DETECTOR DEVELOPMENTS

Practical Wireless

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WAIT FOR OUR TELEVISOR !—

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Vol. II. No. 41 || F. J. CAMM || July 1st, 1933
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ROUND *the* WORLD *of* WIRELESS

Still Forging Ahead

THE number of receiving licences in force in Great Britain at the end of May, 1933, was 5,576,500 owing to an increase of 289,400 during that month. The six million mark should be reached very soon and the Radio Exhibition in August, no doubt, will give us a good start towards the seventh million. Great Britain is "well away" at the top of the list of European broadcasting systems.

National Broadcast of a German Trial

IN one of the Berlin Law Courts the Ministry of Propaganda, similar to the custom prevailing in Russia, has installed microphones in order that the proceedings may be recorded and later, at a more convenient hour, broadcast through the transmitters.

Tuning by Light

ACCORDING to the *New York Times*, Paul MacGahan, an engineer of the Westinghouse Electric and Manufacturing Company of America, has invented a "shadow" meter which greatly facilitates the accurate tuning of a wireless receiver. The gadget consists of a small rectangle of transparent material in the front of the cabinet, over which a shadow travels, as the station is tuned in. At the outset the darkened line is a broad one which gradually narrows as the set is tuned close to the desired frequency. The meter itself is formed by a small aluminium vane which is mounted on a moving coil and in front of which a small shutter has been secured which masks the rays cast by a small lamp. In its normal position, namely, between stations, the shutter blocks out the light rays and thus provides a wide shadow. As the condenser dial is turned and the set tuned, the small vane revolves until at the moment sharp tuning has been reached; the shutter is almost parallel to the rays of the lamp thus casting the narrowest shadow or hair-line on the meter dial.

Teaching Americans the Technique of Speaking

AT Georgetown University, Washington (D.C.), special classes have been formed for training students in the technique of speaking before the microphone. In this way, it is believed, public speakers may be trained, as for radio talks slovenliness in speech must be completely avoided.

Linking Up Swiss Radio

THE Swiss broadcasting system, with the recent addition of Monte Ceneri, has now permitted the interlinking of Beromünster, Sottens and Radio Lugano not only with the principal Swiss centres but also with cities in neighbouring countries. Special pupinized cables through Geneva and Lausanne will allow concerts from Paris, Lyons, or Marseilles to be broadcast through Sottens; Basle feeding Beromünster, connects Switzerland with Strasbourg or Frankfurt-am-Main; Zurich with Stuttgart and Berlin, or through St. Gall with Vienna, and Monte Ceneri through Lugano can transmit programmes emanating from Milan and Rome. In addition, the Post Office authorities have organized a service which will allow 300,000 telephone subscribers to listen to these radio entertainments.

THE STANDARD—

"Practical Wireless" on September 24th last created an entirely new standard in radio journalism. *It guarantees* receivers described in its pages to function in the manner claimed, and to give *free advice* to every reader!

THE STYLE—

It is naturally a source of extreme satisfaction to us to observe that so many of our features have been copied, thus paying tribute to our originality and enterprise.

—AND THE PACE

"Practical Wireless" always publishes first-hand information on the latest developments *immediately they are available to the public—not before!* An inspection of our pages to date will show that we faithfully observe our duty to the reader in providing accurate and up-to-date information—in a phrase, *real, reliable, and unrivalled reader service!* We shall continue to watch and to safeguard the interests of the home constructor!

Monte Carlo on the Air

OWNERS of wireless sets capable of receiving distant and low-powered stations should tune into Nice-Juan-les-Pins (249.5 m.) on the evening of July 8th, when the studio will relay a concert from the Terrace of the *Monte Carlo Kursaal*. The station proposes to carry out a series of similar relays during the season.

German Interval Signals

ALTHOUGH, for the majority of its broadcasts, Nürnberg relies on the mother station, Munich, for its programmes, the two studios have different interval signals. Nürnberg has adopted a five-note phrase from *The Mastersingers*, and Munich a short theme from Wagner's *Parsifal*. Both are given in the form of bells.

Tuning in the Brewery!

SEVERAL of the Milwaukee and St. Louis breweries have installed wireless transmitters at Headquarters for the purpose of direct communication with their motor lorries. In this manner, cars fitted with receivers can receive immediate instructions regarding the delivery of beer. In some instances, these motors possess apparatus allowing them to remain in constant touch with the brewery.

Radio Tessin's Interval Signal

THE Monte Ceneri transmitter now testing temporarily on 1,145 m., as an interval signal has adopted the chimes of the bells of the *Campane di Pazzalino*, an old church in its immediate neighbourhood.

Through Strasbourg to Verdun

THE Strasbourg studio is widening its sphere of action and promises during the summer a series of interesting relays of celebrations taking place at Metz and also at Verdun. Unfortunately, France, generally, is badly supplied with cables suitable for the transmission of music, and until special pupinized lines have been laid, overhead cables must be used for these relays.

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

French High-power Station

WORK has already been started on the 120-kilowatt PTT transmitter to be installed at Thourie, some 40 miles to the North of Nantes, and it is expected that the station will be working towards the end of the year. If the French papers are to be believed the number of wavelengths available in the new Lucerne Plan for France will not permit the inclusion of special channels for the privately-owned transmitters, and on this assumption, with the bringing into operation of Thourie, such stations as Radio Normandie (Fécamp), Radio Lyons, etc., may be compelled to close down. It is further reported that the sum of two million francs has been voted for the reconstruction of the Pontoise *Poste Colonial* short-wave transmitter, and that the power is to be increased from 15 to 50 kilowatts.

Belgian Railway Radio

THE great success obtained by the installation of a wireless receiver and loud-speakers in one of the Belgian expresses has induced the authorities to consider a similar equipment of a large number of trains running on the Arlon-Brussels-Ostende route, and between Liége-Charleroy-Mons and Paris. The carriages will also be supplied with head-phones for the use of travellers.

Jamming the Russians

APPARENTLY Soviet propaganda broadcasts can no longer be heard by German listeners, as on evenings when special transmissions are given for their benefit, the Nazi authorities jam the wavelengths used by Moscow and Leningrad. French radio fans complain that when the Radio Strasbourg news bulletins contain references to German political matters, the broadcasts are also subject to interference. If this is the case, all the heterodyning on the broadcast band is not necessarily accidental!

Spain's High-power Station

THE original plan for the reorganization of the Spanish broadcasting system is making progress, inasmuch as the government has officially stated that the sum of four million pesetas has been earmarked for the construction of a 100 kilowatt transmitter at Madrid; it will, however, be entirely under State control. Economic conditions may not permit the installation of big stations at Barcelona, Valencia, and San Sebastian, but a promise has been made to increase their power to 20 kilowatts.

Radio Toulouse

ALTHOUGH on various occasions it has been stated that the French State had definitely refused to authorize the working of the new St. Agnan high-power transmitter, it is now rumoured in Paris that the Minister of Posts and Telegraphs has unofficially declared that a permit may be granted to the new station within the next few weeks.

INTERESTING and TOPICAL PARAGRAPHS

French Broadcasting Bill

NOTWITHSTANDING considerable opposition the French Government has succeeded in passing the new bill concerning radio receiver licences and taxes on valves, which is to provide an income for the transmitters to whom authority to broadcast wireless programmes is granted. The French listener, who so far has received such entertainments without payment, must now pay a fee of roughly 8s. (at par) per annum for a valve set and the equivalent of 2s. 6d. for a crystal receiver. In addition, a tax is levied on valves; it varies according to the value from 6d. to 10d. per unit. In order to encourage educational institutions to listen to lectures and talks provided by the State studios, public schools will not be required to pay these taxes.

THE KING'S RECORD PRESSED.

A few late workers at the H.M.V. factories at Hayes looking at the first pressing of a record of The King's Economic Conference Speech, which was made by "His Master's Voice" and broadcast the same evening by the B.B.C.

Lucerne Wave Plan

WHATEVER decisions are taken at the Conference in respect of the new allocation of broadcasting channels, it is hardly likely that the amended plan will be brought into force before January, 1934. Listeners, generally, in most continental countries will be given six months' notice before the date on which their stations change over to the allotted wavelengths. In the meantime, there is no doubt that considerable testing and experimenting, after broadcasting hours, will be carried out by individual transmitters, but it is evident that the actual "general post" must take place on one and the same date if chaos in the ether is to be avoided.

Holland's 570,000 Listeners

ACCORDING to recent statistics there were 280,610 owners of wireless apparatus in Holland in April, 1933, and a further 291,628 subscribers to the radio distribution network. The proportion of listeners to population is high, working out at roughly 7 per cent. No registration is in force in Holland, and figures relating to the number of wireless enthusiasts are based on the membership of broadcasting associations; it is therefore estimated that Holland must possess at least another hundred thousand or more "free lances."

Switzerland and the Lucerne Plan

ALTHOUGH definite wavelengths have not yet been allotted, there is a likelihood that some alteration will be made in the channels allocated to the Swiss transmitters. Beromünster, however, will probably work on about 539 metres, and Sottens will take over the frequency now used by that station. On the other hand, although Monte Ceneri has carried out tests on 1,145 metres, there is every possibility that it may have to work on the lower part of the broadcast band.

Vienna Retains its Position

LITTLE change is expected in the wavelength of the new Bisamberg transmitter; it is probable that it may be told to transmit on 515 m. as against 518.1 m., to which, up to the present, it has been tuned.

School of Accountancy: Change of Address

WE are informed that the School of Accountancy has removed its headquarters for England and Wales to Bush House, London, W.C.2, which is one of the most modern office buildings in Europe and, in its new headquarters, the school has installed a highly efficient organization, which must prove of great advantage to its many students at home and abroad.

H.M.V. Move

AS from June 1st, the new address of the Gramophone Co., Ltd., is 98-108, Clerkenwell Road, London, E.C.1.

SOLVE THIS!

Problem No. 41.

Hepworth had a two-valve Det.-L.F. transformer-coupled set which gave good reception. Wishing to increase the volume, however, he converted the set into a three-valver with two L.F. stages. The first of these was R.C. coupled and the second, transformer-coupled. After the set had been altered Hepworth found that it would not oscillate at all on the long waves, and only over a few degrees of the dial on medium waves, unless a higher voltage than previously was applied to the detector high-tension positive tapping. Why was this?

SOLUTION TO PROBLEM No. 40.

When fitting the grid-bias plugs to the flexible leads, Smith had inadvertently fitted the negative plug to the positive lead, and *vice versa*. Reversal of the plugs enabled the receiver to function satisfactorily.

The following reader received a book in connection with Problem No. 39. His was the only correct solution received.

T. Pilkington, 1 Law Street, Accrington, Lancs.

IRON CORE COILS

by HANS VOGT

IMPROVEMENTS IN THE NEW TUNING COILS EXPLAINED BY THE INVENTOR

"Practical Wireless" always gives first-hand information!

INVENTING, it is true, is an art, and any new development of fundamental importance, based on a good and sound new idea, is what we call an "invention." Yet, important as it is, the good idea is only the initial step, and sometimes more spirit and work is involved in turning an invention into practice, and adapting it to the technical requirements, than in the initial inventive idea.

So, after having found the principle of the new iron cored coils satisfactory further work meanwhile has been done to adapt the new principle to the practical requirements of radio technique, and to utilize the chances it offers to the utmost possible extent.

Before describing the latest improvements thus achieved in Ferrocart coils, the fundamental considerations which induced me to create the new coils may briefly be outlined.

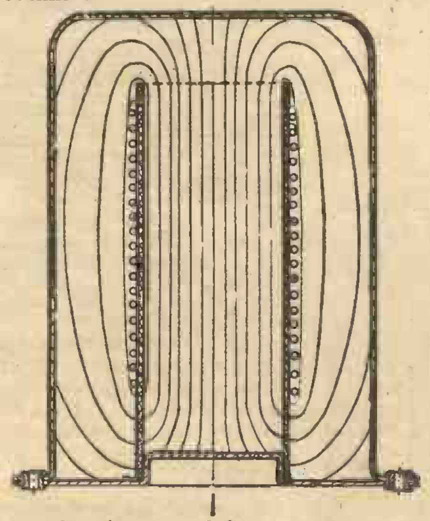


Fig. 1.—An air coil has a weak magnetic field, the lines of force are strayed out and many turns of wire are required to attain a certain amount of inductance.

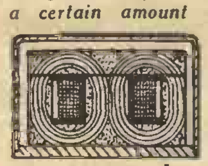


Fig. 2.—By introducing an iron core the field is greatly intensified and concentrated, therefore much less turns of wire are required to obtain the same amount of inductance.

Physical Considerations

From a physical standpoint it is a very simple fact that the dimensions of a coil can be considerably reduced by winding it on a magnetic core, while the efficiency is increased simultaneously by the core. Fig. 2 will demonstrate this. The air coil

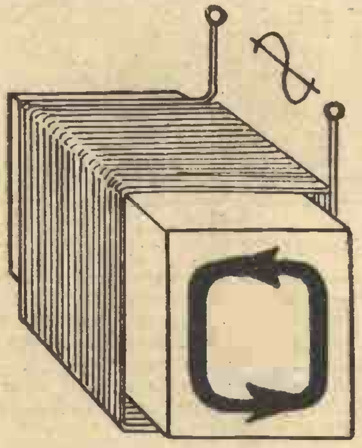


Fig. 3.—In a solid iron core, considerable eddy current losses are induced by the alternating magnetic field.

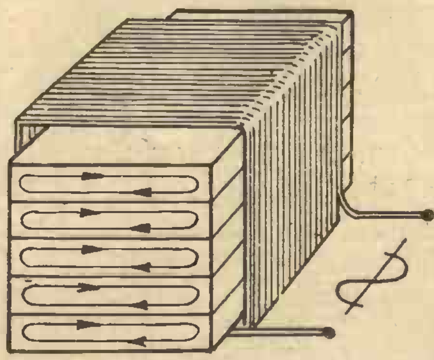


Fig. 4.—In the case of low frequency, these eddy current losses can effectively be avoided by building up the core of many sheet iron laminations. As the eddy current losses are increasing with the square of the frequency this method cannot be transferred to high frequency.

on the left, (Fig. 1.) although being large, has a very weak magnetic field, and a great deal of the lines of force are strayed out. By introducing an iron core (coil on the left) the lines of force are concentrated and intensified; therefore, much less turns of wire are required to obtain the same amount of inductance. By reducing the length of wire required, the ohmic resistance of the coil, of course, is greatly reduced, and, due to the concentration of the magnetic field and avoiding of leakage field, any screening cover may be arranged very closely to the coil, and no additional losses will be produced in it by the leakage field.

Practical Difficulties

Accordingly, you might think it a very simple matter to make a small and highly efficient high-frequency coil by simply winding it on a magnetic core. Practically, however, it is not possible to do so; on the contrary, a simple test will show that the losses of a H.F. coil are advanced enormously by introducing a piece of iron into its interior space. This is because very considerable eddy current losses are induced in a solid core (Fig. 3). To prevent these eddy current losses, the core of low-frequency transformers and chokes is built up of a plurality of thin sheet iron plates with intermediate insulating layers (see Fig. 4). However, as I ascertained by tests in my laboratory, even this method cannot be applied in case of high frequency, for the eddy currents are increasing with the square of the frequency, and so they are one million times higher at a frequency of 1,000 *kilo*cycles than at a frequency of 1,000 cycles. I, therefore, tried to build up the core of insulated iron powder as per Fig. 5, but as it is very difficult to safely insulate the particles from each other and to prevent capacitive coupling between the particles, no definite success could be obtained even by this method.

A New Idea

Having found out that neither the finest lamination nor subdivision into pulverous material is sufficient alone, I tried to combine both methods, arranging very small

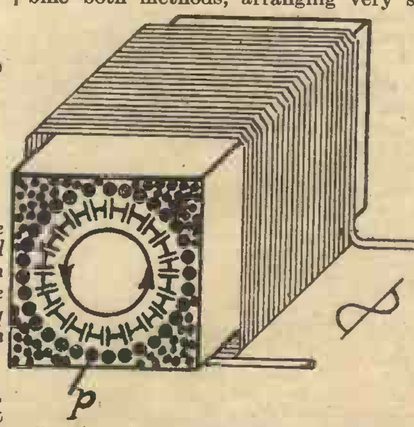


Fig. 5.—A core made of iron particles mixed with insulating material. It is impossible absolutely to insulate the particles and prevent eddy current losses in this way, as there are forming dielectric displacement currents due to capacitive coupling between the particles.

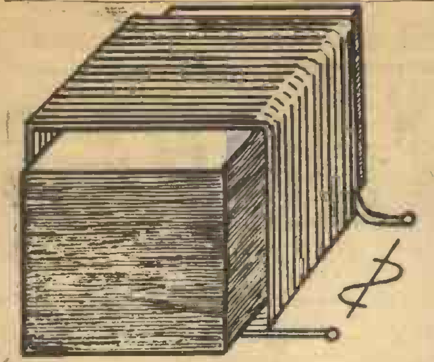


Fig. 6.—A combination of the two methods, arranging a mixture of iron particles and insulating material in very thin layers on an insulating material.

insulated magnetic particles in very thin layers separated from each other by intermediate insulating layers. Already the first tests in this line proved this method to be very effective, and after further improvements as regards insulating methods, size of particles, etc., the Ferrocart in its present form resulted, the structure of which is shown by Fig. 6.

Coil Development

It is one thing to make a new invention, and another to make it practically applicable. So, having developed the suitable magnetic material, the matter was not finished, as considerable work still remained to be done, consisting in creating coils of suitable construction of the new material. Figs. 8 to 10 shows the progress made along this line in the last months, and the great progress of the new coil types as compared with the first toroid coil will be obvious. Special attention has been devoted to convenient construction so as to make the adjusting and fitting as simple as possible, and to create a compact self-contained inductance element. Fig. 8 is a toroid coil of obsolete type. It is difficult to wind, and matching has to be effected by inclining the two halves against each other, putting the coil into a box and filling up the box with a filling mass to solidify the whole. Subsequent matching is not possible. Also the quantity of Ferrocart material required is very considerable.

Fig. 9 is a modern so-called pot-coil. A very small cylindrical coil is automatically wound on a coil-former of insulating material, and is perfectly enclosed in Ferrocart material. Between the Ferrocart pot and the Ferrocart cover there is arranged an air gap, and by screwing down the centre screw this air gap is varied and the inductance varied accordingly. Matching can thus be effected very easily, and re-adjusting is always possible. The shell coil, shown in Fig. 10, is built after the principles of the shell type transformers; the core is stamped out of Ferrocart plates without any wastage in stamping. Fig. 11 is an inductance element embodying coils of this type. The coil in Fig. 11, looking like a little accumulator, is fitted in a transparent cover of insulating material. By a special device the magnetic bridge which is to close the magnetic path of the core can be moved to and fro to vary the air gap. The terminals are arranged in the cover. This little inductance element can be fitted very easily, little holes being arranged in the bottom and cover for this purpose. Also several elements can be arranged in the form of a coil block as per Fig. 12, to form a band-pass filter unit or a short long-wave set.

As is well known, in modern multi-stage receivers with one knob control, it is very important to have accurately matched inductances. In case of air coils, matching has to be made when winding the coils, by removing some of the windings. Subsequent matching of the screened coils fitted in the receiver cannot be realized with air coils, though this would be the ideal way of trimming the set. With the latest construction of Ferrocart coils, on the contrary, this ideal method can easily be applied, and I consider this a very appreciable additional advantage of the new coils over air coils, being of greatest importance from a practical point of view. Comparing the latest types of coils with the first toroid coil, it will be evident that a further important step forward has been done by creating these new types of coils, augmenting considerably the superiority of the new principle of coil construction. The primary advantage of the new coils, of course, consists in their low losses. As you know well, decreased losses mean reduced damping, and so improved selectivity, which is the most important property of a modern receiver.

In conclusion I may point out I always was convinced that, in spite of the rapid progress already realized in the last decade in radio technique, there remained still a wide field open for improvements in the components of radio receivers. Starting from this contemplation, I developed the Ferrocart coils, and I feel sure further progress will follow.

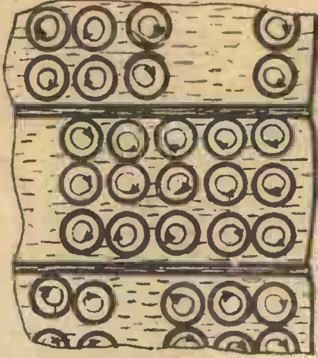


Fig. 7.—The small local eddy currents forming in the compound mass due to insufficient insulation and capacitive coupling, are locked up by the intermediate insulating layers.

Fig. 8.—The first type of coils with Ferrocart core. The coils of this kind are inconvenient to be wound and matched, and although by far superior to air coils they are still relatively clumsy. Subsequent matching is not possible as they must be made stable by putting them into the screening box and filling up the box by a filling mass.

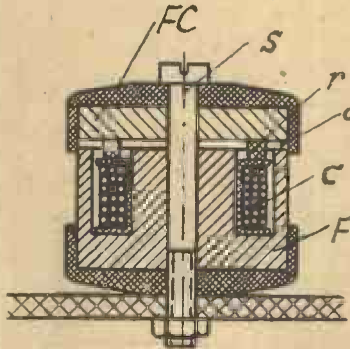


Fig. 9.—A pot coil. The wire coil (C) is completely enclosed in Ferrocart material (F). By handling the centre screw (S) the Ferrocart cover (FC) is approached to the core (F) and the airgap (a) is varied accordingly by pressing together the rubber ring (r). The inductance easily can be matched after the coil is fitted in the receiver, which is a further important advantage of the new coils over air coils and the old Ferrocart coils.

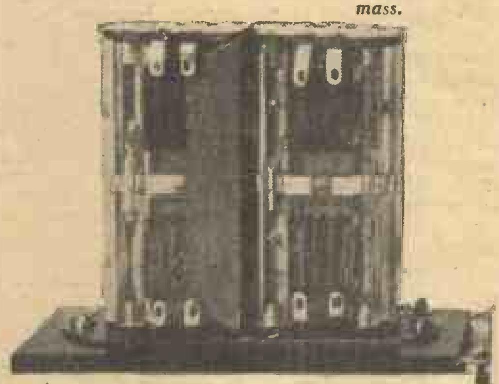


Fig. 12.—Several of the coils of Fig. 11 can be combined in form of a coil block to form a band pass filter unit or a short long-wave set.

Fig. 10.—A shell coil which is very useful from a practical point of view. The thimble gives a comparison of the size.

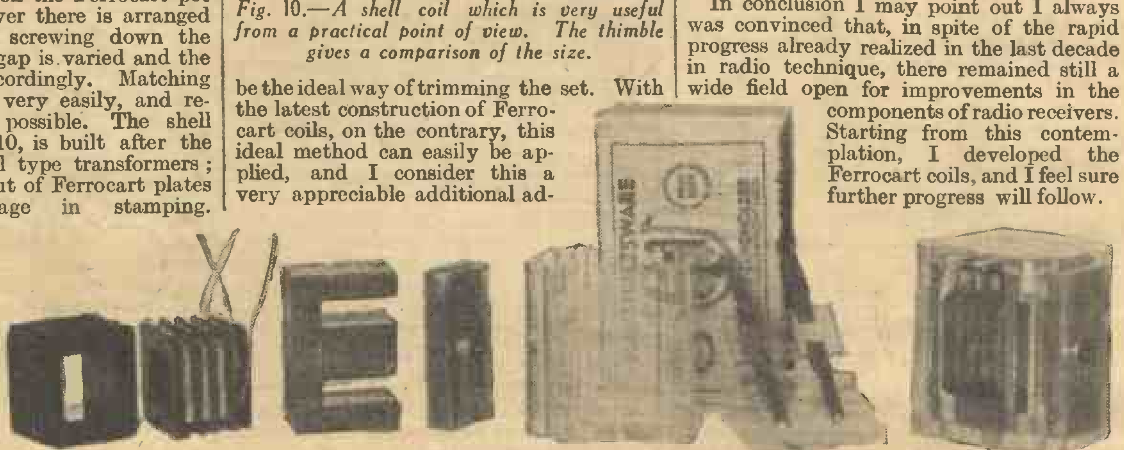


Fig. 11.—An inductance element consisting of a shell type core (a), the wire coil (b), the magnet bridge (c), the transparent casing of insulating material (d), and the transparent cover of insulating material (e). The complete element is shown at (f).

Making an ALL-WAVE RECEIVER

Designed by Togni

In this Article the author tells you how to make a tuner for long, medium, and short waves, and also how to make a "universal" H.F. Choke

AS short-wave broadcasting continues to increase in popularity, there is a rapidly-growing demand for all-wave receivers, that is, receivers which will tune, not only to the medium and long-wave bands, but also to the short and ultra-short waves. Innumerable difficulties present themselves when an attempt is made to design sets of that type, but there is no doubt that they will have to be solved in the very near future, if broadcasting is to continue at its present rate of progress.

Of course, it is a simple matter to receive short-wave stations on a standard long-wave set by using an adaptor or converter, but this is not sufficient; the system is clumsy and inconvenient. I have for some time been interested in the problem of all-wave receiver design, and have experimented with a number of different arrangements with varying degrees of success. It is at once evident that an all-wave receiver must be in the nature of a compromise, since the circuit requirements on wavelengths below, say, 100 metres are somewhat different to those higher up the wavelength scale. At the same time, I have found it quite possible to make an instrument which shows a high degree of efficiency on the longer waves, and yet which will give good reception of the more powerful short-wave stations. I am quite convinced that at present it is impossible to design a reasonably priced set for home construction that is equally efficient on all wavelengths between 15 and 2,000 metres, but I think that if the advantage of fairly good S.W. reception can be combined with very good reception on higher wavelengths, without appreciable extra cost, it is worth having.

Quite naturally, the most important components in an all-wave set are the tuning coils, but the high-frequency chokes must also be designed specially for the work they have to do. I have therefore worked out a fairly simple form of construction both for a tuning coil and for a choke, and it is proposed to describe these components so that you can try them for yourself.

The Tuning Circuit

Before dealing with the constructional work, it will be best to explain the general features of the tuner by referring to the circuit diagram of Fig. 1, which shows it connected up in a Det.-L.F. circuit. There are three tuned windings, short-wave, medium-wave, and long-wave, and these cover wavelength ranges of about 20 to 50 metres, 250 to 550 metres and 900 to 2,000 metres respectively, when tuned by a good (low minimum capacity) .0005 mfd. condenser.

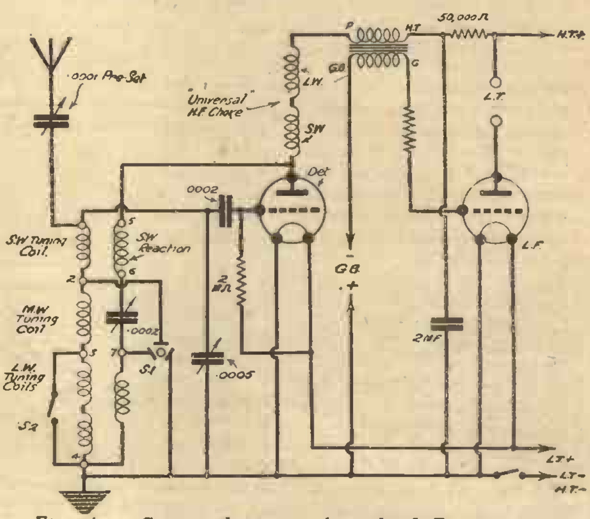


Fig. 1.—Circuit diagram of a det-L.F. receiver using the all-wave tuner and H.F. choke described.

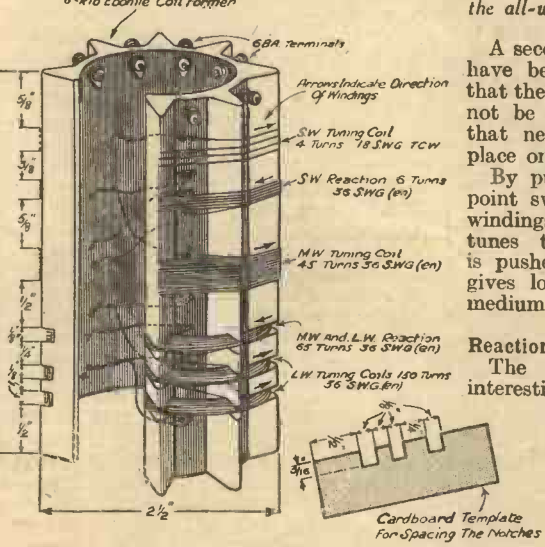


Fig. 2.—Winding data for the all-wave tuner.

A second short-wave tuning range could have been added, but it was considered that the extra complications involved would not be worth while in view of the fact that nearly all S.W. broadcasting takes place on wavelengths below 50 metres.

By pulling out the knob of the three-point switch marked S1, the two larger windings are short-circuited and the set tunes to the short-waves. When S1 is pushed in, the single-pole switch S2 gives long waves (knob pushed in) and medium waves (pulled out).

Reaction

The reaction circuit is unusual and interesting, since two separate windings are joined in series "through" a .0002 mfd. variable condenser. Thus, when the tuner is set to short-waves, one reaction winding is short-circuited by switch S1, and the moving plates of the reaction condenser are connected to earth. By using this arrangement the switching system is simplified and hand capacity troubles are avoided. To ensure that reaction control shall be equally effective on every waveband a "universal" H.F. choke is employed. This really consists of a long and short-wave winding connected in series, but no switching is required because the S.W. winding is ineffective on long waves, whilst on short-waves the H.F. currents are kept well in check by the S.W. winding.

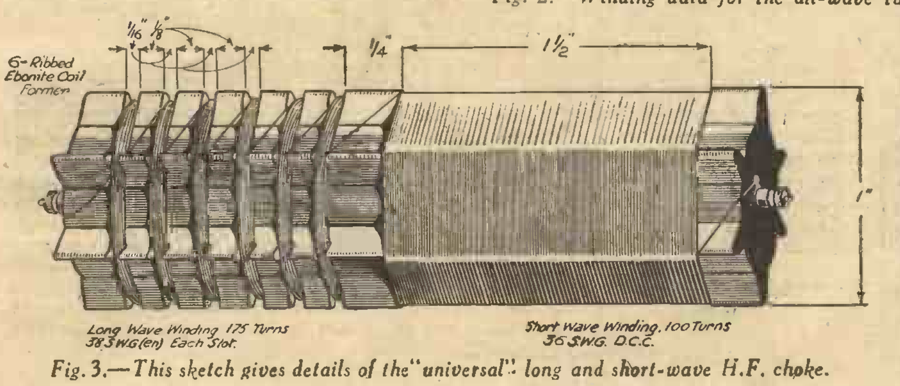


Fig. 3.—This sketch gives details of the "universal" long and short-wave H.F. choke.

Making An All-wave Tuner

The form of construction employed for the all-wave tuner is perfectly simple and straightforward, as can be seen from

(Continued overleaf)

(Continued from previous page)

Fig. 2, and differs only from that of the usual dual-range tuner in so far as two extra windings are added.

The materials required are :—

One 4in. length of No. 12 "Becol" 8-ribbed Ebonite Coil Former $2\frac{1}{2}$in. (outside) diameter.

Seven 6 B.A. Terminals, with soldering tags.

1oz. 36 s.w.g. Enamelled Wire.

One Short Length 18 s.w.g. Tinned Copper Wire.

First of all the ebonite former must be prepared by making three sets of notches in the ribs at the positions indicated in Fig. 2. These are each $\frac{1}{8}$in. wide and $\frac{3}{16}$in. deep, and can easily be made with a small file, unless a lathe is available, in which case the task will, of course, be still further simplified. When doing the work by hand, it will be found that it can be carried out most accurately by making a small cardboard template like that shown as a detail to Fig. 2. This can be laid against the edge of each rib in turn, while the notches are filed out. Next, seven $\frac{1}{8}$in. holes must be made round the upper end of the former to receive the 6 B.A. terminals.

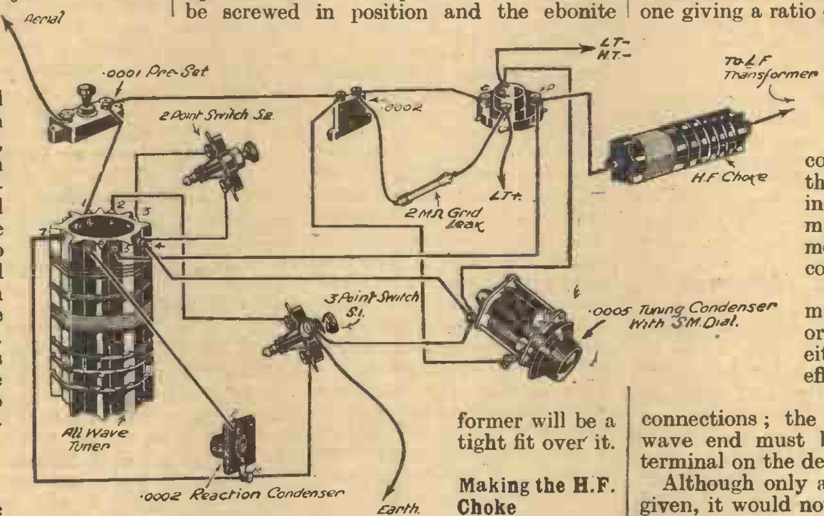


Fig. 4. Pictorial wiring plan for the Tuner and H.F. Choke described.

Winding the Tuner

Having prepared the former, winding can be commenced. Start by making two very small holes near one of the lowest notches, anchor the end of the 36 gauge enamelled wire in these, and leave a length of about six inches on the inside of the tube. Now wind 75 turns in the bottom set of notches, pass over the second set and put on another 75 turns. This completes the long-wave tuning coil, so two more small holes must be made and the wire anchored in these. The combined long- and medium-wave reaction coil comes next and is wound in the third set of notches. This winding must go in the *opposite direction* to that of the tuning coil and consists of 65 turns of the 36 gauge wire ; the ends can be anchored as before. The medium-wave tuning coil is wound as a single layer on top of the ribs and starts $\frac{1}{2}$in. away from the reaction winding. Forty-five turns are put on in the same direction as the long-wave tuning coil, the ends being secured in just the same way as those of the other windings.

We next come to the short-wave reaction coil, which has six turns of 36 gauge wire wound in the same direction as those of the other reaction coil (that is, opposite to those of the tuning coils). Lastly, the short-wave tuning coil is wound. Only four turns of 18 gauge tinned copper wire are used for this, and they are taken in the same direction as the turns of the other two tuning coils. They are wound over the ribs, but instead of being touching each other, a space of about $\frac{1}{8}$in. is allowed between them. The wire should be kept quite tight while winding, and, to prevent subsequent slipping of the turns, it is well to melt a spot of sealing-wax over them where they touch the edges of the ribs.

And now the ends of the various windings can be soldered to their respective terminals. To avoid confusion it is best to do this job systematically, starting at the bottom of the former and working upwards. Pull each wire so it is just taut and then cut it off to such a length that it will comfortably reach the terminal ; scrape off the insulation and apply a spot of solder after lightly smearing with flux. It will be noticed that two wires go to each of terminals 2, 3 and 4 ; the ends of these can conveniently be twisted together before soldering.

That completes the constructional work and the all-wave tuner is now ready for use. The easiest way to attach it to the baseboard is by means of a wooden disc $1\frac{3}{4}$in. diameter and $\frac{1}{4}$in. thick. This can be screwed in position and the ebonite former will be a tight fit over it.

Making the H.F. Choke

In regard to the "universal" H.F. choke; the materials required are :—

One 3in. length of No. 2 "Becol" 6-ribbed Ebonite Coil Former 1in. (outside) diameter.

1 oz. 38 s.w.g. Enamelled Wire.

One Short Length 36 s.w.g. d.c.c. wire.

Two 4 B.A. Terminals, with soldering tags.

The arrangement of the windings is illustrated in Fig. 3, from which it can be seen that the long-wave portion is divided into six sections, each of which is placed in a notch $\frac{1}{16}$in. wide by $\frac{3}{16}$in. deep ; the short-wave portion consists of a single layer wound in a $\frac{1}{16}$in. deep groove $1\frac{1}{2}$in. long. First of all, then, the notches can be made with a saw, again using a template as a guide, and the grooves are taken out with a flat file. The terminals are next fitted into the ends of the former, which has a $\frac{1}{8}$in. hole running through it. If a 4 B.A. tap is available, the ends of this hole may be threaded by that means, but alternatively, the terminals will make their own thread if a little force is used.

Solder the end of the 38 gauge enamelled wire to the terminal nearest the slots and then wind on 1,050 turns, putting 175 in each slot. After filling the last slot, solder the end of the 38 gauge wire to one end of the 36 gauge (double cotton covered) wire and put a single layer winding of the latter in the $1\frac{1}{2}$in. long groove. If the turns are kept close together, it will be found that just about 100 can be fitted in the space provided. Finally, cut off the wire and solder it to the second terminal.

Tuner and Choke Connections

All connections for the tuner and choke can be followed by making reference to Fig. 1, but to assist those few readers who still fight shy of circuit diagrams a pictorial wiring plan showing the detector valve only is given in Fig. 4.

The .0001 mfd. pre-set condenser in series with the aerial lead is absolutely essential since, without it, the set would probably fail to oscillate on the short-wave band. It is also of particular importance that the .0005 mfd. tuning condenser should be a really good one designed on "low-loss" principles and having a low minimum capacity. A bakelite dielectric condenser, though it might be perfectly satisfactory on wavelengths above 300 metres, is quite useless for short-wave work. A good slow-motion, or vernier, dial must be used with the condenser, and one giving a ratio of about 100 to 1 is to be preferred. As an alternative to the vernier dial, a .00005 mfd. variable condenser might be connected in parallel with the normal tuning condenser, and this can then be used for "searching" on short waves, after making a rough adjustment on the .0005 mfd. component.

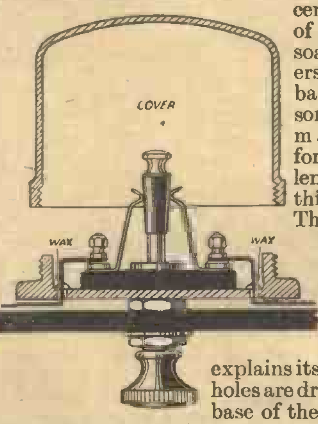
The reaction condenser may be of either the air- or solid-dielectric pattern, either kind being equally effective.

Notice the H.F. choke connections ; the terminal at the short-wave end must be joined to the plate terminal on the detector valve holder.

Although only a Detector-L.F. circuit is given, it would not be a difficult matter to arrange two similar tuners in an S.G. circuit and in that case the reaction windings of the aerial tuner would not be used. Ganged tuning is quite out of the question for short-wave reception.

A SWITCH IMPROVEMENT

PUSH-PULL switches often give trouble after a time owing to faulty contact between the springy metal strips and the plunger. This deterioration can be very largely avoided by enclosing the switch in an airtight case. I have found that certain kinds of shaving-soap containers (made of bakelite or some similar material) form excellent cases for this purpose. The method of adaptation is shown in the sketch which almost explains itself. Three holes are drilled in the base of the container—a central one for the fixing-bush, and two others for the connecting wires to enter. After mounting the switch and connecting up the wires, the holes through which they pass are sealed up airtight with a little melted wax. The cover is then screwed on, making the whole switch assembly completely dustproof and damp-proof.—N. HURST (Wimbledon).



Picnic Aerials

Some Useful Hints on Outdoor Reception.

By A. V. D. HORT.

MOST interesting results can often be obtained by taking a receiver away from its normal surroundings. If you live in a big town, you will almost certainly find that the performance of your receiver is far better when you take it away from the confines of houses and streets. Modern flats, in particular, contain steelwork in their structure which is definitely inimical to long-distance reception with anything but the most powerful set.

Apart from these considerations, a great deal of enjoyment can be obtained from listening to the programmes under out-of-doors conditions. Take your receiver with you when you go off in the car, and you will have a pleasant companion to provide you with entertainment when more active occupations begin to flag.

When you pack up the receiver, do not forget that you must take an aerial-earth system for it as well. If you go by car, you will almost certainly use the car batteries for power supply, so that you need not worry about weighty accumulators. But an aerial you must have, and a last-moment makeshift with odd bits of wire is rarely satisfactory. Even the receiver with a built-in frame aerial will have a wider range, and will give improved signal strength with the addition of a short external aerial, and an earth connection. For the receiver which has no frame aerial you must provide an adequate overhead aerial to replace the one at home, or you will be disappointed.

There is no need to take out with you a coil of the usual 7-22 aerial wire, nor to be equipped with an elaborate mast. This wire is awkward to handle, owing to its stiffness and its liability to kink, and it calls for insulators. The handiest wire for the picnic aerial is the stranded rubber-covered flexible cable, which is commonly used for leading in from the overhead aerial to the house.

Equipment Necessary

Here, then, is the whole equipment, which does not really need any preparation before you start: A 50ft. or even 100ft. length of the rubber-covered cable, a broomstick or stake, 5ft. to 6ft. long, pointed at one end, 3 or 4yds. of stout string, two wooden pegs, and a large clasp-knife. If you cannot lay your hand on the last-named item, a large meat skewer, or similar metal spike, will serve. This list provides for every emergency. In practice you will be able to dispense with one or more of the components, according to the conditions in the places where you have your picnics.

Fig. 1 shows you how to arrange your aerial and earth, using all the parts mentioned. In this way you can put up an excellent temporary aerial in open country, when there are no trees or posts handy for your purpose. Proceed as follows to erect the aerial. Choose the spot for the receiver, and put a peg in the ground close to it. Attach to this peg one end of the cable, using a "clove hitch" to secure it (Fig. 2), and leaving a spare foot or two of the cable to go to the aerial terminal. Run out the cable to its full length, secure the free end to the stake—again with a clove hitch—push the pointed end of the stake into the ground, knock in the second peg in a dead straight line with the aerial, and guy the stake to it with the string. No extra insulators are required, as the rubber covering of the cable is quite adequate for a temporary aerial of this sort. So long as the staying peg is truly in line with aerial, it will hold up the "mast" quite safely without extra pegs at the sides, unless, of course, there is a very strong side wind.

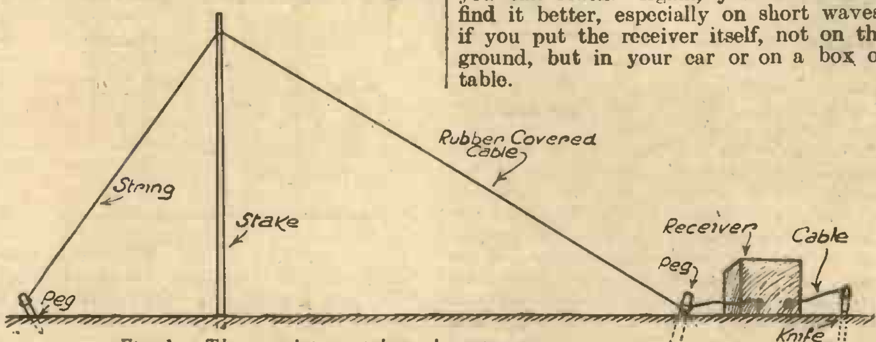


Fig. 1.—The complete aerial-earth equipment.

Aerial and Earth "Hook-ups"

The earth lead is a yard of the same cable. Bare both ends of this lead, and connect one end to the earth terminal of the receiver. Open the smaller blade of the clasp-knife, wind the other bared end round it and close the blade on the wire. The large blade pushed well into the ground will give you an earth connection which, under most conditions, will prove quite satisfactory. In very dry weather, damp the soil round the knife, if you have the water to spare!

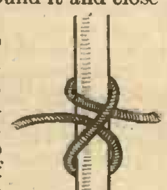


Fig. 2.—A clove hitch shown loosely tied. To finish, press the two loops together and pull the free ends.

A long, low aerial of this kind is, to a certain extent, directional. To get the best results from a given station, arrange the aerial so that it points directly away from the station. You will hardly be able to find the accurate direction without a map and compass, but even an approximation will help. Similarly, if interference is bad from one station, place the aerial at right angles to an imaginary line between your position and the station, as indicated in Fig. 3. Of course, if the wanted and unwanted stations lie in the same direction or in opposite directions, you must simply do the best you can by careful tuning.

The aerial system illustrated in Fig. 1 need only be used in its entirety in an open situation. You can do much better than this with the same equipment, if conditions are favourable. You can raise the far end of the aerial by fixing to a convenient tree. Tie the string to the cable, and one of the pegs to the end of the string, and sling it up over the highest branch that you can reach. Again, you will usually find it better, especially on short waves, if you put the receiver itself, not on the ground, but in your car or on a box or table.

The stranded cable gives you an aerial wire which should continue to give good service for a long time. In a real emergency, if you have nothing else, you can use ordinary cotton-covered wire, about 18 s.w.g. Wire as fine as 26 s.w.g. will do, with the added convenience that you can easily put a coil in your pocket; but handle this fine wire cautiously, and do not try to pull up your aerial too tight.

The Earth

There are many possible variations for the earth connection. On sandy soil, where it is difficult to make a good connection with a short spike in the ground, driving the knife, with the lead attached, into the trunk of a tree will often help; the roots of the tree spread out over a wide area, and the sap is a sufficiently good conductor for the purpose in hand.

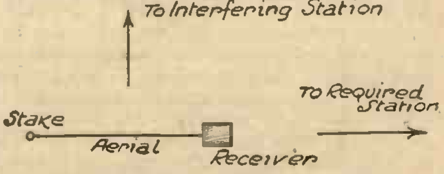
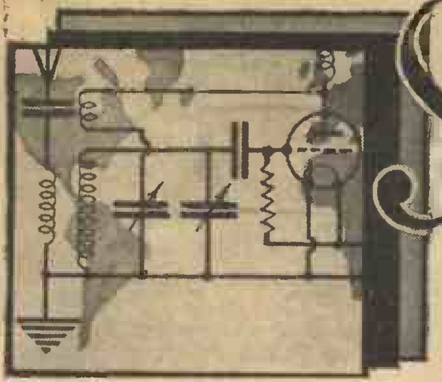


Fig. 3.—How to arrange the aerial to avoid interference.



Short-Wave Circuits

The Author Here Describes the Hartley and Armstrong Super-Regenerative Circuits. By FRANK PRESTON, F.R.A.

OF all the short-wave receivers in use to-day (and there must be many thousands) it is more than probable that something like eighty per cent. of them employ the same circuit arrangement. The reason is, no doubt, that the Reinartz circuit, shown in Fig. 1, has become so popular that no one thinks of trying to improve upon it. But despite the undisputed efficiency of the Reinartz circuit there are others which are better in many respects, and with which every short-wave enthusiast should experiment.

The Hartley Circuit

The first of these which comes to my mind as a real old favourite is the Hartley circuit, shown in Fig. 2. This was actually developed before the days of broadcasting, and was intended for transmitting purposes. It is, nevertheless, a particularly good arrangement for a short-wave receiver, principally on account of the ease of reaction control which it provides, but also because of its simplicity and adaptability for experimental use. You can see from Fig. 2 that a single winding acts as combined aerial, grid and reaction coils. The whole winding is tuned by the usual .00015 mfd. condenser, but only one half is connected between grid and filament of the detector valve. The "top" end of the coil is connected to the anode through a .0001 mfd. pre-set condenser, which provides the necessary feed-back or reaction. As a matter of fact, an ordinary variable condenser could be used in this position, when it would serve as a reaction control. But it is found better to employ a condenser connected between the anode and earth (marked C.3) for the latter purpose. This gives what is known as "throttle" control due to the fact that as its capacity is increased, reaction is "throttled" down, since part of the amplified H.F. currents appearing in the anode circuit of the valve are allowed to leak away to earth instead of passing back into the grid circuit. It can thus be seen that the reaction control works in the opposite direction to the more usual one, the degree of feed-back being increased by reducing the condenser's capacity.

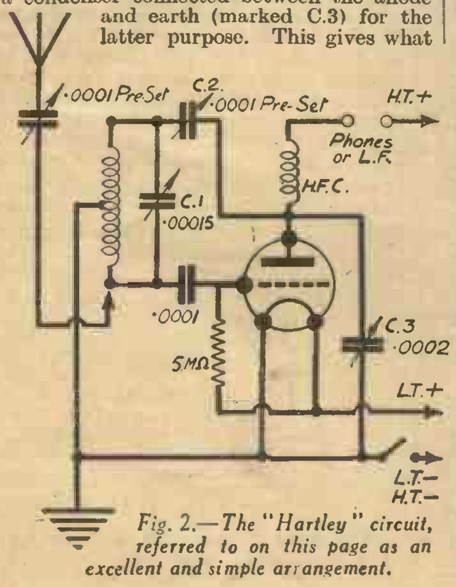


Fig. 2.—The "Hartley" circuit, referred to on this page as an excellent and simple arrangement.

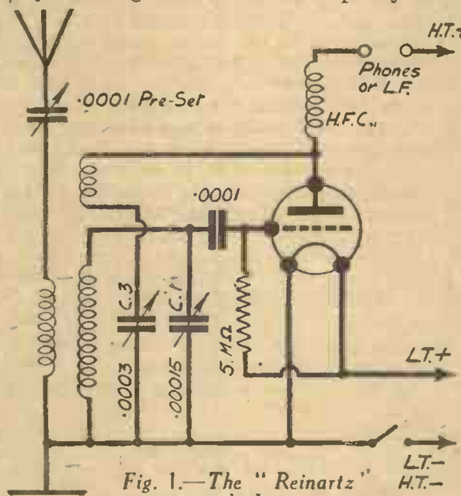


Fig. 1.—The "Reinartz" circuit, which is most popular for S.W. reception.

Making "Hartley" Coils

Almost any type of S.W. coil can be used in the Hartley circuit, but it must, of course, have a centre tapping. For experimental purposes, however, it is much better to make up a few coils like that shown in Fig. 3. Bare 16-gauge wire is employed, and this is first wound round a 2in. diameter former, which may consist of a bottle or cardboard tube. After winding, the coil is removed, when it will expand to about 2 ins. diameter, due to the springy nature of the wire. The turns are then rigidly fastened together by means of four strips of ebonite, as shown. All connections may be made by means of crocodile clips, or terminals can be soldered to the wire if desired. Instead of joining the aerial lead directly to the grid end of the winding as shown in Fig. 2, it can be tried in various positions along the coil.

A coil consisting of 4 turns will cover a wavelength range of approximately 15 to 30 metres, whilst one having 8 turns will tune from about 28 to 60 metres. Others to tune up to 100 metres or so could be made by using proportionately larger numbers of turns, but these will not generally be required since most of the more powerful stations work on wavelengths below, roughly, 50 metres.

Preventing Hand Capacity

Perhaps the greatest objection to the "Hartley" circuit is that the tuning condenser is "in the air" (not connected to earth), and this is liable to cause hand capacity unless precautions are taken. The difficulty can best be avoided by operating the condenser through the medium of an extension spindle, and using a vernier dial provided with a metal screening plate which can be earthed. On completing the receiver, condenser C.2 should first be adjusted to its most suitable position. This is done by setting both the reaction condenser C.3 and the tuning condenser C.1 to 90 degrees and screwing down the knob of C.2 until oscillation just commences. After this, C.3 will provide full control over the whole waveband.

Another particularly interesting circuit is that known as the Armstrong Super-Regenerative. This also was first "invented" before the days of broadcasting by an American engineer named Major Armstrong. The Super-Regenerative circuit met with a fair measure of success as a medium-wave receiver some ten years ago, but although it was extremely sensitive it suffered from the serious objection that it was "noisy." That is, in addition to the signals which it brought in, there was a continuous "hiss" forming a more or less strong background (sometimes even a foreground). Besides this, the set was rather tricky to adjust and was very prone to cause strong interference with other receivers operating within a comparatively wide area. It is interesting to observe in passing, however, that the last-named objection was almost entirely removed by working on a small frame aerial; and, most amazing of all, reception of American medium-wave stations in this country was often accomplished by means of the single valve Armstrong when used on the small frame.

(To be continued.)

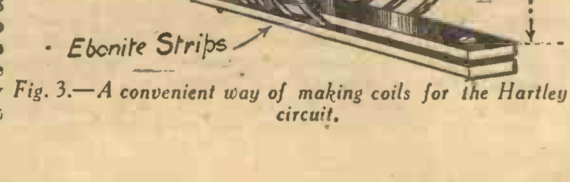
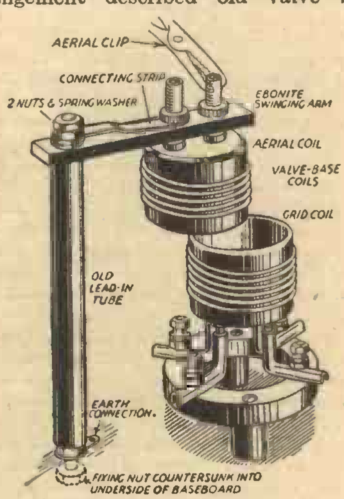


Fig. 3.—A convenient way of making coils for the Hartley circuit.

READERS' WRINKLES — The HALF-GUINEA Page

Inductive Coupling for Aerial Coil

No doubt a large number of short-wave listeners use coils wound on the bases of old valves, and have hitherto used capacitive coupling of the aerial, but would like to try out inductive coupling. In the arrangement described old valve bases



An efficient inductive coupling device.

are also used for the variably coupled aerial coil, and in this case two of the pins in the base are removed and the coil plugged into two suitably spaced sockets screwed into a narrow strip of ebonite. The ebonite strip is mounted on a portion of old lead-in tube of the requisite length. The rod passing through the centre of the tube is fixed to the baseboard by means of two hexagon nuts, the one on the lower side being in a hole countersunk in the under surface of the baseboard, whilst the upper one holds down a soldering tag. The strip carrying the coil sockets is secured to the top of the tube by two hexagon nuts and a spring washer, whilst a soldering tag is also fitted here. The pressure on the spring washer is adjusted until the ebonite arm can be swivelled, but the whole is free from vibration, then the two hexagon nuts are locked to prevent them working loose. The soldering tag at the bottom of the pillar is connected to the nearest earthed point, whilst the tag at the top is connected to one of the two sockets on the ebonite arm. The aerial is connected to the other socket by means of a crocodile clip, and the degree of coupling can be varied by swivelling the aerial coil. In practice, two aerial coils are used, one having twenty turns, and the other five turns, and the variation of coupling will be found of great assistance in removing blind spots in the tuning.—P. Taylor (Penzance).

A Wristlet Voltmeter

When using the popular small double range voltmeter many builders of sets must have found some difficulty in noting the reading of the meter when testing the internal circuits of their sets, especially when their heads are well into

THAT DODGE OF YOURS!

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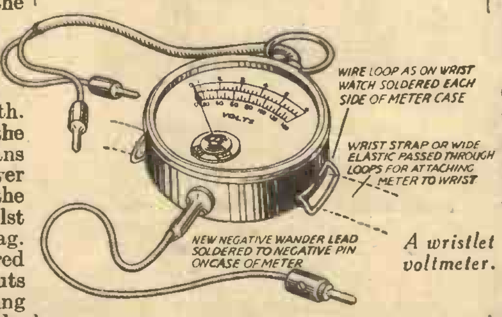
the cabinet, where there is usually no room to stand the meter.

The idea I suggest is a simple one.

Solder two small pieces of fairly rigid wire, previously bent to shape, on the side of the voltmeter case as on an ordinary wristlet watch. A leather band to fit the wrist may be purchased for a small sum from any jeweller or watchmaker, but for the purpose of economy and ease in placing on, or removing from the wrist, a length of ordinary cotton covered elastic is suggested.

Another benefit of this fitting is that it allows for both hands to be free.

As the average two-range voltmeter has



A wristlet voltmeter.

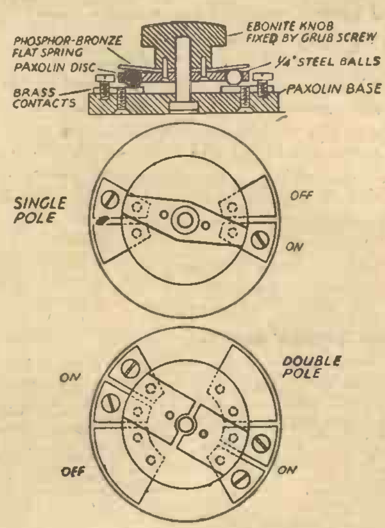
the common negative to the pin at the base of the meter, an extra lead can be soldered to this pin, as shown in the sketch, to facilitate use when the meter is attached to the wrist.

If there is real or fancied danger of shock, a piece of thin rubber sheeting may be stuck to the back of the case.—T. A. Cooksley (London).

A Simple Switch

The accompanying sketches show the construction of a simple and very reliable switch. The contacts consist of ¼in. or 5-16in. steel balls inserted in holes in a paxolin disc and held down by a flat phosphor bronze spring, or springs, as the case may be.

The brass segments on the base have small countersinks drilled in them in the "on and off" positions and the balls drop into these and so locate the switch in the required position, and also ensuring a better contact. The lower sketch (knob removed) shows the arrangement for a double-pole switch, which type will be found very reliable for wavelength selectors, "on and off," and many other purposes where a small current is passed. As the movement of the balls is a combined rolling and



A switch with ball contacts.

slipping one, they are always kept clean. I have used these switches successfully on 200-volt work for small current purposes.—D. Tanguy (Portsmouth).

Curing Corroded Accumulator Terminals

When creeping once commences up the brass parts of accumulator terminals it is very difficult to arrest. I had similar trouble with one which corroded very badly in a month or so, and the screw shank was commencing to deteriorate. After trying many methods of cleaning, painting, and coating thickly with vaseline, the dodge shown in the accompanying sketch effected a complete cure. A cardboard washer, thoroughly soaked in hot vaseline, is clamped between two screwed brass discs. The cardboard washer is also screwed on tightly, and should be slightly larger than the brass clamps to isolate the metal parts, and so prevent future creeping. The terminal shank should be well cleaned and coated with vaseline before the parts are fitted.—W. Black (Coventry).

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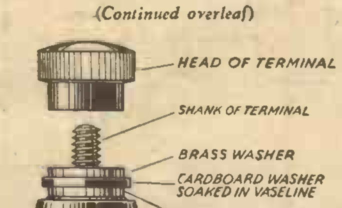


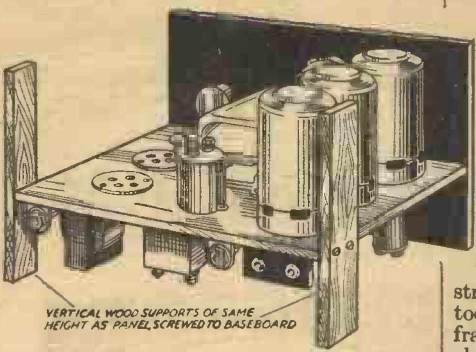
An anti-corrosion dodge.

RADIO WRINKLES

(Continued from previous page)

Supporting a Panel When Wiring

A DIFFICULTY often experienced by constructors who favour fixing certain components "under-baseboard" is that



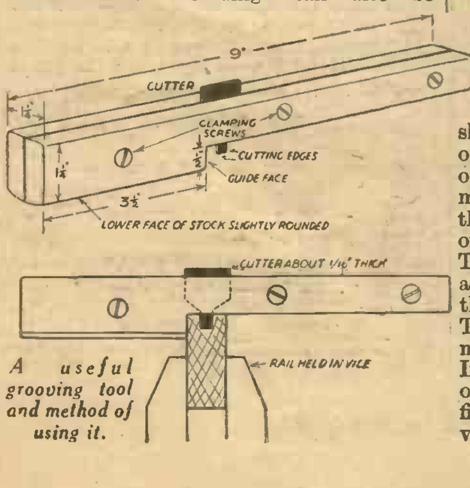
Method of supporting a panel when wiring.

of holding the baseboard and panel firmly in a suitable manner to facilitate reversal of the assembly, and so ease and quicken the job of wiring. When the area of one or the two sides of the board are filled to capacity with components, propping-up the job on books is invariably out of the question—and so is holding the work with one hand, and with the other trying to perform actions which obviously can only be done with both hands. The accompanying sketch shows an extremely easy method of overcoming this drawback.

The legs (length according to height of panel and components underneath) should be screwed or nailed in position, and it must be remembered that two nails or screws in the centre of each leg will be necessary.—W. W. (Leicester).

A Useful Grooving Tool

TO those who like constructing their own radio or speaker cabinets the accompanying details of a home-made grooving tool may be of interest. The cutter is made from a piece of an old band saw, or similar steel, the actual cutting edges being filed square. The stock is made of hardwood such as beech. This is cut along the middle, and three screws inserted so that the cutter is securely clamped between the two halves of the stock. The depth of the groove, etc., can be easily adjusted when clamping the cutter in position. The tool is used the same as a spokeshave, care being taken that the guide edge is always kept pressed close to the piece of wood being grooved. It will be seen that with different shaped cutters small mouldings can also be scratched along rails, etc.—H. F. COLLINS (High Wycombe).

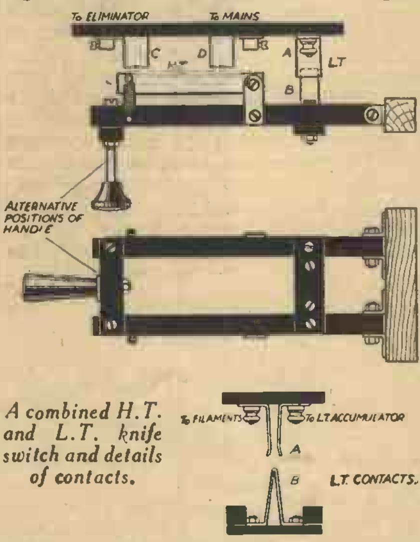


A useful grooving tool and method of using it.

A Combined H.T. and L.T. Switch

MOST readers who possess a set which derives its H.T. from an eliminator, and its L.T. from an accumulator, realize the desirability of ensuring that the L.T. is switched on before the H.T., in order to avoid the strain on components caused by the peak voltage of an unloaded eliminator. Many employ two separate switches, and make a habit of operating the L.T. first, but the gadget described combines the two, and so ensures that even if the set is operated by an unenlightened member of the household, the H.T. cannot be applied before the L.T.

The switch is not at all difficult to construct, to anyone who possesses the usual tools found in a constructor's kit. The framework is built up of four strips of ebonite, fixed together by brass screws and nuts, and pivoted on four angles cut from sheet brass. The four H.T. contacts—the switch is double-pole—are of the type found in aerial earthing switches, and are mounted on a strip of ebonite fixed on edge to a wooden baseboard. The two blades are also of sheet brass—or copper if preferred—pivoted at one end to brass angles while at the other end is a spiral

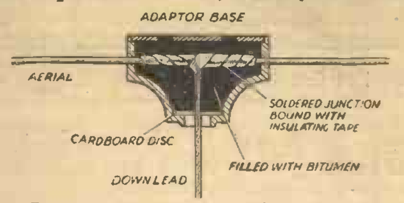


A combined H.T. and L.T. knife switch and details of contacts.

spring to give a quick break action. The L.T. portion of the switch has contacts of sheet brass, bent into the usual form—as in push-pull switches—the blade also being of sheet brass, bent to the shape shown, and fixed to the ebonite cross-bar by screws and nuts. Its length must be such that contact is made between A. and B. before the H.T. blades touch their respective contacts. When completed, the switch should be enclosed in a wooden box, in one end of which a slot has been cut to accommodate the operating handle—which may be in either of the two positions shown—and the whole mounted on the side of the cabinet, in the case of a radiogram or large set, or in any other convenient position. To make the switch still more effective, a fuse should be inserted in each pole of the H.T. supply on the mains side. These may be fixed to the baseboard, making the whole unit self-contained. In my case I have added a pilot light on the side of the box, wired in the filament circuit which gives a visual indication as to whether the set is on or not.—A. J. P. MORLING (Norwich).

A Weatherproof Aerial Joint

IN the majority of cases amateur's aerials consist of horizontally-suspended wires and lead-ins of the T or inverted L type. Often the lead-in is joined to the aerial in a haphazard manner, and is just twisted



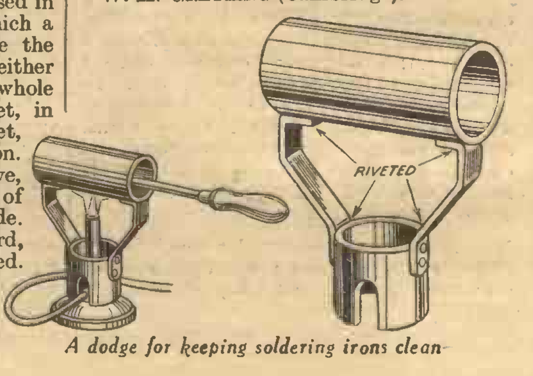
Section of a weatherproof aerial joint.

round a few times and left. Here is a good method of making a weather-proof joint box to protect the joint after it has been well connected up. Insulated aerial wire should be used for ensuring a trouble-free aerial. Procure an electric light plug adaptor, and in the bakelite top drill two small holes opposite each other about ⅜in. below the rim, and just large enough to take the aerial wire, which is threaded through; afterwards sliding the top along the wire to wherever the joint is required. Thread a bared end of the lead-in through the flex hole of the plug top, and twist round the aerial wire, after the latter has been bored just inside the plug top. Solder the connection and bind with insulating tape, afterwards pushing the joint down in the plug top, and filling the top with bitumen, taking care the joint is covered entirely with it. Remove the contacts from the plug base and screw on in the ordinary way, sealing the contact holes with more bitumen. Make sure the wire insulation enters both drilled holes and flex holes, otherwise corrosion will set in.

The cardboard, indicated in the sketch, is to prevent the bitumen running out of flex hole when filling.—JOSEPH A. WILSON (Gidea Park).

Keeping Soldering Irons Clean

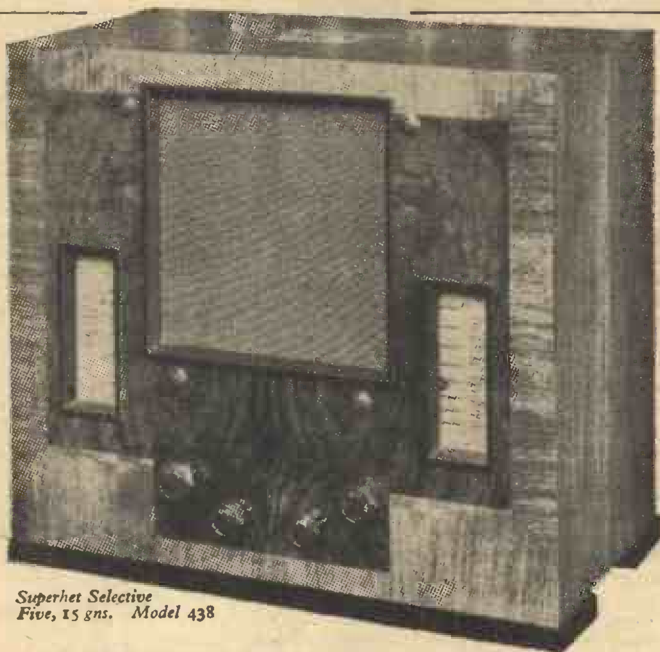
THE simple apparatus shown in the sketch can be made up from iron tubing and strip iron combined. Two pieces of tubing are required, and two pieces of strip. A slot is cut in the lower piece of tubing to clear the tube on the bunsen burner. The strips are riveted to the tubing, and if light irons are used the arrangement will remain steady. If too heavy irons are used an extra support must be fixed. The arrangement prevents the flame from reaching the iron. In this way the iron is kept clean, and will keep so much longer than when used in the bare flame. Copper tubing can be used if obtainable, as it holds the heat longer.—W. H. GRAYLING (Cambridge).



A dodge for keeping soldering irons clean

"HIS MASTER'S VOICE"

WE PLANNED . . .
and NOW THE EXPERTS CONFIRM



Superhet Selective Five, 15 gns. Model 438

WE PLANNED to make a new Superhet Selective Five powerful enough and sensitive enough to cope with every need of today's most experienced listener. We planned a receiver which should not only satisfy the keenest musical ear with " true-to-life " tone from an energised-field moving-coil speaker ; but should sell at a price the average listener was able to pay—15 guineas. And before being put on the market it passed two searching tests—one at Prague, where the ether is more congested than anywhere else in Europe—one within sight of Brookman's Park, to prove its freedom from " second channel trouble "—both with flying colours !

AND NOW THE EXPERTS CONFIRM that all these aims have been fully realised, as is proved by the following extracts from the " Wireless World " :

SENSITIVITY. " The range on both long and medium waves is probably the maximum commercially obtainable with four stages. It is certainly equal to, if not slightly better than, that of any other Superheterodyne of its type so far tested."

SELECTIVITY. " Not a single station is lost on the medium waveband from second channel or image frequency interference."

TONE " . . . speech, natural and free from hollowness."

VALUE " . . . a first-class job which sets a new standard of value."

15 GNS.
or by Hire Purchase

Hear this model at any " His Master's Voice " dealer—and see how completely the set lives up to the verdict of expert technical opinion.

"His Master's Voice"

ALL-ELECTRIC RADIO RECEIVERS

The Gramophone Company, Ltd., 98–108, Clerkenwell Road, London, E.C.1.

The Three Star NICORE

REAL selectivity, well-balanced reproduction, ease of control and long range—those were the points which struck me very forcibly on first taking the controls of the "Three Star Nicore."

After examination of the circuit, and bearing in mind that the new Varley "Nicore" metal-cored tuning coils were incorporated, I rather expected to find these features, but it was a very pleasant surprise to discover how nicely they combined to make a most likeable receiver. In a low-priced set, such as this undoubtedly is, one rather expects that some slight compromises would have to be made ; I found nothing of the kind.

The expression "real selectivity" was used above, so perhaps an explanation of its meaning is called for. With most small sets selectivity is almost entirely dependent upon the use of reaction, but in this case the degree of selectivity was found ample to permit of eliminating the local station entirely by turning the condenser dial through two or three degrees even when the reaction control was "full out." This applies both to medium and long wave reception, and in the latter case there was no trace whatever of "break-through"—a splendid tribute to the new coils. Another important feature was that the volume of the local stations (or any others for that matter) could be reduced to a mere whisper by suitable adjustment of the bias voltage applied to the variable-mu valve.

Due to the fact that selectivity is so extremely good one might expect to find a certain amount of "cut-off" at the higher end of the musical scale, but the designers were careful to make sure that any such tendency was completely counterbalanced by the extra high-note response of the pentode output valve. As a result the quality of reproduction is all that could be desired.

I mentioned ease of control in my opening sentence, so there is no need to enlarge upon this point. I might just say, however, that tuning is carried out by a single knob, which is operative on the two-gang condenser. The two coils are very accurately matched, but to compensate for any incidental capacities introduced by the wiring or by the use of an unduly loud aerial, a trimmer is provided and is actuated by a small knob which is concentric with the main tuning control. Thus, perfect alignment of the tuning circuits is ensured over the complete wavelength range.

It would be superfluous to give a list of the stations received, since it would not necessarily apply to readers' sets, which depend for their results principally upon local conditions. Nevertheless, it should be pointed out that the "Three Star Nicore" is easily capable of bringing in a very good selection of alternative programmes under all circumstances.

Operating Notes

And now a few notes on operating the set will perhaps be useful, especially to the less experienced constructor. Obviously, the first thing is to connect up the batteries, loud speaker and the aerial and earth leads. Terminals are provided for all except battery connections, and as these are clearly marked, there will be no difficulty in identifying them. Of the battery leads that marked "G.B.+" should be connected to the positive socket of the grid bias battery. The "G.B.—" lead attached to the low-frequency transformer should be connected to the 6 volt grid bias tapping, whilst the other "G.B.—" lead may first of all be taken to the 3 volt socket on the bias battery ; it will be removed later, but it is best to start with a low voltage so as to bring the variable-mu valve into its most sensitive condition.

The high-tension wander plug marked "H.T.+1" should be plugged into the 66 volt socket of the battery, and that marked

(*Continued on page 526*)

LIST OF COMPONENTS FOR THE THREE STAR NICORE

- One pair Varley Nicore Coils.
- One J.B. Two Gang Unitune Condenser (.0005 mfd.).
- One British Radiophone Duovol Control with 25,000 ohm resistance.
- One Igranic Midget 3-1 L.F. Transformer.
- One Wright and Weaire H.F. P.A. Screened Choke.
- One Lissen H.F. Choke (L.N. 5092).
- Four Graham Farish Ohmite Resistances—5,000, 10,000, 20,000 and 150,000 ohms.
- One Graham Farish 1 megohm Grid Leak.
- One T.C.C. "S" Type Condenser, .01 mfd.
- One T.C.C. Type "S" Condenser, .0001 mfd.
- One T.C.C. 50 Type Condenser, .25 mfd.
- Three T.C.C. Type 50 Condensers, 1 mfd.
- One T.C.C. Type "S" Condenser, .001 mfd.
- Two Clix 4-pin valveholders.
- One Clix 5-pin valveholder.
- One Bulgin Junior 3-spring switch.
- One Sovereign pre-set condenser, .0003 max.
- One Belling-Lee 5-way Battery Cord.
- Two Belling-Lee Terminal Mounts.
- Four Belling-Lee Type B Terminals (Aerial, Earth, L.S.— and L.S.+).
- One pair Bulgin Type 3 Grid Bias battery clips.
- Three Belling-Lee Wander Plugs—G.B.+, G.B.1 and G.B.2.
- Two coils Glazite, odd length flex, screws, etc.
- One Becol Ebonite Panel, 12in. by 7in.
- One Carrington "Aston" Senior Cabinet, with baseboard, 14in. by 10in.
- Two Side Runners, 10in. by 1½in.
- One Cossor 220 V.S.G. (metallized).
- One Cossor 220 S.G. (metallized).
- One Cossor 220 H.P.T.
- One Smith's "Aondex" 120 volt H.T. Battery.
- One Smith's "Anodex" 16 volt G.B. Battery.
- One Smith's 2 volt, 40 amp. L.T. accumulator.
- One Blue Spot 29 P.M. Loud-speaker.
- One British Radiophone Receptru Lead-in.
- One Graham Farish Filt for earth.
- One Bulgin Indicator Q.M.B. Lightning Switch.

Approximate cost of all the above parts, £12 15s.

PREPARING for Summer Conditions

Useful Hints on Overhauling Your Receiver to Obtain Maximum Results During the Summer Months. By DEREK ARCHER.

WINTER time is the station hunter's paradise, but in the summer time he is confronted with conditions for distant reception entirely different from those ruling in the cold weather period. During the winter, foreigners roll in one after the other with monotonous regularity and even the modest two-valver can be credited with a performance. But during the summer months conditions are vastly different and more difficult, slowly but surely, so that by the time July is out, it will have to be a well maintained three-valver which will give its owner a fair bag of Continental programmes. The main reason for this falling off is, of course, due to the absorbing effect of the sun's rays, which are more powerful in the summer time than in the winter, and, of course, hours of daylight are very much longer. Although a station may radiate the same power, the waves which reach the aerial in summer time will be very much weaker than in the winter.

Compensating for Weak Signals

Much of this loss can be compensated for by a well designed modern receiver, but even then, it will only be possible to get consistent results, provided that every part of the equipment is kept right up to scratch. The receiver is not the only part which must be kept in order. Batteries are likely to run down far more quickly in summer due to the loss by evaporation of the electrolyte; the earth will no doubt become very dry and the aerial become coated with a hard baked deposit. Another thing also counts, and that is the loss of skill. In the winter we all become experts at tuning because we sit for hours at the controls, and we become fully acquainted with the individual idiosyncrasies of our equipment, but in the summer we are out of doors far more and the receiver does not receive any attention until we return from our sport or other occupation, very often too tired to meddle with the receiver very much, and in consequence we turn to the local and don't bother to tune in the distant programmes. Atmospherics are also a little more troublesome in summer than in winter, but quite a lot of assumed static can often be traced to a faulty earth which only requires a good soaking to bring it up to standard again. Valves, after hours of continuous life during the winter, begin to lose their emission and although the effect may not be noticed because the loss is so gradual, a new set of valves may easily make all the difference. All these things taken singly during the winter may not amount to much, but a sum total of them during the summer may make all the difference between indifferent and successful reception.

The receiver, being the most important part of the equipment, should receive attention first. Before starting it is as well to remember to provide the family with an alternative before pulling the set to pieces. It is surprising, especially if the receiver is in a room heated with a coal fire, how much dust does accumulate inside the set, even if it is enclosed in a cabinet. Most cabinets are supplied these days without backs, generally for acoustical reasons and these cabinets require special attention. Start with a good spring clean of this item, the reason being that it will then be ready to receive the set when that important item has been dealt with, and there will be no necessity to leave it about collecting more dust.

Remove the receiver and the loud-speaker from the cabinet and any other gadgets which may have been fixed to it. If the material which covers the fret looks dirty, take this out and have it washed or if a change in design is required, fit a new piece. The easiest way to remove the material if it is wanted again is to damp round the edges where it is glued with warm water. The glue will soften and the material may be gently pulled away. If the material is not required again, it can be torn out carefully and the excess glue and odd ends removed with a scraper. When everything is clear, go over the inside of the cabinet and all the interstices of the fret with a small, stiff brush and remove all traces of dust that could not be removed when the silk was in. Go over the outside with a rag doped with a good furniture polish and regain some of the original finish. If any hinges or locks are fitted to the cabinet, these should be cleaned up and treated to a spot of oil. Many broken hinges are the result of not looking after this small point.

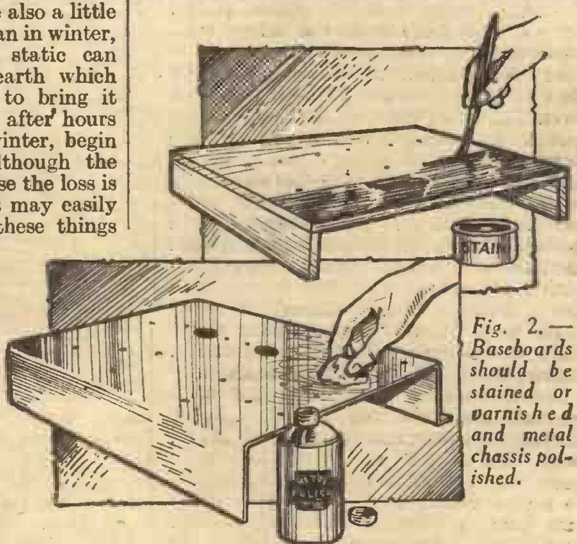


Fig. 2.—Baseboards should be stained or varnished and metal chassis polished.

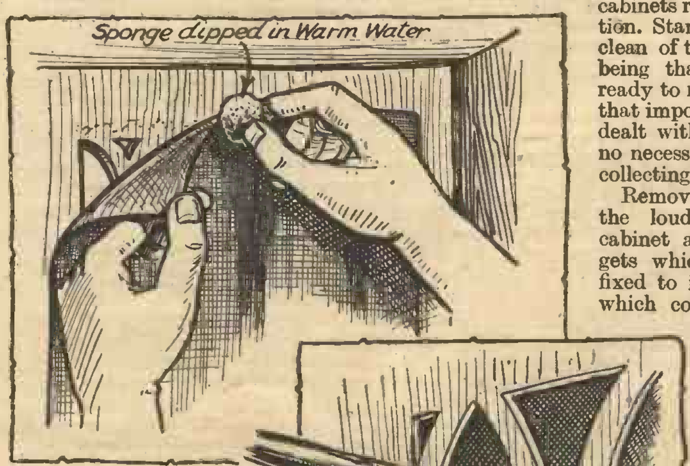


Fig. 1.—Warm water will soften the glue and allow gauze behind speaker fret to be removed. A stiff brush is handy for dusting the speaker fret.

Spring-cleaning the Receiver

Having dealt with the cabinet, the receiver should now be dealt with. The most thorough way in which to overhaul a receiver is to pull it to pieces. Subject every

(Continued overleaf)

Fig. 3.—Some points to look for in the battery connections.

PREPARING FOR SUMMER CONDITIONS *(Continued from previous page)*

Fig. 4.—Never add acid when "topping" up accumulators.

individual part to a good scrutiny and if possible give it a test. Remove all the components from the baseboard and if of wood, treat it with a coat of varnish or stain, or if of metal with a little metal polish. There can be little chance of an error in replacing the components because the holes in the metal cannot shift and the holes in the wood baseboard will be used again. Then go over all the components, such as transformers and tighten up the bottom nuts, replacing the soldering tags if these have been used, after the old solder has been removed and they have been retinned. If the terminals only are used, clean up the faces with smooth emery paper. Do not trust the plating for a good connection, however bright and polished it may appear, as it is often covered with a film which may be very thin, which might easily cause an indifferent connection. Replace the top nuts and tighten them up hard before replacing the components on the baseboard or the panel. Go over the components with variable adjustments and see that the spindles work freely and apply a small spot of oil if necessary. See that the pigtail connections are intact and replace them if they appear to be weak. Clean the dust from the vanes of variable condensers with a pipe cleaner. Dust between the vanes may account for some of the assumed summer atmospherics. If you feel confident that you can put all the pieces back where they came from, a sound scheme is to dismantle this type of component completely, and clean every part separately. Besides doing the job properly you will have learned something of the construction of the components themselves. The more simple components such as valve-holders should most certainly be dismantled and the contact springs given a good clean up, and more than summary attention given to all switch contacts. If the springs are of a material which is likely to oxidize easily, the surfaces of the contacts should be given a thin coat of tinning with the soldering iron.

Grid leaks, which often vary after they have been in use for a year or more, should be tested for correct value, and replaced if necessary. This also applies to the carbon type of anode resistance to a certain extent, but the trouble usually only occurs either with the higher values or with the low valued resistances used for the grid bias carrying their maximum permissible current. A variation of ten per cent. in the value of the bias resistance may affect the anode current with possible damage to the filament of the valve. The value of anode decoupling resistances can vary as much as twenty per cent. without seriously affecting the emission of the valve or the performance of the receiver. Reassemble the components, and commence the wiring of the receiver, using new wire and sleeving if necessary. All battery leads should be carefully inspected for perished rubber covering and replaced if necessary with new flex. Carefully inspect all wander plugs and spade terminals to see that the ends of the flexible leads are making good and proper connection. Clean up the pins and the faces of the spade terminals with emery paper.

The loud-speaker should then receive attention. The simple types of iron armature units can be dismantled, but the complicated types of balanced armature are best left for the attention of the manufacturer, as special tools and jigs are often required to reassemble them correctly. Units should be returned to the manufacturers if any doubt is felt, so that they can thoroughly inspect and remagnetize if necessary. Moving-coil loud-speakers should be carefully dusted, and if the construction allows, remove the cone and the centring device and clean out the gap with a pipe cleaner. Great care must be exercised in replacing the coil, to see that it is properly centralized and that the windings do not scrape on the pole pieces.

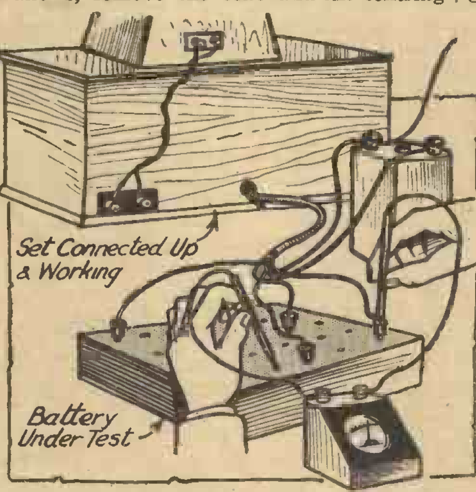


Fig. 5.—Test the H.T. battery when the set is working.

Attending to the Batteries

Have the accumulator acid tested and adjusted for correct specific gravity. It is important to note, when adjusting the acid of an accumulator, that the figure given by the manufacturer is for the first charge or for a charged condition, and the acid should not be "brought up" when the cells are in a run-down condition. If this is done, the specific gravity of the acid will be higher than that recommended when the accumulator is charged, and this will result in the loosening of the paste in the grids, and a consequent shortening of the life of the accumulator. It is well to remember, too, that the acid in a cell never evaporates, and any decrease in the volume of the liquid in the container is entirely due to loss of water, and therefore only water should be added. If a cell is properly looked after, and has been charged correctly in the first place, it will never require that addition of acid unless, of course, some is spilled. It is, however, advisable to completely change the acid in celluloid containers at least once in every two years, but this does not apply to the popular type of accumulator with glass container.

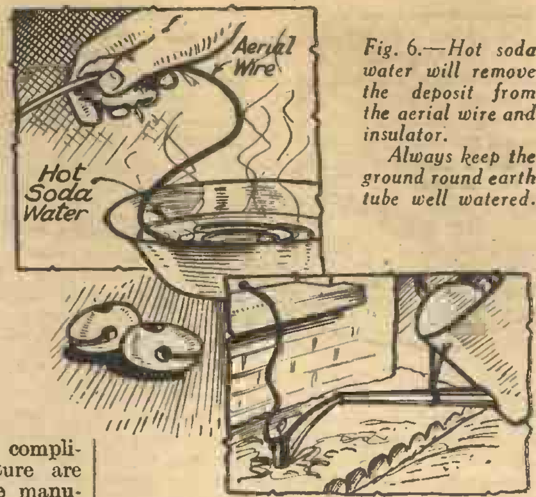


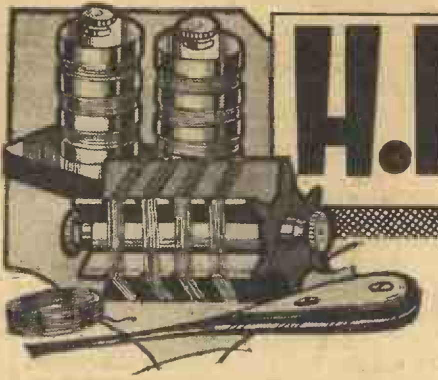
Fig. 6.—Hot soda water will remove the deposit from the aerial wire and insulator.
Always keep the ground round earth tube well watered.

Test, or have tested the H.T., and the grid-bias batteries for voltage, and this should be done whilst the receiver is working, or a wrong reading may be taken. An allowance of about twenty-five to thirty per cent. of the original voltage of an H.T. battery is allowable, but the battery may still continue to give good service at a much lower figure. The only judge of the battery's real service is the owner who must rely on his ears to inform him of the change in quality or volume which must, of course, take place, but is very seldom noticed until the receiver fails to respond to the adjustments of the reaction condenser or reveals trouble by low-frequency oscillation, which usually takes the form of a high-pitched squeak. It is safer to place a very much higher figure on the grid-bias battery, and it is suggested that when the voltage is five per cent. lower than the original it should be replaced. Grid-bias batteries are cheap, and used properly, save a large amount of H.T. current, and their replacement every six months is an investment rather than an expense.

Aerial and Earth

Having attended to the internal equipment, the aerial and earth should now receive attention. In summer the aerial will become coated with a deposit which will require hot water and soda to remove, and although a heavier deposit occurs in winter this is usually so soft that a good shower of rain will wash it off. Now is the time to clean the insulators because the winter deposit can be removed with a dry rag. The earth leads should be thoroughly overhauled to repair the ravages of wind and rain, and all joints remade for safety.

Having rebuilt the receiver and attended to all the accessories, the equipment should be as good as new, and the chances of it giving a high standard of performance in the summer months are much greater than if the points mentioned had not been attended to.



H.F. Chokes & how to make them

FIRST ARTICLE

In This Article the Author Deals with the Underlying Principles, and the Construction of Several Types of H.F. Chokes

By HAROLD DOWNING

PROBABLY one of the most neglected and yet most interesting components in a wireless receiver is the high-frequency choke. Because it consists merely of a number of turns of fine wire wound on a slotted bobbin or tube it is frequently regarded as being of little importance. But that the H.F. choke is of great consequence is proved by the numerous types of this component on the market and by its several uses in a modern receiver. Chokes have a tremendous effect on the proper functioning of a wireless set, and an understanding of their properties and uses will go a long way towards the gaining of a clear idea as to how they can be made and what points must be watched in designing them.

What is the Purpose of an H.F. Choke?

One might well start to consider the high-frequency choke by asking "What does it do?" This question may be prompted by your having found that it is often possible to short-circuit the choke in certain receivers without affecting results in the slightest degree. In such cases one can be sure that either the choke is inefficient or that its work is being performed by some other component. But to answer the question; expressed somewhat blandly, the object of an H.F. choke is to check the flow of high-frequency currents in a circuit, and at the same time to allow free passage to low frequencies.

This reply, however, will not satisfy the person who really wants to know the exact "why and wherefore" and he will probably ask, "How can a choke differentiate between the two kinds of current." To understand the reason we must now regard the choke as an inductance coil—which it is, of course. Now inductance is the electrical equivalent of mechanical inertia—the resistance of a body to a change of motion. In other words, inductance is the property which a coil possesses of opposing a change in the amount of current passing through it. We all know that alternating currents are constantly changing in intensity between zero and their maximum value. Well, then, an inductance (choke) tries to prevent such changes, and so opposes the passage of the currents through it. The important point is, however, that the opposition, or impedance, is proportional to the rate of change—more technically, the frequency—of the currents. Hence, its impedance to low frequencies (which we generally take as those up to about 8,000 cycles per second) is much less than to high frequencies (which for our present purpose we can consider as being above some 150,000 cycles, or below 2,000 metres).

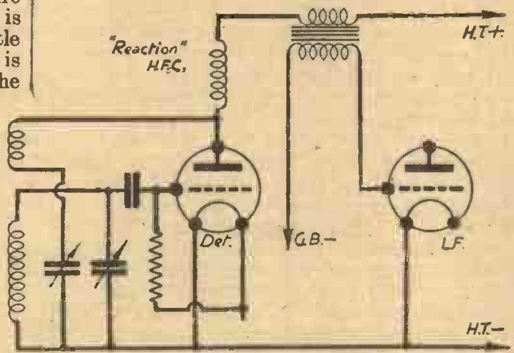


Fig. 1.—The most common use of an H.F. choke is for reaction purposes, when it is wired in the anode circuit of the detector valve.

Fig. 2.—The arrangement of a binocular choke: the two halves of the winding go in opposite directions so that their magnetic "fields" neutralize each other.

The "Reaction" Choke

Before going any further it will be best if we examine the function of a choke in respect to some particular use in the circuit. Its best known use is in the anode circuit of a detector valve with capacity reaction, where it is connected as shown in Fig. 1. Assuming that the set tunes up to 2,000 metres (150,000 cycles) our choke must offer a high impedance at this frequency and a comparatively low one at the highest audio frequency, say 8,000 cycles. We cannot assess definite values of impedance at the two frequencies, but must work on a comparative basis. Actually we find that the choke will be quite efficient if its impedance at the lowest high frequency (150,000 cycles) is about 100,000 ohms; its impedance at 8,000 cycles will then be approximately 5,000 ohms, or 20 times less. To fulfil these conditions the choke will require an inductance of 100,000 microhenries. This assumes that the component has no self-capacity, because if it had, the impedance at high frequencies would be very much reduced and consequently the

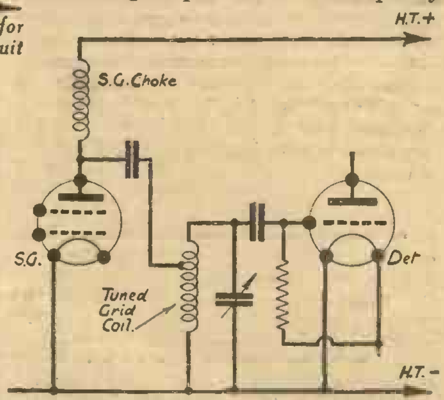


Fig. 3.—The choke used in the anode circuit of an S.G. valve must have a much higher inductance than an ordinary "reaction" choke.

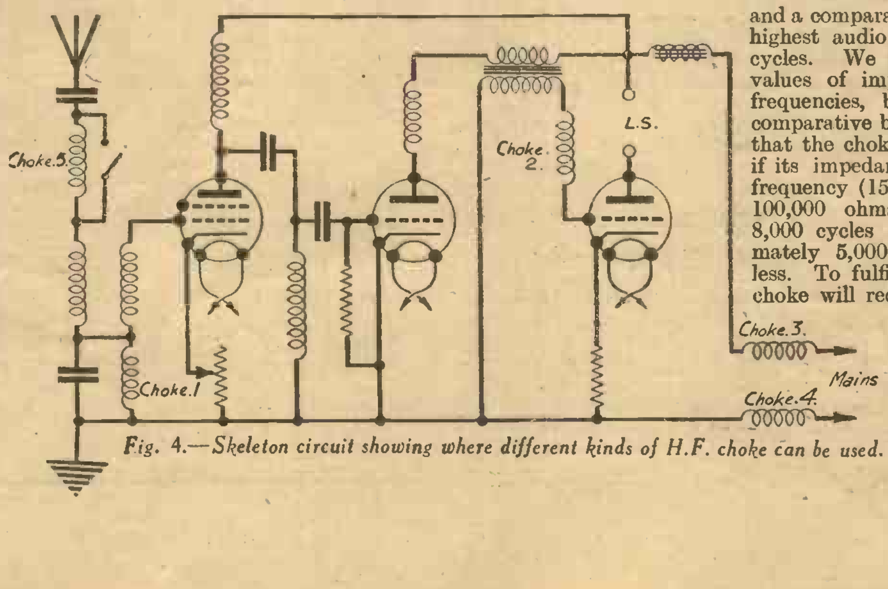


Fig. 4.—Skeleton circuit showing where different kinds of H.F. choke can be used.

choke would be less efficient. In practice it is impossible to eliminate capacity entirely, due to the proximity of adjacent turns, but we can cut it down to reasonably low limits by dividing the winding up into sections and arranging the terminals fairly well apart. The constructional part of the work will be considered later.

Preventing Feed-back

There is another point to consider because a choke, like a tuning coil, has a certain magnetic "field," and therefore if it is placed near to a coil or another choke the fields of the two will link together and cause feed-back, or unwanted reaction. This difficulty can be minimized in three ways. One is to arrange the two components with their axes at right angles, another is to make the choke of binocular form (see Fig. 2), when the fields of the two halves will neutralize each other, and the third is to fit the choke with a screening box. The third method is best, but certain precautions must be taken in using it. Since a metal screen lowers the inductance, the choke must have a greater number of turns than otherwise; the screen must not be placed too near the windings, and it must be made of some metal such as aluminium, copper or silver which will not "absorb" any power from the choke.

S.G. Chokes

In addition to the "reaction" choke already referred to, there is another kind which is connected in the anode circuit of an S.G. valve and is used in conjunction with a tuned-grid coil for high-frequency coupling purposes. The connections are shown in Fig. 3. It is not generally realized that this choke must have quite different characteristics to that used for reaction purposes. It must match the anode impedance of the S.G. valve, having an impedance about twice as great at the lowest frequency (highest wavelength) to which the set will tune. As the average impedance of modern S.G. valves is 300,000 ohms the choke must approximate to 600,000 ohms. This means that its inductance should be about 500,000 microhenries. Besides having a high inductance, however, the choke must have a very low self-capacity or else it will be inefficient at the higher frequencies.

Special Uses for H.F. Chokes

Other uses for H.F. chokes are represented in the skeleton circuit diagram of Fig. 4. The component marked Choke 1 is a by-pass for the B.-P. coupling condenser, and its purpose is to feed the grid-bias supply to the V.-M. valve; an ordinary "reaction" choke may be used here. It is more usual to employ a resistance in this position, but the choke is often better when certain forms of low-frequency interference are experienced. Choke 2 really supplements the reaction choke and serves to prevent the leakage of H.F. into the low-frequency stages. Here again, a fixed resistance is generally employed, but a choke is sometimes better; one of the "reaction" kind is quite suitable. The two mains chokes, marked Choke 3 and Choke 4 are often helpful with any mains receiver (either D.C. or A.C.) since they prevent interference due to H.F. currents which are sometimes superimposed on the mains supply. A suitable inductance for these chokes is about 100,000 microhenries, and they must be able to carry the total current drawn from the mains, generally up to .5 amp. or so.

Fig. 4 shows yet another choke marked Choke 5—and this is generally referred to as an "anti-break-through" choke, its purpose being to prevent interference from a nearby medium-wave Regional station when listening on the long waves. To be effective it is clear that this choke must have a fairly high impedance at about 300 metres, and a much lower one at 2,000 metres. An inductance of about 1,500 microhenries is a good average value.

Short-wave Chokes

Short-wave chokes are, theoretically, just the same as those used for the longer wavelengths, and in fact many of the "broadcast" chokes available will work satisfactorily down to so low as 10 metres. At the same time, it is generally better to employ special S.W. chokes designed so as to have a very low self-capacity, since this is of increasingly greater importance as we move down the wavelength scale. To cut down capacity means reducing the number of turns, but this can be done quite safely because the impedance for any given number of turns becomes greater as the wavelength is reduced. For example, a 1,000-microhenry choke has an impedance of something like 40,000 ohms at 6,000,000 cycles (50 metres), and of only 50 ohms at 8,000 cycles; a component of that value would therefore be perfectly suitable for a receiver working on wavelengths between 10 and 50 metres. I have quoted 10 metres as the lowest wavelength limit, since for still shorter waves a choke of but a few microhenries, and having an almost negligible self-capacity, is better.

FROM THE FLASHLAMP

By Photon

DESIGNING A LOUDSPEAKER HORN

IT is generally considered that the correct shape of a horn, whether it be for a gramophone or for a speaker, is that given by the logarithmic curve or "exponential" law. Although the logarithmic law gives a good form of horn, the mouth or termination of the horn ceases to be logarithmic—at the mouth there is a sudden change whatever the theoretical form or contour of the horn may be. If it were not for this question concerning the mouth of the horn, there would be nothing amiss with an ordinary cone, because the conditions in a cone are precisely the same as those which obtain when sound radiates from a source in three-dimensional space. The point is that, whatever the basis of design may be, the mouth itself should be "flared" in order to slur over the change where the horn opens into the world at large.

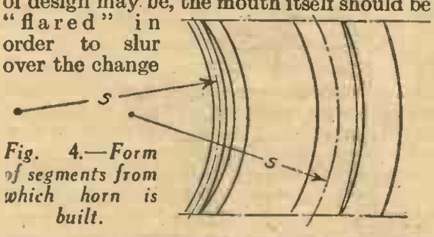


Fig. 4.—Form of segments from which horn is built.

A well-known property of the logarithmic curve is illustrated in Fig. 1; a tangent to the curve at any point p meets the base line (which may be taken as the axis of the horn) at a definite distance r, measured along the axis from a perpendicular from the point of contact p. If a trammel be constructed (Fig. 2) consisting of a bar carrying a tracer wheel at one end, and a pointer at the other, the distance from the pointer to the centre of the tracer wheel being called s, then, if the pointer be moved along the horn axis or base line of Fig. 1, the tracer will follow a logarithmic curve so long as its angle to the base line is small. When this condition no longer applies, as when the angle of the trammel increases, the projection of the length s on the base line (or horn axis) diminishes and the r of Fig. 1 is no longer constant.

If we continue to develop the traction curve laid off by the tracer wheel outwards, we find that the departure from the logarithmic curve is as shown in Fig. 3, and the diameter of the mouth of the horn, where the trammel has become vertical, is equal to $2s$.

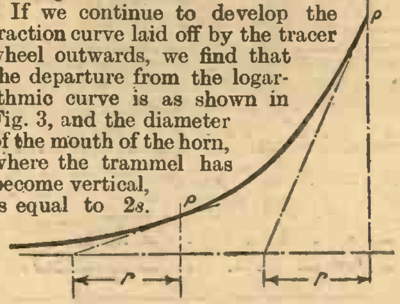


Fig. 1.—Illustrating a property of the logarithmic curve.

We thus derive by a simple means a form of horn which consists in a logarithmic curve in its narrower part with an easy transmission to a flare at its mouth.

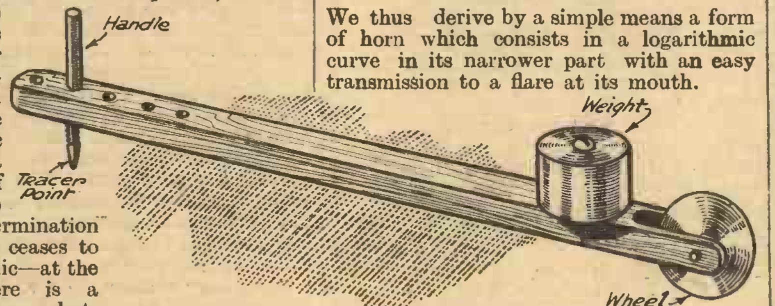


Fig. 2.—Trammel with tracer point and wheel.

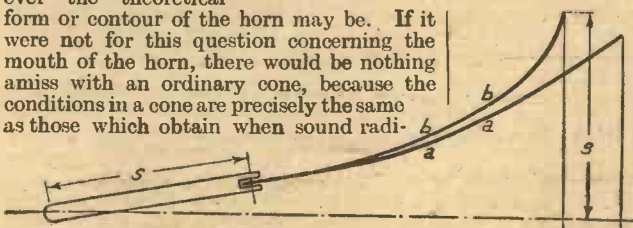


Fig. 3.—Illustrating the use of trammel for laying out horn contour b, b, also departure from true log from a, a.

There is a beautifully simple method of constructing a horn of the form given which is within reach of anyone whose resources include a pair of scissors and a gluepot. From the fact that the length of the arm s is constant, it follows that if we consider the horn as made up of a number of circumferential strips, all the strips when developed on the flat have the same radius of curvature. Hence, in order to build up the horn we have only to cut up a quantity of paper segments as in Fig. 4, whose mean radius = s, and build these up one on the other as in Fig. 5. The foundation can be made from stout cartridge paper or Bristol board. When that is dry, and set, the necessary thickness of *papier maché* can be built up by pasting on layer upon layer of newspaper or "lining paper." Every piece of paper is cut to the same segmental form and pasted circumferentially round the horn, each layer breaking joint with that previously laid.

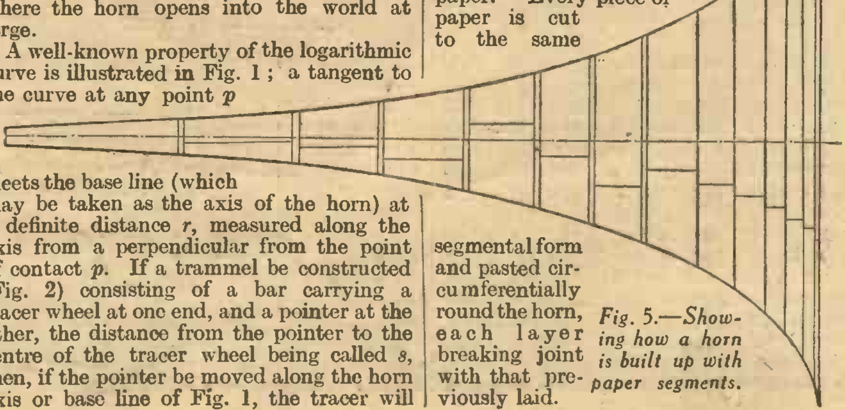


Fig. 5.—Showing how a horn is built up with paper segments.

DETECTOR DEVELOPMENT

A Brief Résumé of the Evolution of Detectors from Pre-Broadcasting Days to the Present Time

By L. A. HODGES

DETECTORS are common to all wireless receiving sets; the first set had one, and the latest designed Class "B" Ferrocart receiver has one. Any device used for the reception of wireless signals is really a detector of the small alternating currents set up in the receiving aerial. Since wireless waves were first produced by Hertz in 1868 many types of detectors have been employed before reaching the advanced and efficient methods of to-day.

It is interesting to see just what form and principle of operation these various detectors had, from the earliest type to the most modern type.

The First Detector.

Hertz's receiver took various forms, the usual type of which was simply a certain size of wire ring with two spark balls separated by a small air gap, the size of the ring being adjusted until the best effects were obtained, employing the principle of resonance. The impact of the wireless waves cause induced charges to surge backwards and forwards within the ring, these surgings manifesting themselves as minute sparks at the air gap. Such a device, although of no practical use, constituted the first wave detector. The detector is illustrated in Fig. 1 and is sometimes called a resonator.

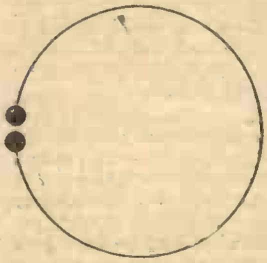


Fig. 1.—A Hertz detector or resonator.

The Coherer.

Probably the earliest form of detector to be used was the improved form of coherer. This is based upon a peculiar microphonic behaviour of loose metal contacts to electric waves. This was first brought into prominence by Professor Branley in 1890, and afterwards more thoroughly investigated by Sir Oliver Lodge, to whom the term "coherer" is due.

It was found that the impact of electric waves upon a glass tube filled with nickel and silver filings would cause them to cohere, making them conductive to a direct current which could flow through it. The coherer, in its simplest form, was not reliable, and it was much improved by Marconi. His pattern consisted of an evacuated narrow glass tube containing accurately fitting silver terminals (Fig. 2), separated by a small gap, between which are the metal filings. Connections to the plugs were made by means of wires sealed in the glass, and the complete coherer placed in a circuit with a cell and some form of relay or recording instrument. The potential applied to the coherer, by means of the cell, was adjusted until just insufficient to cause the metallic filings to cohere without the additional potential of an incoming wave. To the coherer was added an automatic tapper to "decohere" after each signal. Although this necessitated a slow rate of signalling, this delicate receiver of electric waves made wireless telegraphy practicable. The coherer constitutes the first detector to give an audible signal produced by, or rather resulting from, electric waves. It was with this improved form of coherer that Marconi, in 1899, established communication by wireless across the English Channel.

The Magnetic Detector.

Following this Marconi, in 1902, made another important step forward by developing a more sensitive detector known as the magnetic detector, as the result of which signals could be heard in the telephone.

Fig. 2.—A Marconi coherer.

Referring to Fig. 3, the magnetic detector consists of two magnets A, A, with like poles placed together so as to magnetize an endless band of stranded iron wire B, continuously moving through coil C. The hysteresis lag causes the field to be carried on by the wire a little beyond the central point, and when oscillatory currents flow through coil C the residual lagging flux is annulled, and the magnetism may be said to jump to the central position. This slight though rapid shifting of flux induces a current in the coil D, so that a click is heard in the telephone E, for each spark transmitted, and received by the circuit. Thus a dot is rendered by a short crackle, and a dash by a buzz. The sounds are not very loud but the action is regular. The magnetic detector constitutes a current-operated device, and is inserted directly between aerial and earth. Before coming to the introduction of the valve detector, it is necessary briefly to describe rectification.

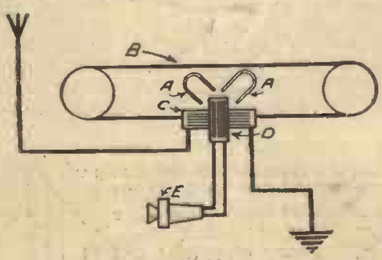


Fig. 3.—Magnetic detector of 1902.

Rectification.

The high-frequency alternating currents used in wireless broadcasting consist of two components, the high-frequency carrier current, and, superimposed on it, the low frequency, or microphonic current. The high-frequency current is useless in itself as far as the diaphragms of the telephones are concerned, its variations are so rapid that no diaphragm could possibly follow them. It is the low-frequency component that matters to the receiver, and the work that the detector has to do is to separate the low-frequency component from the high-frequency one. In doing this, a current is obtained which is varying in accordance with the variations of sound in the studio at the transmitting end, and is capable of making the diaphragms of the telephones or loud-speaker responsive. This work of the detector is known as rectification.

Whilst it is true to say that the above devices described were detectors of wireless signals, they could not do what the detectors of to-day accomplish, *i.e.*, rectify the high-frequency currents set up in the receiving aerial. There are two kinds of detectors to do this, the crystal detector and the valve detector.

Crystal Detectors

The discovery by General Dunwoody of the rectifying property of carborundum was made in 1906, it being subsequently found that certain other crystals of mineral alloys were excellent rectifiers. A popular form of detector is shown in Fig. 4. The detecting property of the crystal lies apparently in its varying conductivity of electrical currents in different directions. A crystal that rectifies may be described as a conductor of electricity in one direction only. The advantages of crystal detectors lie chiefly in the fact that they are cheap, simple, and compact. They cost nothing to maintain, and for these reasons they had a good general run of popularity for several years, and passed the advent of broadcasting, until rivalled strongly by the valve.

Crystals, however, rectify only; there is no amplification. Their range is short, selectivity rather difficult, and they are unable to handle strong impulses, so it was left to the valve to overcome this.

The Valve Rectifier

The introduction of the vacuum valve as a rectifying detector was made in 1904 by Professor Fleming. We all know that after an ordinary electric lamp has been in use for some time

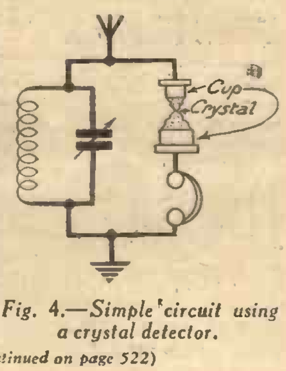


Fig. 4.—Simple circuit using a crystal detector.

(Continued on page 522)

THIRD ARTICLE

CHANGING FASHIONS in SET DESIGN

A Brief Survey of the Development of Wireless Receivers from the Inception of British Broadcasting to the Present Day

By H. J. BARTON CHAPPLE,
Wh.Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.

As we have seen, up to the end of 1926, quite large sets, including five-valvers with two high-frequency stages, employed general purpose valves throughout. Even in the early months of 1927 the same state of affairs persisted, but then, quite suddenly, the result of months of patient experiment, and the outcome of several years' accumulated experience were showered upon us in a flood of new valve types which greatly modified set design.

Early among the new arrivals were special high amplification valves for use in resistance capacity coupled stages. R.C.C. had become popular on the score of good reproduction—chiefly because low-frequency transformer design often left much to be desired. Because of the low stage gain possible with general purpose valves coupled in this way, however, it was often necessary to employ as many as three low-frequency stages. With the new high magnification valves the gain per stage was greatly increased, and two low frequency stages became the rule.

More New Valves

Swiftly following the R.C.C. valves came power and super-power output valves of the dull emitter type, permitting the advantages of greater output and better reproduction to be enjoyed by listeners who were restricted to comparatively small low-tension batteries. The power valves gave reasonable output, and certainly better quality than the old general purpose valves, while the super power type, with its much greater grid acceptance, resulted in enormous improvements in reproduction with the popular sets of the day with their multiplicity of low-frequency stages.

I have just been looking at a description of a constructional set published in the early summer of 1927 and typical of large numbers of sets produced about that time. It comprises a detector valve and three resistance-capacity-coupled low-frequency stages, the output valve being of the power type. With such a set, volume control naturally assumed considerable importance, because although the full amplification available would be necessary on weak signals, serious overloading might be experienced with the local programme. Accordingly we find that in addition to the reaction control, there is a complicated system of jacks, by means of which either one or two valves can be cut out as required, while further control is possible by means of filament rheostats.

Tetrode

But valve development did not end with the introduction of the new output valves. For some time past, interest had been shown in the tetrode or four electrode valve. This valve, possessing two grids, was employed mainly as a means of reducing the anode voltage required for receiving valves. The reason why high tension voltages of 50 to 150 volts were necessary is that the electrons—minute negative charges, emitted by the filament—mutually repel each other. Unless the H.T. voltage is high enough to overcome these forces, an undue number of electrons will be forced back to the filament while many others still hover in the space between the filament and the control grid, forming the so-called "space charge," in which position they tend to "blanket" further emission.

In the early tetrode an auxiliary grid, maintained at a fairly low positive potential, was situated between the control grid and the filament. Its duty was to neutralize the space charge and, by its attractive force, give the electrons emitted by the filament such a high velocity that a large proportion of them passed through the auxiliary grid into the influence of the true, or control grid, and thence on to the anode. The device was very successful in that satisfactory results could be obtained with anode voltages as low as 15 volts. But somehow the idea did not take on as well as it deserved—probably because the newer types of dull emitter valve had such generous emission that the tetrode scheme did not seem worth while. Out of the four-electrode principle, however, came an entirely new valve form which cleared away immediately several problems that had been worrying set designers, and marked the commencement of a new era in radio.

Neutralizing and Selectivity

The problems in question were these. First, the neutralized high-frequency circuit, although representing a great improvement in radio frequency amplification, was not entirely satisfactory. As the neutralizing effect depended upon the reactance of a condenser, a quantity which varied according to the frequency of the signal being received, one setting of the condenser only gave *perfect* neutralization for one particular frequency (wavelength). It was, of course, impracticable to re-neutralize the set for every station, so that a compromise had to be effected, with the result that the H.F. stages operated only at maximum efficiency at one point on the tuning range.

The second problem, which was bound up in the first, was that with the increasing number of stations on the air, greater and ever greater selectivity was necessary. Most of the methods of improving selectivity had also the effect of cutting down signal strength, so that the maximum amount of amplification possible was necessary to give good performance, and even the best neutralized triode could scarcely be termed satisfactory in this direction.

The solution was forthcoming in an entirely new type of tetrode—the screened grid valve, which first appeared in commercial form during the early summer of 1927, and, by the autumn, was shown by all the leading valve manufacturers.

Screened grid valves are so well known, and so universally applied to-day, that it is unnecessary to say more than that this type of valve was one in which the inter-electrode capacity, and its effects, were reduced to an almost negligible quantity. In the first place, the electrodes themselves were spaced well apart, especially as regards the grid and anode, the connections to which were at opposite ends of the bulb. Then the fourth electrode, or screening grid, is situated between the control-grid and the anode, and is maintained at a positive voltage approximately equal to half the anode voltage. As a result, although the screen is positively charged, it is, so far as radio frequency is concerned, effectively earthed through the high-tension supply. It therefore acts as an electrostatic screen between the grid and

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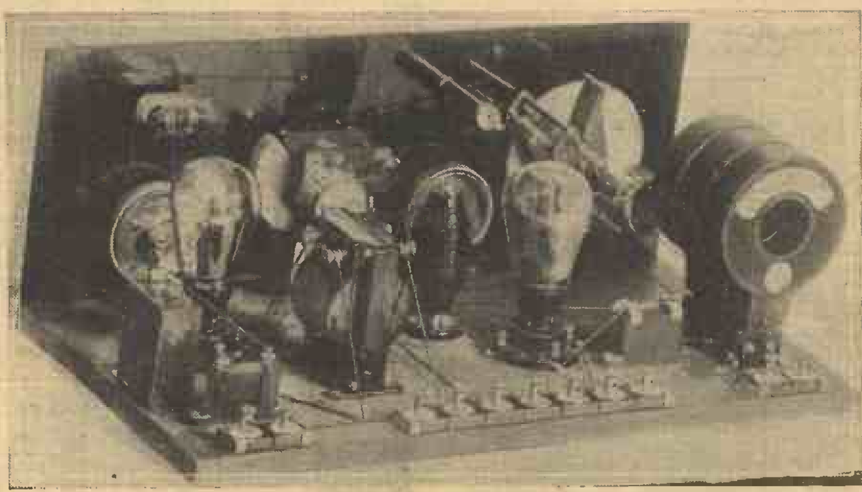

A set which savours of past experiences (about 1927). Note the filament rheostats, plug-in coils and neutralizing condenser.

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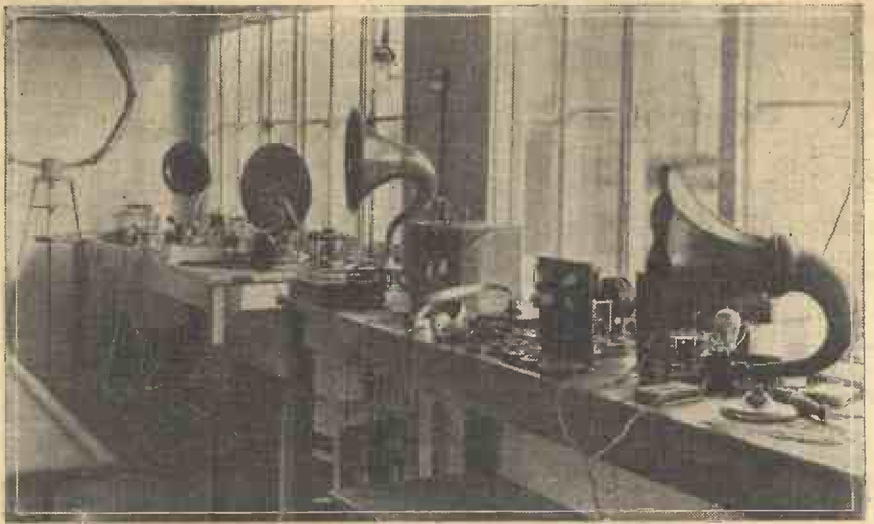
the anode, and prevents feed back between the two circuits.

The necessity for neutralizing coils and condensers was at once done away with, and the circuit connections immediately considerably simplified. The very high amplification factors of these valves also made possible greater stage gains, but in this connection it should be noted that, although the amplification factors of these early screened-grid valves was from 150 to 200 or more, the anode impedances were also very high, so that the full advantage of high-stage gain could be reaped only when correspondingly high-impedance couplings were employed. The most efficient coupling is a tuned circuit, so the tuned anode or choke fed tuned-grid coupling became standardized. Designers endeavoured by all the means at their disposal to decrease the losses in coils and condensers, while accuracy of tuning was further improved by the production of variable condensers the vanes of which were modified in shape to give more open settings on the tuning scale. Great improvements were also made in the design of slow-motion devices for fine and accurate tuning.



Different types of horn loud-speakers, a cone speaker, a range of plug-in coils, slow-motion dials, etc., characterize this laboratory equipment.

Another change in set design which was brought about by the screened-grid valve, was the form and extent of screening between stages. The effects of inter-electrode capacity had been minimized, and any unwanted reaction effects could generally be tracked down to stray couplings between components and wiring. As a result, in order to achieve stability in sets employing screened-grid valves, very complete metallic screening between anode and grid circuits of high-frequency stages was necessary. Usually, this took the form of metal plates attached to the metal panel. A hole, just large enough for the valve to project through, had to be made in the screens, and the valves had either to be fitted horizontally, when they took up a deal of space, or vertically when the design of the screening was intricate, and the wiring of the various stages was difficult and very inaccessible. Very much later, screening cans for valves, and still later the modern metallized valve simplified the mechanical problems of screening, but on the sets of 1927 and 1928, the constructor had to be something of a structural engineer and juggler to erect the complicated screening partitions.

The screened-grid valve had done this for radio, however, it had rendered receivers much more sensitive and much more stable, so that a four-valve set incorporating one high-frequency stage, detector valve, and two low-frequency valves gave range and selectivity equal to, if not greater than, that previously obtainable with two high-frequency stages, and this, too, with increased stability and ease of operation. With the addition of really efficient power output valves, quality too had improved out of all recognition. The use of proper output valves gave an additional fillip to the production of better loud-speakers, and although horn type instruments were still largely used, their acoustic design was on sounder lines, and electrically they were also superior than any that had gone before.

Using the Mains

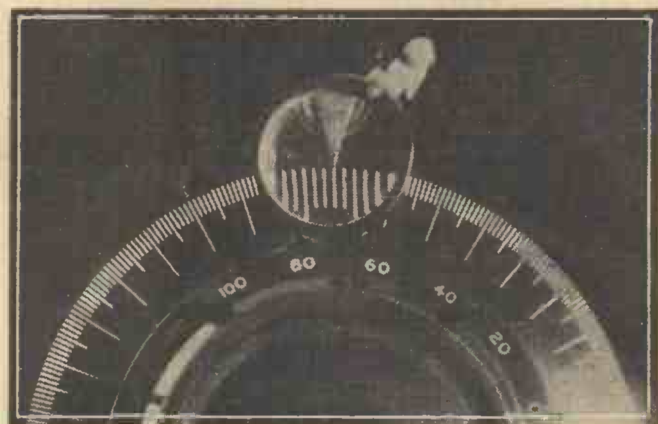
Battery eliminators had also made their appearance, and generous high-tension was, therefore, within the reach of all who could afford the somewhat high initial cost of this apparatus. Towards the end of 1927, the first indirectly heated A.C. mains valves were placed on the market. These were of the general purpose type, and were available in H.F. and L.F. forms. For the output stage, ordinary directly heated super-power valves of the four-volt type were recommended.

Although very efficient from the point of view of characteristics, these valves were somewhat slow in achieving popularity, chiefly because the associated apparatus, filament transformers, and H.T. units were high in price, and partly because the listening public had not been educated up to mains radio at the time. Later on, the production of A.C. mains apparatus was to be undertaken on a larger scale, prices were to become cheaper, and listeners were to become "mains minded," but for the moment the full range of battery valves, including screened-grid types, provided as much technical food as the average listener could assimulate, and entailed more cost than he could usually afford. In the following year, still further technical achievements were to be recorded, but a full two years were to pass before even the screened grid valve could be said to have passed into universal acceptance.

AN AID TO DIAL LOGGING

With so many high-powered broadcasting stations on the air it is becoming a problem of great importance to log the dial readings accurately when you have tuned in the various stations correctly on your wireless set. Not only is it desirable to have slow-motion dials on the condensers, but in some cases it becomes necessary to add some simple device which will enable the proper condenser markings to be noted.

One simple method for this to be carried into effect is shown in the accompanying illustration. First of all procure a small vest pocket type magnifying glass and remove the cover. These glasses are really quite powerful and have a focal length of anything up to two inches. Take a short strip of thin brass and fix one end to the glass frame with a 8BA screw. Drill a hole in the ebonite panel of the wireless set, slightly to the right and above the top of the condenser scale as shown and, bending the brass strip at right-angles at each end, attach it to the panel with a 6BA screw and nut. The lens can be held away from the panel a distance just sufficient to give correct focussing and can be swung in and out of use as desired. As the photograph shows, the dial divisions are magnified, and in this way it is possible to log more accurately the particular settings for different stations.



Showing how a small pocket magnifying glass can be mounted to ensure accuracy in logging condenser dial readings.

Are YOU interested in 5-METRE WORK? Then see Next Week's Issue

RADIO RAMBLINGS

By JACE

Jottings from my Notebook

The Best Position for an Indoor Aerial

I RECALL a somewhat odd experience I had a short time ago. A friend had bought a rather unselective two-valve set and asked my advice in regard to the most suitable type of aerial. A short inside one was suggested and this was duly erected as an insulated wire running along two sides of the room and loosely tacked to the picture moulding. Results? Practically nil, for even the local station was barely audible. Investigation showed that the wire was running almost parallel with an electric conduit pipe, which was (as is always the case) earth connected.

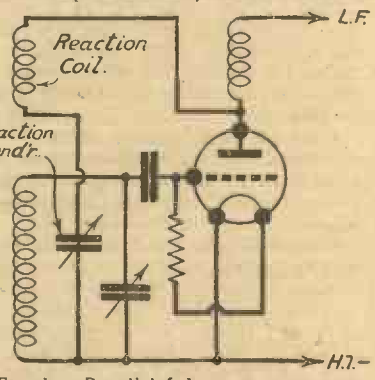


Fig. 1.—Parallel-fed reaction circuit.

By moving the aerial to the two opposite walls, all was well. Apparently the earthed conduit had been acting as an efficient, though unwanted, screen.

The moral is, if you employ an inside aerial, try it in different positions until the best one is found.

Instability with Class "B"

A DIFFICULTY which is occasionally experienced with a class "B" output stage is that there is a certain amount of parasitic oscillation due to slight variations in the two halves of the class "B" valve, or to other causes. This is generally evidenced by a faint, high-pitched whistle or by a peculiar form of distortion on certain high notes.

A satisfactory cure can nearly always be effected by connecting a condenser of about .005 mfd. across each half of the primary winding of the output transformer. The condensers also have a tendency to reduce the high-note emphasis which is always produced by class "B" valves, but they are not usually quite sufficient, in themselves, for this purpose. A more complete measure of tone correction may be secured by joining a .02 mfd. fixed condenser between the ends of the secondary winding of the "driver" transformer.

Another point to watch in a class "B" set is that there should be no leakage of H.F. current from the detector anode circuit into the amplifier, because this is liable to be magnified and to cause serious low-frequency instability and distortion. The usual expedient, of inserting a .25 megohm resistance in the grid lead of the first L.F. (or "driver") valve, is usually sufficient but occasionally a better effect is produced by wiring a 50,000 ohm resistance in shunt with the primary winding of the first L.F. transformer.

The Screening Grid Potential

WITH present-day receivers it has become the usual practice to have only one H.T. positive tapping, the various valves being fed through suitable voltage-dropping resistances. This system is all very well so far as the anode voltages are concerned, but things are rather different in respect to the screening grid supply to S.G. or V.-M. valves. A voltage equal to about two-thirds that applied to the anode is required, but as the current is so very small an ordinary fixed resistance is practically useless for reducing the voltage to a correct figure. In mains sets the difficulty is overcome by using a potentiometer (connected between high-tension positive and high-tension negative) for supplying the screening grid potential, and although the same idea may be applied to a battery set it is not very economical, since the potentiometer causes a constant waste of H.T. current.

Aerials and Interference

BECAUSE a short indoor aerial generally gives more selectivity than the usual elevated wire there seems to be a good many people who think that it is also better for eliminating *electrical* interference. This may or may not be the case—it all depends on the circumstances. If the interference is definitely due to an outside source the indoor aerial will probably prove helpful. But if it is coming into the house *via* the electric lighting mains its

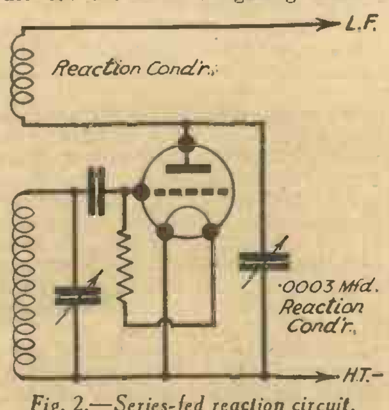


Fig. 2.—Series-fed reaction circuit.

effect will be much greater when the aerial is comparatively close to the mains leads. Where interference is experienced, then, and its source is unknown, the best thing is to try both kinds of aerial and

(Continued overleaf)

RADIO RAMBLINGS

(Continued from previous page)

find out for yourself which best suits your own case.

Series and Parallel-fed Reaction

ALTHOUGH the Reinartz, or parallel-fed reaction, arrangement (Fig. 1) is almost universal, there is much to be said in favour of the series-fed reaction circuit shown in Fig. 2.

As a matter of fact, the latter circuit is practically the same as was used a few years ago with plug-in coils, except that reaction is controlled by a .0003 mfd. variable condenser instead of by "swinging" one of the coils. This throttle control, as it is called, works more smoothly than the swinging coil and is less liable to produce instability than is the Reinartz method. In addition, it saves the necessity for a high-frequency choke. It will be clear that the reaction condenser operates "left-handed"—that is, the amount of feed-back is increased as the condenser's capacity is reduced. When the capacity is increased, H.F. currents appearing in the detector anode circuit are allowed to leak away to earth, and therefore there is a reduction in the amount of reaction obtained.

The parallel-fed reaction arrangement is applicable to any type of set using either plug-in coils or the more usual dual-range tuner, but it is of particular value on the shorter wavelengths.

The Latest From Lucerne

ALTHOUGH "long" wavelengths at the time of writing have not yet been definitely allocated, it is easy to foresee that considerable alterations will have to be made in the dials of receivers bearing the names of stations. The latest proposal places some well-known transmitters in the following order. Kalundborg (1,153 m.); Huizen (1,195 m.); Oslo (1,239.7 m.); Madrid, Ankara, Kaunas (1,282 m.); Motala (1,327.4 m.); Warsaw (1,388.9 m.); Daventry National (1,522.8 m.); Königs Wusterhausen (1,604.3 m.); Radio-Paris (1,694 m.); Bucarest, Reykjavik and Porto (1,775.1. m); Lahti (1,863.3 m.); Moscow (1,973 m.). It will be noticed that no provision has been made for Eiffel Tower and that France may thus lose one long channel. If allocated in this manner the list does not take into consideration a number of transmitters already working in the band, and some of the wavelengths may still be shared.

DETECTOR DEVELOPMENTS

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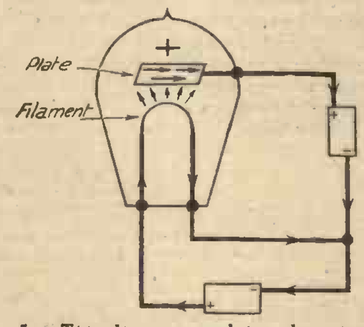


Fig. 5.—This diagram explains the principle of the two-electrode valve.

there is a tendency for a black deposit to form on the inside of the glass wall of the bulb. It was from the investigation of this phenomenon by Professor Fleming that the first valve rectifier was evolved. He introduced a second electrode into the vacuum in the form of a small metal plate and connected up as shown in Fig. 5.

When switching on the current to the filament, the plate being connected to the positive terminal of another battery, a small current flowed in the plate circuit, although there was no metallic connection between the plate and the filament. He further found that, when changing over the wires so that the plate was negative, no current flowed in the plate circuit.

As this device permits electrical currents to pass through in one direction only (as in the case of the crystal), it was soon adopted as a rectifier of oscillatory currents of electricity, and was known as the two electrode valve. Following this discovery, De Forest added a third electrode to the valve, between the filament and the plate, known as the grid. The current in the plate circuit could be controlled according to the manner in which the grid was charged. The result of this was that the valve was made to act as an amplifier of wireless signals as well as a rectifier.

After manufacturers had mastered the art of maintaining a vacuum in producing these valves, crystals gradually took a back seat. The progress of the three-electrode valve (Fig. 6) since broadcasting commenced is well known. Developments from bright emitters to dull emitters, the introduction of mains valves, their applications as leaky grid or anode band detectors, the introduction of more electrodes, as in the screened grid detector, etc., all seemed to point that valves would be the last line of detectors.

And now comes the new cold valve.

The Westector

This, the Westector, is the latest development in detectors. This new cold valve (Fig. 7) consists of a number of discs of copper and copper oxide plates, an electronic action taking place between

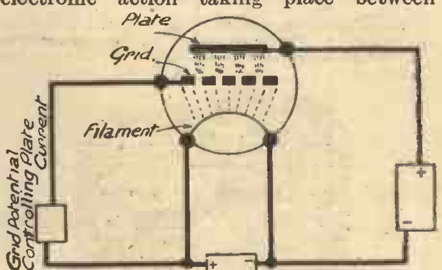


Fig. 6.—Illustrating the function of the three-electrode valve.

these permanent junctions. The Westector will handle large inputs, but it only rectifies—it will not amplify—a particular advantage being that no heater or anode currents are necessary for its operation. As they are particularly suitable to sets of superhet design they can certainly be classed as a possible rival to the valve

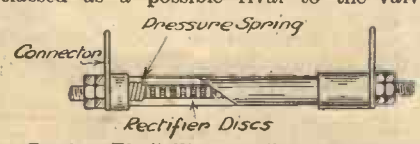


Fig. 7.—The "Westector," or cold valve.

rectifier. However, in comparison with early detectors, we have to-day reached such a stage of efficiency in detection that it will be difficult to revolutionize these methods by any new means of detection.

Facts and Figures

Components Tested in our Laboratory

BY THE PRACTICAL WIRELESS TECHNICAL STAFF

PILOT CLASS "B" CONVERSION KIT

THE illustration shows the Peto-Scott "Pilot" Class B Conversion Unit, which retails at 37s. 6d.

The unit should be wired as Blue Print supplied, care being taken to ensure that the seven pin valve-holder is wired exactly as in the sketch, terminal No. 6 being left blank.

This Unit will operate on the majority of sets without any alteration to the existing receiver. In operation the existing Power valve acts as the driver valve, and must be a Triode, the normal small power being satisfactory. Under test we found it to be extremely efficient.

In the case of sets with one L.F. stage which is transformer coupled to the detector valve, the unit will connect direct to the loud-speaker terminals, P. and H.T. on transformer being connected to LS— and LS+ respectively.

The Peto-Scott Class B unit.

If a choke output circuit or output transformer is fitted between output valve and loud-speaker terminals, it should be removed and the P. and H.T. terminals on driver transformer connected to plate of output valve and H.T.+ respectively.

The filament connections should be made to a 2-volt accumulator. The loud-speaker is now connected to the terminals on the output choke. There are two ratios, viz.:—

The Plew Anti-fading Unit which gave excellent results under test.

1—1. Connect speaker between terminals marked 2 and 2.

1.5—1. Connect speaker between terminals marked 3 and 3.

If the first stage of your existing receiver is resistance coupled, it would be advisable to cut it out.

This should be done as follows:—

The feed resistance which is connected between H.T.+ and the anode terminals of detector valve must be removed. The connection from anode terminal to reaction condenser and H.F. choke remains. The wire from the "A" or "P" terminal of existing L.F. transformer must be transferred from the first L.F. valve holder to the anode of detector valve holder.

If an H.F. choke is used, the wire from transformer should connect to the H.T. side of choke; that is the side from which the anode resistance has been taken off. The first L.F. valve can be taken out of set to save filament current, as it is no longer used.

The Unit should be connected to the loud-speaker terminals as previously described.

The operation of your set is exactly as before. The Grid Bias to the driver valve should be increased somewhat, so as to economise in H.T. current. The bias increase should not be such as to cause distortion.

It should be noted that the Class "B" Valve is switched off by simply disconnecting one of the accumulator leads.

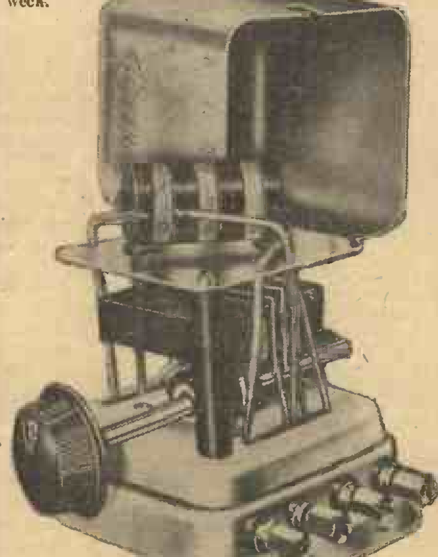
Should a special Class "B" Speaker be used, the output choke can be dispensed with and the connections made to anodes and H.T.+.

THE PLEW ANTI-FADING UNIT

WE have just received an excellent little device from the Phasodyne Radio Co., 22, George Street, Hanover Square, London, W.1, called the Plew Anti-Fading Unit. This consists of a small moulded bakelite case fitted with four terminals which are marked "P," "O," "H.T." and "S" respectively. The unit is connected in the anode circuit of the detector valve and is made to vary the screening grid potential applied to the preceding S.G. stage. The component is very ingenious and works well. As the name implies, its object is to prevent fading, and it accomplishes this by acting as a form of automatic volume control device. The makers are very modest in their claims and we were pleasantly surprised to find how efficiently the unit operated; stations such as Fecamp, which normally fade badly, were receivable at practically constant strength during the whole of a fairly long test. Complete with a sheet of wiring diagrams and full instructions for use, the unit retails at the attractive price of 10s.

THE WRIGHT AND WEAIRE "NUCLEON" COILS

THE illustration below shews the ingenious design of the new "Nucleon" Coils manufactured by Wright and Weaire, Ltd. Originality and low price is their keynote, and they will be extensively dealt with next week.



The new Weairite Nucleon iron-core tuning coil, details of which will be given next week.

IMPRESSIONS ON THE WAX

A REVIEW OF THE LATEST DISCS

By E. REID-WARR

THERE is still a shortage of the more important orchestral works on records, most of the lists being made up of the more ephemeral type of music.

We will begin with the songs which still top the lists. Another Caruso record has been rejuvenated—*Celeste Aida* and *Je Crois Entendre Encore* (*Pearl Fishers*), *H.M.V. DB*1875. In this record you hear Caruso's voice when tendencies towards baritonal quality were developing—a not unusual occurrence in the career of tenors—and it is interesting to compare it with earlier ones. The two arias are admirably chosen—one grandiloquent, the other tuneful, haunting in charming simplicity. John Hendrik, that very good German tenor, has made another excellent record in *Parlophone R*1517. He sings two Lehar songs in German—*Gipsy Love* and *The Czarevitch*—which are a very delightful pair. This young man is so very good that it is difficult to believe that he was working as a clerk less than four years ago. Now he is well on the way to fame. Another cheering example for amateurs!

Talking of amateurs, have you heard the Hon. W. Brownlow? Here is a baritone who is a very fine artist from every standpoint. The entire rewards of his efforts benefit charity, hence his amateur status. His last record contains two light trifles, *This Lovely Rose* and *When I Think of You*, on *Columbia DB*1126. A vocal record which has much to commend it is Robert Burnett's *Edward* and *Wee Willie Winkie* and *Jenny Wi' the Lang Pock* on *Parlophone E*11236. This Scottish baritone has a rare dramatic gift. His singing of that gruesome poem of Dalrymple's is positively eerie. You'll need much Scotch (the language) to follow the other two. Stuart Robertson has two martial ditties well worth hearing in *Vimy Ridge* and *Light of Foot*, on *H.M.V. B*4416, and the new show, "*Music In The Air*," is most artistically and generously ensampled by the Light Opera Company on *H.M.V. C*2568.

I liked Brahms' best two, *Hungarian Dances* 5 *and* 6, as they are played by the San Francisco Symphony Orchestra on *H.M.V. E*607. Almost everybody knows them well; the gaiety of spirit they express is most infectious. A record to come back to at any time. A strange offering comes from *Brunswick* (119). This is *Lament For The Living*, with the subtitle "Suite in G Flat." The name leaves one guessing, but the four parts or movements, "Lament," "Searching," "Phantoms" and "Why?" begin to enlighten one. If you can imagine an allegorical film round such a lachrymose subject, this music would fit in admirably. It is tuneful, modern, but not hair-raising. I think I rather like it.

Bird of Love Divine and *I Hear You Calling Me* are bound to be popular as they are played by so fine an orchestra as the London Palladium. Here you have a symphonic arrangement quite in the grand manner and yet the melody stands out delightfully. Two old favourites in very fine raiment. On *H.M.V. C*2563.

Medleys that are different are the two Scenas, *Venetian Nights* and *A Vision of Spring*, played by the New Mayfair Orchestra. Vocals for colouring such pieces as Come, Lassies and Lads and Offenbach's Barcarolle help to make two quite attractive pictures on *H.M.V. C*2565.

Another *Lilac Time!* The Commodore Orchestra (and Organ) play it on *Broadcast* 3309. It is competent—the Commodore always is—but they should have locked the organ and mislaid the key for *Lilac Time*. Now for a really brilliant bit of playing. This is *The Enchanted Forest* by Ilja Livschakoff's Orchestra on *Decca F*3565. Every modern trick and instrument is used, and the result is uncommonly attractive. *The Little Company* backs it up. Because the orchestral qualities are predominant, I mention here with pleasure *The Black Gipsy* and *The First Flowers in May*—two tangos by the Dajos Bela Dance Orchestra. These are *Parlophone R*1510.

I like Mark Hambourg's playing of Beethoven's *Sonata in C Sharp Minor* (*The Moonlight*) better than anything by him for a long time, not, perhaps, so much from the actual execution, but from the artistic interpretation, which is very satisfying. Hear *H.M.V. C*2551-2 with the fourth side containing a positively enchanting fragment—Beethoven's *Nel Cor Piu Variations*.

In a very different world is John Hunt's introduction of the "Neo-Bechstein" piano *via* Chopin's *Prelude in C Minor*, *Op.* 28, *No.* 2, and *Mazurka in A Minor*, *Op.* 68, *No.* 2, and *Clair de Lune* (Debussy). The chief interest lies in this new instrument which has no hammers, but electromagnets and a loud-speaker! The result is a kind of cinema organ effect with amazing swell effects. John Hunt plays these pieces delightfully, and has great skill with this new invention. Definitely a record to have—*H.M.V. C*2567.

The best humorous record comes from Ronald Frankau, who gives pungently *The Preparatory School*, *The Public School and The Varsity*, on *Parlophone R*1515. The other side is *Let's Go Mad*. That loving couple (!), Billy Caryll and Hilda Munday exchange more amenities on *Broadcast* 3311 (*Home Chat*). Then two funny men with excellent voices sing of *Eucalyptus* and *The Golden Shores of Wigan* on *Sterno* 1193. You doubtless heard Duke Ellington's broadcast and formed your own views! I will but say that he hurt me far less on *Hot Feet* and *The Blues I Love to Sing*, on *H.M.V. B*6343. I feel that we should have understood it all better, had we lived in either 6000 B.C. or A.D.!

Practical Letters from Readers.

The Editor does not necessarily agree with opinions expressed by his correspondents.

Class "B" and H.T. Eliminators

SIR,—I have read in PRACTICAL WIRELESS recently quite a lot about Class B Amplification, and I would very much like to adopt this form of amplification. I understand, however, that it is practically impossible to work Class B off an average type H.T. eliminator. What about the thousands of experimenters, myself included, who have either bought or made H.T. units? Have we to scrap them and buy new ones? I know of only one such unit on the market at present designed specially for Class B, *but* it is rather expensive. Here is a splendid chance for the technicians of PRACTICAL WIRELESS to lead the way once again, by telling us how to adopt out present units to suit. Wishing PRACTICAL WIRELESS every success.—R. E. ATKINS (Horden).

[*Provided that the eliminator delivers sufficient current for the maximum requirements of the amplifier, the Neon Stabiliser may, of course, be used in place of the smoothing condenser in the unit to keep the voltage constant. The subject is, however, receiving our attention.—Ed.*]

I.N.R. and His Majesty's Speech

SIR,—I happened to tune in Brussels on the afternoon of June 12th, and heard someone speaking. After a while, I knew it was King George, and I listened to the end. Afterwards there was a very pleasing incident, which I wish to report. *The announcer told us in Flemish, that that was the end of His Majesty's speech, and said, "We will now put on a gramophone disc and play 'God save the King.'* We will then proceed with our concert."

As a regular reader of your splendid paper, and being a Britisher, I thought this jot of news may interest you, and be worth publishing, just to let Englishmen know what the officials of the I.N.R., which is the Broadcasting Company of Belgium, think and feel when they relay a speech by our King. Best wishes for the future of PRACTICAL WIRELESS.—F. J. WHALLEY (Antwerp).

A Ceylon Reader's Views

SIR,—Being on leave in London when PRACTICAL WIRELESS began publication I took it in from No. 1 and have continued doing so after my return to Ceylon. Like the many thousands of other readers I can say I have not met its equal for giving good value, both as regards the practical as well as the theoretical side of wireless. Every subject, however abstruse, is dealt with in such clear and simple language that one *has* to understand it. I must also thank you for the Wireless Constructor's Encyclopædia which I have found most useful. As you welcome criticism may I make a suggestion.

Most of the circuits given in PRACTICAL WIRELESS need special coils which are more often than not unobtainable in Ceylon (I should think this applies to other parts of the Empire, too) and, therefore, their construction is either not possible or has to await receipt of the necessary coils, etc., from the manufacturers. Another point that has struck me is: Why is it considered a *sine qua non* of a set that a wave-change switch must be included in the circuit? We, in the Colonies, do not in the least mind coil changing, and, as our receivers, to be of any use, have to tune in all wavelengths from 12 or 15 m., to 1,000 m. we generally build them so that it is merely a question of changing coils for each waveband.

The ideal circuit for us is one with S.G., det., and 2 L.F., as with this and the necessary coils the world is within our reach. On such a set the Empire S.W. station comes in at full L.S. strength often when we cannot hear our local (Colombo) owing to atmospherics. Now, sir, if you can describe a set using such a circuit (the last stage might with advantage be Q.P.-P., or Class B amplification), giving details for making the necessary coils, you would be conferring a boon on all readers outside England.—R. G. LEEMBRUGGEN (Matara, Ceylon).

(*Continued on page 526*)

CUT THIS OUT EACH WEEK

DO YOU KNOW?

—THAT if signal strength is not reduced when the earth is removed the earth connection is inefficient.
—THAT a mains A.C. receiver can always be used on mains of higher frequency than that for which the set was designed, but should not be used on mains of lower frequency.
—THAT in making a portable set it is always best to screen the loudspeaker leads, to prevent instability.
—THAT when calculating the value of bias resistance for an A.C. pentode the anode and screening grid currents must be added together.
—THAT good reception can often be obtained by dispensing with an aerial and connecting the earth lead to the aerial terminal.
—THAT fitting new valves to an old set often causes instability.
—THAT for power grid detection the detector anode voltage must not be less than 120.
—THAT the wiring of an electric bell often makes a good indoor aerial.
—THAT when decoupling is provided there is no harm in wiring a new high-tension battery in series with a partly exhausted one.

NOTICE.

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

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

PRACTICAL LETTERS

(*Continued from page 525*)

Price of Components Wanted in Specification

SIR,—PRACTICAL WIRELESS is certainly maintaining its high standard, and I must say it is its style that attracts me, almost as much as its contents. Further, the authors express themselves very clearly, so that the average amateur can understand, and this is surely half the battle. But I have one complaint to make. Quite sensibly you give a clear and definite list of all the parts required to build one of your sets. But why not give their *prices* as well? I know you say that advertisers state prices for kits; but this is *not* really satisfactory. Take the featherweight portable, for instance. About one advertisement appears. This states price of kit, excluding panel, baseboard, cabinet, and speaker. What about the cabinet, baseboard and panel? Have I got to wade through all the literature about the set to find out about these; and then remain ignorant of the price? Why could you not put the price of the components in the specification? It would be *so* much more convenient. After all, the very *first* thing one must know about a set is its price.

O. C. UHTHOFF (Marlborough).

[*This matter is under consideration.—Ed.*]

From A South African Reader

SIR,—I have been a subscriber to at least two wireless papers since wireless existed. The circumstances here are somewhat similar to those existing at home in 1925. We have no necessity for selectivity and dual range coils. Our nearest station is Johannesburg, 600 miles away. Since the early 'eighties I have been interested in electricity, and the earlier numbers of the wireless papers were devoured by me. Lately they have devoted too much (as far as I'm concerned) time to selectivity, etc., and in the above circumstances these things do not interest me. Consequently the coming of PRACTICAL WIRELESS has been a godsend. I like your paper because you discuss fundamentals as well as the technical requirements of the conditions in Europe.

Here is a suggestion: Why not publish a series of articles dealing with the signal as sent out by the broadcasting station tracing it through the receiver until it emerges from the loud-speaker, treated with such mathematics as a boy of fifteen can understand. Youths of that age are better qualified to study wireless than older people.

Thank you for the wonderful Encyclopædia which has just come to hand—I made use of it the moment I received it, to decide what anode resistance to use in an R.C. coupled L.F. valve.

In my opinion the four most outstanding events in wireless to date are: the Screen Grid, Class B amplification, The Empire Short-waver, and PRACTICAL WIRELESS.—MALCOLM CANMORE (Salisbury, Rhodesia).

The Faultfinder's *Vade Mecum*.

SIR,—My copy of "The Wireless Constructor's Encyclopædia" to hand. I have not had an opportunity to look carefully through it yet, but a rough glance at the television section proved exceedingly interesting. I am a television enthusiast, having had some experience on the manufacturing side in its early days.

Coil winding data is also exceedingly useful, and other material seems to be level with radio progress. As a faultfinder on commercial sets, etc., and with nearly twelve years' experience, it is my opinion that *all* faultfinders should be in possession of a copy of the Encyclopædia; it would lighten their daily tasks. Success to your instructive journal, and please carry on the good work, and boost up television progress.—W. J. BUTTERFIELD (Seven Kings, Essex).

RADIO CLUBS & 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.

A NEW ZEALAND CLUB

Far away in New Zealand is situated the New Zealand DX Club. This club aims to forward the interests of DX listeners. Membership (including a badge and card) is 2s. 6d. Although situated at such a great distance from England the club is well worth joining. Particulars will gladly be supplied (upon receipt of a stamp) by the International Secretary, Leslie W. Orton, "Kingsthorpe," Willowbank, Uxbridge.

THE WESTERN ENGLAND TELEVISION AND SCIENTIFIC SOCIETY

This Society has been recently honoured by the acceptances of Fellowships by The Marchese G. Marconi, Sir John Ambrose Fleming, L. Francis Fogarty and John Logie Baird, Esq. These gentlemen, to whom we owe a good deal the present perfection of Radio and Television, are too well known to need any introduction. We would take this opportunity of pointing out that our Foundation membership lists are not yet closed. Foundation members have no entrance fee to pay. All interested are invited to write to the Honorary Secretary, H. Montague Smith, "Eden House," Eden Grove, Filton, Bristol, 7.

ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY, etc.

The Anglo-American Radio and Television Society, the International Radio Society and the International DX'ers Alliance have pleasure in announcing that a programme dedicated to them will be broadcast from Radio Normandy (Fécamp) upon 226 metres between 1 and 1.30 a.m. (B.S.T.), July 2nd, 1933 (Sunday morning). We are desirous of hearing from readers receiving this transmission. Letters should be addressed to 11, Hawthorn Drive, Willowbank, Uxbridge, England.

GOLDERS GREEN AND HENDON RADIO SCIENTIFIC SOCIETY

The Annual Direction Finding Competition under the auspices of the above Society will take place on Sunday, July 2, in the area enclosed by St. Albans—Watford—Berkhamsted. Wavelength to be used, 164 metres pure c.w. crystal controlled. The fixed transmitting station will be operated by G5RD, near King's Langley. The unknown and mobile transmitting station will be operated by G5CD. All communications should be addressed to H. Ashley Scarlett, 60, Pattison Road, London, N.W.2.

HACKNEY RADIO AND PHYSICAL SOCIETY

At our last meeting, held at the Hackney Electricity Showrooms on Monday, June 12th, Mr. A. R. Twiss gave another of his very interesting talks when he lectured on Push Pull. Commencing his talk with a few notes on the normal output circuit, Mr. Twiss followed with many details of ordinary Push Pull output. Having dealt at length with this form of amplification the lecturer passed to Quiescent Push Pull, and gave much interesting information on this subject. Class B amplification is to be the subject of another evening's talk. Details of coming events may be obtained from the Secretary, A. F. Rogerson, 19, Sewdley Street, Clapton, E.5.

ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY (Huddersfield Branch)

The above society paid a visit to the transmitting stations at Daventry on Sunday, May 21st, by motor coach. The party were welcomed by the engineers and shown around the 5XX and 5GB, and finally the New Empire Short-Wave Station. The visitors were extremely interested in the progress made in transmitting gear as shown by the 1925 5XX to the New Station built last year. They were most interested also in the Programme Repeater Station and distribution equipment. After tea at Daventry, the party were taken to the Hillmorton G.P.O. station at Rugby, and from there home. A most enjoyable day was spent by all. It was decided to continue these outings throughout the summer months, and to arrange a series of interesting lectures in the autumn, touching on the places visited. New members are welcomed. All enquiries to J. Sutcliffe, 32, Mulberry Street, Moldgreen, Huddersfield, or L. Goucher, 10, West Grove Avenue, Dalton, Huddersfield.

SLADE RADIO

"Automobile Radio" was the title of a lecture given by Mr. G. T. Peck at a recent meeting of this Society. Stating that he was dealing with sets which could be used on motor-cars and other vehicles and also on boats, the sets having to operate while these were in motion or stationary, he drew a comparison between them and the home set. The question of hidden aerial and the reason why such sets had to be four times as sensitive and far more robust than the ordinary type were dealt with, also the question of interference from ignition, etc., was described and the methods by means of which this can be suppressed. Three modern receivers were then described and demonstrated, these being capable of giving $1\frac{1}{2}$, $2\frac{1}{2}$ and 6 watts undistorted output respectively. They were of the superhet type with the new American super-valves and extremely efficient A.V.C., the results being very pleasing. Cars fitted with sets were also available, and small parties given a demonstration under normal running conditions were highly impressed with the extremely satisfactory results which were obtained. The lecture and demonstration proved very interesting and members had the opportunity of experiencing what may become a universal practice. Hon. Sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

THE THREE STAR NICORE

(*Continued from page 512*)

"H.T.+2" will require the full 120 volts. Connections to the accumulator require no explanation and the spade terminals are appropriately marked with plus and minus signs.

After everything is connected up the set is ready for its first trial, but before switching on, just examine the drawing which shows the positions of the controls and which was reproduced at the foot of page 486 in last week's issue. Set the wavechange switch to the waveband required—clockwise rotation gives medium and anti-clockwise, long waves—and pull out the knob of the on-off switch. Next set the volume control to its midway position and rotate the tuning knob until the local station is heard. After that the volume can be adjusted as desired by turning the volume control clockwise (to increase), or anti-clockwise (to decrease). Should it be found that the local is still too loud, even with the control set to its minimum position, the variable-mu grid bias should be increased in $1\frac{1}{2}$ volt steps until the required strength is obtained. This adjustment should for preference be made when the pre-set aerial condenser is screwed to its "half-in" position.

The final step in the process of making preliminary adjustments concerns the trimmer on the side of the second section of the tuning condenser. This latter is operated by means of a star wheel which can easily be turned with the finger tip. First tune in a fairly weak signal about the middle of the waveband, leaving the trimmer knob on the panel in its central position, and then move the star wheel slowly until signal strength attains a maximum. This setting will hold over both tuning ranges so that all delicate and final tuning adjustments can be made for any station merely by turning the panel trimmer knob, which incidentally operates on the first or aerial section of the gang condenser.

If D.X. reception is your favourite occupation you can now commence to "search" in confidence that the set is working efficiently. Should it ever be found that some particular signal is just too weak to give good speaker reception, its volume can be increased by screwing down the knob of the pre-set condenser or by reducing the bias voltage applied to the first valve. In connection with this latter point it might be explained that signal strength is greater with a low G.B. voltage, but that selectivity is improved by increasing the voltage; between the two extreme limits there are a number of settings which will be found satisfactory for average requirements.

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO QUERIES and ENQUIRIES by Our Technical Staff

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

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

SPECIAL NOTE

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

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

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

FUSE CONNECTIONS

"Having recently had the misfortune to burn out a new set of valves by connecting my high tension battery wrongly, I decided to fit a safety fuse, and wired this in the common high-tension—low-tension negative lead. When I switched on there was no sound from the loud-speaker, but the fuse continued to glow until I switched off. When I removed the fuse my set behaved properly again. Do you think there was something wrong with my fuse, or was it connected wrongly?"—N. D. (Wembley).

The fuse was wrongly connected, for by putting it in the common lead it had to carry both H.T. and L.T. current to the valves. It thus lit up due to the L.T. current, but prevented the set from working by acting as a resistance and so preventing the valves from receiving their proper supply of low-tension current.

The correct place to fit a fuse in any kind of set is between the H.T. negative and L.T. negative terminals, when all connections to the valves and other components must be taken from the latter point.

CLASS "B" OUTPUT TRANSFORMER.

"I am building the Class 'B' Unit recently described in 'Practical Wireless,' but as I have obtained a moving-coil speaker fitted with a Class 'B' transformer, I wonder if the output transformer contained in the unit will still be necessary."—J. S. (Doncaster).

No. The output transformer will not be required in your case and the three terminals on your loud-speaker will correspond to those marked "A," "H.T." and "A" respectively on the transformer specified. The two outside ones will be connected to the two anode terminals on the seven-pin valve holder, and a high tension positive lead should be joined to the centre terminal.

RESISTANCE OF WIRING.

"I intend to make the 'Pyramid' two-valve portable set described in 'Practical Wireless' No. 37, using a small 4½ volt dry battery for low tension purposes. You say in the article that this is permissible, but it appears to me that if the two valves are wired in series they will only require 4 volts for filament heating. Will not the extra ½ volt damage the valve filaments?"—M. N. (York).

You are quite correct in assuming that when the valve filaments are wired in series they will require only 4 volts between them, but in practice there is a certain amount of resistance in the filament wiring and this is sufficient to "absorb" the additional ½ volt.

Besides this, dry batteries have a comparatively high internal resistance which itself tends to reduce the output voltage when the discharge current is fairly high (as it is in the present case).

A MAINS VOLTAGE DIFFICULTY

"As I have lately moved into a house fitted with 105 volt A.C. lighting mains, I am wondering how I can best obtain the power for my commercially-made radio-gram, which is designed for 200 to 250 volt A.C. mains."—H. G. (Worthing).

It would be possible to obtain a transformer for stepping up your mains voltage to 200, but you would first require to know the power consumption of your set, in watts. Having found that, a suitable transformer could be obtained from any good firm specialising in their construction.

A much better method, however, if the set is of British manufacture, would be to ask the makers to replace the mains transformer now fitted by one suitable for the new mains supply voltage. This would be both cheaper and more satisfactory than the first-mentioned method.

L.T. FROM H.T. ELIMINATOR?

"I have an H.T. eliminator which gives three different voltage outputs, but as I only employ the 'maximum' tapping I wonder if one of the others could be used for low-tension supply in place of the 2 volt accumulator. Presumably a series resistance would be required to reduce the voltage to a suitable figure, but I am quite prepared to buy or make a component for that purpose."—L. M. (Liverpool).

DATA SHEET No. 41.

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

WINDING PARTICULARS FOR DUAL RANGE TUNING COILS.

The following table shows the approximate number of turns required when making dual range coils with a ribbed ebonite coil former. In each case it is assumed that the medium wave winding is wound as a single layer, whilst the long wave and reaction windings are put in slots ⅜in. deep. The long wave winding is split up into three equal parts, each of which is placed in a separate slot. The latter slots are ⅛in. wide and the same distance apart. The reaction winding is situated between the other two, being ¼in. away from the end of the long wave winding and ½in. away from the end of the medium wave one.

Diam. of Ribbed Ebonite Former	Long Wave Winding		Medium Wave Winding		Reaction Winding	
	No. of Turns	Gauge of Wire	No. of Turns	Gauge of Wire	No. of Turns	Gauge of Wire
3 in.	135	36	40	28	45	36
2½in.	150	36	50	28	60	36
2 in.	174	36	58	30	75	36
1½in.	210	36	80	36	85	36

In each case the wire is enamelled.

Unfortunately it is absolutely impossible to obtain sufficient current for low tension purposes by the method you suggest. Even the smallest type of 2-volt valve takes a filament current of one tenth of an ampere, whilst the maximum current that can be taken from the "low voltage" tapping of an eliminator is no more than *one hundredth* of an ampere.

When there is some difficulty in getting the accumulator charged, the best method is to employ a trickle charger, or better still, to buy an H.T. eliminator which has a charger built into it. The extra cost of the charger is extremely small in comparison with the expense it saves.

H.T. CURRENT READINGS WITH CLASS "B" SET

"I have just bought a milliammeter reading up to 30 mA. and decided to measure the H.T. current consumption of the valves in my Class "B" set, since I was afraid that they were taking more than my triple-capacity H.T. battery could economically supply. On inserting the meter in the various H.T. positive leads the following readings were obtained:—Detector, 2 mA.; Driver, 4.5 mA.; Class "B" from 3 to 30 mA. These figures agree with those given on the valve makers' Instruction Sheets, but as a check it was decided to measure the total H.T. current by inserting the meter in the common negative lead. On doing this I obtained a steady reading of 31 milliamps. This is far more than my battery can supply so I am in doubt as to what I should do. Do you think that there is some leakage in my set, or is the above reading what I should expect to get?"—L. K. (Leeds).

The first readings which you obtained were quite correct and indicate the actual current consumption of your set. The second reading (with meter in common negative lead) is valueless because it does not show the amount of high-tension current which the set is taking, but is the low tension current flowing through the valve filaments when the resistance of the meter is in series between them and the accumulator.

To measure the real total anode current you should insert the meter between the H.T. negative wander plug and the set. With the meter in this position a current of from 9.5 to 36.5 milliamps (the sum of the "positive" currents) should be registered. Incidentally, such a current supply is well within the capabilities of a super-capacity battery, such as the Lissen, or Smith.

MODIFYING AN ELIMINATOR FOR CLASS "B"

"I recently built a Class 'B' receiver, and it worked perfectly well when a dry battery was used for high tension. Immediately the battery was replaced by an eliminator distortion was very noticeable, however. But from a recent issue of 'Practical Wireless' I learnt that an ordinary eliminator was not suitable for a Class 'B' set and I therefore purchased a neon stabiliser which I connected between the positive and negative terminals of the eliminator, thinking that this would give suitable voltage regulation. On measuring the high tension voltage while the set was in operation I found that it still varied to a great extent and distortion was still present. Have I made some mistake, or do you think my neon stabiliser is faulty?"—J. B. (Montrose).

For the neon stabiliser to be fully effective it must be connected "after" a resistance of rather critical value; that is, a resistance must be included in either the positive or negative lead from the eliminator. Occasionally the smoothing choke itself provides the necessary resistance, but more often a special and additional resistance is required. The value of resistance varies from 1,000 to 2,000 ohms and it is thus best to employ a variable one of 2,000 ohms maximum, and then to find the most suitable setting by experiment. The resistance should be joined between either the positive or negative terminal of the eliminator and the set, when the stabiliser is connected directly between the positive and negative high-tension terminals on the set.

UNEVEN REACTION CONTROL

"I have made up a three-valve receiver similar to the "Selectone" described in Numbers 16 and 17 of "Practical Wireless," but using a home-made tuner. The set works fairly well, but reaction is difficult to adjust properly at certain parts of the medium-wave band. Can you please tell me how I can overcome this trouble, either by altering the tuner or by some other means?"—L. M. (Tring).

You could effect a cure by altering the number of turns and the position of the reaction winding, although this would entail a fair amount of patient experiment. In all probability the same result could be obtained much more easily merely by inserting a fixed resistance of between 100 and 200 ohms in the lead going from the anode terminal of the detector valve to the reaction condenser. The resistance should be non-inductive, and one of the metallized or composition type will, therefore be suitable. It might be added that the method just described is applicable to nearly any kind of set, the resistance having an excellent "smoothing" effect on the reaction control. In very obstinate cases it is sometimes better to increase the value of resistance up to about 500 ohms, but the actual figure is not very critical.

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AMERICAN TYPE VALVES

THE old difficulty of obtaining valve replacements in American mains receivers has now been overcome by the Eta people, who have placed on the market a complete range of American type valves. We have just received a folder giving details of characteristics and prices of the valves, which include screened-grid, variable mu, power, pentode, and full and half-wave rectifier valves. A copy of the folder can be obtained from The Electrical Trading Association, Ltd., Aldwych House, Aldwych, London, W.C.2.

GRAHAM FARISH COMPONENTS

A COMPLETE range of the latest components made by Graham Farish, Ltd., is given in a booklet recently issued by this firm. A new potentiometer volume control, the "Megite," has an element of fine nickel-chrome wire embedded in bakelite. The action is through a slipper plate, giving a smooth, silent operation. Among the other components listed are a new H.F. choke, grid leaks, "Ohmite" resistances, fixed and variable condensers, valve holders, and "Filt," the new percolative earth. The address is Mason's Hill, Bromley, Kent.

GOLTONE RADIO PRODUCTS

GOLTONE components are too well known to require any introduction to constructors, who will welcome a new and comprehensive catalogue recently issued by Ward and Goldstone, Ltd., Frederick Road, Pendleton, Manchester. A useful range of dual-range coils, H.F. chokes, fixed condensers, radio meters of various types, dry batteries, switches, and aerial and earth fittings are listed. Particularly useful to the constructor is the section devoted to instrument wires of all gauges, aerial and connecting wires, and battery and loud-speaker cords. Particulars are also given of a new screened aerial down-lead wire, recently introduced by Ward and Goldstone, who also specialise in a very compact and efficient charger for L.T. and H.T. accumulators, for use with D.C. mains.

VARLEY RECEIVERS

AMONG the latest products of Messrs. Varley are a fine range of "Square Peak" mains receivers and radio-gramophones, the outstanding features of which are quality of reproduction, selectivity, and simplicity of design. The three-valve receiver (S.G., detector and pentode) is provided with band-pass tuning and a built-in moving-coil speaker, and is housed in a beautifully-finished figured walnut cabinet. The "Square Peak" super-het. model is a five-valver with one-knob tuning, and is obtainable either as a table or console model. The all-mains radio-gram. is also equipped with a five-valve super-het. set and moving-coil speaker, while the gramo. motor is a Garrard model. Full particulars of these high-class receivers are given in a neat booklet, a copy of which can be obtained from Messrs. Varley, Kingsway House, 103, Kingsway, London, W.C.2.

Replies to Broadcast Queries.

X-BAR-B (W.9): (1) C2CT, an amateur transmitter, R. W. Peel, 24, Temple Grove, Golders Green, N.W.11, calling G6WQ, A. C. Webb, 10, Arbedour Road, Goodmayes, Ilford, Essex. (2) G6RL, R. F. Loomes, 14, Nursery Close, Wickham Road, Shirley, Croydon (Surrey). (3) HB9AK, J. Muller, Eglistrasse 3, Zürich, Switzerland. (4) G5ZX, J. P. Stove, 35, Melville Street, Pollockshields, Glasgow. (5) G2RP, cannot trace, advise you to write to R.S.G.B., 53, Victoria Street, S.W.1. (6) Regret, cannot trace EARAM, write to Asociacion EAR, Apartado de Telegrafos, Santander, Spain. J. HOLLAND (Cleethorpes): G2QH, C. Hewins, "Sunnyside," Fairfield Ave., Scarthoe, Grimsby, Lincs. G6AK, T. S. Brister, 22, Sherbairn Street, Cleethorpes (Lincs.). GBZW; S.S. *Berengaria.* E. WALKER (Sheffield 11): G6SR, S. W. Rowden, "Rosebank," Pilrig Street, Edinburgh, G5LT, E. S. Elliott, 13, Merlin Way, Sheffield, Yorks., G6YC, J. Roberts, "Fern Bank," Endcliffe Rise Road, Sheffield (Yorks.); G6IZ, E. G. Ingram, Tullos House, Nigg, Aberdeen; GBZW, S.S. *Berengaria.* G6KB, G5MM, G5RD, regret, cannot trace in published lists; advise you to write to R. S. G. B. SPRINGBOK (Somerset): Yes, Moscow on 50 m. MODULATION (Coventry): G2DL, R. H. Lauderdale, "Kilwinning," Sutton Avenue, Hornchurch, Romford (Essex); ON4MOK, regret, cannot trace in published lists; advise you to write to *Reseau Belge,* 33 rue Alphonse Renard, Bruxelles (XI), Belgium. MARK II (Canterbury): G2KT, J. E. Nickless, "Newsonia," Bull Lane, Rayleigh (Essex); G2DQ, H. G. Collin, Highfields Cottage, Rectory Grove, Southend Road, Wickford (Essex); G5MM, regret, cannot trace; write to Radio Society of Great Britain, 53, Victoria Street, London, S.W.1. J. HARKER (Halifax): Cannot understand the interference referred to Huizen, broadcast gramophone records then went over to the *Concertgebouw,* Amsterdam, for a recital of contemporary music. CRUMBS (N.W.10): Too vague to trace; apparently a morse station.

STOP PRESS NEWS!

Interesting items relating to the latest developments announced as we go to press. Where desirable further details will be given later.

PETO-SCOTT CLASS B KIT

A CLASS B unit has just been received from Messrs. Peto-Scott Co., Ltd., 77, City Road, London, E.C.1. This consists of the necessary "driver" transformer, tapped output choke and seven-pin valve-holder neatly mounted and wired up on a small baseboard. The unit can be employed with any type of battery or eliminator-operated set, and in most cases no alteration of any kind is required to the receiver. At the price of 37s. 6d. (without valve, of course) this is a very interesting amplifier. We shall give it a thorough test and publish a full report at the earliest opportunity.

TUNGSRAM H.F. PENTODE

WE have received a descriptive leaflet from the Tungsram Electric Lamp Works describing the latest addition to their range of valves in the shape of a high-frequency pentode. The latest valves embody a new form of construction, and are made in a dome shape bulb which enables the electrodes to be firmly supported at both ends, instead of being attached to the "pinch" only, as is more usual. Messrs. Tungsram also tell us that the complete range of their valves is being modified so that in future all valves will have the domed bulb and double electrode support. They claim that this will make Tungsram valves the most robust on the market, and that all valves will be able to withstand any normal amount of vibration without the characteristics being in the least affected.

"TEMPEX" ELECTRIC CLOCKS

MESSRS. EXIDE SERVICES LTD., 203-231, Shaftesbury Avenue, London, W.C.2, have recently sent on to us full particulars and photographs of their new "Tempex" electric clocks. These can scarcely be classed as wireless components, but readers will be interested in them in so far as they are made by a firm which gives great attention to their battery requirements. The clocks are of elegant appearance, and are produced in several models at prices ranging from 30s. upwards. Besides those made for operation from the mains, there are two battery-fed models.

COLUMBIA PRICE REDUCTION

WE are informed that price reductions have taken place for three Columbia instruments. Those affected are the "Columbia Radiograph Four," Model 620, which has been reduced in price from 32 guineas to 23 guineas. This price is effective for both A.C. and D.C. models. The Model 355 "All Electric Four" is now retailed at 12 guineas instead of 16 guineas, whilst the famous "Portable Superhet" Model 380, a 6-valve superhet battery receiver, will sell at 13 guineas instead of 17 guineas.

ADVERTISEMENT INDEX

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