.C.1 (Phone NATional 7473)

THE RADIO MARKET PLACE OF THE WORLD.

G.W. RADIO offer the following manufacturer's surplus. Cash with order or C.O.D. Over 5/-, c.p.

GENUINE American 5-pin valve-holders 3d T.C.C. and Dubilier mica condensers, all values 1½d. Carbon resistors, 3d.

1,000 ohm 40 Henri smoothing chokes, 1/-. 1,000 ohm choke coils, 9d. 3-way speaker lead 18ins., 2d. 4-way, 3d. 2-way motor cord with tags, 24ins., 2d.

CADMIUM plated 5-valve chassis ex-Philco, 12x6x3½, 1/-, or with 3-valve screen, 1/6.

AMERICAN 3-piece valve screen, 8d.; American spring type knobs 2d.; Igranic Phono jacks 2d.; 4-way cable, any length, 3d. yard.

WIRE. 36 and 38 s.c.c. 1/- lb.; pushback connecting 6 yds., 4d.; Philco mahogany cabinet, 22x11½x11, horizontal type, 5/6.

SPECIAL offer of following sets: Burgoyne Class B 3-valve sets, complete with 3 Mullard valves, Exide batteries and accumulator, moving-coil speaker. Brand new. List £6/18/0. Our price, 60/-. Latest American 5-valve A.C./D.C. dual wave 3-gang condenser superhets, 100-250 volts, £4/2/6.

HAVING purchased £14,000 Philco new parts we offer the following parcels for the experimenter. "A" parcel, price 12/6, contains: 1 mahogany Philco cabinet, 1 5-valve metal chassis, 1 3-valve screen for above, 1 speaker cone chassis, 1 1,000 ohm field coil with core, 1 set of 3 useful coils and a number of Dubilier and T.C.C. fixed condensers and useful parts. "B" parcel, price 4/-, contains: 5-valve metal chassis, speaker chassis, coils, condensers, wire, etc. Call and inspect. Thousands of bargains. All goods guaranteed. Money refunded if not satisfied within 7 days.

G. W. Radio (Dept. P.A.), 7, Chapel St., Lamb's Conduit Street, London, W.C.1. 'Phone Hol. 4434.

VAUXHALL. We have prepared a new list of 3,000 bargains. Limited number available free. Send postcard.

VAUXHALL. All goods previously advertised still available. Standard lines, new goods only.

VAUXHALL UTILITIES, 163a, Strand, London, W.C.2. Temple Bar 9338. Facing Bush House. Over Dennys, Booksellers.

SILVERPLATE your brass or copper fittings. An easy, fascinating hobby: Trial bottle 1/- from Bullock, 33x, St. Bernards Road, Shirehampton, Bristol.

WOBURN Radio Offer following New Stock.

ALL Kits as last week.

BURGOYNE Class B three, new and in maker's sealed cartons, including Mullard valves, Drydex and Exide batteries, Magnavox 7" P.M Speaker, 69/6, carriage extra. Telsen Model 474 A.C. Bandpass Three in sealed cartons arrive next week, price will be announced next issue.

WESTINGHOUSE Rectifiers H.T.8 and 9, 8/9. Transformers for H.T.8, fully shrouded, made by Standard Telephones, with 4 v. .4 a. C.T. at 8/6. Chokes: 30 h. 30 m.a. 3/6. 150 h. 60 m.a. 9/-. Dubilier Electrolytics, dry, 8 mfd. 500v. 2/10. T.C.C. electrolytics 25 mfd. 25 v., 50 mfd. 12 v., 15 mfd. 100 v., 1/3. 6 mfd. 50 v. 6d. 2 mfd. 200 v. working 1/6. Tubulars, .1, .01, .02, 6d. .25 mfd. 9d. Dubilier and Erie resistances 6d. each.

BRITISH Radiophone semi-curved dials, with twin dial lights, and bronze escutcheon, 3/9. Slow motion condensers with slow motion dial, 0005, 0003, 2/11. Short Wave slow condensers, 0001, 00015, 00016, 0002, 00025, with dial, 3/-, without, 2/-. Bakelite reaction condensers, 0001, 0003, 0005, 1/-. Differentials, all sizes, 1/2. Popular Iron cored canned coils, 2/6. Popular Air cored coils, canned, 1/10. without can, 1/6.

HIVAC Valves now stocked.

WESTERN Electric Microphones, 2/3. Mike transformers ratio 100/1, 2/3. Electric Soldering irons, complete with flex adaptor and rest, 1/11, plus 6d. postage.

TRADE LIST NOW READY. Enclose trade heading and stamp.

WOBURN Radio Co., 9 Sandland Street, W.C.1. Holborn 7289. First turning on right up Red Lion Street from Holborn.

£4 10s. 0d. 4 Valve A.C. All Electric Receivers manufactured by R.A.P. Ltd., Surrey. Guaranteed 12 months by makers. Absolutely brand new. Limited number available: cannot be repeated. Cash with order. We pay carriage. Price & Co. (Manchester) Ltd. 78 & 78a Tib Street, Manchester.

HULBERT.

HULBERT for Quality Surplus Speakers.

ALL Speakers Listed Below are Brand New and Made by one of the Best Known British Makers of High Grade Moving Coil Speakers. Repeat orders coming in daily.

10/6 Only, original price 30/-.—Energised, 8in. cone, 6,500 ohms field, for direct use on 200-240 volts D.C. mains; also 1,800, 2,000, 2,200 or 2,500 ohms field; price includes power, pentode, or universal transformer as required.

14/- Only, usual price 45/-.—As above, but with 10in. cone, a very powerful quality speaker capable of handling large outputs.

15/6 Only, usual price 35/-.—Permanent magnet model with cobalt steel magnet of high efficiency, 8in. cone, power, pentode, or universal transformer.

18/6 Only, usual price 39/6.—As above, but with 10in. cone, powerful quality speaker giving large output with given input.

19/6 Only, usual price 41/-.—Permanent magnet model with the new Alni magnet, high flux density and wide frequency response, 8in. cone, power, pentode or universal transformer.

24/- Only, usual price 70/-.—As above but with 10in. cone, ideal for use with quality receivers.

2/9 Only.—Brand new cabinets, suitable for any of above.

SECURE One of These Bargains Now. Repeat orders coming in Daily.

CASH With Order or C.o.d.:—Hulbert, 6, Conduit St., W.1.

HULBERT for Surplus Speaker Bargains.

UTILITY SALES.—The "FAERITONE" Short-Wave TWO with 3 sets of coils ready made 55/-, separate component list of prices with diagram, 6d.

REGENTONE W.5.A 200/250 A.Vc. Eliminator with ½ Amp. charger 20 Milliamp 37/6. Ditto TELSEN 28 M/A 39/6.

10,000 NEW DARIO Valves to clear. Detector, H.F., L.F. 2/6, power 3/6, S.G., Pen. 5/6. TRIOTRON, all types 3/-. Power 4/-, S.G., Pen. 6/6.

DARIO 4 Volt Valves: Super H.F. Detector. E.C., L.F. 1/3.

CELESTION 45/- list 7in. Permanent Magnet, Universal transformer 17/6, ditto LOTUS 14/6. Cash with order, 24 hours service, carriage paid.

FAERITONE RADIO, Faeritone Corner, 57, Praed Street, London. Paddington 0251.

ALL goods advertised in last week's issue, still available.

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

SILVER SOUVENIR.—Complete Specified Kit. No alternatives. 79/6 cash. Host of other bargains. Kits, Accessories, etc. Lowest prices always.—Write now for free lists, Melfo-Rad, Queen's Place, Hove. (Trade Supplied.)

CLARION VALVES.—All brand new; battery types, 2-volt, HF.2, LF.2, LP.2, 1/9. Super power, PP.2, 2/6; screens and pentodes, 3/9; A.C. Mains, 4-volt, 1 amp., general purpose, 3/3; power, 4/-; screens and pentodes, 4/6; full wave rectifiers, 3/6; postage paid, cash with order, or C.O.D. over 10/-. Clarion Valves, Dept. 2, 885, Tyburn Road, Erdington, Birmingham.

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

BANKRUPT Bargains. List free. New 1935 AC mains sets. Lampex 4v. 3 pentode MC, £4/10/0. Drummer 5v. Superhets, 14gns. models, £7 Many other types equally cheap. Telsen 3v. sets with Mazdas, 27/6. Celestion Soundex PM, 10/6. Ditto PPM/W, 16/6. Triotron valves, 2/6, power 3/6. Stand Microphones, 5/6. Telsen 28ma eliminators, 28/6. Regentone 30mA, 32/6. Burgoyne Class B 3v. sets complete, 70/-. Vidor 1935 universal, £6.—Butlin, 143B, Preston Road, Brighton.

BIRMINGHAM RADIOMART,

SPECIALISTS IN SHORT-WAVE AND QUALITY COMPONENTS AT LOWEST PRICES.

Our stock is much too large to itemise here: From a soldering tag to a superhet we can supply everything, and what is more you won't be "Caught"! Send 1½d. stamp for our latest **CATALOGUE.** No firm has larger stocks or is cheaper than

THE SQUARE DEALERS,

BIRMINGHAM RADIOMART,
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COUPON

This coupon is available until May 25, 1935, and must be attached to all letters containing queries.

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W.C.E. 19

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LARGE SHORT-WAVE SECTION

Practical and Amateur Wireless

3D. EVERY WEDNESDAY

Edited by F. J. CAMM

AND AMATEUR TELEVISION

A GEORGE NEWNES *Publication*

Vol. 6. No. 140.
May 25th, 1935.

Adding A.V.C. to "Practical and Amateur Wireless" Receivers

'SUPER-FERRODYNE' RADIO

REGD.

with

VARIABLE-MU SCREENED GRID IN H.F. STAGE

H.F. PENTODE DETECTOR

SUPER-SELECTIVE IRON-CORED COILS

SINGLE KNOB TUNING

FULL VISION SCALE

for the

BATTERY or MAINS USER

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'SUPER-FERRODYNE' RECEIVERS

MODELS 353 and 358

Whether the source of your supply is Battery or Mains, you can enjoy all the advantages which the Cossor 'Super-Ferrodyne' developments bring .... better selectivity and wider range. With either of these models you can enjoy the best of Europe's Wireless fare — free from interference.

Ask your dealer about their modern Variable-Mu Screened Grid Circuit—the Super Selective Iron-Cored Coils and the many other special features. Most important, ask for a demonstration.

BATTERY MODEL 353

3 Cossor Valves (Variable-Mu Screened Grid, H.F. Pentode Det., and Economy Pentode Output), 8" Permanent Magnet M.C. Speaker. In handsome walnut finished cabinet similar to illustration. **£6.17.6** *(Exclusive of Batteries)*

Hire Purchase Terms: 15/- deposit and 10 monthly payments of 14/-.

ALL-ELECTRIC (A.C.) MODEL 358

As Model 353 but with 4 Cossor Mains Valves (including Mains Power Output and Rectifier), 8" Energised Moving Coil Speaker. Illuminated dial. In handsome walnut finished cabinet. For A.C. 200/250 v. (adjust.) 40/100 cycles. Similar to Illustration. **£8.15.0**

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Prices do not apply in I.F.S.

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To A. C. COSSOR LTD.,
Melody Dept.,
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Please send me free of charge, literature giving full particulars of Cossor 'Super Ferrodyne' Receivers.

* *Please state Model required.*

Name.....

Address.....

PRAC. 25/5/35

* MODEL NO.....

6885

READ THERMION'S NOTES ON PAGE 293

Practical and Amateur Wireless

Edited by F. J. CAMM

Technical Staff:
W. J. Delaney, H. J. Barton Chapple, Wh.Sch., B.Sc., A.M.I.E.E., Frank Preston.

VOL. VI. No. 140. May 25th, 1935.

ROUND *the* WORLD *of* WIRELESS

Index for Volume 5

INDEXES for Volume 5 of PRACTICAL AND AMATEUR WIRELESS are now ready, price 6d. each, by post 7d., or complete with binding case 3s. 6d. post free. Readers who wish to complete their files of Volume 5 may obtain most of the back issues for 4d. each, post free from the Back Issue Dept., Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Thames River Police Adopt Wireless

THE patrolling boats of the Thames River Police have now been equipped with small transmitting and receiving instruments which enable them to remain in constant touch with Scotland Yard. The utility of the apparatus was demonstrated recently when a patrol boat, noticing that a barge had caught fire on its way down stream, communicated the fact to headquarters, which in turn telephoned the nearest fire brigade. An engine was rushed to a point down river which the barge would be passing, but steps had already been taken to extinguish the fire.

Italy's Multi-lingual Speakers

IN order to ensure a daily news service in various languages, the Rome station now possesses speakers fluent in English, French, German and Italian, and regularly every evening broadcasts of items which may be of interest to foreign listeners are included in the programme. From the Italian Network it is surprising to learn that in addition to the above languages, transmissions are also made in Croatian, Bulgarian, Esperanto, Albanian, Arabic and Romanian.

Eiffel Tower on Long Waves

ALTHOUGH for the purposes of broadcast entertainments the wavelength of the Eiffel Tower has been reduced to 206 metres, certain transmissions are still made on 1,389 metres and 2,650 metres. These channels, however, are solely devoted to time signals or meteorological reports. The former are broadcast on 2,650 metres at B.S.T. 09.26 and 22.26, the latter at 07.45 and 11.50.

Opening of High-power Toulouse Station Delayed

ALTHOUGH for some time statements have been made in the Press to the effect that the new Toulouse P.T.T. transmitter would be brought into operation at the end of April, 1935, a report from Paris states that the plant is far from being ready and that the station may not be working for some months. Commenting on this fact, the French Press adds that although the Ministry of Posts and Telegraphs had promised the new transmitter for the end of April, it did not make it clear in what year this was to take place!

Radio Maroc now 25 Kilowatts

THE French transmitter at Rabat has increased its aerial power, pending the construction of a new station. In Western Europe, however, reception of these transmissions is still rendered difficult by the fact that the channel is so close to those of Vienna and Florence, of which the broadcasts are more frequently heard.

Stand-by for Motala

SHORT tests by the new Swedish high-power transmitter having proved satisfactory, it is now expected that the station will take up its duties within the next week or so. As the power is much greater than that at present being used, broadcasts of the Stockholm programmes should now be regularly received in the United Kingdom.

Short-wave Transmitter for Lisbon

IN addition to the 20-kilowatt transmitter which the National Broadcasting Corporation of Portugal is planning to erect at Lisbon, it is reported that in the course of the year a Catholic station, working on short waves, will be installed in the neighbourhood of Oporto. It is to bear the name Radio Renascenca.

New Polish Relay Station Planned

ANOTHER 10-kilowatt transmitter is to be added to the Polish Network for the relay of the Warsaw programmes. Although its exact site has not yet been fixed it is proposed to install it at Luzk.

Interesting Statistics

FROM information published by the U.I.R., Geneva, it would appear that thirty-three broadcasting associations are now members of this organisation, and that they control a total of 467 transmitters. Although it is an impossible matter to estimate the number of listeners, it is computed that the figure must be around 185,000,000.

Bulgarian High-power Station

THE new transmitter which is to be erected at Sofia in the course of the summer will be another 100-kilowatter, and it is almost a replica of the Vienna Bizamberg station.

Is This Another Record?

INTERNATIONAL interest in the King's Silver Jubilee celebrations was so great that many of the programmes relayed by the B.B.C. were taken not only by the Columbia Broadcasting System and National Broadcasting Company of America for redistribution throughout the States, but also by France, Germany, Holland, Sweden, Denmark, Austria, Finland, Czecho-Slovakia, Egypt and the Argentine Republic. In addition, it may be recalled that the Thanksgiving Service in St. Paul's Cathedral on May 6th, through the medium of the Daventry Empire transmitters and the radio telephone circuits of the G.P.O., was broadcast throughout the Empire.

Summer Time

IN addition to the countries which have already adopted Summer Time, New Zealand also makes an alteration inasmuch as on the first Sunday in September of each year at 2 a.m. the clock is advanced thirty minutes, and remains so until the end of the summer, coinciding with the last Sunday in April. In South America the Argentine is the only State which advances one hour during the summer months.

ROUND the WORLD of WIRELESS (Continued)

"The Village Opera"

THIS is the title of a novel type of programme which will be broadcast on May 24th. J. Michael Diack has selected certain music from Handel and arranged it so as to make an opera. The characters are: Phyllida, Marie Thomson; Daphne, Catherine Mentiplay; Strephon, John Tainsh; Corydon, Andrew Baxter; Sergeant, Neil Forsyth; Chorus of peasants and soldiers, the Scottish Wireless Singers.

"Famous Song Transcriptions"

THE second of the series of programmes "Famous Song Transcriptions" will be given for Western listeners on May 27th, and will contain such favourites as "Berceuse de Jocelyn," by Godard, Schubert's "Ave Maria," the serenade by Richard Strauss, and two songs from Liza Lehmann's ever popular Song Cycle "In a Persian Garden."

New Musical Serial

FOLLOWING closely upon the introduction of the new Russian feature, "The Red Sarafan," comes the Variety Director's new musical serial called "The Mystery of the Seven Cafés," which is a musical thriller written by Holt Marvell and Sydney Horler, the well-known writer of mystery stories. This amusing series will open on June 20th with a prologue lasting fifteen minutes, which will explain in music and words the manner of presentation and the line which this musical mystery will take. The first instalment proper will be June 23rd, and afterwards at approximately fortnightly intervals.

"Dog Days"

A NEW series of Northern talks, entitled "Dog Days," starts on May 23rd. Opening with a talk about dogs in general, the series will subsequently cover specific groups of dogs, such as sporting dogs, terriers, and toy-dogs, all of which will be given by Northern experts.

"The 1935 Evening Follies"

A VARIETY bill on May 29th comes from the Kemble Theatre, Hereford, where Reg. Maddox presents "The 1935 Evening Follies," a combination which has just been engaged for its fourth consecutive season at Llandudno. Leslie Hollwood is the principal comedian.

The "Signposts" Series

"TO Shearsby, Arnesby and Peatling Parva" is the title of the next talk in the "Signposts" series. On May 28th Denis Morris will talk about these three Leicestershire villages. Mr. Morris, who has broadcast before, is the youngest member of the Leicester City Council.

INTERESTING and TOPICAL PARAGRAPHS

Talks on Composers

LESLIE HEWARD begins, on May 30th, a series of talks on composers. His first subject is Dvorak. There will be musical illustrations by the B.B.C. Midland Orchestra, of which he is joint conductor.

New Musical Romantic Tale

MARK LUBBOCK and Denis Freeman are collaborating in the writing of a new musical romantic tale in much the same style as their successful features called "One Night in Venice," "Music at Court," and "Footsteps in the Snow." This new story will be broadcast on May 24th, and the locale is now to be Spain. Denis Freeman, who produces the monthly revues, is writing the book and collaborating with Mark Lubbock in the choice of music, which will be drawn from the works of well-known Spanish composers and will have a romantic flavour to suit the story.

Eights Week at Oxford Broadcast

ON May 29th there will be a half-hour's programme, devised by Owen Reed, giving a radio impression of Eights Week at Oxford. This will be the first occasion when the Mobile Recording Van of the Corporation will have been used in a Midland programme. The Oxford University Boat Club are kindly co-operating, so that the various scenes on the towpath may be recorded. The central idea is to show the development of a crew from the beginning to the final row-past of the boats in Division One.

HOLIDAY RADIO

A "His Master's Voice" portable receiver in use in a Southern Railway camping coach, by means of which holiday-makers can live in the most charming parts of the country and enjoy radio music whenever required.

SOLVE THIS!

PROBLEM No. 140.

Peters built a three-valve set from old parts which he had accumulated, as he intended to give the receiver away as a present. He used the standard detector and two L.F. (one R.C. and one transformer coupled) stages and on testing out found that good results were obtained. After the receiver had been in action for five minutes or so, however, the signal strength dropped suddenly to a very weak value, and in spite of various adjustments no improvement was obtained that evening. On switching on the following day the original signal strength was obtained, but again, after a few minutes it fell to the former weak value. What was wrong? Three books will be awarded for the first three correct solutions opened. Envelopes should be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes should be marked Problem No. 140 in the bottom left-hand corner, and must be posted to reach this office not later than the first post, Monday, May 27th, 1935.

Solution to Problem No. 139.

When Jarrold connected his meter in series with the lead to the cap of the first valve he was forgetting that this cap was not the anode but the control grid. In this respect it differs from the ordinary H.F. valve and consequently his test gave no indication that anything was wrong.

The following three readers successfully solved Problem No. 138 and books will accordingly be forwarded to them in due course: H. Gentry, 41, Essex Road, Acton, London, W.3; I. Haskell, 15, Warren Road, Farncombe, Surrey: F. Oliver, 36, Wenallt Road, Abernant, Aberdare, Glam.

Concert from Foster Hall, Bodmin

A CORNISH concert will be relayed from the Foster Hall, Bodmin, for Western listeners on May 28th, when the artists will be Foster Manley (bass) and the St. Austell Male Voice Choir, conducted by W. Brennand Smith. St. Austell is the capital of the Cornish china-clay industry, and several members of the choir are associated with that industry.

"Queer Fish" Series

CONTINUING the "Queer Fish" series on May 24th, Mr. T. A. Waterhouse will tell Northern listeners about the burbot or eel-pout, an almost extinct fish which is found only in slow-flowing streams, notably the Trent.

Broadcast Version of "Abraham Lincoln"

FOR the Midland Studio performance of the broadcast version of John Drinkwater's famous chronicle-play "Abraham Lincoln," to be given by the Birmingham Repertory Theatre Company on May 26th—as already announced—the producers will be Val Gielgud and Herbert M. Prentice. Mr. Prentice is the producer at the Birmingham Repertory. The adaptation has been made by Marianne Helweg of the B.B.C. London staff. An hour and a quarter has been allotted for the performance.

COMPONENTS

Their Action, Principle & Purpose

Further Details are Given Concerning the Method of Feeding the Low-Frequency Valve, Special Attention Being Devoted to the Auto-Choke. The Pentode is Also Explained by F. PRESTON

LAST week we considered the L.F. transformer used to couple together the detector and low-frequency valves, but we only dealt with the "direct" method of connecting the transformer, where the primary winding is between the detector anode and the H.T.+ supply lead, the secondary being between the grid of the L.F. valve and G.B. negative. It was explained that if the transformer is to prove efficient the primary must have an impedance equal to at least twice the A.C. resistance of the detector valve at average audio frequencies. It is, however, very often difficult to provide a sufficiently high impedance when using the connections referred to above. There are several reasons for this, but the two most important are that the number of primary turns must be limited so as to avoid too high a self-capacity (as explained last week), and that the H.T. current passing through the primary winding tends to reduce the impedance to an appreciable extent.

Resistance Feed

These and other difficulties can be avoided by connecting the transformer on the parallel-feed, or resistance-feed principle, as illustrated in Fig. 2. This is the method which is most commonly employed nowadays, for besides having the advantages mentioned it is generally less expensive, due to the fact that a smaller and cheaper transformer can be used with complete success. It is evident from Fig. 2 that a fixed resistance takes the place of the transformer primary, and one end of this is connected to the transformer through a fixed condenser, marked C.C. (coupling condenser). The fixed resistance is chosen so that it matches the impedance of the detector valve; this is a simple matter because the impedance of a resistance of this nature—especially if it is entirely non-inductive—does not vary according to the frequency of the audio-frequency currents passing through it. The resistance acts

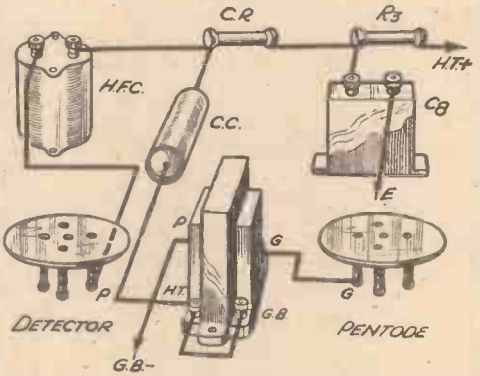

Fig. 3.—When the L.F. transformer is resistance fed and connected as shown here, the step-up ratio obtained is greater than that at which the transformer is rated.

in a very similar manner to the H.F. choke used in the anode circuit of the S.G. valve, and marked H.F.C. in Fig. 1, for it carries the H.T. current to the plate of the valve, and also prevents the alternating currents from passing through it and "leaking" away. The difference is that the resistance operates on low, or audio-frequencies, whereas the choke is used for high, or signal, frequencies only.

Due to the high impedance offered by the resistance the audio currents find it easier to pass through the coupling condenser, C.C., and to the transformer windings. Here the voltage of the audio-frequencies is stepped up exactly as described last week, and applied between the grid and cathode (or filament) of the L.F. valve.

Varying the Step-up Ratio

When the transformer is connected as shown in Fig. 2, the step-up ratio is equivalent to the turns ratio, but it is an easy matter to obtain a variety of different ratios simply by changing over the transformer connections. For example, the connections shown in Fig. 3 provide a greater ratio than those shown in Fig. 2; in point of fact the step-up ratio figure is increased by 1, so that if the transformer is rated at 1 : 5, the ratio obtained is 1 : 6, or if it is rated at 1 : 3, a ratio of 1 : 4 is obtained. In a similar manner the connections can be changed to those shown in Fig. 4, when a lower ratio is provided, this being 5 : 6, or 1 : 1 1/5, for a 1 : 5 transformer, or 3 : 4 for a 1 : 3 transformer.

In the examples given, the transformer acts as an auto-choke, since the two windings are in series and behave precisely as if there was only a single tapped winding. Because of this it is often possible to use a good multi-tapped choke having a total rated inductance of about 80 henries, when a multiplicity of ratios are available, and the most suitable can easily be found by trial in working conditions.

Tone and the Coupling Condenser

The value of the coupling condenser is not critical, but something between .1 and 1 mfd. is generally suitable. It is a fact that the frequency response, or tone of reproduction, can be varied over wide limits by varying the capacity of the condenser and the impedance of that part of the choke which is connected between the grid of the L.F. valve and G.B. negative, and this is a point which it is well to consider. The point is best understood by making reference to the formula given two weeks ago in connection with the grid con-

(Continued overleaf)

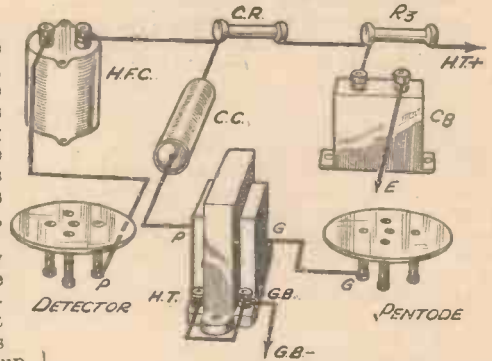

Fig. 2.—Showing the method of resistance feeding the L.F. transformer in a circuit such as that of Fig. 1.

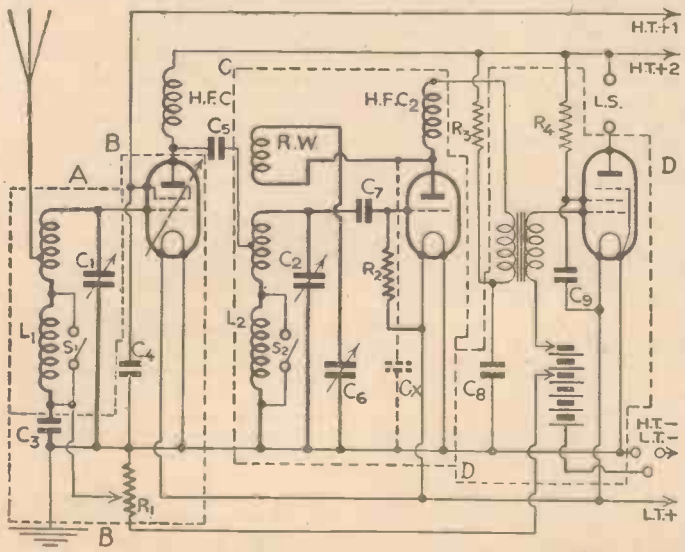

Fig. 1.—The three-valve circuit which is taken as an example. The parts of the receiver dealt with this week are enclosed within the broken lines marked D.

(Continued from previous page)

denser and leak of the detector. For most purposes, however, it will be found that an inductance of 80 henries and a capacity of .1 mfd. are most suitable for a circuit such as that represented by Fig. 5. Increased high-note response can be obtained by increasing the inductance of the choke and reducing the capacity of the condenser, whilst the reverse effect can be produced by increasing the capacity of the condenser and reducing the effective inductance of the choke; that is by connecting the G.B. negative connection to a point "higher-up" the choke.

It will be evident from what was written in the last article of this series that the value of the decoupling resistance will have to be reduced when using the resistance-feed method of connecting the L.F. transformer or choke. Actually, the resistance of the coupling resistance must be subtracted from the calculated value of the decoupling resistance; the D.C. resistance of the transformer primary can be ignored because it is so low by comparison with the value of the resistances.

The Pentode

We must now pass on to the pentode valve itself, although its function is practically the same as was explained in connection with the first valve. The pentode deals only with low-frequency impulses, but it is a voltage amplifier all the same. The screening grid (often referred to as the auxiliary grid) provides the same function as the screening grid of the S.G. or variable-mu valve, and is fed with H.T. through a decoupling resistance and by-passed by a fixed condenser (R.4 and C.9 in Fig. 1). The object of R.4 is the same as that of R.3, which we have previously considered, for it "drops" the H.T. voltage, and also prevents the L.F. currents from modulating the high-tension supply and so causing motor-boating or L.F. instability. In the same way, C.9 carries out a similar function to that of C.8.

The third grid of the pentode is situated between the auxiliary grid and the anode, and is connected inside the valve to one end of the filament. Its purpose is to maintain the degree of amplification afforded by the valve reasonably uniform over a range of applied anode voltages. In other words, the "outer" grid, or suppressor grid, removes the "kink" which appears in the characteristic curve of four-electrode valves.

With regard to the values of R.4 and C.9, it should be stated that these are not usually critical, but 1,000 to 2,000 ohms, and 1 mfd. to 2 mfd. are suitable; the larger capacity should be used with the larger resistance. In any case R.4 should be kept as low as possible consistent with its being able to perform its necessary function, because if it is too high it will limit the voltage applied to the auxiliary grid and thereby reduce the amplification of the valve.

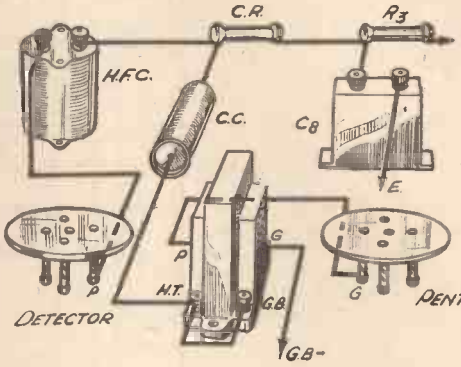

Fig. 4.—When the transformer is connected as shown here the effective ratio is little more than 1 : 1.

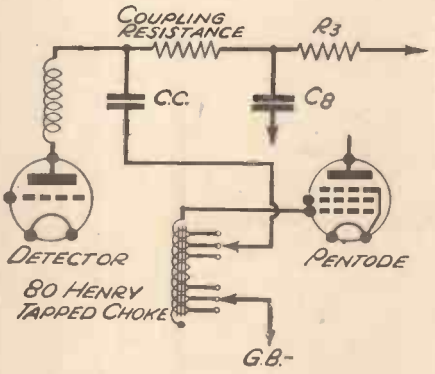

Fig. 5.—Showing how a multi-tapped L.F. choke can be used in place of a normal transformer in a resistance-fed circuit. The tapped choke makes variation in tone and step-up easily possible.

G.B. Voltage Variation

The question of the grid-bias voltage to be applied is our next consideration, and is dependent entirely upon the particular valve employed. As an example of this it might be mentioned that the Cossor 230 P.T. (a power pentode) requires a G.B. voltage of 15, whilst the Cossor 220 H.P.T. (an "economy" pentode) requires only 4.5 volts—in both cases assuming anode and screen voltages of about 150. No matter what valve is employed, however, it is best to apply the greatest value of G.B. with which good reproduction can be obtained. The reason is that the anode-current consumption is reduced as the G.B. voltage is increased. If the voltage is increased too much, however, the amplification of the valve is reduced and reproduction becomes "thin" and "screechy." On the other hand, if the voltage is too low, distortion takes place on loud passages of speech or music. The best method is to adjust the G.B. voltage to the highest figure stated on the makers' instruction sheet, and then to reduce it in 1½-volt steps until the most suitable value is found. It may appear that the makers' figures must always be correct, and thus that no deviation from it should be made. In almost every instance the figure *is* correct, but it applies only when the maximum anode voltage of 150 is applied to the valve, and in practice this is seldom done. For one thing it is usual to employ an H.T. battery of 120 volts, and additionally there is always a "drop" across the loud-speaker windings or across the transformer which is used to feed it.

Safety First

It is important that the H.T. supply should be disconnected before attempting to change the G.B. voltage; the reason for this is that a current "surge" takes place when the grid circuit is broken (as it is when the G.B. lead is removed) and this may be sufficient to damage the valve.

We are not going fully into the matter of choosing a suitable valve for the output stage, because this was done thoroughly in the recent series of articles entitled "Valve Types and Uses."

Next week we will discuss the method of feeding the loud-speaker and of compensating for the high-note accentuation which is always provided by a pentode, and which sometimes tends to make reproduction unpleasantly high pitched and therefore deficient in bass.

PROGRAMME NOTES

Langwith Colliery Band

ONE of the youngest brass bands in the country, judged by the age of its members, is that of Langwith Colliery, near Mansfield, which will have its first broadcast on May 27th. The average age of the players, all of whom are employed at the colliery, is only twenty-three. The band was founded over forty years ago and has won many trophies at Festivals. Albert S. Grant, its conductor, is often called upon to adjudicate at brass band contests.

"The Partners"

THE play, "The Partners," which is to be relayed from the Winter Gardens, New Brighton, for Northern listeners on May 24th, was first presented at the same theatre fifteen years ago. The author was a young man named Vincent Douglass, son of the manager of the theatre. He died in 1927, shortly after the first broadcast of the play. Wilfred Shine, how played the lead in the original performance, will take the same part in the forthcoming broadcast; and his son, Billy Shine, who took a small boy's part in the original show, is now grown-up, and will play the juvenile lead. Hannah Watt, Malcolm Tearle, and Lionel Gladstone will also be in the cast.

Royal Command Concert

SIR WALFORD DAVIES has received the Royal command to organise a concert of British music on May 24th, and this will take place in the Royal Albert Hall. Their Majesties the King and Queen will honour the performance with their presence, and the concert will be broadcast. The programme will be representative of British music from Elizabethan times to the present day and will be performed by an orchestra of two hundred instrumentalists and a massed chorus of more than a thousand. The various items will be conducted by leading British conductors, and famous British artists will appear as soloists. This will be one of the British concert world's contributions to the artistic side of the Jubilee celebrations.

Promenade Concerts, 1935

ACCORDING to a recent B.B.C. announcement the Promenade Concerts at Queen's Hall will begin on Saturday, August 10, and will run for eight weeks, finishing on Saturday, October 5. This will be the forty-first summer season under the conductorship of Sir Henry Wood, and the ninth under the auspices of the B.B.C.

The Experimenters Explain—

This Week the Subject is Automatic Volume Control, and Simple Methods of Adding This to Popular Published Receiver Designs are Described

AUTOMATIC volume control has been a popular topic with wireless enthusiasts of all kinds for a couple of years or more, and it is interesting to consider the advantages and disadvantages which it provides. About two years ago the marvellous benefits of A.V.C. were shouted from the housetops, as it were, and so keen were we then on the new idea that we were likely to overlook the disadvantages and to want to fit A.V.C. at all costs. We were told that automatic volume control would once and for all eliminate the constant bugbear to long-distance reception, fading, that it would thereby prevent distortion which is often experienced when listening to a distant station, and that it would help to give a quiet background.

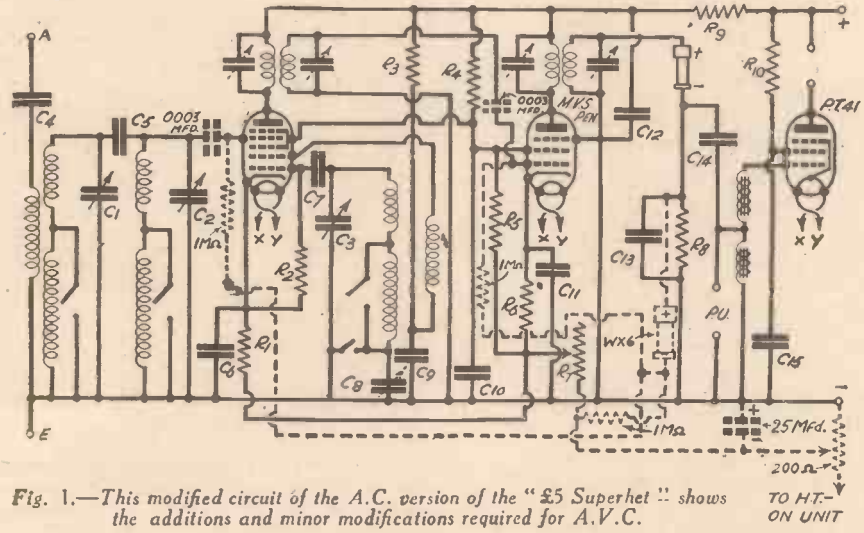

Fig. 1.—This modified circuit of the A.C. version of the "£5 Superhet" shows the additions and minor modifications required for A.V.C.

Disadvantages

It was proved that, *properly applied to the right type of receiver*, it actually would do all these things, but it was also found that it was always likely to *increase* background noises between the tuning positions of different stations, and that, although it prevented fading it gave an equally bad effect because when the signals should, normally, have faded various forms of hisses and crackles were heard as well as the music. It seemed, then, that in many ways the cure was as bad as the original complaint. The position was not quite so bad as that, however, and it was soon found that, so long as we did not expect the impossible, and provided that the A.V.C. system was correctly fitted in a suitable receiver, there were many real advantages which were not offset by corresponding disadvantages.

Many readers, realising this, have often written to ask why A.V.C. was not made a standard fitting on every PRACTICAL AND AMATEUR WIRELESS receiver. That question is answered by the foregoing paragraphs—it is not every receiver that lends itself to the application of a useful measure of A.V.C. In addition to this, we are very well aware that the majority of readers always favour the simplest possible design, devoid of all "frills" and fitments which are not absolutely essential. This is very well borne out by the figures we have been able to compile with regard to the numbers of various published designs which have been built by readers; the simpler the set, the greater the number which has been built.

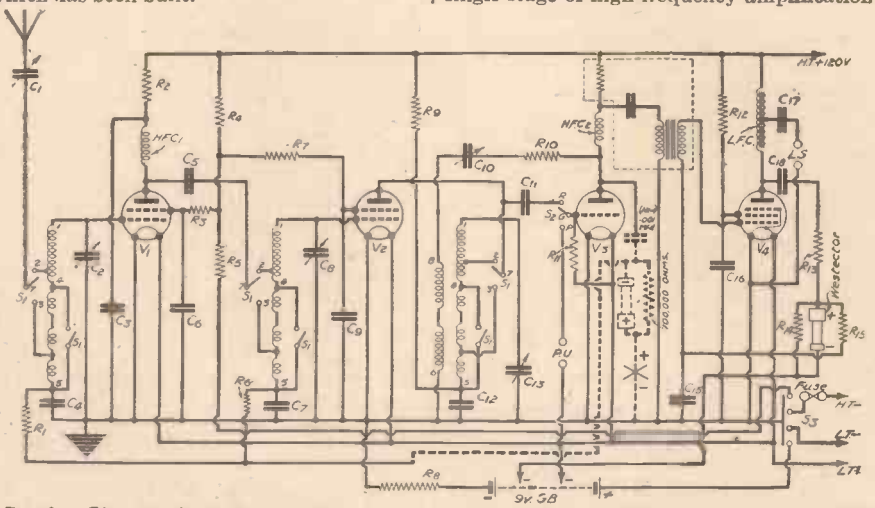

Fig. 2.—Showing the simple alterations required in adding A.V.C. to the "Fury Four Super."

For the benefit of those who have built a PRACTICAL WIRELESS receiver, and who wish to add A.V.C. we shall deal in this article with the methods to be followed in dealing with a few of the more popular receivers. It will, obviously, be impossible to deal with every one, but sufficient will be written to enable owners of sets other than those described to understand how to carry out the modification.

Suitable Receivers for A.V.C.

In the first place it is necessary to decide what type of receiver is suitable for the inclusion of an A.V.C. circuit, for there are frequent inquiries from those who have built such receivers as the "Selectone," the "Sixty-Shilling Three," or the "Hall-Mark Cadet," and who wish to incorporate A.V.C. so as to reduce fading on certain European stations. We must say at once and with emphasis that A.V.C. cannot possibly be added to such sets. The reason is that all three are of the detector-L.F. type, whilst A.V.C. functions by virtue of the fact that a portion of the signal voltage supplied to the detector is used as bias for a variable-mu H.F. stage, so that the bias is increased as signal strength increases. This means that the degree of amplification afforded by the H.F. amplifier is reduced on stronger signals and increased on those which are comparatively weak.

H.F. Essential

From this it is evident that at least a single stage of high-frequency amplification

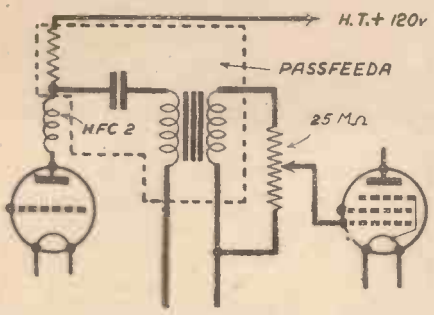

Fig. 3.—This circuit shows how an L.F. volume control can be added to the "Fury Four Super."

is essential if A.V.C. is to be used. Even when there is one H.F. valve the degree of A.V.C. obtained is not great, since the variation in G.B. voltage is not sufficient to alter the amount of amplification to the necessary extent. When two variable-mu high-frequency stages are incorporated in the receiver, however, a useful automatic volume control action can be secured. Even then the control is not generally so good on medium as on long waves; this is because the process of rectification (when using a metal rectifier, such as is fitted in the various A.V.C. units) is not so efficient on the higher frequencies.

A.V.C. and the "£5 Superhet"

A.V.C. is most effective in the case of a superhet, and the popular "£5 Superhet" lends itself remarkably well to the modification. We will, therefore, consider this circuit first of all. A simple and fairly effective method of adding A.V.C. to the battery model was described in the issue of PRACTICAL WIRELESS dated November 17th, 1934, but another method—in this case in respect of the A.C. model—is shown in Fig. 1. This is more effective, partly because of the greater amplification afforded by the A.C. valves, and partly because the control is of the *delayed* kind. It will be seen that an additional Westector, type W.X.6, is used for A.V. control, the normal Westector acting as second detector just the same as in the original circuit. A grid condenser is inserted in the grid circuit of both the pentagrid and the H.F. pentode, a grid leak being taken from each grid to the negative end of the Westector. The "earth" end of the manual volume control potentiometer, R.7, is connected to one end of a 1-megohm grid leak joined between the negative end of the Westector and the slider of a 200-ohm potentiometer joined between the "earth" line and H.T. negative, whilst the latter potentiometer is by-passed by a 25-mfd. (about 25-volt working), electrolytic condenser.

The Delay Voltage

With these altered connections the manual volume control acts exactly as before, A.V.C. is provided by the second Westector, and the "delay" voltage is developed across the 200-ohm potentiometer. By altering the setting of the 200-ohm potentiometer the "delay" voltage can be adjusted to suit prevailing conditions. The object of delayed A.V.C. is to prevent the controlling voltage from being applied to the grid of the variable-mu valves until a definite value of signal strength has been reached. Thus, the delay voltage neutralises the A.V.C. voltage on weak signals, thus preventing the sensitivity of the receiver being lost when it is most required.

The "Fury Four Super"

A popular "straight" receiver to which A.V.C. can usefully be applied is the "1934 Fury Four Super," and the connections required are shown in Fig. 2. In this case the manual volume control is dispensed with, and the lead which was previously connected to the slider is taken to the negative end of a Westector wired in the anode-filament circuit of the detector. The change-over in this instance is particularly simple, and the alteration can be effected in a few minutes. All that is necessary is to remove the by-pass condenser C.14, connect one terminal of a .001-mfd. fixed condenser to the anode terminal of the detector valve-holder, join the second terminal of this to the negative terminal of the Westector and to the lead which previously went to the potentiometer slider, join the positive terminal of the Westector to earth, and connect a 100,000-ohm fixed resistance in parallel with the Westector. After the alteration the set can be used exactly as before, but without the H.F. volume control. Some form of volume control will be required, and this can be fitted in the L.F. circuit by connecting a .25-megohm potentiometer in parallel with the secondary winding of the Passfeeda transformer, and connecting the grid lead from the output pentode to the slider of this instead of to the grid terminal on the Passfeeda; the connections are shown in Fig. 3. It might be considered desirable to provide delayed A.V.C., in which case a 4½-volt G.B. battery can be inserted between the positive terminal of the Westector and earth at the point indicated by a cross in Fig. 2.

A simple system of adding A.V.C. to the "A.C. Fury Four Super" is illustrated in Fig. 4, which is similar to that illustrated for the battery model, with the exceptions that the control voltage is applied to the grids of the variable-mu valves through 1-megohm grid leaks, and the manual control is not disturbed.

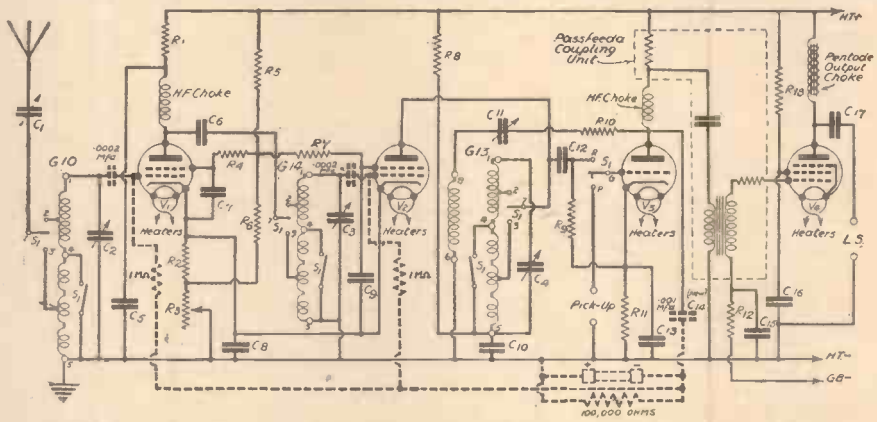

Fig. 4.—The simple alterations required when adding A.V.C. to the "A.C. Fury Four Super" are shown here.

The Simple Three-Valver

There may be a number of readers who would like to fit A.V.C. to receivers such as the "Hall-Mark Battery Three." It should be made perfectly clear that the A.V.C. action will be by no means complete, due to the fact that only a single variable-mu stage is provided, but a reasonable control can be provided which will, at least, be sufficient to prevent overloading when listening to the more powerful transmissions. The control will also have some effect in reducing fading, although not eliminating this trouble completely. The connections required for the few A.V.C. components are shown in Fig. 5, where it will be seen that a Westector is again used, and the connection from the "earth" terminal at the aerial coil is broken, a .1 mfd. condenser being used in its place. An L.F. volume control can be provided in exactly the same manner as was described in respect of the "Fury Four Super," and illustrated in Fig. 3.

We have refrained from describing modifications entailing the use of double-diode triode and similar valves, because these nearly always make it necessary to design the complete circuit around them.

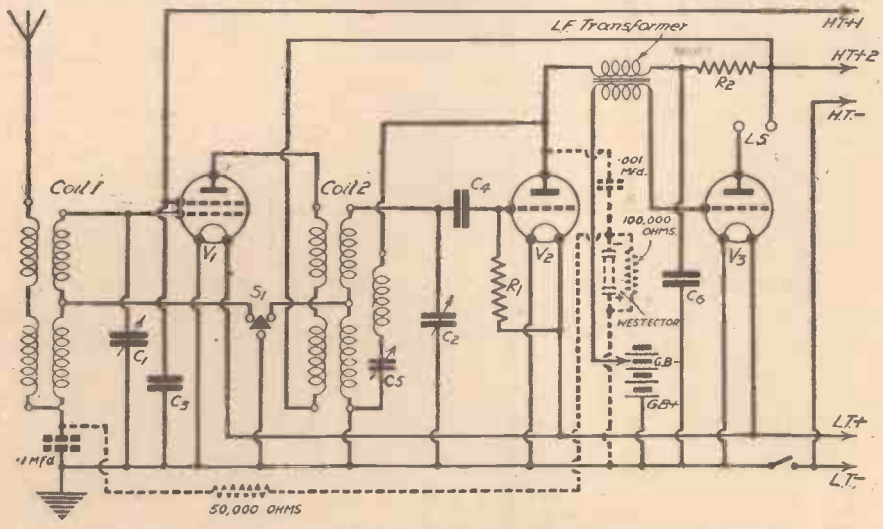

Fig. 5.—This revised circuit shows the few extra connections required when adding A.V.C. to the "Hall-Mark Three" battery model.

Distortionless Volume Controls

Various Methods of Arranging a Volume Control so that Quality is Preserved at All Settings

By G. V. COLLE

IT would be difficult to imagine a modern radio receiver without a volume control, and perhaps even more impossible to visualise the use to which it is put with respect to its setting for sound output in the hands of each listener. The pre-detector control is not used nowadays to any large extent, as it has been replaced by automatic methods, fed from the D.C. voltage component of a diode detector. The delayed automatic system is truly distortionless, because it in no way modifies the characteristics of the tuned H.F. or L.F. circuits. Furthermore, the signal input to the detector is so arranged that on strong signals it restricts the input voltage to an acceptable amount to prevent overloading, and on the other hand will provide sufficient voltage to give linear rectification.

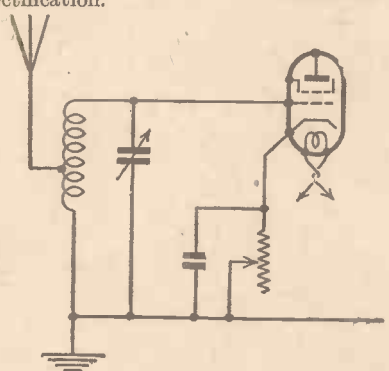

Fig. 1.—The simplest form of H.F. volume control.

A manual pre-detector control for regulating the grid bias to a variable-mu H.F. or pentode valve (see Fig. 1) is not exactly free from criticism on this score, unless linked up with the aerial circuit as in Fig. 2, in which case an increase in grid bias for lower magnification will result in a lower aerial input voltage to avoid cross modulation in the valve. Assuming that the H.F. valve will accept the largest available signal, the improved control shown in Fig. 2, unless operated judiciously, will result in too small a signal to the detector, with consequent distortion.

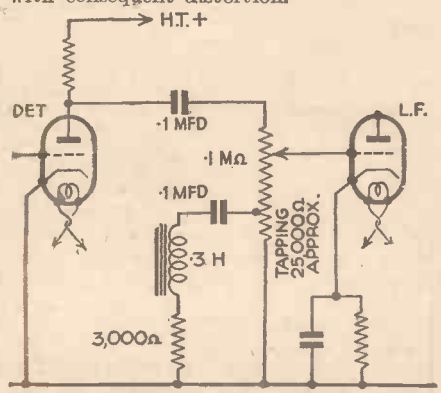

Fig. 4.—A tone-compensated volume control.

L.F. Controls

Now turn to Fig. 3 and examine the circuit of a conventional volume control. The arrangement shown is typical of the majority of home-built sets, and undoubtedly proves serviceable. At absolute maximum and minimum positions the scheme is entirely free from technical criticism, but this does not apply to intermediate positions of the slider. The complete resistance element is across the source of potential (the signal) and offers a fixed impedance path. Another impedance path exists between the grid of the valve and the filament circuit—such as provided by a grid leak. Yet this second path is varied while the first remains fixed, so the input characteristic of the L.F. valve is modified with volume. Any constructor who has tried the effect of changing the value of a

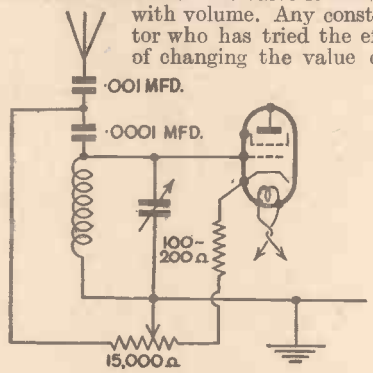

Fig. 2.—An improvement on Fig. 1—which will give much better control of volume.

grid leak in a "quality" amplifier will know that the combination of a defined condenser capacity with different grid leak values results in uneven amplification. On some sets the effect becomes more marked the lower the setting of the control, as the loud-speaker frequency response becomes irregular.

A number of commercial sets now incorporate the special frequency boosting devices shown in Figs. 4 and 5 to obviate the defects mentioned, but nevertheless the obvious course is to provide equal impedance paths as in Fig. 6. For the

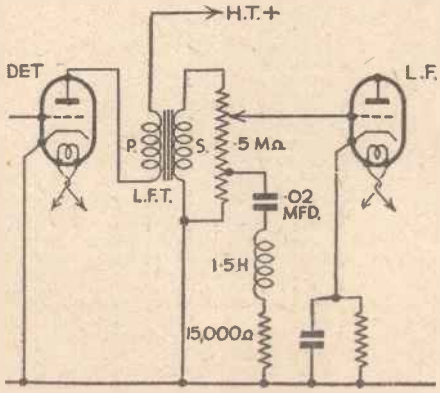

Fig. 5.—Transformer coupling with tone-compensated control.

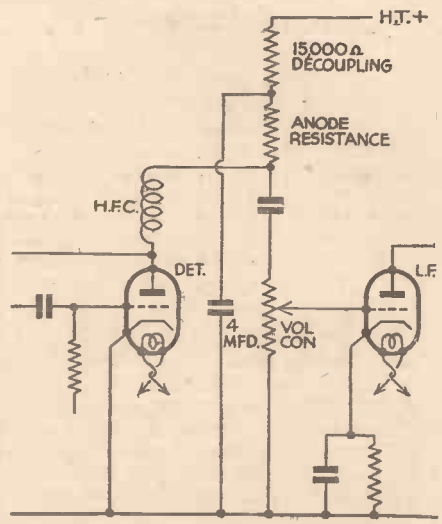

Fig. 3.—The simplest form of L.F. volume control.

reason that the provision of the compensating impedance network in Fig. 6 reduces the maximum volume obtainable, the system has not become so popular as its technical merits deserve. It is not essential that the home constructor should build an amplifying system giving an output which assumes the maximum, and if one allows for, say, 40 per cent. loss over the normal predicted output, then it is possible to provide for the scheme in Fig. 6 and so derive the benefit of a system which has everything to recommend it.

The B.B.C. stations employ control and fade-out panels which provide even attenuation of programmes with proper impedance matching, and a careful listener with a good set will note that little loss of quality results from the gradual decreasing volume until the fade-out. A further distortionless volume control which is not so well known

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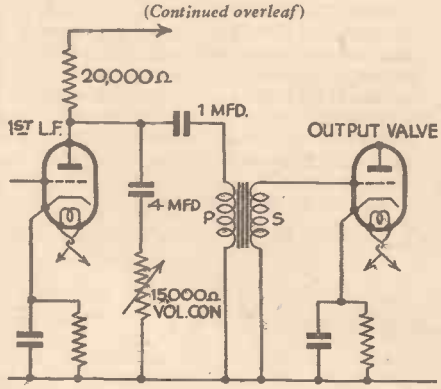


Fig. 7.—This scheme enables remote control to be used.

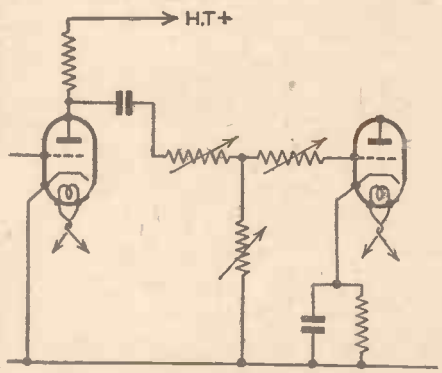


Fig. 6.—A little known tone-control arrangement.

DISTORTIONLESS VOLUME CONTROLS

(*Continued from previous page*)

is illustrated in Fig. 7, and it is a notable point that the scheme is readily adaptable to remote adjustment.

By means of a jack, the extension control can be disconnected and a similar control in the set automatically brought into use. It may prove desirable to modify the value of the condenser and variable resistance according to the valve and anode resistance employed.

Avoiding Hum

There is a type of hum sometimes experienced with grid connected volume controls as in Fig. 3, which manifests itself when the slider is half-way round the resistance element. One is tempted to diagnose the hum as being due to a faulty or open-circuited resistance element, or a break in the slider contact, and yet a test with suitable instruments disproves this theory. Recent investigations have led to the belief that the trouble may be due to a certain operating state of the associated valve. It is suggested that where the hum is experienced, steps should be taken to try a new valve, or modify the value of the anode resistance. A low-capacity screened grid lead to the control can also be tried, as induction or capacity effects of stray A.C. fields or nearby leads cannot be overlooked.

THE NEW PRONUNCIATION

ACCORDING to a B.B.C. announcement the latest recommendations of its Advisory Committee on Spoken English are as given in the accompanying table.

Professor A. Lloyd James, Secretary of the Committee, in discussing these recommendations, states that:—

"The Committee owes Professor Wyld a debt of gratitude for enlivening their meeting by asking a riddle: What letter made Queen Elizabeth mind her p's and q's? The answer, of course, is the Armada; which is not only a good pun, but evidence that the pronunciation 'armáyda' is respectably old. A canvas of modern historians, however, reveals that they, at any rate, favour the version 'armáada,' and it would be interesting to know what views readers of *The Radio Times* hold on this point. A similar case is the word Huguenot, which some pronounce as in French, while others pronounce with the 't' audible. Here again the historians consulted favour the French version. The Committee, however, have provisionally decided on 'hewguenott.' They would be glad of opinions and information on both these words from interested readers.

"'Marylebone' is a great puzzle. The modern version used by busmen and railwaymen appears to be 'márlibŏn,' which is regarded by all good Londoners as something to be really ashamed of. Some adopt the rather fussy version 'márrilibŏn,' but find it difficult to fit in the four syllables, and generally crash. The historic and unimpeachable version is 'márribŏn,' and the Committee has decided to recommend it.

"Televiewer"

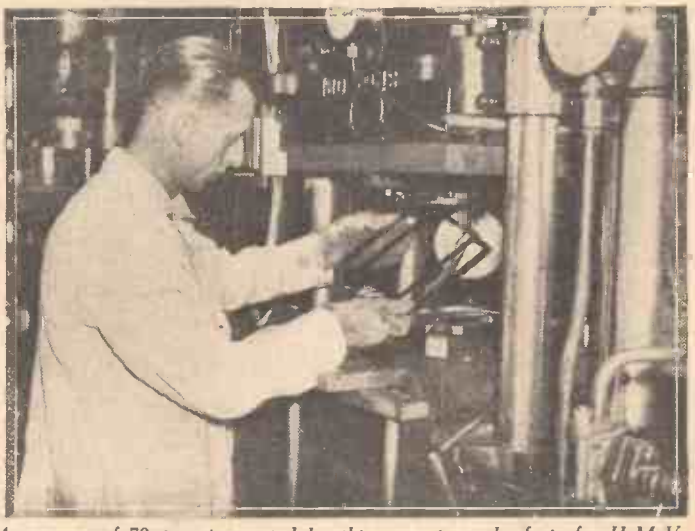
"The problem of finding a suitable name for the person who receives a broadcast television programme is one that has given the daily Press much exercise; the coining of new words does not strictly come under the jurisdiction of the Spoken English Committee, but in this case the Corporation has asked the Committee for its blessing upon the suggested word 'televiewer,' which it is hoped will rapidly learn to disguise its mongrel origin by shedding the prefix and showing itself to the world as 'viewer.' Some name has to be found, and 'viewer' will serve for the present. It is not unlikely, however, that the man-in-the-street, with his customary genius for the *mot juste*, will hit upon the word that will finally be accepted into the language. Here is a good chance for the Reading Listener or the Listening Reader to help us to decide what name shall be given to those who look as well as listen."

Advisory Committee

The Advisory Committee on Spoken English makes recommendations primarily for the benefit of announcers, to secure some measure of uniformity in the pronunciation of broadcast English and to provide announcers with some degree of protection against the criticism to which they are, from the nature of their work, peculiarly liable. It is not suggested that these pronunciations are the only "right" ones and it is not suggested that any special degree of authority attaches to these recommendations.

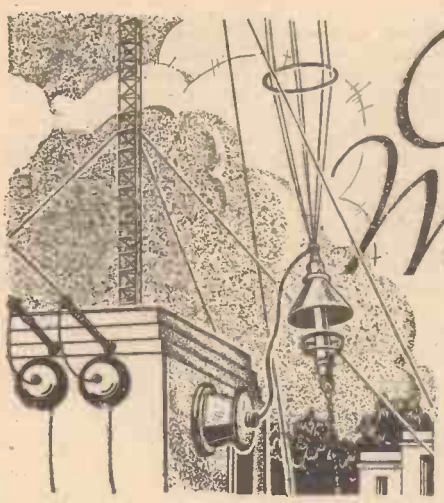
The Committee, under the Chairmanship of Mr. George Bernard Shaw, consists of Professor Lascelles Abercrombie; Lady Cynthia Asquith; Lord David Cecil; Kenneth Clark; Sir Johnston Forbes-Robertson; Professor George Gordon; Professor H. J. C. Grierson; Professor Daniel Jones; Professor A. Lloyd James; F. L. Lucas; P. H. B. Lyon; Rose Macaulay; Edward Marsh; Harold Orton; S. K. Ratcliffe; I. A. Richards; Logan Pearsall Smith; Professor H. K. C. Wyld; Mr. Kenneth Barnes; Rev. H. Costley-White; Dr. W. W. Greg; and Mr. W. B. Maxwell.

STAMPING RADIOGRAM FRETS

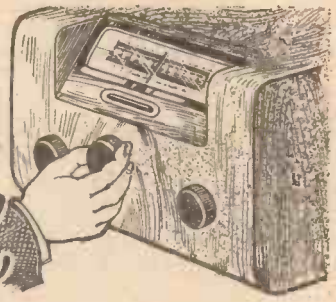


A pressure of 70 tons is exerted by this press to make frets for H.M.V. radio receivers and radio gramophones at the "His Master's Voice" factories at Hayes, Middlesex.

WORD.	PRONUNCIATION.
Almanack	Áwlmănack
Ambivalent	Ámbiváylĕnt
Apposite	Appŏzit
Authoritative	Awthórritătiv
Aviation	Ayviáyshŏn
Bakelite	Báykĕlite
Bathos	Báythoss
Boor	Bŏŏer
Boycott	Verb: Bóycŏt Noun: Bóycŏt
Breakdown	Bréakdown
Bureaucracy	Bewrócrăcy
Charabanc	As in French
Civilisation	Civilizáyshŏn
Connoisseur	Connisér (last syllable rhymes with "fur")
Cotoneaster	Cottōniáster
Crabbed	Adj.: Crábbid Verb: Crabd
Debouch	Geographical: Dĕbówtch Military: Dĕbówtch
Defect (noun)	Dēfect
Employee	Emplóyee
Extol	Extóll
Gallant	Noun (man of fashion): Gállănt (ladies' man): Gălánt Adj. (brave, etc.): Gállănt (amorous, etc.): Gălánt
Heinous	Háynŭs
Hosiery	Hŏzhĕry
Ideology	Ídeólŭjy
Itinerary	Ítinnĕrăry
Landscape	Lánskip
Longeron	Lónjerŏn
Lunatic	Loónătic
Matriarch	Máytriark
Matricide	Máytricide
Matrix	Máytrix
Mosquito	Mŏskéetō
Necessary	Nécĕssăry
Nonce	Nonss
Orchestra	Órkĕstră
Polygamy	Polliggămy
Poteen, Potheen	Pŏtchéen
Prebendary	Prébbĕndăry
Quinine	Kwinyúeen
Rococo	Rōcōcō
Salicylate	Sălissillayt
Salicylic	Sallissillic
Salute	Verb: Sălóot Noun: Sălóot
Scaramouch	Scárrămowtch
Siderite	Síderite
Sponsor	Spónsŏr
Stern (nautical)	Sturn
Studdingsail	Stúnsle
Superfluity	Sewperflóoity
Superfluous	Sewpérflōŏŭs
Symposium	Simpōziŭm
Tabard	Tábbărd
Troche	Trōsh
Venison	Vénz'n
Vertigo	Vértiggō
Vicissitude	Vicissitewd
Wednesday	Wénsdy
Xylophone	Zíllŏphōne
Zenith	Zénnith
PROPER NAMES	
Armada	Armáydă
Boer	Bŏer
Capuchin	Cáppewtchin
Colombia	Cŏlómbiă
Colombo	Cŏlómbō
February	Fébbrŏŭry
Hosier (Surname)	Hŏzier
Huguenot	Héwguenott
January	Jánnewăry
Londonderry	(Lord): Lúndŏndry (place): Lúndŏndĕrry
NAMES OF STREETS, ETC.	
Mall (The)	Mal
Marylebone (Road Church, etc.)	Márribŏn
Pall Mall	Pĕll Mĕll



On Your Wavelength



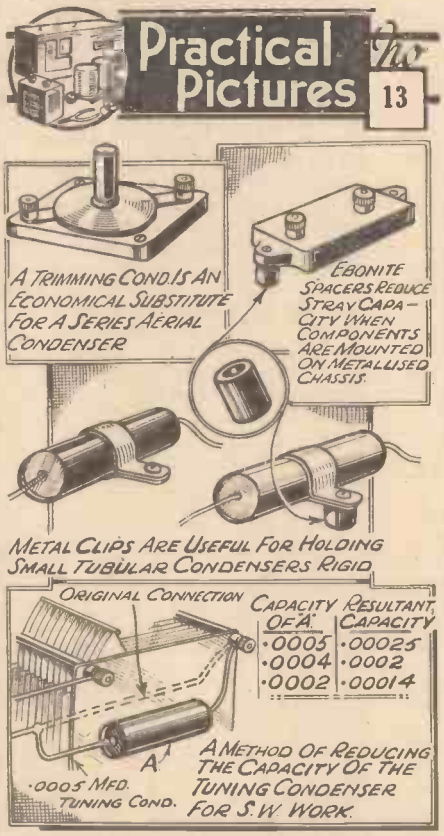
By Thermion

Tap Dancing by Noises Off

THERE is one aspect of broadcasting which I think could well be produced by the "Noises Off" department. I refer to tap dancing. The real pleasure of the rhythm of the human digits is in seeing them. Merely listening to them detracts from the pleasure because you are able to discern any slight "raggedness" or misfires on the part of the tap dancers. The Dancing Daughters who form parts of popular broadcast fare do not, I think, come over particularly well, and since other effects are produced artificially I think that this should be included. There is no need to employ a crowd when the effect of rapturous applause is required. A few feet of Blattnerphone tape produces the required results. I am equally certain that a mechanical device could reproduce tap dancing with greater accuracy than the human toes. I agree that when television arrives it will be far better to see them, but for ordinary listening purposes it seems to me a waste of good talent.

Who Will Buy Me a New Hat?

HEREWITH a letter I have received from B. G. W. (Worthing). "Dear Thermion, since I became a radio enthusiast nine years ago I have read your late rival *Amateur Wireless* and PRACTICAL WIRELESS together with a number of other radio journals. The combined journal PRACTICAL AND AMATEUR WIRELESS only survives; I have dropped all the others. If I tell you why, please do not send me the bill for your next hat. Well! I just weighed you all up in my financial balances and I let the others drop in favour of 'P. and A.W.' *and* Thermion. Times out of number I have thought of sending you a line of appreciation, but let it slip, thinking you must surely have a surfeit of them. Your recent paragraphs anent crooners, dance bands, etc., has been the deciding factor. Your defence of amateur constructors also interested me. I made the original Century Super (wonderful set, that), and I wonder why I parted company with it. Two of my friends managed to build it, and I still have a soft spot for it. It was selectivity personified and left my present set as an also ran. More power to your elbow and pen for your bold paragraphs on what are termed dance bands. Those responsible for them do not know the difference between dancing and squirming; they make me do the latter. I am a garage hand. For dinner I nearly always get dance records, for tea dance bands, at night I get another dose as a purgative to retire on, but I get my 10s. worth. Leslie Jefferys, for example, were he, instead of being a musician, a dance band fanatic, I suppose he would abbreviate his Christian name and make it 'Les'. Do you live as you write—in partial obscurity? For daring to write as you did, I wonder you did not get your windows broken, to say the least. Larry the Lamb sopranos, horse-neighing tenors are taboo with me. Now for a bite of supper, which I will swill down with a glass of nut-brown ale with which I will drink to the health of Thermion who can write sense and at the same time give dance bands a kick in the pants."



Nice, indeed, of this reader to write to me in this strain. It is true that I am compelled to write and live in obscurity, and I do not think anyone inside the radio trade or out of it has ever successfully pierced the identity enshrouded by my pseudonym of "Thermion." But I do not fear the risk, in spite of this, of anyone breaking my windows! People who live in glass houses cannot throw stones at my domicile. Just in case someone is minded to do so let them note that I turn the scale at 12 st. 6 lbs., am good at sprinting up to a quarter of a mile, and can use 'em a bit.

Wet Electrolytics

A WORD of warning concerning the incorrect use of components should be unnecessary in these enlightened days, but even I tripped sadly recently when testing a commercial chassis. This was fitted with three or four electrolytic condensers, and some of these were of the "wet" type. As is usual with commercial chassis, many of the components were underneath and in most inaccessible positions, and as no signals of any kind could be heard on the set it was necessary to take various meter tests. Accordingly the chassis was stood on its edge on a table, with both top and bottom accessible, and was switched on ready for the necessary testing procedure. After one or two measurements had been taken I was standing with the set between me and a window, when I was surprised to see what I at first took to be a thin beam of light oscillating in time with some music. I couldn't hear any signal, but as I placed my head in a certain position this fine ray of light was seen to be dancing in quite a weird manner, and I stood for a moment watching it and wondering whence it came. Although I thought of an emission from an anode passing through a small gap in the gettering, the valves were not in the right position, and I could not, for a time, find the source. When I did, I rapidly switched off the set, and muttered a silent curse against manufacturers in general. What I had taken to be a stream of light was actually a fine jet of liquid, and it was emerging from one of the small holes in the top of a wet electrolytic condenser. The metal edge of the chassis was sufficiently thin to permit the chassis to waver, and this slight movement was being imparted to the stream of liquid. The test was not being carried out in a workshop, but in a living-room, and the jet was reaching the wall, with the result that traced across the wallpaper was a most interesting pattern of grease, with a steady trickle down to the floor. I got most of it off, but, of course, a lesson had been learned.

Changing Valves

A SHORT article recently appeared in these pages concerning the age of valves, and I was interested to see there explained a point concerning the changing round of valves when one is thought to be defective. In the old days this was a common procedure when a set failed to work, and it was often found that one valve would work in one stage but not in another. In a modern set, of course, this changing about is not so simple, but a three-electrode valve may be used in a detector or L.F. stage, whilst an S.G. valve may be plugged into a stage wired normally for a three-electrode valve and will work. In this case, of course, the screening grid is functioning as an anode, and although it will not be highly efficient it will work and give an indication if the original three-electrode

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valve is defective. The point stressed in the article in question is best illustrated by the small sketch below. It will be seen that

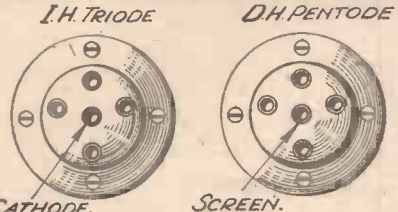


Diagram illustrating Thermion's reference to value changing.

the ordinary five-pin valve-holder is in use, and that a mains (A.C.) receiver is referred to. If the output stage is wired for a directly-heated pentode, the centre socket will be joined to a point about 150 to 250 volts above earth potential. An ordinary triode is wired with its cathode joined to the centre pin, and in an ordinary L.F. stage this cathode is intended to be given a small positive potential. As a detector, of course, it may even be at zero. If a valve of this type is plugged into the holder shown on the right it will be seen at once that the cathode is provided with a very high positive potential, and the valve will probably be immediately ruined. It is these little points which trip up the unwary, and when experimenting great care should be taken before making changes of any description.

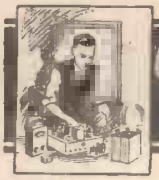
Check the Components

HOW often is it that a finished home-constructed receiver fails to give the expected results simply because of a minor defect in one of the components? In writing this I have no intention of casting any reflection on component manufacturers who, as a whole, turn out really good stuff, but there is always the possibility of damage being done while the parts are in transit or being handled by the retailer. Added to this there is the chance that a component may be dropped or otherwise damaged during the process of construction. Because of these things I always make a practice of giving all parts a "once-over" before commencing constructional work. I do not mean that accurate measurements are applied to every item, but that tests for continuity and resistance are made, and I would strongly recommend readers to do the same. You only need a battery and a pair of 'phones or speaker to apply sufficiently-accurate tests to the average components.

Such items as coils, L.F. transformers, and chokes can easily suffer damage due to one of the fine wire leads to a terminal being fractured—probably because it was knocked by another component. This does not, of course, always apply, since many manufacturers arrange the connections in such a manner that they are well protected, but even then there are other possibilities of damage being done. Another very small, but nevertheless important point concerns the terminals of components such as valve-holders; they are always liable to work loose, with a result that they do not make proper contact with the metal tag to which they are attached. For this reason it is well to run over the parts with a screwdriver and a small spanner to ensure that such faults do not exist.

Reflex Circuits Again

MANY readers who have been in the wireless game for ten years or more will have clear recollections of the old reflex circuits which were so popular between about 1923 and 1926, and will remember the excellent results which some of these yielded. The reflex arrangement fell out of favour principally, I think, because valves became cheaper and required a smaller amount of L.T. current. In addition, however, the matter of better quality reproduction was a deciding factor, for it was found that reproduction was seldom quite so good with a reflex as with a "straight" circuit. But I have recently come to the conclusion that the reflex arrangement is worthy of revival, and my experiments indicate that modern pentodes (both L.F. and H.F. types) function remarkably well as combined high- and low-frequency amplifiers. I can strongly recommend those experimenters who have not used a reflex arrangement for a number of years to give it a thorough trial with present-day valves and components; I have no doubt that they will find that good reproduction is now possible, and they will probably be rather amazed to find that excellent reception can be obtained with a two-valve reflexed superheterodyne arrangement. Those who are interested will find a suitable experimental circuit for a short-waver on page 368 of PRACTICAL AND AMATEUR WIRELESS dated November 24th, 1934. This circuit can, of course, be modified for use on the broadcast bands by using appropriate coils and tuning condensers, and by using a frequency-changer in place of the autodyne H.F. pentode used in the first stage.



Notes from the Test Bench

Short-wave Superhets

TESTS we have recently conducted with pentagrid valves indicate that these provide efficient frequency changing in short-wave receivers, provided that they are used in conjunction with suitable coils. A well-designed superhet incorporating a pentagrid, one I.F. stage, and an efficient L.F. stage can be relied upon for world-wide telephony reception. Unfortunately, there does not seem to be a two-gang condenser specially designed for short-wave reception available yet, but the necessary difference in frequency between the oscillator and H.F. stage can easily be obtained by using a straight two-gang condenser in conjunction with a small variable trimmer connected in parallel across the aerial section. With an intermediate frequency of 150 kc/s very slight movement of the trimmer will be necessary, but if a higher I.F. is used (*e.g.*, 465 kc/s) a greater movement of the trimmer will have to be effected, but even then a trimmer having a maximum capacity of 40 m.mfd. should prove adequate.

C.W. Reception

THE normal superhet receiver cannot pick up continuous-wave transmissions, and therefore it is not as popular as the straight receiver, as the majority of short-wave listeners take an interest in the reception of morse. It is possible, however, to convert the superhet for C.W. reception by purposely making the I.F. stage or stages unstable, using a grid bias control so that the valves can be brought out of oscillation when telephony or I.C.W. reception is desired. There are several methods of producing this instability, but probably the easiest way is to run the I.F. anode lead near to the grid leak.

Valve Metal Caps

THE latest models of H.F. pentode valves are being supplied with metal caps instead of the usual screw caps. It is emphasised, however, that cap leads should not be soldered to these—special connectors are available for this purpose. A reader who had adopted the soldering method of connection could not obtain any signals from his receiver, and when we submitted the valve to test it was discovered that the internal lead connected to the cap had become disconnected whilst soldering the external lead.

Using Eliminators

WHERE mains are available, receivers having battery type valves can very cheaply be supplied with H.T. from a mains unit. It is essential, however, to choose a unit having the correct current output rating to suit the particular valve types in use. Most eliminators designed for supplying battery sets have an output of 120 to 150 volts, but their current ratings vary considerably. For two or three-valve receivers having a small power or an economy pentode valve in the output stage a 120 volt 12/15 m.a. unit is suitable, but if a super-power or a power pentode valve is used a rated output of 20 to 25 m.a. is necessary.

Interference

LIGHT switches, vacuum cleaners, and certain types of cars are all very troublesome, together with electric trucks which are now being used by a well-known firm of milk suppliers, and which are known as the "silent electric motor"! I also heard recently of a very unfortunate case where an experimenter was having his results ruined following the erection of traffic lights outside his residence. These lights caused a terrible amount of noise every few seconds as the lights changed. On the broadcast wavelengths a good deal has been done in eliminating these noises by the use of a special screened down-lead, and now a special cable for a similar purpose on short waves has been brought out by Messrs. Ward & Goldstone, Ltd., who will supply details to those interested.

"Unknown Blind Man's" Appointment

MR. WILLIAM J. SHARP, the "unknown blind man" whose Christmas broadcast appeal for the wireless fund produced a £10,000 response, has been appointed reception officer at the headquarters of the National Institute for the Blind, in Great Portland Street, London. His main duty will be to welcome the many visitors who desire to "look round" the famous building. In a farewell message to his friends in South London, where he has been engaged in welfare work for the past nine years, Mr. Sharp describes the Institute's headquarters as "an Aladdin's palace of wonder and delight for the blind."

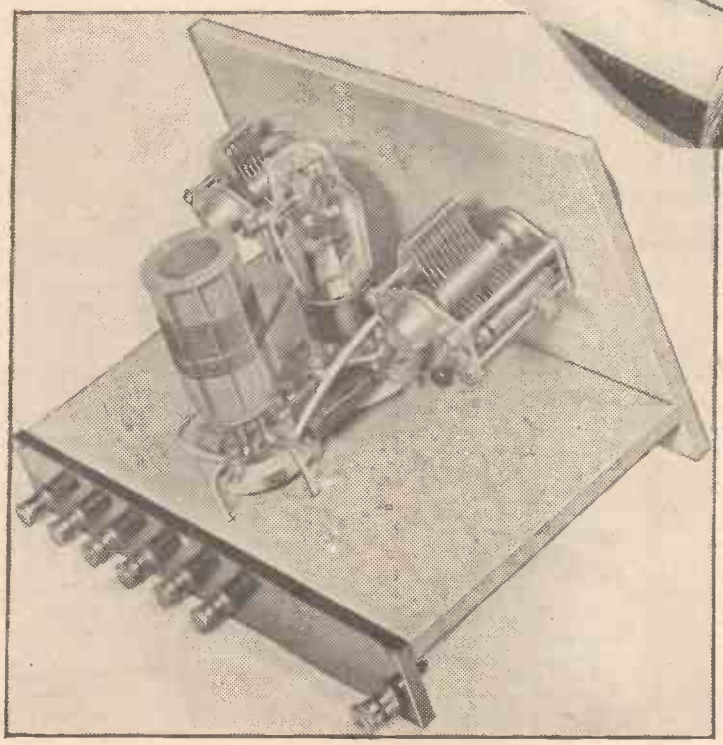
Panama City

SOMETIMES if you work back slightly from your condenser settings for DJC, (49.83 metres), you may be lucky enough to strike HP5B, Panama City (49.75 metres), which, although 5,270 miles from London, has been logged on a two-valve receiver between G.M.T. 01.00 and 03.30. Both Spanish and English calls are broadcast. It is a worth-while catch.

2 SPECIAL DESIGNS

The "P.T.P. THREE"

In this outstanding number of "WIRELESS MAGAZINE and Modern Television" you will find exclusive details of a "straight three" battery receiver built on a new and improved system. It employs a highly efficient combination of high- and low-frequency pentodes, gives exceptional selectivity and sensitivity, and sets a new standard of efficiency of layout combined with ease of construction.



New Style SHORT-WAVE ADAPTOR

Read how to build a simple but highly efficient unit which enables excellent short-wave reception to be obtained when used in conjunction with any ordinary receiver. *A special feature of this unit is that it can be used alone as a single-valve short-wave receiver.*

Other splendid contents of "WIRELESS MAGAZINE and Modern Television"

An Enthusiast's Power Amplifier.
By P. Wilson, M.A.

"Five Hours Back."
By L. W. Hayes, of the B.B.C. Engineering Staff.

The Gordon Magnesium Battery.
Described by R. W. Hallows, M.A.

Fading and the Non-fading Aerial.
By J. H. Reyner, B.Sc., A.M.I.E.E.

Keeping High-frequency Where It Belongs.
By Marcus G. Scroggie, B.Sc., A.M.I.E.E.

How the Valve Detects and Amplifies.
By Percy W. Harris, M.I.R.E.

First Details of a New West of England Regional Station. By T. F. Henn.

Is the Portable Worth While?
By "W.M." Set Selection Bureau.

More About Television Scanning.
By G. P. Kendall, B.Sc.
Etc., Etc.

THE JUNE

Wireless Magazine

AND MODERN TELEVISION

ON SALE THURSDAY, MAY 23

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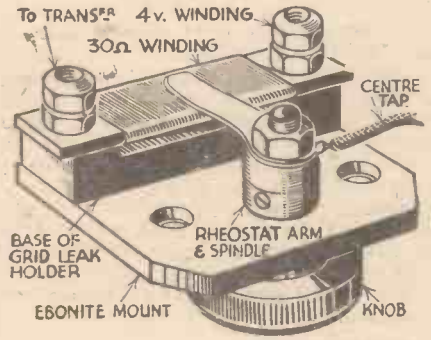
George Newnes, Ltd.

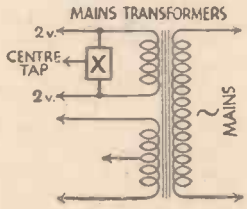
A PAGE OF PRACTICAL HINTS

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

Hum-reducing Device

THIS useful device which I made with odd parts has worked with every satisfaction, and has eliminated practically all the A.C. hum that was coming through my set.





An easily-made device for reducing hum in a mains receiver.

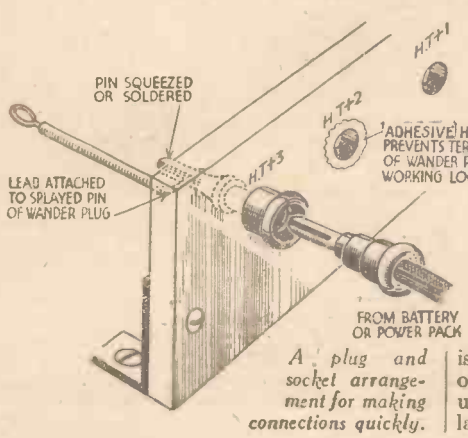
The output valve in my home-constructed receiver is a directly-heated pentode.

In the sketch the flexible lead, marked centre tap, which is soldered to the contact arm, as shown, was made long enough to give the required slight movement for adjustment purposes, and when the best position was found it remained fixed.

The flat type grid-leak holder was fixed to the ebonite base with two No. 6 B.A. screws ¼in. long, nutted at the ends. A brass collar from an old variable condenser acts as a distance piece between the ebonite mount and the contact arm.—WM. N. SPAIN (Coventry).

Making Connections Quickly

THE accompanying sketch shows a method of making battery or power pack connections cheaply and quickly. A terminal strip is drilled to take a number of wander-plug sockets, as required, and the ends of the various leads to the components are either pinched between, or soldered to, the splayed pins of the wander-plug sockets, as indicated in the sketch. The leads from the battery or power pack terminate with wander plugs which can be quickly plugged into their respective sockets.—F. JACKSON (Holywood).



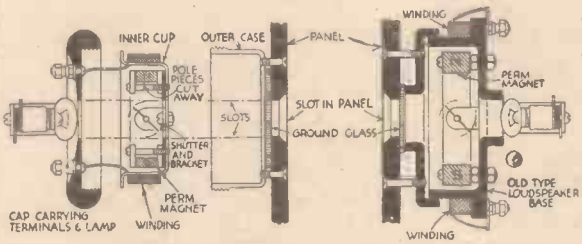
A plug and socket arrangement for making connections quickly.

THAT DODGE OF YOURS!

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

A Visual Tuning Indicator

AN easily-constructed visual tuning indicator, for insertion in the output stage, can be made from an old telephone, as shown in the accompanying sketches. The principle is based upon the deflection of a pivoted shutter (or armature) caused by the current of the loud-speaker circuit through a fixed operating coil acting in opposition to the field due to a permanent magnet. The shutter is placed in the path of a beam of light to throw its shadow upon a glass screen so as to be visible from the control panel of the set. Perfect tuning occurs when the shadow produced is of minimum thickness, thus denoting maximum current flowing in the loud-speaker circuit. The circuit is depicted in Fig. 3, and the indicator may be switched out of the circuit if desired, after tuning in, to avoid undue battery drain.



Figs. 1 and 2.—Sectional views showing methods of making a visual tuning indicator from a telephone ear-piece, and also from an old loud-speaker unit.

The diaphragm, pole pieces and associated speech windings of the telephone receiver are removed, and the ear cap, together with the cups, is slotted to permit the passage of a beam of light from a small lamp mounted upon a bracket fixed to the ear cap: the latter, being made of insulating material, also accommodates the necessary terminals.

The inner cup is drilled for two brackets to receive a soft-iron shutter mounted upon a non-magnetic pivot pin (to avoid undue damping effects). A suitable winding (depending upon the relative values of the permanent-magnet pole strength, and the output current of the power valve) is then wound outside the inner cup. The outer cup is then secured to the panel so as to clamp a ground-glass screen behind the slot cut in the control panel. (See Fig. 1).

Fig. 2 shows a similar adaptation for a visual tuning indicator constructed from an old loud-speaker unit.—WM. A. HARRISON (Aintree).

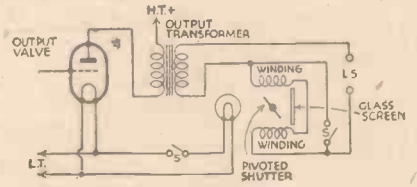
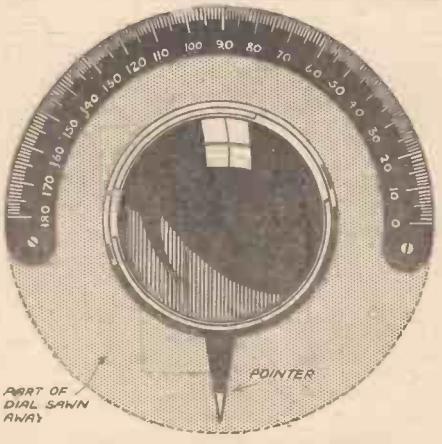


Fig. 3.—Circuit diagram for a visual tuning indicator.

A Converted Dial

AS I found the ordinary dial difficult to read when the numbers are revolved, I cut out the numbered part, as indicated in the sketch, and left a narrow pointer, the tip of which was coated with white paint. Instead of paint, a small piece of white paper, glued on, would answer the purpose just as well. The numbered part of the dial is fixed to the panel with two screws, and the arrangement is a great improvement on the old solid dial.—J. D. CROSS (Blackburn).



A method of converting an ordinary dial to a fixed scale and moving pointer.

SHORT WAVE SECTION

TRANSPOSED AERIAL SYSTEMS

An Article Dealing with Aerial Systems for Reducing the Effects of Man-made Static in Short-wave Receivers. By A. W. MANN

MAN-MADE static, or local electrical interference, is sometimes troublesome to the short-wave listener, and its elimination is a problem difficult to solve.

Motor ignition systems, electrical machinery, domestic appliances, etc., are all potential sources of static interference, the first affecting both town and country listeners alike. International action is necessary in order to suppress static of this kind at the source, and thus clear the ether of unwanted interference. Mobile sources of interference are, however, a problem in themselves, and in the search for a solution town and country dwellers meet on common ground.

We must at present focus our attention in the direction of receiver improvements, such as screening and the erection of noise-reducing aerial systems. To advise the short-wave listener to erect a transposed horizontal doublet aerial, whilst being sound advice, is by no means helpful unless its design, construction, and fundamental principles are understood.

Doublet Aerials

There are various types of transposed doublet aerials.

Fig. 1 shows the single-wire type complete with transposed feeder or transmission line.

Fig. 2 is in the form of an inverted letter L, and Fig. 3 is a cage doublet. The cage form of inverted L is shown in Fig. 4, and a few remarks concerning the various types may be of interest.

So far as maximum height is concerned, there is no limit. The minimum height, however, should be not less than 35ft. This applies to all the types shown. In Fig. 1 the length of each flat top, *i.e.*, A—B and B—C may be from 40ft. to 75ft.

In the inverted L type (Fig. 2), the length G—H is also 40ft. or more. It will be noticed that one side of the cross-feeder line terminates at the insulator Z. The reason for this will be explained later

With reference to the cage type doublets, hoops or spreaders should not be less than 1ft. 6ins. in diameter. The aerial wire E to F for the cage should be not less than 40ft. (Fig. 4). Referring collectively to the various types of aerials illustrated, it will be noticed that the feeder lines are transposed by means of transposition blocks.

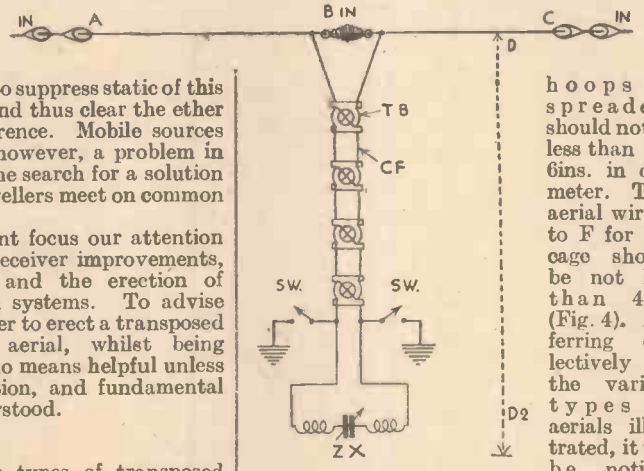


Fig. 1.—A single wire transfeeder system. TB are the transposition blocks, CF is the crossfeeder line. IN are insulators, and SW are switches.

As previously explained, the higher we erect the doublet the better the results will be, but when erecting the more common types of aerial, such as the inverted L-type, a compromise must be effected in order to keep the down lead as short as possible, otherwise the tuning of the receiver will be broad, and the resultant selectivity of a very low order. When the transposed doublet aerial system is used, however, the flat tops or aerial proper may be erected as high as we please. The transposition line or cross feeder may be of any length. It is possible to locate the receiving apparatus a considerable distance from where the lead-in enters a building. For example, the set may actually be located 200 yards from the lead-in point, and the transposed feeder line continued right to the terminals of the set. Radio communication companies in various parts of the world use transposed aerial systems in order to obtain trouble-free reception, and transposition lines over a mile in length are in use nowadays.

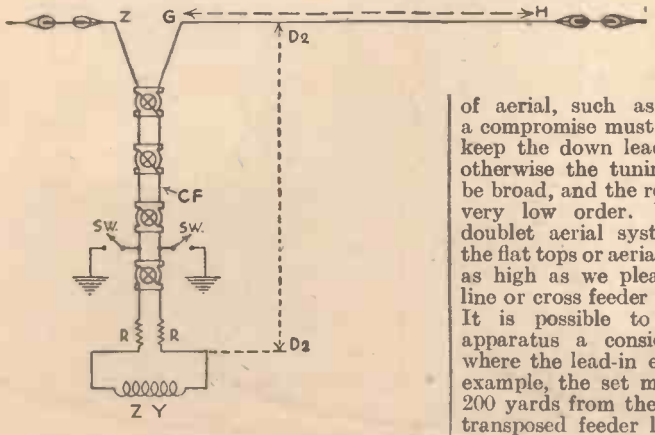


Fig. 2.—An inverted "L" transfeeder. ZY is the coupling coil.

It must be understood that the transposed doublet aerial is an aerial system which successfully reduces the effects of static interference of the man-made variety.

Every signal received by an aerial system, regardless as to type, sets up a voltage in the aerial proper and down lead. At the same time the vacuum cleaner next door sets up a voltage, and thus we may have two or more signals creating voltages in the aerial system and consequent interference.

Ground Level Interference

Vacuum cleaners, magnetos, etc., are all low-power, high-frequency transmitters, the signals of which cover a small area in comparison to those radiated by short-wave stations. Thus local interference at ground level is created. The receiving aerial of the straight wire, cage, and inverted-L as commonly used includes a down lead, which usually enters the house a few feet above ground and within the interference zone. Wanted and unwanted signals are picked up by the down lead with equal intensity, setting up voltage variations and reproduction in the reproducer of wanted and unwanted signals.

To reduce static interference, the transposed aerial, as shown in Fig. 1, complete with feeders may be erected. The flat tops are in line, or 180 degrees out of phase. Transposition of feeder lines, however, does not convert them into non-

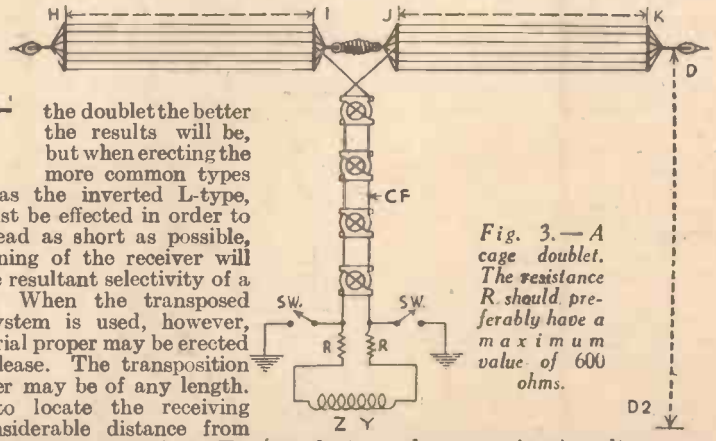


Fig. 3.—A cage doublet. The resistance R should preferably have a maximum value of 600 ohms.

conductors, because signal voltages as caused by static at ground level are still set up in each lead, but 180 degrees out of phase one with the other. These voltages are now equalised, and when applied across the tuning coil of the receiver are partially

cancelled out, the voltages set up by the desired signal in the flat tops passing to the receiver.

In Figs. 2 and 4 the aerial system is out of balance due to one cross-feeder line terminating at the insulator Z. On account of this it is necessary to insert series resistances in each feeder line. If these are variable, various adjustments can be made and results noted.

Connecting the Cross-feeders to the Set

There are a number of ways in which the cross-feeders may be coupled to the set, including connections made directly to earth and aerial terminals or by inductive coupling. It is sometimes necessary, however, to earth the receiver in the usual way, even though the transposed aerial is used.

The type of receiver and the tuning coils used largely determine the form of coupling employed. Variable coupling, however, and tuning the aerial system enable it to be unbalanced, thus helping to reduce noise well below signal strength if necessary. Whilst the horizontal doublet reduces local man-made static it will not eliminate the interference caused by electrical storms which take the form of atmospherics, grinders, etc., as these produce comparative high voltages in the aerial with the consequent terrific crashes in headphones and loud-speaker.

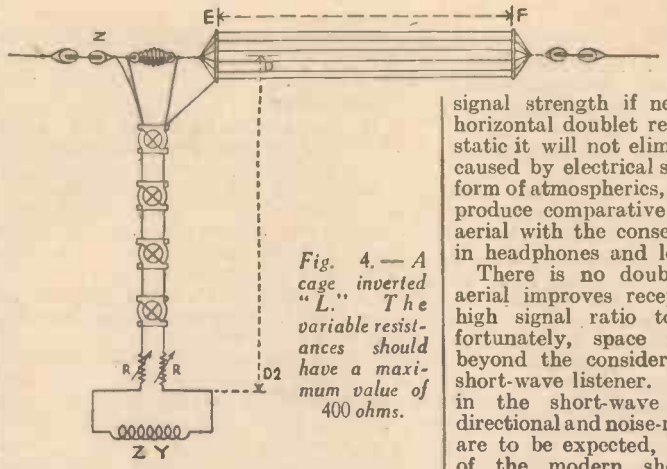


Fig. 4.—A cage inverted "L." The variable resistances should have a maximum value of 400 ohms.

There is no doubt that this type of aerial improves reception, and enables a high signal ratio to be obtained. Unfortunately, space restrictions place it beyond the consideration of the average short-wave listener. Future developments in the short-wave field centring on directional and noise-reducing aerial systems are to be expected, because the efficiency of the modern short-wave receiver is largely governed by the aerial system used in conjunction with it.

Making Your Own Short-wave Components

Tuning Coils are Not the Only Components which may be Made by the Constructor for Short-wave Work. In this Article Some Interesting Hints are Given for Improvising Other Parts for Experimental Use. By W. J. DELANEY

THERE are doubtless large numbers of constructors who have read of the interest of short-wave work, and who would like to carry out some experiments in this direction before spending money on the commercial units. They fully realise that many parts at present used for ordinary broadcast receiver construction are unsuitable for short-wave work, and thus they leave this interesting avenue unexplored until they may obtain proof that there is indeed a great deal to be gained by getting down to the short waves. On numerous occasions in these pages we have given constructional data for short-wave tuning coils, and in this article it is proposed to show how certain broadcast apparatus may be converted so that a good short-wave receiver may be constructed, and from the results obtained the constructor will undoubtedly be sufficiently interested to obtain good modern parts and thus join the hundreds of listeners who already possess good short-wave receivers.

Tuning Coils

There are dozens of different methods of building up short-wave tuning coils, but the principal thing to bear in mind with all short-wave apparatus is the avoidance of losses. Therefore, as much dielectric material as possible must be dispensed with in every direction. Thus, a good tuning coil must be wound on some sort of skeleton former, and the lower the wavelength (or the higher the frequency) the greater is the need for attention to this point. Similarly, owing to the high frequencies, skin friction must be reduced in the H.F. circuits, and so thick wire is essential. To avoid increased skin friction due to a corroded or pitted surface, tinned copper wire or enamelled wire is desirable, and for the lower wavelengths the covered 18-gauge connecting wire sold for wiring broadcast receivers will be found very useful. Every constructor will have some of this wire about and thus no expense will be incurred here.

The former may be made from old ebonite panels or similar material, and one very simple arrangement is shown in Fig. 1. Two rectangles are cut, and a slot is cut down the centre so that these two pieces may be joined together to form a cross. Small notches may be cut in the edges to retain the thick wire in position, and other cuts may be made for reaction windings, etc.

Another scheme is shown in Fig. 1, and is slightly more ambitious. Two octagonal (or hexagonal) pieces of ebonite are cut and some strips of similar material, of about one-quarter of an inch square section, are obtained of the required length. These are let into the edges of the shaped pieces and screwed firmly into position. Again, notches may be cut for the winding if desired.

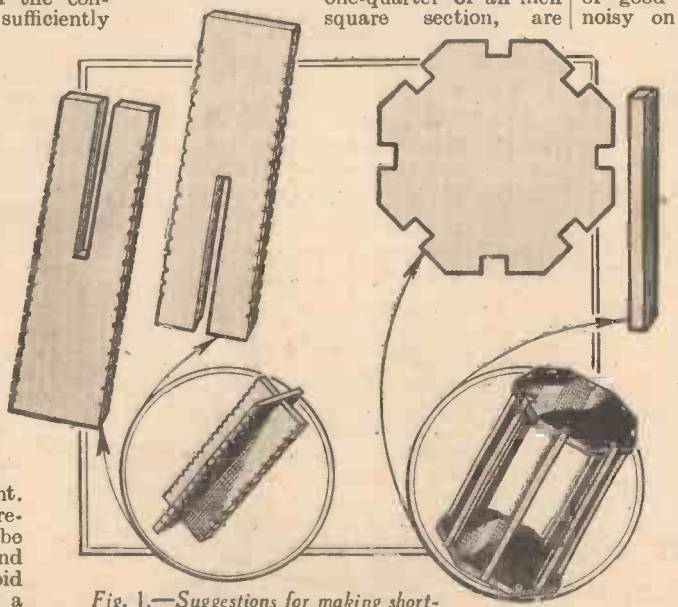


Fig. 1.—Suggestions for making short-wave coil formers. Similar methods may be adopted for winding short-wave chokes.

Messrs. Becol manufacture a large range of ribbed ebonite formers of various sizes, and those who wish to make a permanent type of coil may obtain these in any desired length.

Tuning Condensers

The tuning condenser undoubtedly presents the greatest problem to the experimenter, in view of the efficiency which is required in this component. The ordinary standard broadcast condenser is, from many points of view, unsuitable. The capacity is much too large, and unless of good manufacture it will be found noisy on short waves and perhaps will have a rather high loss ratio. However, any old tuning condenser may be temporarily converted for experiment, but it should be realised at the outset that the same results cannot be expected from a converted 1920 five-shilling condenser as will be obtained with a modern all-brass special short-wave condenser. It will work, and thus give you some indication of what to expect.

The first thing is to reduce the capacity, and in doing this the general design of the old condenser will no doubt be improved. Remove the locking nuts and completely dismantle the condenser, placing spacing washers, etc., on one side. If the condenser is very old it may be advisable to clean every part thoroughly, either by placing in petrol or paraffin, or by a more methodical brushing up with metal polish. The material from which the condenser is made will govern the method of cleaning, but

(Continued overleaf)

MAKING YOUR OWN SHORT-WAVE COMPONENTS

(*Continued from previous page*)

cleanliness is essential. Now reassemble, but instead of using one washer between each vane, use two, so that when reassembled the spacing between vanes will be much larger than at first and only half of the original vanes will be employed.

Instead of relying upon the old connection to the moving set of vanes fit a pig-tail. This should preferably be of insulated wire and only one spiral should be wound. A strip of springy brass or copper may be used instead of wire and the scheme is shown in Fig. 2.

An alternative to carrying out this modification scheme is to use band-spread tuning, with an old broadcast condenser as the tank (fitting a pig-tail for efficiency) and stripping down an old reaction condenser for the band-spreading condenser. If a solid-dielectric condenser is at hand, remove the dielectic and double space the vanes as before-mentioned.

A similar type of condenser may also be constructed for use in the aerial circuit, whilst in general an air-spaced condenser will also be desirable for reaction purposes.

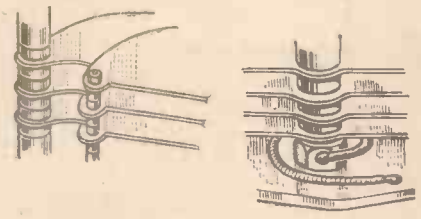


Fig. 2.—How to modify an old condenser. Double spacing for the vanes, and a pigtail for connection.

In each case, do not rely upon friction for the connection to the moving section, but fit a pig-tail.

Valve-holders

It is also possible to use up old valve-holders for short-wave work, although they must be modified as shown in Fig. 3. It will be seen that as much of the material in between the sockets is removed as may be carried out safely without destroying the strength of the holder. A central hole must be cut (unless a 5-pin holder is being converted) and with a fret-saw or similar tool the slots are cut up between the sockets as shown.

An alternative scheme is also shown in this illustration and for this the sockets are removed from an old holder and are soldered to strips of brass or copper. A ring of ebonite is next cut, and a valve is inserted into the sockets in order to obtain correct spacing, whilst the strips of metal are screwed to the insulating ring. Terminals may be fitted for connection, or the necessary wires soldered direct to the ends of the supporting strips.

Extension Handles

The main tuning controls should preferably be some distance from the hand to avoid body-capacity effects and thus mounting brackets will be required for these components. Any odd metal may be used for these. To extend the control spindles lengths of ebonite tubing may be pressed into use and various methods of mounting may suggest themselves according to the type of component.

H.F. Chokes

The construction of chokes may follow the same lines as the tuning coils, although there is not the same need for reducing losses. Ordinary ebonite tubing about 1in. in diameter, or tubing made from brown paper glued and rolled round a

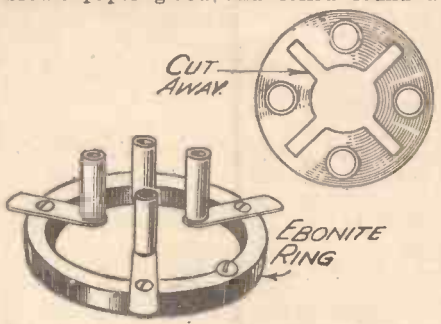


Fig. 3.—Valve-holders may be converted or constructed as shown here.

suitable rod and removed when dry, is quite good, as also is glass tubing (an old test tube for instance), or a skeleton made by halving two pieces of wood or ebonite together may be used.

Instead of utilising an all-metal chassis, the now popular metallised wood may be employed, or alternatively an ordinary chassis may be cut from wood and covered with thin metal foil. On no account should attempts be made to metallise wood by means of the various metallic paints which are now on the market, as in the majority of cases a conductive surface cannot be obtained owing to the medium which is used for compounding such paints. If joins have to be made in the metal foil, soldering should be adopted throughout the length of the join in order to reduce resistance losses.

Logging Distant Short-wavers

The Correct Times to Listen, and Other Useful Hints are Given in this Article

MANY novices to the short waves are greatly disturbed by the fact that, although there is a programme to be found somewhere any time of the day, the station they require never seems to be there exactly when they want it. The solution to this problem is that they overlook the fact that, as short waves provide a world-wide programme, so their time-table is world-wide. In England at any given time there are twenty hours' difference in time between the farthest point East and the farthest point West, and we can hardly expect America or Australia to provide twenty-four hours' programmes simply to give us a chance to log them at our most convenient time!

Time Zones

Those readers who observe the short-wave time-tables will notice that in the case of our own Empire short-wavers, at Daventry, each station serves one particular "zone" and the programmes of each one are put out at such a time as will serve its own particular zone best. A similar idea is adopted by the several Zeesen stations, each of which sends out programmes for certain sections of the world at different times. The Zeesen programmes can consequently be picked up at any time of the day on one of the wavelengths.

Another point the listener must watch is that every station does not operate every day, some of them only appearing on the air every other day, or, perhaps, only two days per week. Saturday and Sunday, the latter particularly, are generally favourite days of the majority of short-wave broadcasters. With regard to Sunday, the morning is full of activities on the part of the amateurs, or, possibly, we should say "hams." To me, personally, the "chatty" conversations, full of "radiese," of these keen fellows bring as big a thrill as anything; and the distances they cover with remarkably low powers are surprising.

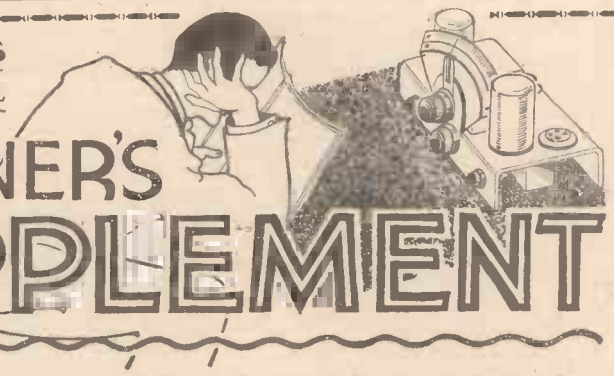
A Day's Listening

Now let us consider one day's listening in the life of a short-wave listener. If he is up at six a.m. it is just the right time to listen for the Eastern end of the world. Australia and New Zealand are in the middle of their previous evening's programmes, and should be coming in well. Johannesburg, South Africa, will also be broadcasting, and an hour or so later Calcutta, in India, starts up. At nine o'clock Sourabaya, Java, and the rest of the Indian stations will be working, and from then onwards other Asiatic and European stations will be coming in until midnight, or even later. With regard to America, the South American stations come in first, some time in the early evening, and U.S.A. will be heard from 9.30 p.m. onwards. Canada's times are, of course, similar to the States, but the far western stations of these countries frequently do not commence operations until midnight, going on into the early hours of the morning.

The foregoing should serve to show how continuous and varied is the fare provided on short-waves, and the fact that the great majority of stations announce in several languages, one of which is English, is a distinct asset. In the writer's opinion the only intelligent way of listening on these high frequencies is with the assistance of a short-wave list giving the programme times of the broadcasts. The short-wavers of to-day have a definite programme value, and the listener must plan his listening in advance just as carefully as on broadcast bands.

WHERE CHOKES ARE ESSENTIAL

BEGINNER'S SUPPLEMENT



The Reasons for the Inclusion of these Components in Certain Parts of a Circuit are Described in this Article.

A CHOKE is one of the few radio components which have been given names really descriptive of their functions, for a choke, which is simply a coil of insulated wire, actually does choke back an alternating current. It is one of the fundamental laws of electricity that if the current in a conductor is changing, a voltage will be set up in neighbouring conductors which tends to oppose the change of current. Therefore, if, as in an alternating current, the current strength in a coil is changing, the voltage produced *in the turns of the coil itself* opposes the change—in other words, presents a high "impedance" to the alternating current.

Now in nearly every part of a complete radio circuit we are dealing with two currents flowing in a section at the same time—usually one is a direct current and one an alternating current or, what is the equivalent, a direct current bearing an alternating modulation. Often one of these currents is of value, the other being incidental, and it is very often necessary or at least desirable to separate the two. In such instances, a choke can play a big

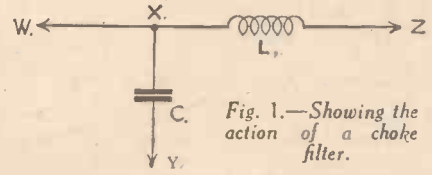


Fig. 1.—Showing the action of a choke filter.

part in the separation, for since it offers a high impedance to alternating current and only a comparatively small resistance to direct current, if an alternative path of low impedance but very high D.C. resistance is provided, the alternating current portion will be diverted by the choke through the easier path. Such an "easy path" for alternating currents is provided by a condenser which, as readers know, has practically infinite resistance to D.C.

Two Distinct Categories

There are quite a large number of sections in a radio set where a choke is necessary, and others where a choke is equally or even more effective than alternative pieces of apparatus. All of them, however, fall into one or the other of two distinct categories. Firstly, a choke may be employed to prevent an alternating current from passing into a circuit where its presence would be harmful, and secondly, it may be used to divert an alternating current into a circuit in which its presence is necessary, but where a direct current is not wanted. These two functions are, of course, very similar, the only difference being that in the first case the direct current is the one which is required, and the alternating current is, shall we say, only a by-product; while in the second case the alternating current is the all-important factor, the direct current being the unwanted by-product.

The diagram, Fig. 1, is typical of all applications of a choke. Here, a mixed alternating and direct current is flowing in the part of the circuit W-X. At the point X the alternating current portion is diverted by the choke L, and passes through the low-impedance path represented by the condenser C into the branch X-Y, while the direct current, unable to flow through the condenser, passes through the windings of the choke into the branch X-Z.

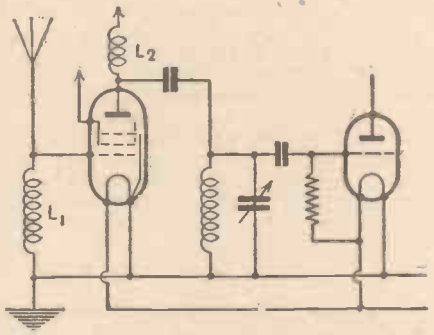


Fig. 3.—Using an H.F. choke as the grid coil of an H.F. valve.

H.F. and L.F. Types

Chokes may be divided into two main sections—high-frequency and low-frequency types; the differences between these and the desirable qualities of each will be described later, but for the description of circuit positions in which they may be employed it will suffice to mention merely the type most suitable—H.F. or L.F.

Dealing first with positions in which chokes are really essential, Fig. 2 shows a simplified circuit diagram of an ordinary A.C. mains receiver in which the chokes

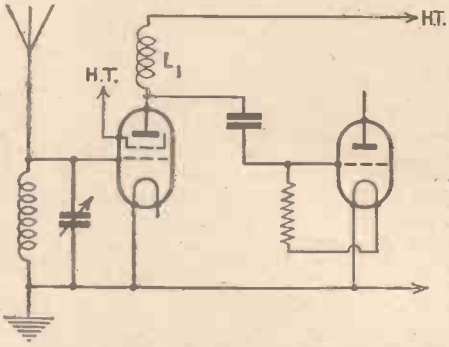


Fig. 4.—Early circuits made use of aperiodic coupling.

are indicated by the letters L1, L2, and so on, and the associated condensers by the letters C1, C2, etc. There are three essential chokes in this circuit, the first, L1, being connected directly in the anode circuit of the high-frequency amplifying valve. The anode current of this valve is, of course, a direct current, but it is modulated by the high-frequency signal which has been applied to the grid of the valve. It is required to apply this radio-frequency modulation to the tuned-grid circuit of the detector valve, and this is ensured by the choke L1, which allows the direct current component of the anode current to pass through it but deflects the high-frequency alternating-current component through the condenser C1 to the grid coil. It would, of course, have been possible to include the second tuned circuit in the anode lead of the H.F. valve, but in this

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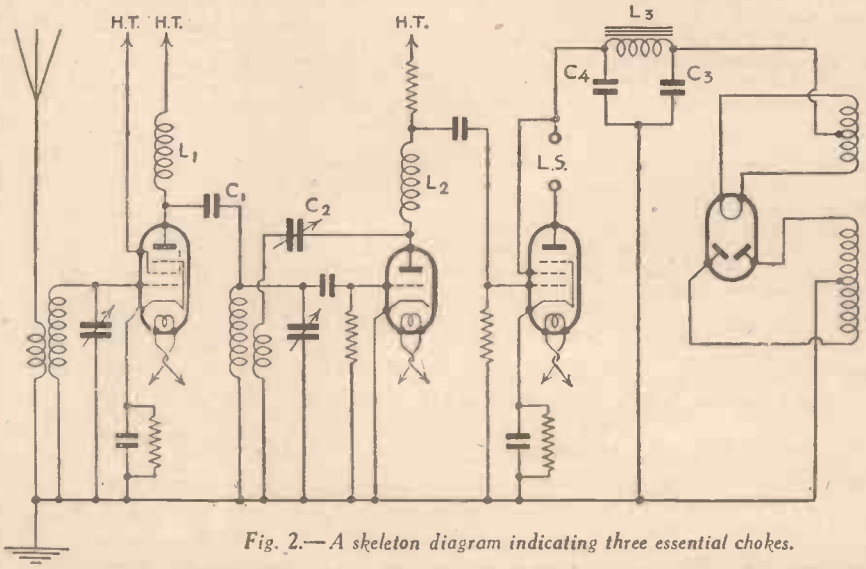


Fig. 2.—A skeleton diagram indicating three essential chokes.

(Continued from previous page)

case it would have been impossible to use a double-gang condenser having the case and moving vanes earthed, since the condenser would have been connected to the H.T. plus terminal. In the arrangement shown, this advantage is secured.

The second choke, L2, is in the anode circuit of the detector valve, and its function is to divert part of the unrectified H.F. component of the anode current *via* C2 into the reaction coil in order to obtain regeneration. In this case there are, in effect, three currents to deal with—the direct-current portion of the anode current, the audio-frequency modulation, and the unrectified portion of the high-frequency signal. The choke must therefore be of the high-frequency variety because it is the H.F. currents that are to be choked back, the audio-frequency current being required in the low-frequency side of the receiver.

The third essential choke, L3, is at once recognised as the smoothing choke in the H.T. supply. The rectified output of the rectifier valve is uni-directional, but carries a strong alternating current ripple. Owing, however, to the comparatively high impedance offered by the low-frequency smoothing choke, L3, this ripple is filtered out and by-passed by the smoothing condensers.

Two Other Uses

Turning now to non-essential uses of chokes, but positions wherein, nevertheless, they can be employed to good advantage, Fig. 3 shows part of a short-

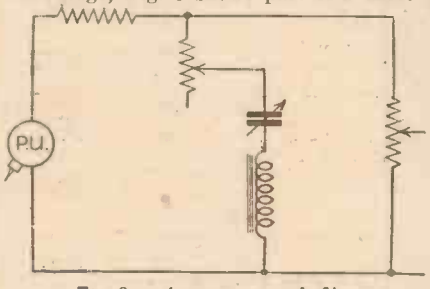


Fig. 8.—A gramo. scratch filter.

wave set of a type quite popular. Here, the first valve is used as an H.F. amplifier, not so much on account of the extra amplification it will give, but as a "buffer" valve. The aerial circuit is not tuned, a short-wave choke being used as the grid circuit of the H.F. valve. Admittedly, a tuned circuit here would give greater amplification, but this adds to the complexity of operation in certain cases.

Although seldom used to-day, the arrangement shown in Fig. 4 is reproduced as it is interesting. Here the grid circuit of an H.F. valve is tuned and the anode circuit is aperiodic. Amplification again is not so high as with a tuned coupling, but the arrangement is useful in certain circumstances. For instance, in one particular case, a circuit of this type followed by a detector and output stage formed a simple and efficient two-station local set where it was impossible to use any type of aerial but a small frame.

Employing L.F. Chokes

Leaving the high-frequency side of the receiver, we find that L.F. chokes can be used in a number of places. For example, choke-capacity L.F. coupling is quite an interesting alternative to

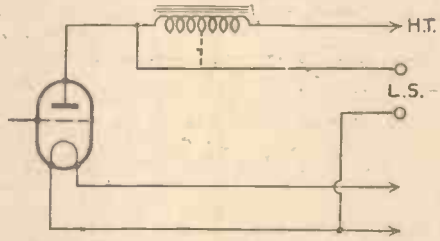


Fig. 5.—Two forms of choke output circuit.

resistance capacity, especially in the detector anode circuit, because the H.T. voltage drop in a choke is much less than in a resistance. Apart from substituting the choke for the resistor, the two circuit arrangements are identical and, being familiar to all, are not reproduced.

In a similar way, a low-frequency choke can be substituted for a resistance in a parallel fed low-frequency transformer coupling, while if high-tension volts are scarce it is quite permissible to employ chokes for decoupling instead of the more conventional resistances. A low-frequency choke may also be used as an alternative to a transformer for the output circuit. Fig. 5 shows the arrangement, the dotted line being for a tapped choke which is, in effect, an auto-transformer arrangement and can be used for impedance matching, and the other a parallel feed method which merely avoids the passage of direct current through the speaker.

Other Schemes

Some of the most interesting examples of the use of chokes are in tone control and correcting devices, some of which are indicated diagrammatically in Figs. 6, 7, and 8. If it is borne in mind that a choke offers a higher impedance to high

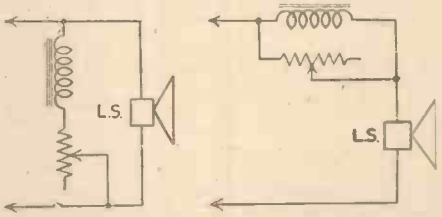


Fig. 6.—A method for reducing bass response.

Fig. 7.—One way to reduce treble response.

frequencies than to low frequencies, while a condenser offers a lower impedance to high frequencies than to low frequencies, the action of the various arrangements will be perfectly clear. Thus, the shunt connected choke of Fig. 6, providing an easier path for the lower (bass) frequencies than for the treble, reduces the proportion of the low notes passing through the speaker winding.

A circuit comprising both a choke and a condenser is shown in Fig. 8. Here, by adjusting the value of the condenser, a tuned circuit can be formed which is resonant at a frequency corresponding to the pitch of needle scratch, so that scratch is shunted through the filter and does not affect the amplifier.

Chokes are also employed largely in interference suppressors to avoid noises carried by the mains current. Very adequate filtering would be obtained from a unit of the type shown in Fig. 9, in which a choke is used in each of the mains leads, and series connected condensers with their mid-points earthed being included both before and after the chokes.

H.F. and L.F. Differentiations

For high-frequency chokes a winding without an iron core is used generally, while low-frequency chokes for smoothing, decoupling and intervalve coupling are wound upon iron cores similar to those of low-frequency transformers. Some of the smaller types of low-frequency choke used for tone correction, however, are usually of the air-cored type.

In the case of high-frequency chokes, two things are of main importance. In the first place they must have a high impedance at the frequency on which they are intended to operate, and second, they must have a small self-capacity. If the winding is so designed that the capacity is high, a large part of the radio-frequency energy which is supposed to be choked back by the choke will be by-passed through the self-capacity and the effectiveness of the choke thereby impaired. Moreover, the inductance of the choke in conjunction with its capacity may produce a resonant peak at a point

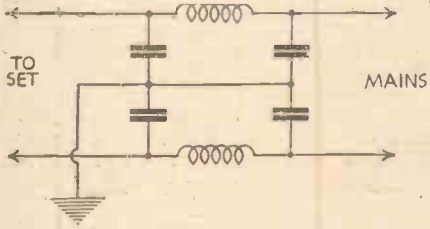
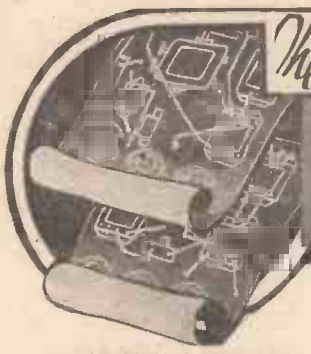


Fig. 9.—A mains-borne interference suppressor.

within its working frequency range. For many purposes a high-frequency choke must be screened, and it is important that the screening can be well spaced away from the winding if a high capacity to earth is to be avoided.

For low-frequency chokes, not only must they have the required inductance at the working frequency—as a result of which the impedance will be of the correct value—but the windings must be capable of carrying the full rated current load without danger, and the core so designed that it will not be saturated at full load current. If the core becomes saturated, the magnetic effect does not undergo maximum change with changes of current, so that the effective inductance is decreased.



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Tyers Portable (SG, D, 2 Trans)	*Aug.* '34	WM367

SHORT-WAVERS. Battery Operated.

One-valvers: Blueprints, 1s. each.

S.W. One-valve	—	AW329
S.W. One-valve for America	—	AW429
Roma Short-waver	10.11.34	AW452

Two-valvers: Blueprints, 1s. each.

Home-made Coil Two (D, Pen)	14.7.34	AW440

Three-valvers: Blueprints, 1s. each.

World-ranger Short-wave 3 (D, R.C. Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-waver	*Jan.* 19, '35	AW463
Short-wave Adapter	Dec. 1, '34	AW456
Superhet, Converter	*Dec.* 1, '34	AW457

Four-valvers: Blueprints, 1s. 6d. each.

"A.W." Short-wave World Beater (HF Pen, D, RC, Trans)	2.6.34	AW436
Empire Short-waver (SG, D, RC, Trans)	*Mar.* '33	WM318

Mains Operated.

Two-valvers: Blueprints, 1s. each.

Two-valve Mains Short-waver (D, Pen) A.C.	10.11.34	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	*Aug.* '34	WM368
"W.M." Long-wave Converter	*Jan.* '35	WM380

Three-valvers: Blueprints, 1s. each.

Emigrator (SG, D, Pen), A.C.	—	WM352

Four-valvers: Blueprints, 1s. 6d. each.

Gold Coaster (SG, D, RC, Trans) A.C.	*Aug.* '32	WM293
Trickle Charger	*Jan.* 5 '35	AW40

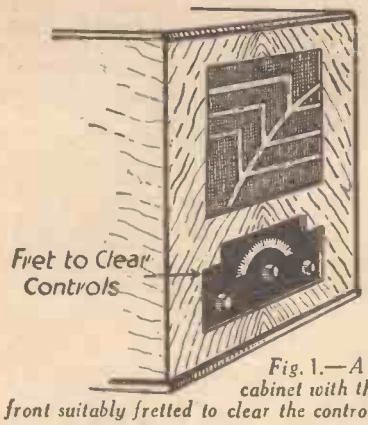


Fig. 1.—A receiver cabinet with the panel front suitably fretted to clear the control knobs.

Accessibility and Appearance

In this Article the Author Describes a Novel Method of Housing a Self-contained Set in a Cabinet in Such a Manner that Any of the Components may be Completely Exposed at a Moment's Notice. By W. H. DELLER

IT is highly desirable that dust be excluded as far as possible from the inside of a set, therefore, it is necessary, in order to avoid frequent attention in this direction, to completely shield the receiver by means of a case or cabinet. To house a self-contained set in a cabinet in such a manner that any of the components or portion of the wiring may be completely exposed at a moment's notice is no easy matter.

Where the circuit employed is of an experimental or semi-permanent nature easy access becomes a question of primary importance. Unfortunately, owing to lack of other accommodation, such a set may have to occupy a fairly prominent position in the living-room, and must, therefore, present a tidy appearance. In addition to this, it may be used normally for quite long periods between alterations or additions, and it is worth while designing a special cabinet on modern lines. The foregoing remarks do not infer that accessibility is a condition necessary only in sets of a purely experimental character, as, in order to maintain any set in tip-top condition, a certain amount of periodic testing, cleaning and adjustment is called for. Even such an item as battery replacement is greatly facilitated by means of careful initial disposition to ensure that, while the terminals are readily reached, removal is not necessary for testing purposes. Beyond this their position should be such as not to interfere with the inspection of other parts.

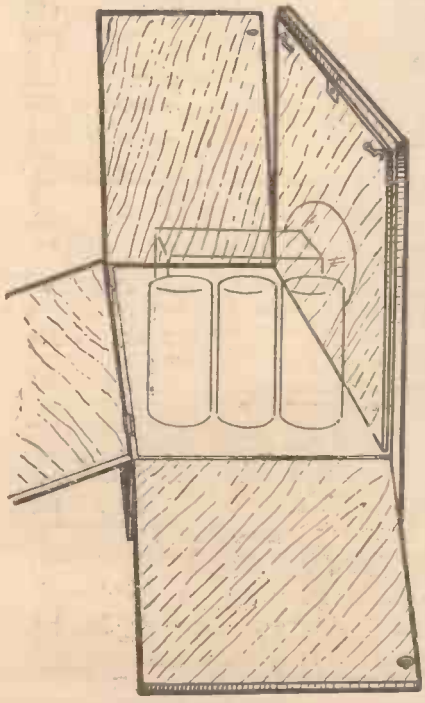


Fig. 3.—A combined folding chassis and cabinet for providing easy accessibility to the set.

Points to Avoid

Where the cabinet follows the lines of generally accepted practice—that is, of a box formation with a removable back—avoid mounting any components directly on to the inside surfaces, and do not pass the control spindles through individual holes drilled through the front face. For it has to be remembered that in order to remove the chassis the leads will have to be disconnected from the components so attached. Also, where the control spindles are passed through separate holes it will be necessary to remove the knobs before the set may be removed from the cabinet. Failure to observe such points will entail extra work in providing extension leads to the components left behind, and in refitting the control knobs before tests under working conditions may be carried out.

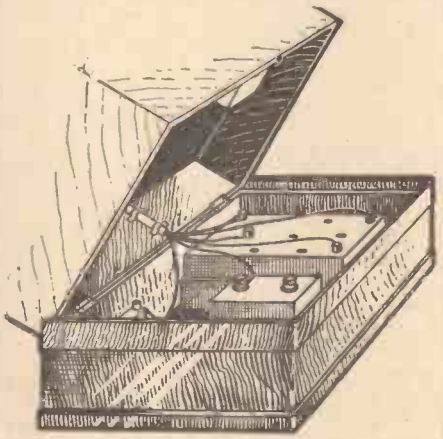


Fig. 2.—A method of housing the batteries.

Methods to Employ

To overcome objections like those mentioned, without in any way detracting from finished appearance, arrange to have the front panel of the chassis to extend to the full height of the inside of the cabinet, to provide a fixing for the speaker baffle board. For that matter, by using a certain form of shock absorber, it may be made to form the baffle itself. The portion of the front panel surrounding the controls is finished in keeping or in contrast with the exterior of the cabinet, and the front of the panel suitably fretted well clear of the knobs, as shown in Fig. 1. Provision is made to hold the chassis firmly in position by attaching two metal thread screws to the inside front of the cabinet, holes being drilled to correspond with them in the front panel of the chassis, wing nuts being fitted to the projecting part of the screws. It is suggested that 3-16in. or ¼in. Whitworth screws with countersunk heads be used for the purpose, these being prepared for fixing by sweating them into a countersunk hole in a plate or washer suitably drilled to take a couple of wood screws.

Thus the complete set is rendered withdrawable from the cabinet by the removal of the wing nuts only.

Housing Batteries

A convenient method of housing the batteries is illustrated in Fig. 2. The top portion of the cabinet hinges at the back from the lower part or battery container, which is made 6in. or so in depth. The leads are taken through or behind the back of the chassis. By raising the top part not only are the batteries exposed but also the components and wiring on the underside of the chassis. It will be necessary to fix a bead or strip along the front and sides of the bottom half to form a rebate to conceal the join.

Some method to secure the halves together will have to be provided to prevent the top from being accidentally raised, and to allow the set to be moved. Purely for the sake of neatness the locking arrangement is fitted inside, and can take the form of a pair of long links made from $\frac{5}{8}$in. or $\frac{3}{4}$in. by 1-16in. brass strip drilled at both ends to accommodate round-head wood screws. One hole in each link is slotted to extend to the edge, and the links are attached one on either side of the inside lower half near the front so that they are free to pivot on the screws. A screw is also fixed opposite each link in the top half in such a position that the slot will pass over it after the manner of an ordinary hook and eye. It should be pointed out that the slotted end of the link must be arranged to project above the chassis platform.

Another way to house the batteries is to make separate compartments on either side of the cabinet which are covered by means of hinged flaps.

Making the Chassis Form Part of the Cabinet

An arrangement which is most likely

(Continued on next page)

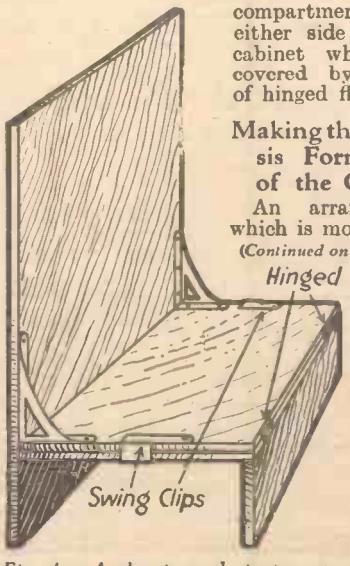


Fig. 4.—A chassis made in two pieces hinged at the back.

MINISTER OF TRANSPORT AND CAR RADIO

THE fitting of radio sets to motor-cars, subject to minor stipulations, has now received the approval of the Minister of Transport. This decision, which is of special interest to motor manufacturers and to thousands of motorists throughout the British Isles, is made known in a letter addressed by the Ministry to the Society of Motor Manufacturers and Traders Ltd., and transmitted to the Philco Radio and Television Corporation of Great Britain, Ltd., for their views.

At the request of Mr. Hore-Belisha, Philco, who introduced car radio in this country three years ago, recently made a full report setting forth their views on the safety of radio on the road and offering to afford every facility for a thorough investigation.

The letter from the Ministry states :—

"I am directed by the Minister of Transport to state that he has recently had under consideration the fitting of wireless sets to motor vehicles. No evidence has been brought before him which would indicate that it is necessary on grounds of public safety to prohibit the fitting of such sets, and accordingly, as at present advised, he proposes to make only such regulations as may appear to him to be necessary to prevent danger of fire from the use of the apparatus and to avoid interference with the driving control of the vehicle.

"Before making any regulations the Minister will consult with your society.

"I am to add that, in the Minister's view, it is most desirable that the wireless sets fitted to motor vehicles should not be of sufficient power to be liable to be a source of annoyance."

Complete assurance that their sets comply in every respect with the three safety requirements stipulated is given by Philco in their reply.

In regard to danger from fire they welcome the fullest investigation into the structure of their sets, and state that exactly similar sets manufactured by their American Company in Philadelphia are the only sets approved by the United States Fire Underwriters' Association.

ACCESSIBILITY AND APPEARANCE

(*Continued from page 304*)

to appeal to those engaged on purely experimental work is shown in Fig. 3. This has a decided advantage in the fact that the set can be laid completely bare by letting down the flaps which form the cabinet. In this manner quite an attractive looking job can be made, the finished appearance of which is quite modern, and none of the means employed for fixing need be visible when the case is shut.

Briefly, the construction is as follows: The chassis platform and panel is made on normal lines from metallised plywood. A false panel of faced plywood is fitted to the front, being large enough to project beyond the top and sides of the chassis panel by ¼in. to form a rebate. The back board of the chassis is ¼in. thick, and extends to the full length of the platform. End pieces below the platform are of a similar thickness, and when fitted should stand proud of the front panel by ¼in. Strips pinned along the inside top edge form a screw-hold to which the platform is attached. The sides and back are hinged on a level with the platform. Screw-eyes are fitted near the top-front edges of the sides to engage with hooks on the front panel. The back is secured in the same way, but the eyes are not shown in the sketch. Hinges are also used to attach the top to the back, a ball-catch being fitted to hold the lid down. Allow the back to fit between the sides, and a considerable improvement will be effected by fitting strips each side for the back to close against. A hinged bottom completes the job. Should any objection be raised against the hinges showing at the sides it may be overcome by carrying the sides down to the base in one piece and hinging from that point.

Where components are mounted on both sides of the baseboard it is often difficult to trace out the wiring easily. A method of bringing components so mounted into one plane is illustrated in Fig. 4, and, as will be seen, the platform is made in two pieces hinged at the back. They are held together by means of a pair of swing clips.

In adopting such a suggestion, care must be taken in the disposition of the components, especially those that are to occupy the underside, as it must be remembered that for the hinging to be effective the leads connecting the top and bottom components will have to pass behind the hinges. Therefore, only those components least likely to be affected by the extra length of the wiring should be mounted on the underside of the baseboard.

CONSTRUCTOR CRUSADERS' CORNER

A CONSTRUCTOR Crusader who did not give his number, although he proudly mentioned that he was one of the first to join the league, has written me a dozen pages concerning his experiences with an all-range receiver which was described some time ago in our pages. There are several points which will be of interest to other readers, and I will mention some of them in this column. Firstly, the coil was a commercial article and covered short waves as well as the normal broadcast band. After he had used the set for some time he became dissatisfied with the short-wave results. After a little experiment, he decided that the wave-change switch mechanism was not quite good enough. In this particular component, long flexible fingers were pressed against shorter fingers by means of ebonite cams on the operating rod, and he decided that the capacity between the open points was causing the trouble.

A Simple Scheme

HE completely dismantled the switching mechanism and reassembled it with the arms reversed. That is, where formerly the two arms made contact on the right-hand side of the switch rod (viewed from the front of panel), he made them contact on the left-hand side. To enable the cams to press the fingers into contact the latter had to be bent in the centre and the result is that now the contacts open over a quarter of an inch, where formerly the separation was barely one-sixteenth. He assures me that actual results on known stations have proved definitely that the improvement is 100 per cent. It is these little points which often show that the real experimenter or keen amateur can definitely solve problems which even the manufacturer overlooks.

Very Misleading

ANOTHER Crusader wrote pointing out how a little knowledge can prove dangerous, and how many hours were wasted in endeavouring to trace a non-existent fault. He had constructed for a friend a receiver which was described in a wireless book. In the circuit was shown an L.F. transformer with a potentiometer across the secondary. During some tests which he had to carry out owing to poor performance, he found that the potentiometer was in direct connection with the anode of the preceding valve, and at once suspected the L.F. transformer. This was of foreign make, and incorporated the tone control device shown in the diagram. He pulled the thing to pieces, digging out wax, paper and various packing agents, and finally found that the control was not across the secondary but across the primary, and thus there was nothing wrong at all. He says that he will leave unsaid his remarks when he discovered this mistake in the wiring diagram!

The Silver Souvenir

HAVE you tried the Silver Souvenir yet? I can assure you that this is a really high-class receiver and gives you a wonderful range for so simple a circuit. During some recent tests, I found that the medium-wave reception was not too good—it was brilliant and sunny outside and the soil was undoubtedly dry, thus giving my poor earth rather a big task. I had logged a number of stations and was just going to switch off, when I thought of running through the short-wave band. I was surprised at the punch small stations had. I logged a Portuguese amateur on telephony, three or four French amateurs, and, finally, heard some very interesting conversations between people in this country and those on board the *Berengaria*. At times, some of the most distant stations came in with the same punch as the London stations, and these are less than six miles from my aerial. Truly, the vagaries of the short waves are beyond comprehension.

REPLIES IN BRIEF

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

H. A, E. (Antwerp). Regret we cannot understand your letter. The handwriting is very indistinct. Could you please repeat your query in a clearer form?

H. F. L. (S.E.3). We would suggest that you carry out trimming correctly, following the adjustment order given recently in the column entitled "Notes from the Test Bench." We shall be glad to hear from you again if this fails to cure the trouble.

T. M. L. (Holmwood). Fit a large condenser in the earth lead and endeavour to use such a lead. Results should be improved thereby. The choke may be coupling with another component and various positions should be tried for it. Separate chokes for the initial stages and output stage would be desirable.

E. J. (Greenford). The four-way flexible cable is used as a battery lead for H.T. and L.T. supplies. You will see from the diagram that there are four such leads required, and the four-way cable forms a convenient method of arranging such leads.

J. S. (Stratford). The makers could test the coil for you, but it would appear more probable that the set is unstable. Watch the position of wires as well as the actual point to point connection, and you may find that two wires are unduly close and thus causing the instability.

A. El S. H. (Giza). The fading in question is a natural phenomenon and you cannot prevent it.

H. R. S. (N.W.10). An article on the subject is being considered, and if it is found desirable to make the changes you refer to we shall describe how to do so.

J. C. (Paisley). We have no blue-print using exactly the parts you give. We have sundry circuits in which various items could be accommodated, but you would have to obtain the remaining parts, especially if you wished to avail yourself of our guarantee of performance.

E. S. (Loughborough). There is no book published on the subject. The necessary licence must be obtained from the Postmaster-General, London.

W. B. H. (Sth. Hackney). Yes, you may use your valve in the manner you mention.

A. J. S. (Cambridge). The only suggestion we can offer is to obtain modern iron-core coils and new valves. But it would be preferable to dispose of the entire receiver and obtain the parts for a complete modern design.

A. M. (London). We would not recommend you to attempt the reconstruction. It would be better to retain the component exactly as it is and use it as an L.F. choke.

F. E. B. (Whaley Bridge). The regulation of the transformer and trickle-charger will ensure the correct charging rate, but to make certain an ammeter should always be connected in circuit. Naturally, with a single cell charging will take place at a much quicker rate than when three or four cells are on charge on the same point.

A. G. M. (Gosport). Although we cannot identify your coil it would appear that the letters stand for the following: A, Aerial; G, Grid; R, Reaction; S1, S2 and S3 are probably the points of a three-point switch. Perhaps these references will help you.

J. H. J. (Rotherham). Simply plug the power valve into the pentode valve-holder. The only alteration which might be necessary is in the value of the applied grid bias.

A. B. (Thornaby-on-Tees). Any good L.F. amplifying stage may be used, and we would recommend a pentode valve for greatest amplification with only one stage. The metal foil may be nailed down or held with drawing-pins.

F. L. (Wokingham). Messrs. Ormiston Bros., 79, Clerkenwell Road, London, E.C.1, can supply the wire.

F. M. (Curbar). You short-circuit the H.T. battery each time you short the reaction condenser. A fixed condenser (.0002 mfd. or .0003 mfd.) joined between the anode of the detector valve and earth should cure matters. If not, then the primary of the L.F. transformer connected in the detector anode circuit is faulty and has a partial disconnection.

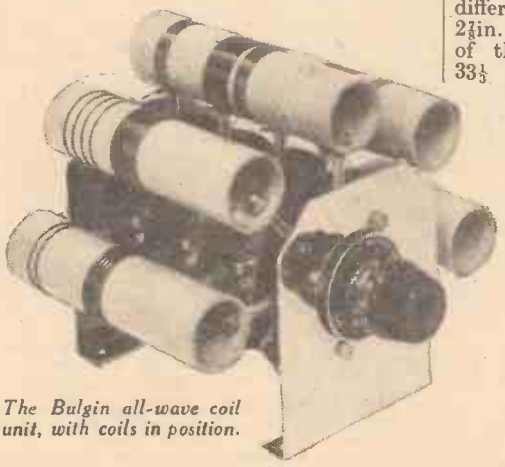
H. J. O'M. (S.W.7). We would draw your attention to the special notice on the Queries and Enquiries page limiting the number of queries to two per reader. Use triode detector. There would be danger of overloading pentode but not power output valve. Choke is preferable in aerial circuit. H.F. choke should be used in output circuit. Seven-pin H.F. pentode should be preferable.

Facts & Figures

COMPONENTS TESTED IN OUR LABORATORY

An Adaptable All-wave Tuner

TO enable a receiver to be designed to cover the short waves as well as the normal broadcasting wavelengths, one of the all-wave tuners can be employed, and the special component manufactured by Messrs. Bulgin (illustrated below) possesses some novel points. First and foremost is the fact that the coils are of the plug-in type, and thus any desired combination may be used. In the unit shown, the two coils on the right-hand side of the unit are for the normal and long broadcast band, whilst the three remaining coils cover the 10-22, 20-45 and 40-90-metre bands, the identifications for these particular ranges being engraved upon the dial supplied with the chassis. This is obtainable for



The Bulgin all-wave coil unit, with coils in position.

15s. 6d. as a complete unit and may be wired into a receiver employing either a simple detector circuit or an aperiodic H.F. stage. Four connections only are required, these corresponding to aerial, grid, reaction condenser, and earth. The tuning condenser may be of the ordinary broadcast type, with a small band-spread condenser used in conjunction with it. The chassis is in contact with the earth terminal, so that it becomes automatically earthed when connected in circuit, and the contact between the rotating switch arms and the various socket positions is very positive and self-cleaning. Coils for the unit are obtainable separately, and these are wound on 1in. diameter paxolin formers, the windings being arranged for each coil in such a manner as to obtain the maximum performance. Thus the lowest range (10-22 metres) is provided with a grid winding of 16-gauge enamel wire, with a reaction winding of 24-gauge enamel wire interwound with it. An aerial coupling coil of similar gauge wire is wound at one end of the former. The higher ranges are provided with separate windings, and the long-wave broadcast coil utilises wave-wound coils rigidly mounted. The following types of coil are obtainable:

S.W. 23, for 10-22 metres, 3s. 6d.
S.W. 24, for 20-45 metres, 3s. 6d.
S.W. 25, for 40-90 metres, 3s. 6d.
S.W. 26, for 85-170 metres, 3s. 6d.
S.W. 27, for 130-240 metres, 3s. 9d.
S.W. 28, for 200-500 metres, 4s.
S.W. 29, for 1,000-2,000 metres, 4s. 6d.

New Drydex Battery.

A NEW dry battery known as the Drydex "Challenger" super capacity has been introduced by Exide Batteries to cover the range of 60, 100, 108 and 120 volts and to replace the corresponding "Red Triangle" range.

The tappings are the same as in the "Red Triangle" series and the only difference in dimensions is the increase from 2⅞in. to 3 3/16in. in height, but the capacity of the "Challenger" is approximately 33⅓ per cent. greater—the comparative figures, when discharged at 10 milliamps. three hours per day, seven days per week, to 0.75 volts per cell being: "Red Triangle," 159 hours; "Challenger," 211 hours.

The maximum recommended discharge rate is 12 milliamps. The retail prices are:—

Type Super 60, 60 volts, 5s. 6d.
Type Super 100, 100 volts, 9s.
Type Super 108, 108 volts, 9s. 6d.
Type Super 120, 120 volts, 10s. 6d.

Modifications to Mullard Indirectly-heated Types

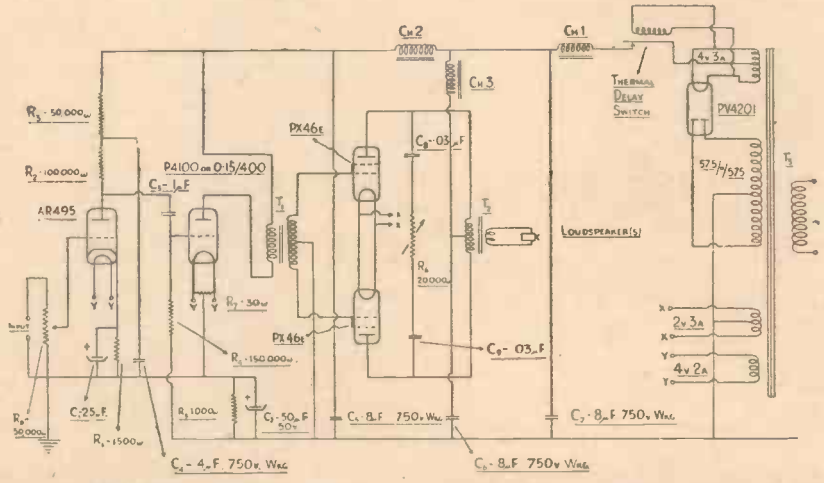
UPON inquiry we understand from Mullard that a number of their established valve types are now being made on a new system of construction. This week details have reached us of no fewer than seven types being modified—994V, 904V, 244V, 164V, 154V, 354V and T.D.D.4. The installation of modern manufacturing plant for the production of the latest valves permits the older types to conform to modern constructional practice.

Outwardly the only difference is in the shape of these valves: the domed bulb has been adopted for all except the T.D.D.4, and we would say in passing that it would seem that very shortly this bulb will be generally in use throughout the Mullard range.

The new construction has enabled Mullard to make the electrode assembly decidedly more robust, and as the alteration in characteristics is negligible, each type is interchangeable with its predecessor. The modified versions of the 354V and the T.D.D.4 will be available shortly. The other types will gradually make their appearance as existing stocks are absorbed.

Using the Tungsram PX 46E Valve

WE have already referred on this page to the Tungsram power valve type PX 46E, and this valve, although of the mains-heated type, may be employed in a Class B circuit. For the benefit of those readers who are interested in this arrangement, or who wish to build a power amplifier, we give on this page a circuit recommended by the makers of the valve, from which it will be seen that the two grids of the valve are connected together, but that in other respects the ordinary Class B arrangement is adopted. The PX 46E valve, when used in ordinary Class A amplifiers, will deliver an undistorted output of approximately 1.25 watts. In the circuit shown the undistorted output is stated by the makers to be no less than 21 watts, but great importance is attached to the transformers and chokes, and the makers recommend that the driver transformer should be a special Partridge component, whilst the three chokes should also be of the same type. The frequency response is appreciably flat from 50 to 10,000 cycles, and it is emphasised that the ordinary domestic loud-speaker (rated to handle only 8 to 10 watts) is entirely unsuitable for use with the amplifier. Suitable heavy-type speakers are, of course, manufactured by Messrs. Rola, Celestion, etc.



A class 'B' mains amplifier using Tungsram valves. The undistorted output of this particular amplifier is 21 watts.

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).

S.W. Reception

SIR,—The letter by F. A. Beane (Ridgewell) in a recent issue of PRACTICAL AND AMATEUR WIRELESS is very interesting. I congratulate your correspondent on his exceptional log of S.W. stations, and wish to state that I also regularly receive PRA8 (Pernambuco), using an o-v-2 receiver and an indoor aerial only 7 ft. high. As an old reader of your paper, it may interest you to know that I have received verification cards and letters from various S.W. stations in all six continents. I also hope that you will in future be able to give more space to this ever popular side of radio.—C. A. RIGBY (Seghill).

An American's Boast

SIR,—We recently received the following testimonial from one of our many distinguished customers:

"Boloney sets—they sure are good,
Made of paper, wire and wood;
If you can't get a sound on thine,
It's all Boloney
—just like
mine!"

Well, what do you think of *that* for a testimonial, sir? Sort of makes you realize Baloney is a name to play about with, doesn't it?—of course it does! And you bet we were pleased as the cat when natural whiskers went out of fashion, when we got that cute little thanksgiving check off'n the railroad worker this morning.

Were we surprised! Bulleeve us, you coulda knocked the whole bunch for a long line of garbage cans and dreg tins.

This program comes to you by courtesy of:—

BALONEYPHONE RADIO, INC. (RUMPEL STILTZ, PRES.), WALLA-WALLA, WASH.

P.S.—Guess you guys think this is the old soft soap, huh? Our new portable is the latest in triple threats—you can carry on about it, an' you can carry on without it, but boy! oh boy! you can't carry it about. Our adverts are testimonials in themselves, our every spoken word just another breath for Baloney. Our setz are the nertz! —GEE (Ellesmere).

Our Remarkable Three-valve Superhet

SIR,—I have been a keen radio listener ever since broadcasting began and have made up several sets from time to time, but I must say your £5 superhet is the best that I have ever used or listened to. I would recommend anyone who wishes to have a clean-cut station-getter clear of overlapping to build it. Wishing PRACTICAL AND AMATEUR WIRELESS every success.—HARRY COUZENS (Gillingham).

A Four-valve Straight Set

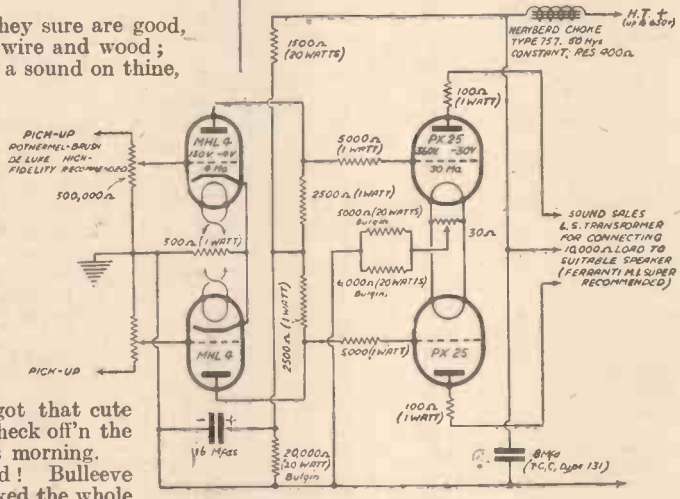
SIR,—I would like to support Mr. E. F. West's suggestion *re* a four-valve straight set mounted on a flat baseboard. I feel sure the following suggestions would be agreed to generally: Two-gang tuning condenser, separate tone and reaction controls, and pick-up.

I suggest that the set could be revised every year.—E. O'CONNOR (Blackrock, Dublin).

A Good Power Amplifier

SIR,—I enclose a schematic diagram of a powerful amplifier which I have built.—W. S. (Frinton).

[*This amplifier, which is not expensive, overcomes the great difficulty of an R.C. amplifier in so far as the grid to filament paths of the output valves are of low D.C. resistance (roughly 32,500 ohms each), and are, in fact, the conductive streams of the previous valves. The amplifier is best balanced by ear—inserting one pick-up lead at a time and volume-controlling each to a similar level, about one-third of the power output finally required.*—ED.]



Circuit diagram of a power amplifier for giving a large undistorted output, and referred to in the letter by W. S. (Frinton).

Loud-speaker Results

SIR,—As a regular reader for many years of PRACTICAL WIRELESS, may I be permitted, through the medium of your journal, to emphasise your remarks with regard to choice of loud-speakers, under the heading of "Beginners' Supplement" in your issue of May 11th.

Recently I fitted in my set a new moving-coil speaker made by the British Rola Co., Ltd., which has given wonderfully good results. I had no idea that my set was capable of such a good performance which it has reproduced since fitting the new speaker. Both as regards quality, volume, sensitiveness, and selectivity this speaker has converted my set into a really good receiver, which previously was throttled by using an unsuitable 'speaker.—CHARLES W. RILEY (Manchester).

Short-wave Receivers

DEAR "THERMION,"—I was very interested in your remarks on short-wave receivers in the last issue of PRACTICAL AND AMATEUR WIRELESS. I think I can explain why so few receivers designed by the technical press for S.W. reception are built; it is because almost invariably the design is such that building the set incurs quite a large expenditure, as the components must nearly all be designed for the short waves, while for BCB sets, the constructor is almost bound to have some of the parts on hand, and even if he has not, BCB components are usually much cheaper than S.W. ones. Further, in an ordinary straight set, the tuning condenser, for instance, is nearly always a .0005 mfd., while in a short-wave set it can be .00025, .0001, .00015 or .00016 mfd., according to the coil or coils. As the set designed may incorporate a .0001 condenser, the set previously used may have a .00016, and as S.W. condensers are by no means cheap components, the constructor naturally does not want to purchase a new one while there is nothing wrong with the other. The same applies to reaction condensers.

Perhaps, however, the more important reason is that short-wave sets are so simple, and, as I have already said, the published designs seldom are. Since America can be received on a single valve, why should the constructor build large sets? A two-valve receiver such as the Midget S.W. Two is, in my opinion, all that is necessary for short-wave listening. Being a simple set, many ideas can be tried out on it, and little refinements can be added with the certain knowledge that the design would not be upset, as would be the case in a larger set.

So, to sum up, my arguments are:—

(1) Components are not always interchangeable.

(2) Large and complicated sets are unnecessary, and

(3) There is no chance for experiment with a designed set. Wishing your excellent paper the best of luck.—R. S. LAWSON (Wembley).

CUT THIS OUT EACH WEEK.

Do you know

—THAT changes in grid bias or anode voltage should never be undertaken without first switching off the L.T. supply.

—THAT commercially-made components should not be modified or dismantled unless you are thoroughly conversant with the particular component, as many delicate parts are protected by the makers and may be damaged.

—THAT an old type moving-coil speaker of the energised type which gives trouble from hum may be improved by fitting a hum-bucking coil.

—THAT resonance in a loud-speaker may often be cured by carefully scraping the diaphragm so as to modify its natural frequency.

—THAT care should be taken in carrying out the above modification as the diaphragm may be torn.

—THAT instability may often be cured simply by fitting an output filter to a receiver.

—THAT the self-capacity of an H.F. choke is a very important feature in its design and function.

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

(Continued from previous page)

"The Best Obtainable"

SIR,—I have bought your admirable paper from the first issue, and this is to let you know I think it the best obtainable. It is only surpassed in excellence by your *Practical Motorist's* Touring Maps.

Wishing PRACTICAL AND AMATEUR WIRELESS every success.—JOHN LENNOX (Mosser, Cumberland).

Too Many Short-wave Articles? Push-pull Switches

SIR,—May I, as a reader of PRACTICAL AND AMATEUR WIRELESS, suggest a slight modification in the articles which are published. I think that far too much space is devoted to short waves. I am a short-wave fan myself, and think that short waves are excellent for entertainment, and especially for distance work, but my idea is that a corner for long-distance medium-wave work is wanted. Really good performances are obtained on the medium waves as well as on the short waves. I feel sure that there are many thousands of readers that try for remote foreigners, and get them regularly even on ordinary three- or four-valvers. My set is an eight-valve superhet, which was originally a seven-valver, but I added an extra I.F. stage. It is battery-operated with economisers, and it takes only 15 ma. on the general run of stations. Finally, may I ask why it is that push-pull switches are universally specified for battery outfits? A combined volume control and switch looks better and has a far more positive action. If the volume control is not wanted there are plenty of rotary switches on the market, and they give the set a more professional appearance. Take the Silver Souvenir, for instance, the push-pull switch spoils what would have been the best-looking set of the year.—D. E. MORGAN (Stafford).

[*The objection which most listeners have to the combined volume control and switch is that it is necessary, each time the set is switched on, to find the best setting for the control. In general, it is preferable to leave this at its best setting, and then switch on and off as desired.*—ED.]

New Members Wanted for R.S.G.B.

SIR,—I am anxious to increase the local membership of the Radio Society of Great Britain, and shall be glad to get in touch with anyone in Newport and Monmouthshire who is interested in short-wave wireless work, either with receivers or transmitters, and whether on ordinary short waves or on the ultra-short waves. I should be pleased to show anyone around my station, who is so interested. I might add that your excellent journal, PRACTICAL AND AMATEUR WIRELESS, has a very large following in this district.—R. V. ALLBRIGHT (G2JL), County Representative for Monmouthshire.

[*All interested readers in the Newport district should write to Mr. Allbright for further particulars.*—ED.]

2 H.F., A.V.C. Receivers

SIR,—You ask for readers' ideas as to sets. I am looking out for a design for a quality battery set, 2 H.F. with A.V.C. and tone control. Something, I think, on the lines of your "Fury Four," but up to date. Not to include short-wave reception, which does not seem to me altogether compatible with quality on ordinary ranges. Your paper is appreciated and studied weekly.—JNO. LUSH (Helensburgh).

[*We give in this issue instructions for adding A.V.C. to the Fury Four, and no doubt this will prove of interest to our correspondent.*—ED.]

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 (NORTH SURREY BRANCH)

MR. RALPH EVANS, of 182, Ewell Road, Surbiton, Surrey, has organised the North Surrey Branch of the Anglo-American Radio and Television Society. The first meeting of this branch will be held shortly, and Mr. Leslie W. Orton, honorary president of the A.-A.R.T.S., has promised to attend. Full particulars may be obtained from Mr. Evans at the above address.

The West Middlesex and East Buckinghamshire Branch of the Anglo-American Radio and Television Society are anxious to hear from members who would like to attend the special Picnic Meeting of the society, which will be held next month in Buckinghamshire. This meeting will be a social affair, and members are invited to bring their friends. There are no charges made, and readers of PRACTICAL AND AMATEUR WIRELESS are welcome. Inter-branch races and contests will be held, and a very attractive programme has been drawn up. Full particulars may be obtained from Mr. Leslie W. Orton, at "Kingsthorpe," Willowbank, Uxbridge.

INTERNATIONAL SHORT-WAVE CLUB (LONDON)

THIS club will broadcast a special programme for short-wave listeners on Saturday, May 25th, from EAQ Madrid, Spain, wavelength 30.43 metres. There are two transmissions, as follows:—

Transmission No. 1, 8 p.m. to 9 p.m. B.S.T.

Transmission No. 2, 1 a.m. to 1.30 a.m. B.S.T., Sunday, May 26th.

It is hoped that all readers of PRACTICAL AND AMATEUR WIRELESS will listen to this special broadcast, and send their reports to the address given below. To all those who enclose return postage a special verification will be sent. A. E. Bear, 10, St. Mary's Place, Rotherhithe, London, S.E.16.

SHORT-WAVE RADIO AND TELEVISION SOCIETY (THORNTON HEATH)

THE tenth Annual Dinner of this society was held at the Café Royal, Croydon, on Wednesday the 1st instant, and a most enjoyable evening was spent. Owing to his duties in the House of Commons the Society's President, Lt.-Col. G. K. M. Mason, D.S.O., was unable to attend, and the chair was occupied by Mr. S. J. Meares.

After the dinner the toast of the King was drunk with musical honours. After various other toasts Mr. Fernside gave some of his experiences of wireless reception in the Far East. In replying Mr. Meares called attention to the alteration in the society's name, stating that he had heard it reported that the Thornton Heath Radio Society had ceased to exist. This was not the case, its name had merely been changed to include the two subjects of future experiment, namely, short waves and television.

The rest of the evening was devoted to a concert compèred by the hon. secretary, Jas. T. Webber, 368, Brigstock Road, Thornton Heath.

CATALOGUES RECEIVED

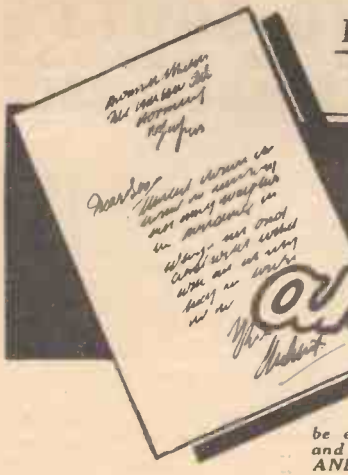
To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2.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

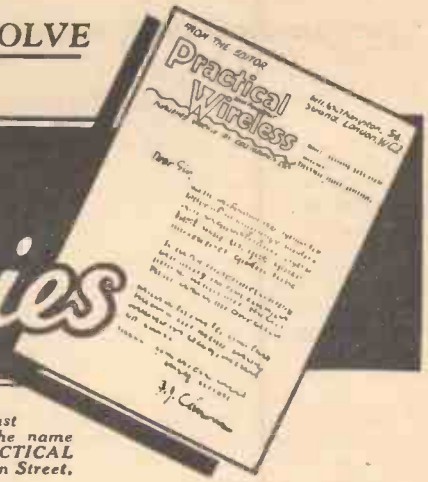
W.B. SPEAKERS

THE high quality of reproduction of Stentorian speakers is well known to most constructors, but to those who have not yet heard these remarkable instruments the following particulars should be of interest. The extraordinary performance of these speakers is largely due to the use of a new magnetic material, the incorporation of the "Whiteley" speech coil, and an ingenious modification of the well-known "Microlode" feature which provides accurate matching to any output. Another important feature is the complete protection of all moving parts from dust or dirt. Various models are available, including the "Stentorian Baby" model, listed at £1 2s. 6d., the "Stentorian" Standard model at £1 12s. 6d., and the "Stentorian" Senior at £2 2s. These prices are for chassis models, but the two last-mentioned speakers can also be obtained in beautifully finished walnut cabinets. Full particulars of these instruments, together with a useful range of W.B. valveholders, switches, and a Class B unit, are given in an attractive folder issued by Whiteley Electrical Radio Co., Ltd., Radio Works, Mansfield, Notts.

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

Queries and Enquiries





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 AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, 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 of receivers described in our contemporaries.
(3) Suggest alterations or modifications to commercial receivers.
(4) Answer queries over the telephone.
(5) Grant interviews to querists.

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

Output of the Universal Superhet

"Will you kindly let me know the maximum output that can be obtained from your Universal three-valve superhet?"—D. C. R.-R. (Cambridge).

The output valve of this receiver (PP. 4118) is rated to give an undistorted output of 3 watts. Naturally, it will only give this output when fully loaded, but this should be possible on many stations within your range and also on gramophone record reproduction.

Incorrect Ganging

"Could you help me in the following trouble? I have built the £5 Superhet and on the long waves I find a certain station very weak. However, by pressing my finger on No. 4 terminal of the centre coil this station was many times louder. I should like to add that on medium waves selectivity, tone, and reception could not be bettered."—C. M. (Bradford).

The solution is quite simple. When you place your finger on the terminal in question you are, in effect, connecting an aerial to the grid of the valve and cutting out the first coil of the band-pass pair. Naturally, signals will be slightly stronger, but if a great improvement is obtained it indicates that the ganging between the two band-pass coils is incorrect and trimming is essential. There should only be a slight improvement when you touch the terminal in question.

Short-wave Coil Connections

"With regard to the portable short-wave receiver recently described in your pages, I would like to know if the B.T.S. 4-pin short-wave coils are suitable, and if so I would like to know which pins are for reaction and which for the tuning coil."—P. S. (N.W.11).

The coils in question may be used in the receiver you refer to. The ends of the grid coil are joined to the two pins which correspond to the grid and anode pins of an ordinary valve base, and the reaction winding is joined across the filament pins.

Transformer Data

"Would you please tell me the output voltage and currents of the transformer used in Circuit No. 42 in Fifty Tested Wireless Circuits, and also the power rating of the resistance in this circuit?"—W. R. (Thorner, Leeds).

The transformer in question has an H.T. winding rated at 250-0-250 at 60 mA, and two L.T. windings rated at 2-0-2 volts. One of these is suitable for a rectifier and is rated at 1 amp., whilst the other is suitable for the operation of three to four indirectly-heated valves and is rated by the makers at 3-4 amps. The resistances in this circuit should all be of the 1-watt type.

A Tuning Point

"I have built up a 3-valve set, using a well-known make of universal coil. Using a 50ft. outdoor aerial, I find that Droitwich comes in at its correct point on the dial reading (viz., 1,500 metres), but signals are rather weak. I thought I would connect the aerial direct to the coil, and in this position Droitwich comes in at much greater strength, but it drops down the dial to 1,000 metres. The same thing happens on the medium-wave band. Can you tell me the reason for this, and if there is a remedy?"—G. S. (Filey).

The coil in question is of the H.F. transformer type, that is to say, it is provided with primary and secondary windings. The amount of wire, or, if you prefer it, the inductance of a coil used in a closed circuit is different from that required to tune to a similar frequency when an aerial and earth are attached to it. Thus, fifty turns of wire would be required on a given former to tune to a certain wavelength when used as a plain grid coil in a simple detector circuit, but if a primary winding were added for connection between aerial and earth, probably sixty turns or more would then be necessary on the secondary to tune to the same wavelength. Thus, in your particular case, when you join the aerial direct to the grid winding the tuning point of a station is found lower down your dial, which is calibrated for use with the coil as designed. You will probably find that the exact tuning point may be retained, and an improvement in signal strength obtained over the normal arrangement, by connecting a fixed condenser between the aerial and the grid coil. The exact value will have to be found by trial.

Choosing R.C. Components

"Can you help me in the choice of the correct resistances and condenser for R.C. couplings? Is there a formula for this?"—J. C. (Brampton).

For maximum amplification with a given valve the resistance in its anode circuit should be infinity, but then, of course, the H.T. applied to the valve (owing to the voltage drop through it) would be nil. It is, therefore, necessary to compromise, and in general a resistance with a value about three or four times the impedance of the valve will be found most suitable. The greater the initial H.T. which is available, the higher may the resistance be made. The coupling condenser should have some value between .01 and 1 mfd.—the greater the capacity the better the bass response. It is obviously unnecessary to use too large a value. The grid leak must be selected in conjunction with the anode resistance and the coupling condenser. The leak is virtually in parallel with the anode resistance, and thus must not be too small. On the other hand, if too large, the condenser will not discharge quickly enough and the following valve will be choked. Generally, a value of .25 or 1 megohm will be found suitable.

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

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face type and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. Radio components advertised at below list price do not carry manufacturers' guarantee. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.

PREMIER SUPPLY STORES

ANNOUNCE a City Branch at 165 and 165a, Fleet Street, E.C. (next door to Anderton's Hotel), for the convenience of callers; post orders and callers to High Street, Clapham.

OFFER the Following Manufacturer's New Surplus Goods at a Fraction of the Original Cost; all goods guaranteed perfect; carriage paid over 5/-, under 5/- postage 6d. extra: I.F.S. and abroad carriage extra; orders under 5/- cannot be sent C.O.D.; please send for illustrated catalogue, post free.

PREMIER SUPPLY STORES Announce the Purchase of the Complete Stock of a World-Famous Continental Valve Manufacturer, all the following standard mains types, fully guaranteed, 4/6 each. HL, L, Power. High, Medium and Low Magnification Screen Grid. Variable-mu Screen Grid; 1, 3 and 4 watt A.C. output, directly heated Pentodes; 250-volt 60 m.a. Full Wave Rectifiers; A.C./D.C. types, 20 volts .18 amp. Filaments; Screen Grid; Variable-mu Screen Grid; H, HL, Power and Pentodes.

THE following types 5/6 each; 350v., 120 ma. full-wave Rectifiers; 500v., 120 ma. full-wave Rectifiers, 2½-watt indirectly-heated Pentodes.

2-VOLT Valves, detector, H.F., L.F., 2/3; power, low consumption power, super power, 2/9; screened grid, variable-mu screened grid 5- or 4-pin Pentodes, Class B D.D. Triodes, 5/-.

THE Following American Types, 4/6; 250, 210, 245, 226, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 27, 77, 78, 2A5.

THE Following Types, 6/6 each: 42, 25Z5, 36, 38, 83, 39, 44, 53, 6B7, 2A6, 2B7, 5Z3, 6C6, 6A4, 6D6, 6F7, 43, 59, 1A6, 1C6, 1V, 12AS, 12Z3, 19, 30, 31, 32, 33, 34, 41, 49, 56, 57, 75, 76, 79, 82, 84, 6Z4, 85, 89.

LISSEN 3-gang Superhet Coils, with switching; listed 30/-, with circuit, 6/-.

LOTUS 3-gang Band-pass Coils; 12/6 per set; with switching.

BEST British make Bakelite cased 0-1 m.c. Milliamp-metres, 2⅜ inch outside diameter 18/6, 3½ inch outside diameter 22/6.

12 TO 2,000 metres. Huge Purchase of All-Band 2 gang Coils from prominent British manufacturer. Fully Screened with switching for S.G. Det. type receivers, 4 Separate Bands, 12 to 2,000 metres. 12/6 with circuit.

SPECIAL Offer B.T.H. Moving Coil Speakers, matched pairs, specially manufactured for McMichael Supervox; 8in. diameter, 1,500 ohms-7,500 ohms (1,500 speaker as choke, 7,500 ohms speaker in parallel with H.T. supply); complete with special dual output transformer for pentode, 15/6 per pair; A.C. kit for above pair, 12/6.

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, 16/6; 9in. cone, 22/6.

A LARGE Selection of Pedestal, table and radio-gram cabinets by best manufacturers at a fraction of original cost; send for list.

T.C.C. Electrolytic Condensers, 15 mf., 50v. working, 1/-; 50 mf., 12v. working, 1/-; 15 mf., 100v. working, 1/-; 25 mf., 25v. working, 1/-.

CONDENSER blocks, H.M.V., 400v. working, 4+2+1+1+1+0.5, 3/9; 2+2+1+1+1+0.5,3/-.

ALL-ELECTRIC 3-stage Amplifiers, 200-250v., 40-60 cycles, 10 watts undistorted output, complete with 5 valves, and Magnavox Super 66 energised speaker, £12/10/-.

ELIMINATOR Kits, including transformer, chokes, Westinghouse metal rectifier, condensers, resistances, and diagrams, 120v. 20 m.a., 20/-; trickle charger, 8/- extra; 150v. 30 milliamps, with 4 v. 2-4 amp., C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v. 60 milliamps with 4v. 3-5 amps., C.T., L.T., 30/-; 300 v. 60 m.a., with 4 volts 3-5 amps., 37/6; 200v. 50 m.a., with 4v. 3-5 amps., L.T., 27/6.

PREMIER Chokes, 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; 25 milliamps., 20 hys., 2/9.

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

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

B.T.H. Truspeed Induction Type A.C. only, Electric Gramophone Motors, 100-250v., 30/- complete; ditto, D.C., 42/6.

COLLARO Gramophone Unit, consisting of A.C. motor, 200-250v. high quality, pick-up and volume control, 49/-; without volume control, 46/-.

(Continued at top of column three)

(Continued from foot of column one)

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

SPECIAL Offer of Wire-wound Resistances, 4 watts, any value up to 50,000 ohms, 1/-; 8 watts, any value up to 100,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

WHITELEY Boneham Energised M/c Speakers, 2,000 or 2,500 ohms, 8 inch diameter, 9/11. Please state which type transformer required.

COSSOR Permanent Magnet M/c speakers, large Darwin Cobalt Steel Magnet, 8 inch diameter, please state transformer required, 13/6.

LISSEN 2-Gang Condensers, Uniknob Trimmer, Disc Drive, .0005 each section, 5/6.

POLAR STAR, manufacturers' model, 3-gang condensers, fully screened, 7/6, with trimmer; unscreened, 5/-.

WIRE End One Watt Resistors, our assortment, 2/- per dozen.

ORMOND No. 4 Variable Condensers, 0.00025, 1/6. O.K. for Short Waves.

SPECIAL Offer Western Electric Mains Transformers, input 200-250 volts, output 350-0-350 volts, 120 milliamps, screened primary, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-5 amps., 9/6; input 100-250 volts, 300-0-300 volts 60 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 6/6; input 200-250 volts, screened primary, output 500-0-500 volts 150 milliamps, 4 volts 3-5 amps., 4 volts 2-3 amps., 4 volts 2-3 amps, 4 volts 1 amp., 4 volts 1 amp., 19/6.

MAINS Transformer, with Westinghouse rectifier, output 200v. 30 milliamps, and 4 volts 3 amps., L.T., 15/- the pair.

U.S.A. 3-gang Condenser, .0005, with trimmers, 3/11; a really solid job; Utility disc drive, 1/6.

SPECIAL Offer.—0.00015 brass short wave tuning condensers, with slow motion and complete dial, 3/9; short-wave chokes, 10-200 metres, 9d.

DUBILIER Electrolytic Condensers, 12 microfarads, 20 volts, 6d.; 8 plus 4 microfarads, 500 volts, 4/-; 50 mf., 50 v., 1/9; 8 mf., 500 v., 3/-.

RELIABLE Intervalve Transformers, 2/-; M.C. Multi-ratio output transformers, 2/6; 2-1 or 1-1 output transformers, 2/6; microphone transformers, 50 and 100-1, 2/6; 3 henry chokes, 2/6. 100 henry chokes, 2/6.

KOLSTER BRANDES Model 301 Pick-up with Arm; list price, 35/-; our price, 10/6.

RELIABLE Canned Coils, with Circuit, accurately matched, dual range, iron core, 2/11.

UTILITY 3-gang Condenser, 0.0005, fully screened, with trimmers, ball bearing, straight or superhet, 6/9; complete with disc drive, 7/6; the best 3-gang available.

T.C.C. Condensers, 4 mf., 450 v. working, 4/-; 4 mf., 750v. working, 6/-.

VARLEY Constant Square Peak Coils, band-pass, type B.P.7, brand new in makers' cartons, with instruction and diagram, 2/4.

VARLEY H.F. Intervalve Coils, B.P.8, band-pass, complete with instructions, in original cartons, 2/6.

SCREENED H.F. Chokes, by one of the largest manufacturers in the country, 1/6.

PREMIER British-made Meters, moving iron flush mounting, accurate .0-10, .0-15, .0-50m.a., 0-100, 0-250m.a., 0-1, 0-5amps.; all at 6/-; read A.C. and D.C.

POTENTIOMETERS by Best Manufacturers, 200, 350, 500, 1,000, 2,500, 5,000, 8,000, 10,000, 15,000, 25,000, 50,000, 100,000, 250,000, 500,000, 1 meg. 2/-; 5,000, 10,000, 15,000, 100,000, 250,000, with mains switch, 2/-.

U.S.A. Electrolytic Condensers, 550v. peak working, standard tubular metal condenser, 4 mf., 8 mf., 12 mf., a real bargain, 1/9.

BRITISH Radiophone 2-gang 0.00016 Short-wave Variables, all brass with steatite insulation, 5/6.

1,000 OHM 150 Milliamp, semi-variable resistance, 2/-; 1,000 ohm 250 milliamp., tapped, for any number .1.8 valves, 3/6; 800 ohms 350 m.a., tapped, 2/-.

RELIABLE Smoothing Condensers, 250v., working, 1 mf., 6d.; 2 mf., 1/-; 4 mf., 2/-; 350v. working, 1 mf., 1/-; 2 mf., 1/6; 4 mf., 3/-.

ALL Premier Mains Transformers have Engraved Panels, terminal connections, all low tension, windings centre tapped, tapped and screened primaries, 200-250 volts.

PREMIER 250-0-250 60 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-4 amps, 10/-.

PREMIER 350-0-350 150 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-4 amps., 12/6.

PREMIER Combined H.T.8 and H.T.9 Transformer, rectified output 250 or 300 volts 60 milliamps, 4 volts 1-2 amps., 4 volts 3-5 amps., 10/-; or with Westinghouse rectifier, either type, 18/6.

PREMIER H.T.10 Transformer, rectified output 200 volts 100 milliamps, 4 volts 1-2 amps., 4 volts 3-5 amps., 10/-; or with Westinghouse rectifier, 19/6.

PREMIER H.T.11 Transformer, 500 volts, 120 milliamps., rectified output, 4 volts 2 amps., 4 volts 2 amps., 4 volts 3-5 amps., 22/6; with Westinghouse rectifier, 42/6.

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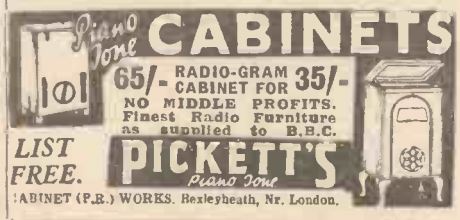

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Printed in Great Britain by NEWNES & PEARSON PRINTING CO., LTD., Exmoor Street, Ladbroke Grove, W.10, and published by GEORGE NEWNES, LTD., 8-11, Southampton Street, Strand, W.C.2. Sole agents for Australia and New Zealand: GORDON & GOTCH, LTD. South Africa: CENTRAL NEWS AGENCY, LTD. *Practical and Amateur Wireless* can be sent to any part of the world, post free, for 17/4 per annum: six months, 8/8. Registered at the General Post Office for Transmission by Canadian Magazine Post.