Practical and Amateur Wireless, November 2nd, 1935.

LARGE SHORT-WAVE SECTION—See Page 217

# Practical and Amateur Wireless

AND PRACTICAL TELEVISION

3D. EVERY WEDNESDAY

Edited by F. J. CAMM

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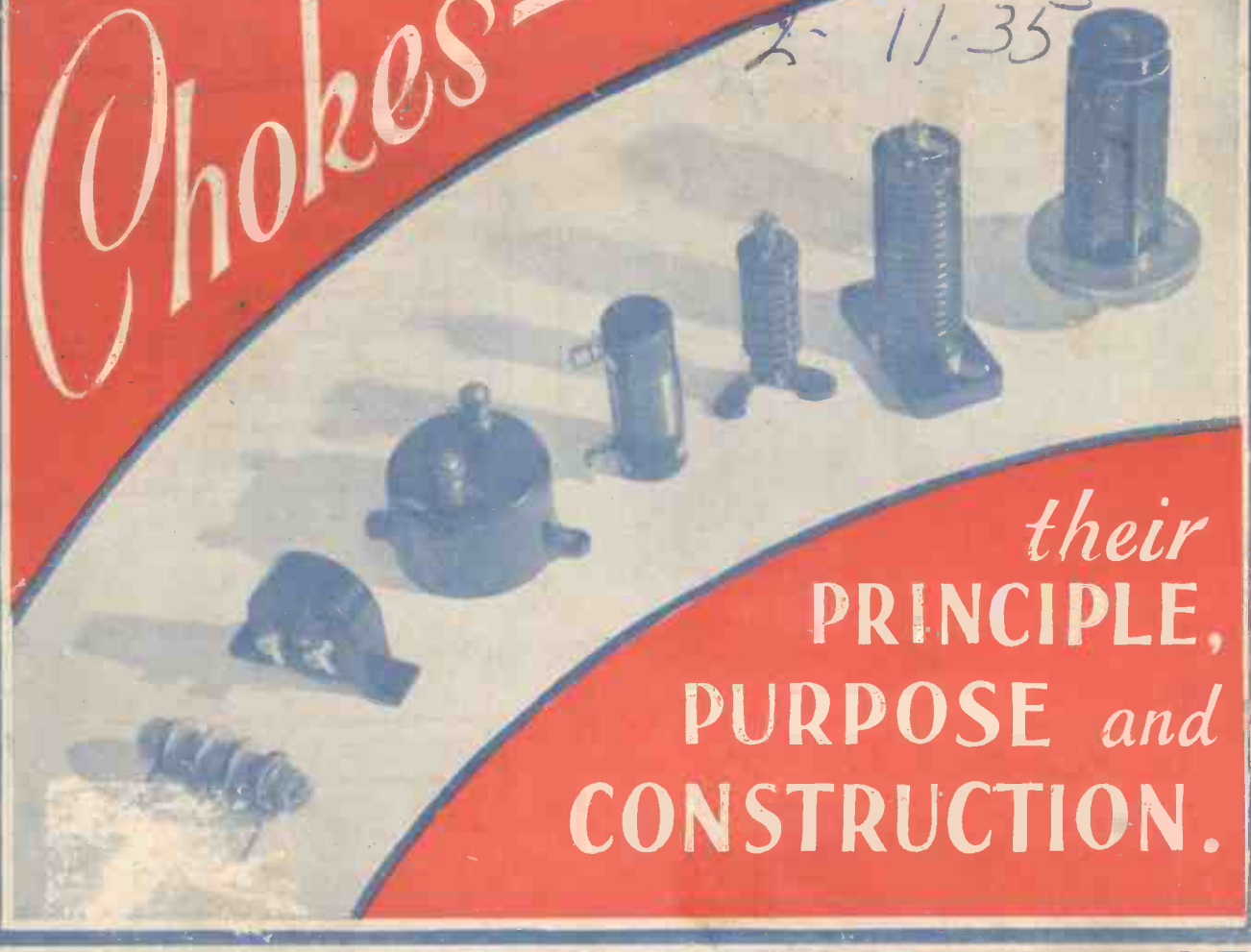
November 2nd, 1935.



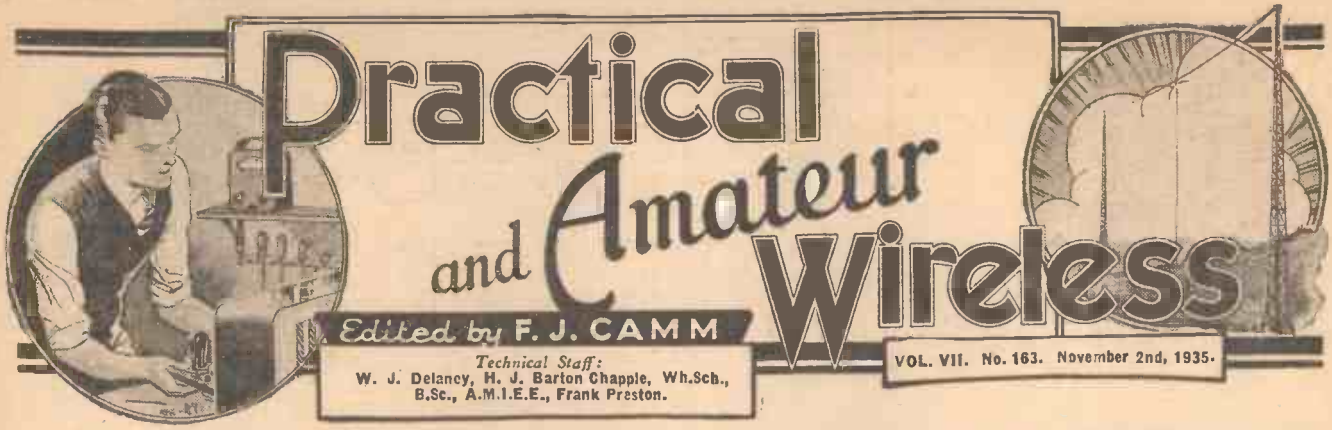
## Chokes—



## their PRINCIPLE, PURPOSE and CONSTRUCTION.

# PREPARING FOR WINTER RECEPTION

See Page 201.




# ROUND *the* WORLD *of* WIRELESS

### B.B.C. Autumn Talks

MEMBERS of the B.B.C. Talks Department are making several experiments this autumn, striving to find out new subjects and technique for improving the entertainment value of talks sessions. One of these new experiments is called "Decision." Everyone is faced with problems on which vital decisions must be taken. These may be of all sorts and descriptions, touching on professions, departures, operations, finance, friendships—countless major facts of life. The young modern must decide, for instance, whether he will be chained to an office desk or whether he will give hostages to fortune, refuse to settle down, and so make use of the wide world which is his heritage and which few explore. In order to put over this idea, the Talks Director is seeking to obtain the assistance of well-known dramatists, who will write the dialogue of a situation in which the central figure comes to cross roads and has to make a decision.

### Radio Lyons Inaugurated

THE new 25-kilowatt station, constructed at Dardilly, near Lyons (France) for the private concern which has now operated a small transmitter for many years, was officially opened at the beginning of October. It will be found on 215.4 metres (1,393 kc/s).

### An Aristocratic Announcer

FOR the benefit of British residents in Malta, the Authorities have lent a wireless transmitter for the broadcast of news bulletins relayed from the B.B.C. Empire stations. During a part of her stay in the Island, Lady Louis Mountbatten acted as studio announcer, presiding at the microphone for this important feature of the programmes.

### Germans Ban Jazz Broadcasts

ALL German dance music, in future, is to be carefully examined, as any compositions approaching the jazz style are to be rigorously banned. On the other hand, dances of the older style written by German musicians are to be encouraged.

### The Only Greek Broadcaster

ALTHOUGH many attempts have been made to establish a Greek broadcasting system, no plan has yet matured. The small, privately-owned station installed a few years ago at Salonika, and which was working for a month or so last year, has resumed operations. The wavelength is 233.5 metres (1,285 kc/s), and the call: Empros etho Thessaloniki.

### Still Forging Ahead

BRITISH radio receiving licences in force at end September, 1935, amounted to 7,224,123, or an increase of 750,133 for the year. In Germany, on October 1st they numbered 6,651,924.

### Broadcasts from the War Area

IT is reported that the N.B.C. of New York has commissioned Mr. Floyd Gibbons, a well-known American broadcaster and war correspondent, to telephone running commentaries whenever possible on incidents connected with the Italo-Abyssinian struggle. Transmissions of his talks have already been carried out through the Italian ETA, Asmara, station.

### Radio City has Twenty-seven Studios

ALTHOUGH the Headquarters of the National Broadcasting Company of America, at Radio City, New York, now possess twenty-seven studios, it is stated that for the development of this organisation new studios are to be built at Chicago and Hollywood.

### More Powerful Stations for French Colonies

IN addition to a reconstruction of the Rabat (Morocco) broadcasting station, the Authorities propose to build a high-power transmitter at Constantine (Algeria), which should prove a more favourable site than the present Algiers station. Plans have also been drawn up for the construction of transmitters at Duala and Jakunde, in French West Africa, as well as up-to-date plant for Tananarivo (Madagascar).

### Denmark Relays Foreign Dance Music

ARRANGEMENTS are being made by the Copenhagen studio for the regular relay of dance music from various European capitals, as well as from London and New York. The broadcasts will be made through the medium- and long-wave Danish transmitters. For listeners who cannot tune in America direct, the Kalundborg wavelength should prove a good channel.

### Radio Through Electric Lighting System

OWING to the mountainous character of many Norwegian districts, listeners in the valleys encounter difficulty in tuning in to Oslo. Experimental transmissions are now being made by the capital through the electric light cables. It has been found that a 60-watt transmitter feeding the programme into the network gives satisfactory results. Comparatively simple receivers may be used to pick up the broadcasts.

### Bulgaria's Future Plans

TO replace Rodno Radio, the small station which is at present operating at Sofia on 352.9 metres (850 kc/s), the Authorities have already started to build a high-power transmitter. When it is completed the 1-kilowatt plant will be transferred to Varna, and a further relay station will be erected at Stara Zagora.

### PTT Marseilles on 400.5 metres

WHEN the new 120-kilowatt transmitter comes on the ether, its channel will be sandwiched between those of Munich and Katowice, but the power of the broadcast will be such that its programmes should be heard throughout Europe. The wavelength is shared with the 10-kilowatt Finnish transmitter at Viipuri.

### *On Other Pages*

# ROUND the WORLD of WIRELESS (Continued)

### Variety from Morecambe

AN excerpt from the variety bill at the Winter Gardens, Morecambe, will be relayed to Northern listeners on November 6th. The bill includes Master James Phelan, the King's Jubilee soloist, Bertini and Clarke (violinists), and Louis Almer (mouth-organist).

**INTERESTING and TOPICAL PARAGRAPHS**

**GRAMOPHONE RECORDING AT THE H.M.V. STUDIOS**

*H.R.H. The Prince of Bijawar and his Prime Minister learning some of the secrets of gramophone recording at the "His Master's Voice" London studios. Renara, the well-known syncopated pianist, is showing them the "H.M.V." record they heard her make.*

### Hallé Concert

THE Hallé concert, which is to be relayed from the Free Trade Hall, Manchester, on November 7th, will be directed by Vincenzo Bellezza, the well-known Italian conductor. The soloist will be Elena Gerhardt, world-famous German soprano.

### Conspiracy in the Midlands

THE Gunpowder Plot was Midland in its origin—at least six of the conspirators were Midland men—and it was at Holbeche House, near Himley, where, after the discovery of the plot, they made their last stand. Fred R. Buckley, cinema critic of a Birmingham newspaper, and author of several novels, dramatised the principal episodes in a radio play, "Conspiracy in the Midlands," which was first produced in part as a relay from Holbeche House last year. This Guy Fawkes day it is to be produced in full by Owen Reed in a studio.

### Relay from Empire Theatre, Cardiff

A CONCERT by the Herbert Ware Symphony Orchestra, conducted by Herbert Ware, will be relayed from the Empire Theatre, Cardiff, on November 3rd. This orchestra was formed in 1920, and its personnel through these years has been practically unchanged. The artists at this concert will be Ina Souez (soprano), Heddle Nash (tenor), and Louis Godowsky (violin).

### At the Cenotaph

THE B.B.C. first broadcast the commemoration service from the Cenotaph, Whitehall, in 1928. The King, supported by other members of the Royal Family, is expected to attend the ceremony on November 11th this year. As in previous years, the music will be in charge of the massed bands of the Brigade of Guards, whose music leads up to the striking of 11 o'clock, the time of remembrance, by Big Ben. Then follows the two minutes' silence, ended by the salute fired by a battery of guns in St. James's Park, accompanied by syrens calling to mind the days of the air-raid warnings. The service, conducted by the Bishop of London, will then be heard.

### New Musical Production

JOHN WATT and Harry Pepper have gone into conference over the new Watt-Pepper production to be broadcast on October 31st, in the Regional programme. This musical romance will be on the lines of their previous musical production, "It Seems Only Yesterday." Characters reminisce and scenes come to life. It was in the first production of "It Seems Only Yesterday" that Joan Carr scored such a great success, in addition to her work in the Monthly Revues. In "It Seems Only Yesterday," she was doubled by a famous singer, as the climax of the story was a terrific aria which had to be supremely sung, and this clever artist insisted on a famous voice singing the climax for her.

### A Tale of Old Japan

STOKE-ON-TRENT Choral Society, which has sung many important works in its sixteen years of active life, is to give Coleridge-Taylor's "A Tale of Old Japan" at its concert on November 9th, and this will be relayed from the Victoria Hall, Hanley. The society's last three broadcasts were of opera for the Northern programme. A number of its 200 members are so enthusiastic that they travel twelve miles into Hanley regularly for rehearsals. Ernest C. Redfern, of Trentham, is the conductor, and the soloists for this concert will be Olive Groves, Constance Willis, John Turner, and Thorpe Bates.

### Kettering Rifle Band

KETTERING Rifle Band, which gives a concert on November 9th, has had an interesting history. It was founded in the kitchen of Chesham House over a hundred years ago. For its first thirty-five years it was a Yeomanry Band, and then in 1867 it became a brass band. Thirty-one years later it was the champion band of England and represented this country at the Dieppe contest. The present conductor, Percy Cook, was appointed in 1924.

### Microphone At Large

CLEOBURY MORTIMER, the birthplace of William Langland, author of "Piers Plowman," is to be the next place in "The Microphone at Large" series, produced by David Gretton and James Ludovici. It lies between Wyre Forest and the Clee Hills, has been a market town for over 700 years, and had an interesting place in the struggle between Henry II and the Mortimers. The church, chiefly thirteenth-century work, has a warped steeple above its tower, and a Langland window; there are some fine old houses. Simon Evans, the postman-poet and author of two volumes of tales and sketches, "Round the Crooked Steeple," is the principal local "contact" for the feature programme on November 6th.

### "Tyneside Calling"

A POPULAR variety show having the above title is to be presented from Newcastle in the main Regional programme on November 7th, and for Northern listeners only on November 9th.

## SOLVE THIS!

**PROBLEM No. 163.**

Rawlins had a three-valve battery receiver which suddenly ceased to work. He tested the L.T. consumption and found that this was perfectly correct, but found that the H.T. consumption was low. He therefore inserted the meter in each anode circuit in turn and found that the detector anode circuit registered zero current. He had the valve tested but it was found perfectly intact and up to characteristics. What had happened? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 163 in the bottom left-hand corner and must be posted to reach this office not later than the first post Monday, November 4th, 1935.

**Solution to Problem No. 162.**

The indirectly-heated pentode of the universal type which Jackson first fitted was rated at 16 volts. The substitute valve which he fitted was rated at 13 volts, with a .2 heater compared with a .25 for the 16 volts, and therefore on the face of it the substitution should have at least produced some signal. The fact that nothing was heard, however, is explained by the fact that the connections to the valve pins are different for the two types of valve, the anode and grid connections being reversed. The following readers successfully solved Problem No. 161 and books are accordingly being forwarded to them: F. J. Anstee, 557, Chepstow Road, Newport, Mon.; W. C. Young, 32, Emmadale Road, Weymouth, Dorset; R. Blair, 4, Clerk Street, Edinburgh.

# About H.F. Chokes

In this Article the Purpose, Principle, and Construction of these Important Components are dealt with. By L. ORMOND SPARKS

A HIGH-FREQUENCY choke, more often referred to as H.F.C., is a component which plays a very important part in modern receiver design. As its name implies, it is used to choke the flow of high-frequency currents, and owing to the very nature of its work, the efficiency of a circuit will often be governed by the capabilities and design of the choke, or chokes, that are used. Many a receiver, although of good design, has had its performance seriously affected through the use of unsatisfactory H.F. chokes, and many are the mysterious faults, not always easy to trace, that are produced through the same reason. Far too little consideration is given to this vital component when parts are being purchased, and there appears to be a very prevalent idea that anything labelled H.F.C. will do for any circuit.

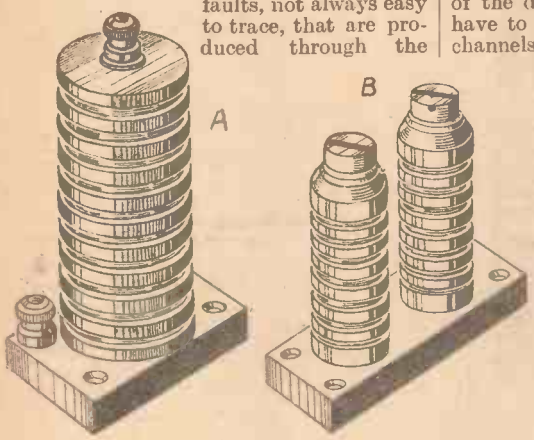



*Fig. 1.—Sectional wound chokes for reducing the capacity of the windings.*

The design of an H.F.C. calls for very special consideration owing to the exacting requirements, and component manufacturers of repute have spent a great deal of money and time on producing the high-efficiency H.F. chokes of to-day.

Why is it so essential to use a choke in the average radio circuit ?

That question can most easily be answered if a little consideration is given to the circuit.

A radio circuit can be divided into two distinct sections, and for the present purpose we will refer to them as the H.F. and L.F. sections. The two together form a complete circuit from the point of view of radio reception, but each section has its own particular work to do, and they can get on with their own jobs in the most efficient manner when they are not interfered with by each other. This sounds very reasonable and simple, but, unfortunately, high-frequency currents have a nasty habit of trying to wander through into the neighbouring section, and when they do, they become particularly troublesome.

It is obvious, then, that some method has to be adopted to prevent the H.F. currents from straying from their proper paths, and that is most easily done by making use of an H.F. choke. Of course, it would be very nice if we could do without these H.F. currents, but that is impossible, as they form an essential part of the signal received in the aerial circuit. In fact, the signal in any part of the circuit before the detector consists of a mixture of high and low frequencies, the detector being there to sort them out and pass on—to the L.F. stages or output—the low-frequency or audible part of the signal.

While the detector carries out its duties in a very able manner, it is practically impossible to prevent high-frequency currents from getting through to the anode of the detector valve, and therefore they have to be trapped and diverted into safe channels.

## Method of Operation

High-frequency chokes, and, as a matter of fact, low-frequency chokes also, depend on that property of an electrical circuit known as inductance for their satisfactory operation. When a current flows along a conductor, an electro-magnetic field is produced around the whole length of the conductor, and this can readily be proved by the methods described in the article on "The Galvanometer" contained in the issue of April 6th, 1935.

If, instead of a direct current, we now pass an alternating current along the conductor, a field is produced in just the same manner but, owing to the nature of the current, it no sooner reaches its maximum strength than it collapses and has to start all over again. The rapidity at which these changes take place depends on the frequency of the alternating current.

Now, if there is one thing an electro-magnetic field does not like, it is sudden changes, particularly if they are rapid. In fact, the field around the conductor sets up another electromotive force during the variations, and this new force flows along the conductor in the *opposite* direction to the original current producing the changes in the field, and likewise tends to prevent its passage.

## Inductance

This peculiar property of opposing the passage of an alternating current is usually called inductance, and while we normally think of an inductance being connected with coils, it must be appreciated that a perfectly straight wire can also possess the property.

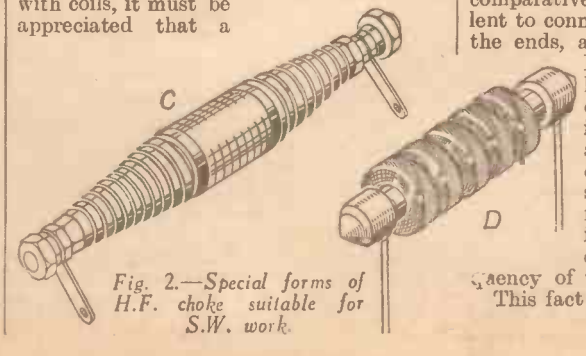



*Fig. 2.—Special forms of H.F. choke suitable for S.W. work.*

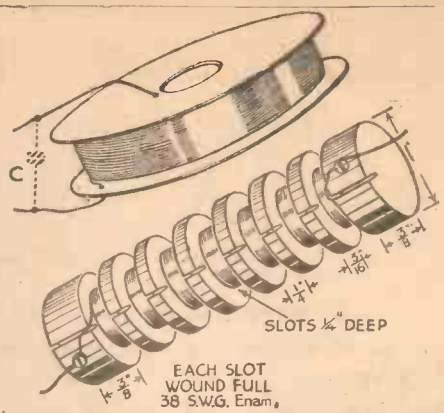



*Fig. 3.—A pile-wound coil and a former for a sectional-wound choke.*

If, however, the conductor or wire, providing it is insulated, is wound into a coil, the inductance value is greatly increased, which means that the opposing force is also more powerful; therefore it is possible to design a coil to prevent the flow of all alternating currents whose frequencies come within a certain band, pre-determined by the designer according to his requirements.

From the above remarks it will be seen that inductance has an opposite effect in a circuit to that produced by capacity. A condenser prevents the flow of any direct current, and offers a free passage, speaking in a practical sense, to alternating currents, while, as already mentioned, a choke resists alternating currents and, apart from the D.C. resistance of the wire, offers no opposition to direct currents. These totally different effects play a very important part in the design of chokes, particularly those for use at radio or high-frequency. This brings us to the essential features of an inductance that is to be used as an H.F. choke.

The first requirement is, of course, the highest possible inductance consistent with operating conditions.

A standard long-wave coil has an inductance of 2,200 micro-henries, while a well-designed H.F. choke will have a value as high as 350,000 micro-henries. This comparison gives some idea of the number of turns and size of wire on the choke.

A good average value of inductance is 250,000 micro-henries, the type having the higher value being used chiefly in super-het circuits.

## Self-capacity of Windings

The next very important consideration, and the one that can affect the whole efficiency of the choke, is the self-capacity of the windings forming the inductance.

If, as in the early days of radio, the necessary amount of wire is wound into a simple pile-wound coil (Fig. 3), the capacity of the coil will be very large, comparatively speaking, and will be equivalent to connecting a fixed condenser across the ends, as shown by the dotted lines.

Now, we have already seen how a condenser acts in a circuit when alternating current is flowing, but there is also another characteristic of capacity that must receive serious consideration. The reactance, or you can think of it as a resistance, of a condenser decreases as the frequency of the alternations increase.

This fact should be noted, as the choke

(Continued overleaf)

(*Continued from previous page*)

has opposite characteristics and offers greater opposition to alternating currents under the same conditions.

It is obvious therefore that unless the capacity of the winding is kept at a very low value, all high-frequency currents will be by-passed across the choke, and the windings or inductance rendered useless.

The capacity of the average well-designed H.F.C. is between two and three micro-microfarads, or, in figures, .000002mfds. to .000003mfds., and to obtain such a very low value special consideration has to be given to the size of the wire, the material used for the bobbins or former, and the formation of the winding.

### Reducing Capacity of Windings

Figs. 1 and 2 show some of the more usual methods adopted to reduce the capacity of the winding, and it will be noted that in every case the inductance is split up into small sections. The type marked A in Fig. 1 represents the usual sectional winding method, each section or coil having the same diameter. Another way of reducing the capacity is shown at C (Fig. 2) where the effective area of each section is gradually reduced, and this method is widely used in the construction of H.F.C.s for short-wave work. Type B shows a binocular style, where the two formers have their windings wound in opposite directions, the object being to reduce the external field, and thus avoid or minimise the possibility of the field inking up with other components. In the construction of the choke shown at D every step has been taken to reduce the amount of material and likewise the capacity, and it should be noted that each coil is air spaced from its neighbour, thus decreasing the dielectric constant to the minimum. This method is also favoured by the short-wave enthusiast.

Another desirable feature, and one that cannot be ignored, is low D.C. resistance of the winding, and this necessitates the use of high conductivity wire, otherwise the D.C. resistance will be high and cause excessive voltage drop.

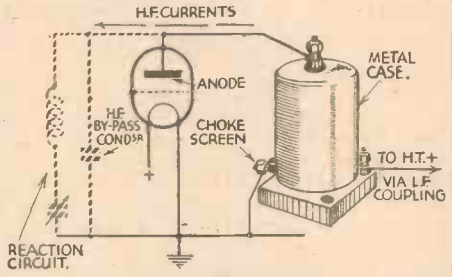



*Fig. 4.—A screened H.F. choke in the anode circuit of a detector valve.*

### Screening

Now that it is possible to obtain a very high gain per stage, due to the progress in valve and circuit design, it often becomes necessary to see that no interaction can take place between the various components. This applies particularly to the high-frequency choke, owing to the external field it creates; therefore designers have produced a screened type in which the actual winding is housed in a neat metal container, as shown in Fig. 4.

This development has also another good effect; it helps to prevent hum and other forms of interference due to electrical radiation being introduced into the circuit by pick-up on the part of the choke. To render the screening thoroughly efficient, the metal can is provided with a terminal or tag to allow it to be earthed.

Since the introduction of iron-cored inductances for use in high-frequency circuits, it has been found possible to use iron cores in the construction of high-frequency chokes, and obtain certain advantages over the early air-cored types. It is possible, by the inclusion of a suitable metal core, greatly to increase the value of inductance, reduce the self capacity, and create less stray field than that produced by an equivalent choke having an air core.

While this article is not intended to cover the uses of H.F.C.s, there is one rather important point concerning their use which is often overlooked.

It is of little use embodying H.F. chokes in a circuit to trap H.F. currents unless some means is provided to enable them to get away from the part of the circuit concerned. For example, Fig. 4 shows an H.F.C. in the anode circuit of a detector valve, and while the reaction circuit provides a path to earth for the trapped H.F. currents, it is often advisable to insert the small fixed condenser shown to provide an adequate means of escape.

# Experiments in Quality Reception

(*Concluded from page 143 of our issue dated October 19th.*)

### A Set with Permeability Tuning

TO avoid the various difficulties mentioned previously a 3-gang Varley permeability tuner unit was incorporated in the receiver, the final circuit being as shown in Fig 2 (page 143). The two radio-frequency valves are again vari-mu pentodes with fixed bias, the values in each case being calculated to effect the best compromise between sensitivity and signal handling capacity, and the second stage being biased to a greater degree than the first. In the experimental make-up variable resistors were used for the two bias resistances, but after the final trials measurements were taken of the optimum settings, and fixed resistors of these values were substituted.

Performance tests with this receiver revealed a very considerable improvement on the previous design both in sensitivity and selectivity. No difficulty was experienced in receiving Kootwijk (Holland), Radio-Paris, and Droitwich at excellent strength and without interference by day on the long waves, while the medium-wave band yielded two or three useful alternatives to the B.B.C. transmissions. The night performance on the long waves did not add to the number of stations receivable, but the four programmes already named could still be enjoyed free from interference. On the medium-wave range, however, the final adjustment of the set gave eight of the most powerful Continental stations quite clear of interference. Many others were well within the range of the set, but were interfered with and could only be separated by increasing the selectivity to an extent which reduced the quality of reproduction below the standard aimed at.

Throughout the tests, a good loft aerial and buried earth were used. Although no more than average care in layout and decoupling was taken, the background was dead silent, and the receiver was perfectly stable on both long and medium wavebands.

Reproduction, using the "Stentorian" speaker on a 3ft. by 2ft. 6ins. by ¾in. baffle, was very considerably higher in standard than that likely to be obtained from any commercial receiver other than one in the high-priced fidelity class.

### Low Cost

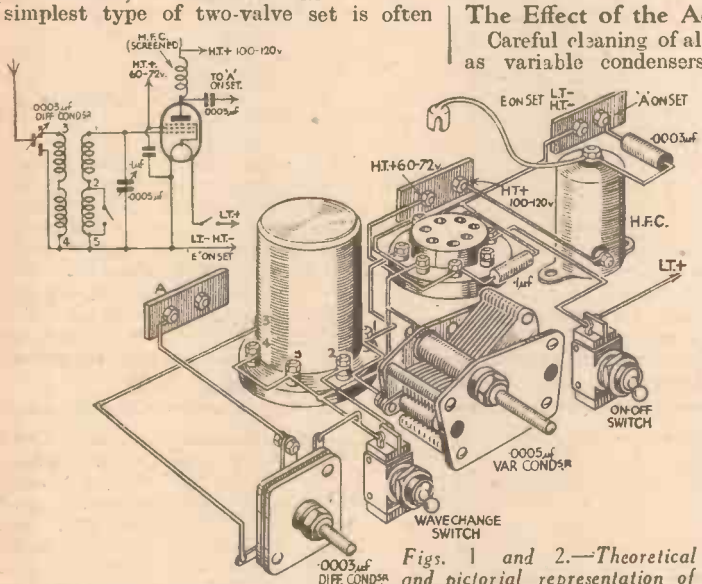
Experience with the set over a period of several months, during which time various minor alterations in connection with the aerial coupling and with different types of speaker were tried out, leads to the conclusion that the final arrangement, as described, represents something very close to the best which can be produced from the point of view of high quality, plus a good assortment of stations, at a price within the region of £10 to £12. This figure covers all the major components, valves, speaker, and so forth, including the power unit, but not the chassis, baffle, or cabinet work. As, however, most constructors possess a goodly collection of fixed resistors, condensers, and other small components, and may also have many other components which can be worked in, the actual cost will, in many instances, be considerably lower.

At the same time, it should be realised that the equipment described, while giving much above the average in reproduction, cannot represent the last word in fidelity. Any further improvement, however, must be looked for in the output stage and speaker. The next development would obviously be the use of an output valve or valves giving more than the 2½ watts or so provided in the set described. This could be either a push-pull arrangement using two 250-volt triodes, or a 5-watt output triode of the 500-volt class. With such an equipment a larger and more expensive speaker could be used to good advantage, but as both these developments would involve expenditure considerably over the cost of the equipment already described, they must be left for discussion on some other occasion.

# Preparing for Winter Reception

An Explanation of Some Methods of Improving Selectivity, and Constructional Details of an H.F. Amplifier and of a Superhet Converter. By FRANK PRESTON

MANY of those readers who have built their first receiver during the past few months, especially if the set is of the simpler type, will probably have been surprised to find how different are the results obtained now from those which were obtained during the lighter months. The main difference is that long-distance reception is much easier in winter time, so that even the simplest type of two-valve set is often capable of bringing in upwards of ten stations on the loud-speaker. But this remarkable advantage is not the only difference which is noticeable in reception; the longer effective range of the hundreds of European stations makes the question of selectivity far more acute. Because of this it is not unusual to find that even the local station cannot be received entirely free from interference, whilst it is probable that dozens of other transmissions will have no entertainment value, due to the fact that they cannot be separated.




*Figs. 1 and 2.—Theoretical and pictorial representation of the circuit of a simple H.F. amplifier. The components are shown in the correct relative positions, but the coil terminal numbers are arbitrary, and depend upon the actual coil employed.*

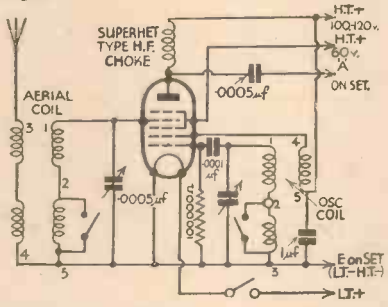
## The First Steps

Clearly, then, some alteration to the receiver is required if the best possible entertainment is to be ensured. The most obvious method of effecting an improvement would be to dismantle the old set and use the parts in the construction of a new one with a higher degree of selectivity (the Superformer, for example), but in hundreds of cases the expense involved would be too great. The next best thing is carefully to check over the existing set and, possibly, make small and inexpensive additions to it.

First of all, you should test such obvious items as the high-tension battery and accumulator, and then the valves should be tested against a new set. Nearly any reputable dealer will be pleased to arrange for you to try new valves in place of the old ones, and if each valve is replaced in turn it will be an easy matter to "spot" any that are not pulling their weight.

## The Effect of the Aerial

Careful cleaning of all components, such as variable condensers, terminal strips, and the like should follow, whilst it is also wise to see that all terminal connections are perfectly tight and all soldered joints secure. Even when all these steps have been taken, and a certain amount of improvement noted, it will probably be found that tuning is not sufficiently sharp—what is to be done about it? There are many selectivity aids which can be tried, and several of these were described in the article on "Obtaining Variable Selectivity," in the issue dated October 12th. Another excellent plan which is appreciated in that it generally costs nothing is to reduce the length of the aerial, or alternatively, to replace the outside aerial by an inside one taken round the attic or roof rafters. The effect of this will be to reduce the sensitivity of the set and also to improve selectivity; in fact, the over-all results will probably be very similar to those obtained during summer.




## An H.F. Amplifier

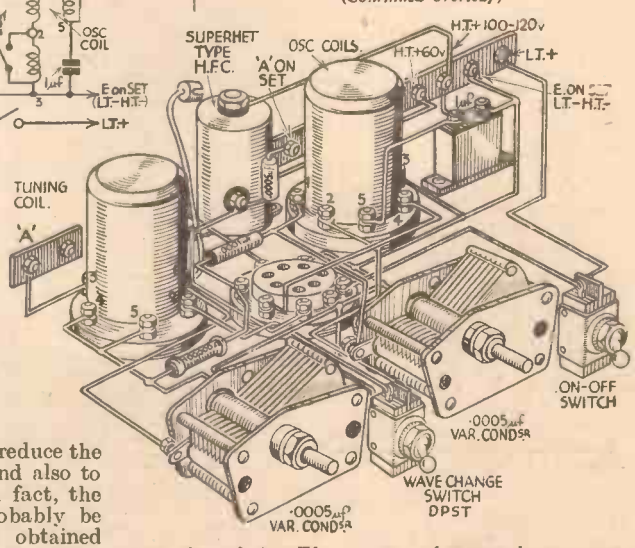
When it is preferred to take advantage of the better reception conditions, it is generally best to add another tuned circuit to the receiver. Thus, the aerial tuner can be replaced by a band-pass filter, or an H.F. valve may be added. The former method is slightly cheaper, but the latter is considerably better, because it gives greater sensitivity (which means greater range) as well as sharper tuning. A simple H.F. amplifier using an H.F. pentode valve can be made by following the circuit given in Fig. 1, and the pictorial wiring plan in Fig. 2. This is the simplest type of unit which can be made, but it is highly efficient and need cost very little, especially if the constructor has a fair amount of "junk." The principal components are the coil and variable condenser, and both of these may be of the ordinary type, although it is most satisfactory to use a coil of the same type as that in the existing set, for the setting of the additional condenser for any station will then be similar to the setting of the previous tuning condenser.

## Volume Control

Variable-mu volume control is not used in the interests of simplicity, but effective control is provided by the differential condenser in the aerial circuit. To use the amplifier it is necessary only to transfer the aerial from the terminal on the set to the new terminal on the amplifier, to connect the lead from the amplifier in its place, and join up the battery leads. After that, the new tuning condenser must be operated in conjunction with that in the set. An alternative is to mount the amplifier components on the receiver chassis and use a gang condenser of the type provided with an external trimming control.

When it is desired to receive the local stations, current can be saved by switching off the L.T. to the H.F. pentode and leaving all other connections unaltered. This will have the effect of converting the

(*Continued overleaf*)




*Figs. 3 and 4.—The circuit of a simple frequency-changer for adding to a straight set with H.F. amplifier, so converting it to a superhet, and a pictorial representation of the same circuit showing the layout and connections.*

## PREPARING FOR WINTER RECEPTION

(*Continued from previous page*)

original tuner into a band-pass circuit with top-capacity coupling, the capacity of the first valve serving for coupling purposes. This will reduce signal strength very considerably, however, since the capacity of a modern valve is too low for effective coupling. This objection can be overcome by using a two-pole change-over switch connected as shown in Fig. 5. When one pole breaks the L.T. circuit, the other connects a small-capacity fixed condenser between the "top" of the two grid windings. The fixed condenser is made by twisting together for a distance of 2in. two lengths of insulated connecting wire, as shown in Fig. 5. In using this idea, care must be taken that all leads to the switch are short and direct, and that they are kept as far apart as possible. Incidentally, this system of switching may be applied to practically any receiver having an H.F. valve.

### Converting to Superhet

Those who have a receiver provided with one or more H.F. stages might care to take a rather more ambitious step by adding a unit which will convert the "straight" receiver into a reasonably efficient superheterodyne. This is not difficult, but it does involve the purchase of a pair of coils (aerial coil and oscillator) and of a pentagrid valve; it might also be desirable to buy a two-gang condenser of the superhet type in order to simplify tuning. Theoretical and pictorial circuits for the converter are given in Figs. 3 and 4, where separate .0005-mfd. condensers are indicated. The method of connecting the unit to the receiver is the same as in the case of the H.F. amplifier previously described, but the method of operation is quite different. In the first place, the receiver must first be set to the highest wavelength to which it will tune—probably 2,000 metres, which is equivalent to 150 kc/s—and all tuning carried out on the two condensers in the converter.

With regard to the method of construction it can be stated that this need not present any difficulty, and all the components can easily be mounted on a metallised chassis measuring about 8in. square by 2in. deep. The coils should be mounted one towards each end of the chassis immediately behind the tuning condensers, and the valve holder can be in the centre. The grid condenser and leak should be placed as near to the valve holder as possible, and the other few parts can be placed in any convenient position. If it is preferred to use a two-gang condenser, this should be of the type designed for an intermediate frequency of 150 kc/s, and the coils should be chosen according to the same requirements. The lay-out in that case would require to be somewhat different, and the coils should be placed alongside the condenser towards the left of the chassis, the valve being mounted to the right. Apart from these small points the connections, method of construction, and use are the same.

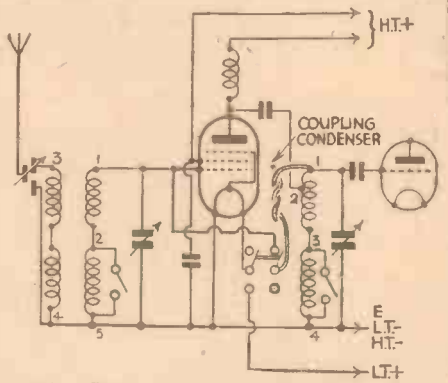
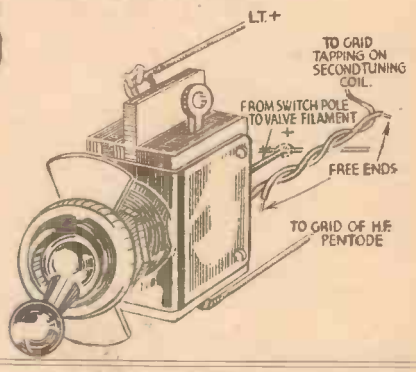



*Fig. 5.—Showing a simple method of switching out an H.F. valve and using the aerial coil in conjunction with the tuned-grid coil as a band pass filter with top-capacity coupling.*




# Potentiometer Problems

This Article Deals with Current Distribution and Explains the Method of Calculating Resistance Values by the Application of Ohm's Law

THERE can be few readers of PRACTICAL AND AMATEUR WIRELESS who are unable to apply the simple rule known as Ohm's Law to the calculation of the correct value for a voltage-dropping resistance in a radio receiver. Whether the resistance be required for adjusting the value of the anode voltage, or the provision of automatic grid bias, or as a line resistance to ensure the correct heater current in a universal set, the method of calculating its value is the same, namely, to multiply the required voltage drop by 1,000 and to divide the result by the current to be passed expressed in m/A. The answer will give the required resistance in ohms.

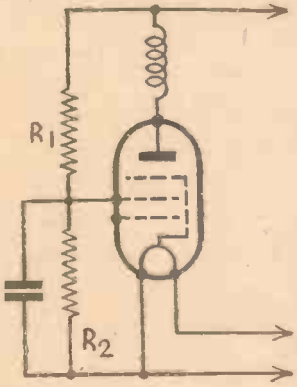



*Fig. 1.—A fixed potentiometer for obtaining the screening-grid voltage.*

In certain positions, however, a mere series resistance is not entirely satisfactory, and in such cases—as, for instance, for obtaining the screen voltage of a screened grid or screened pentode valve, it is necessary to make use of a potentiometer arrangement with a fixed tapping point as indicated in Fig. 1.

Although the calculation of the values of the two fixed arms of the potentiometer is really quite a simple matter, being nothing more or less than a slight extension of the Ohm's Law principle, many constructors find it something of a bother. The following brief explanation, however, should relieve the problem of all its difficulties.

Referring again to Fig. 1, it will be seen that the circuit consists of three parts: the upper portion of the potentiometer resistance, R1; the lower arm of the potentiometer, R2, in series with R1 across the high tension supply; and the screen-cathode path of the valve, which is in parallel with R2. If we consider the screen-cathode path as a simple resistance, the "equivalent circuit" of the arrangement will be shown in Fig. 2, where R3 represents the screen-cathode path.

### Current Distribution

We can now examine the current distribution in this network. First of all it will be clear that if the valve were removed from its socket there would be a steady flow of current through the potentiometer of a value equal to the H.T. voltage divided by the sum of R1 and R2. This is what is called the "standing current" of the potentiometer. Now, if the valve is again plugged into its holder the screen current will flow through R1 and R3, in addition to the standing current through R1 and R2. Thus, the current in R1 will be equal to the potentiometer standing current plus the screen current of the valve, the current in R2 will be equal to the standing current only, and the current in R3 will be the screen current only.

In order to ensure "good regulation"—that is to say, a reasonably constant screen voltage under varying circuit conditions—it is usual to arrange the network so that the potentiometer standing current is at least four times the screen current. Let us assume that in a certain battery receiver an anode feed voltage of 100 v. is available, that the correct screen voltage for the high-frequency pentode employed is approximately 40 v., and that under these conditions the screen current will be 0.4 m/A.

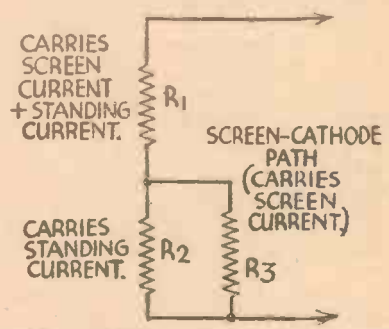
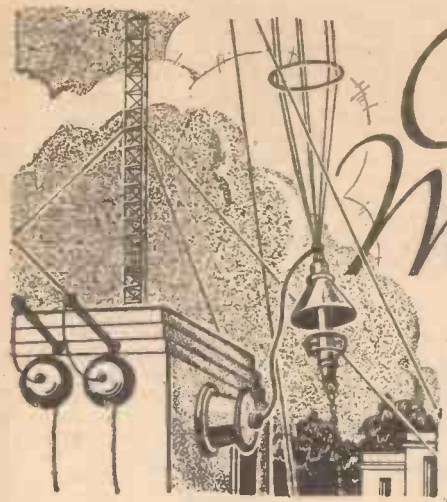
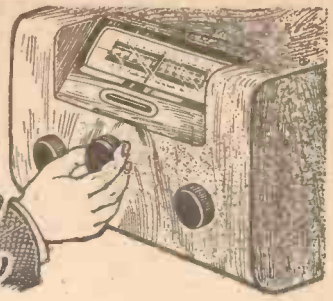



*Fig. 2.—The equivalent electric circuit of Fig. 1.*

The first step is to decide upon a suitable value for the potentiometer standing current, which, for the sake of argument, we will make 1.5 m/A, or a little less than four times the screen current. It will be clear, therefore, that the resistance R1 will have to carry 1.5 plus 0.4 m/A, or 1.9 m/A in all, and in doing so drop 60 v., leaving 40 v., the required screen voltage. The value of R1 should be 60 multiplied by 1,000 and divided by 1.9, or approximately 31,500 ohms. R2, which has to pass only the standing current of 1.5 m/A, and drop only 40 v., should have a resistance of approximately 26,500 ohms. As these values are not standard resistance sizes, R1 would probably be made 30,000 ohms and R2 25,000 ohms.



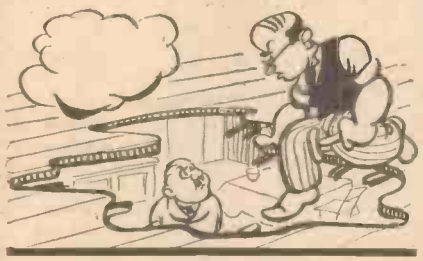
# On Your Wavelength



By Thermion

## An Expensive Way of Erecting an Aerial

A FRIEND of mine who ought to know better has just moved into a desirable residence with h. & c., three bds., rm. for gar., 3 mins. from sta., freehold, lino laid free, £1 down and 5s. per week if you are lucky. Comfortably ensconced in this demesne, a veritable paradise for a newly-married two, after about a fortnight of



*Lofty thoughts about . . . loft aerials.*

connubial bliss he came down to earth, returned to normality and thought it time to install a radio set. It was then that the aerial problem became acute. A clause in his agreement states that he must not erect an aerial or any other contraption which will destroy the outlook and reduce the residential value of the property. Being a lofty-minded individual, his thoughts turned to the loft, and it was then that he discovered snag No. 1, to wit, said loft was not boarded. Knowing less than nothing about building, he proceeded to push away hefty lumps of the ceiling to the discomfiture and extreme annoyance of the person in the room below. Cost of inserting a tape aerial in the room wherein reposed the wireless set—half a crown ; cost of new ceiling, £8 ; debit balance due to false economy, £7 17s. 6d., oodles of wasted time, frayed tempers, and estrangement of spouse. Item : why can't all lofts be boarded ? Why have an inverted man-hole to lead you into this abode of spiders and thus invite you to push your feet through the lath and plaster ?

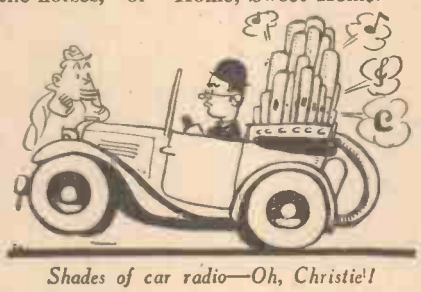
*A friend from over the border saves his saxpences getting his music from the air.*

## Music from the Air

I CONTINUE to read in the daily papers of fortunate people who reside close to powerful broadcast transmitters and can hear music in the air and are thus saved the cost of a wireless set. Frankly, I don't believe this nonsense, although, mayhap, hope springs eternal in the hearts of the lonely lairds and impecunious wee mons over the borrrder. I remember in my early days, as a wireless journalist, I was inundated with requests from Scotland to design a crystal set capable of receiving all of the British and European transmissions, whilst one or two ended up naïvely : "*and America.*" If anyone can convince me that my ear can rectify as well as detect, I shall remove from Thermion Villa and have built one of the desirable residences aforesaid within half a mile of Brookmans Park.

## Car Radio—a Suggestion

WHY all this pother about car radio ? If you want musical entertainment when driving a car, why not design a simple wind instrument to be attached to the rear of the car and operated by the exhaust gases ? This would merely necessitate the addition of a few more pedals, for the vox humana, the vox populi, and the vox dei, which are, I believe, perfectly good musical phrases. When you are in a hurry you could play " Home James, and don't spare the horses," or " Home, Sweet Home."



*Shades of car radio—Oh, Christie!*

## I Blew a Fuse

I AM a great believer in fuses, and I confess that I am inclined to fit them in as many parts of the circuit as possible, especially in an experimental set. The value of a fuse in the output circuit from the rectifier was forcibly demonstrated to me the other day when I was testing an experimental superhet which had been occupying my attention for a few days. In building the power-supply section I ran out of the British-made smoothing condensers which I invariably use and was compelled to use a 4-mfd. component of unknown origin which I had taken from a set bought for a few shillings from a junk store. Anyhow, the condenser was clearly marked " 1,250v.," and as I was using an H.T. voltage of only 250 the insulation resistance should have been quite high enough. But it wasn't, and the condenser must have " gone " immediately I switched on, for the fuse blew and the condenser had been tested for non-continuity only a few minutes before. I shall not be tempted to use a condenser of unknown make again, even if it bears a voltage figure of a million

*I blew a fuse—moral, don't use unbranded condenser.*

—because the figure means absolutely nothing unless it is qualified by the words " working voltage " or others of similar meaning.

## A Halt ?

A SOUTH-AFRICAN reader writes as follows :

" I have been noting your remarks *re* dance music, and am mostly in sympathy with you. You sure hit the nail on the head.

" But is it not time to call a halt ? My contention is that dance music is a transitory stage in the evolution of the classical variety.

" I do not think that you will find a poet who, in his extreme youth, was not fascinated by nursery rhymes and used them as a stepping stone to more serious work. The deadly rhythm (a la ' Humpty Dumpty sat on a Wall ') with its associated ' baby language ' fascinates the mind of the young, and hereby I infer that dance music and the elaborately mispronounced announcements are kin to children's poetry.

" You could do a lot of good by bringing certain people through this awkward stage, not by destructive criticism, but by dwelling on the beauties of the classics."

## Another Viewpoint

ANOTHER reader who lives in the salubrious Isle of Coll says :

" Having read your writings and PRACTICAL WIRELESS from the first issue, I feel I must write and point out to you that all this talk about crooning and jazz is all very nice, but what of us folk, living out here in the Western Hebrides, who cannot get a chance to hear it for more than a few minutes before it all fades away. Why is it that not one English station gives good reception in these quarters, and yet German stations and stations from France come in at great strength, not that they do not fade, mind you ; they do, but not to the extent of the English stations.

(*Continued overleaf*)

(*Continued from previous page*)

"Scottish Regional, for instance, is the station we rely on for our Scottish news; you should come and spend a week up here and try it for yourself; a few days in the Highlands would do you a world of good and also give you a good idea that you in Town get more for your ten shillings licence than we do.

"Please do not put this in your W.P.B. until you have thought about the good you could do for us."

## What is Syncopation?

THUS W. A. M. (Tunbridge Wells): "One more letter for your private secretary (unpaid) 1 or 2, and also on the old topic Jazz. Now, although I dislike most intensely the restless, fidgety noise, I am not going to run it down. (And I can't trust myself to say anything about crooners in case I make nasty blots on the paper). I just want to point out a mistake by one of your readers a few weeks ago *re* syncopation. Syncopation is not merely a note struck on an un-accented part of the bar, it is a note struck on an un-accented part of the bar and *held over a more accented part*. That is where dance bands fail in syncopation. But that's not the biggest mistake. Your reader seems to share the views of many people that syncopation is a recent innovation. As a matter of fact, I have some excellent examples of real syncopation in the shape of Madrigals by William Byrd, about 1560, and Thomas Weelkes, 1590. (One might be nasty and say that perhaps that is why madrigals have never been quite as popular as part songs). It is true that syncopation does emphasise the rhythm, in much the same manner as a huge boulder thrown into a swift-running river would add to the effect of its swiftness with water boiling round it, but we all admire the smooth, irresistible flow of a mighty river, that could be compared, in the musical world, to a huge Cup Final crowd singing the majestic chords of "O God, our help in ages past.' And just one more of his mistakes. I don't know all the tunes he has instanced in support of syncopation, but some of them are definitely not syncopated. 'That's why darkies were born,' 'Round the bend of the road,' and, strange to say, the most popular tune of them all, 'Old Man River,' most certainly straight music. The best syncopated tune I know that would come in this class is 'I want to be happy' from 'No, No, Nanette,' but perhaps that is going back too far. One other thing. I wonder why jazz supporters always jump to the conclusion that if you dislike jazz you must like symphony. Are there no popular classics. Beethoven's Minuet, Gavotte from 'Mignon,' 'The Blue Danube.' All dance tunes. Yes, but there's 'William Tell,' 'In a Monastery Garden,' and thousands more, and then J. S. Bach. Is it because they themselves can only find entertainment in jazz?"

## Reaction With a Diode

THERE seems to be a good deal of misunderstanding with regard to the application of reaction when a diode detector is used. In a recent issue of this journal, in dealing with the design of a receiver required for "quality" reproduction the author stated as one disadvantage, of diode detection the fact that reaction could not be used. He was not dealing with diode detection in the broad sense, but only in connection with a particular type of set. Nevertheless, the article has brought forth a few letters, of which the following from a Scottish reader is a typical example:—

# Notes from the Test Bench

## Padding Condensers

IN the older type of superheterodyne receiver straight condensers were used for tuning purposes, with a separate condenser for tuning the oscillator coil. When one-tuning-control sets became popular, however, it was decided to gang the oscillator condenser to the aerial tuning condenser, connecting a preset condenser in series with the former in order to tune the oscillator coil to the correct wavelength for the production of the required beat note. This method was not very satisfactory, however, as correct alignment at all points on the tuning scale was very difficult. The condenser manufacturers then experimented with oscillator condensers having specially shaped vanes, and it is now possible to obtain superhet gang condensers having an oscillator section that gangs perfectly on the medium-wave band without the use of external padding condensers. It is still necessary to use a padding condenser when tuning to the long-wave band, however, and when an intermediate frequency of 465 kc/s is used, two padding condensers are necessary, one being connected across the long-wave winding and the other in series with the oscillator tuning condenser. The setting of these padding condensers is very critical, especially on 465 kc/s, and therefore in cases where long-wave reception is poor the padders should be carefully readjusted.

## Adding a Tuning Indicator

THE use of sharply tuned circuits is essential these days in order effectively to separate the numerous transmissions which can be picked up by a sensitive receiver. Quality suffers to a certain extent as the selectivity is increased, however, and unless the station is accurately tuned in, marked distortion may be experienced. It is possible, of course, to find this correct tuning point by ear, but it is much more easily found by visual observation. There are several types of visual tuning indicators available, but the one that is most easily applicable to home-constructed receivers is the milliammeter type. This can be connected to the simplest type of receiver. If A.V.C. is not fitted, the meter should be connected in the detector anode circuit. If the detector is of the leaky grid type, the current reading will be at its lowest when the station is accurately tuned in; this is due to the fact that the input signal automatically biases the detector valve. With anode bend detection, on the other hand, the current will rise when a station is received and will be at maximum when the station is accurately tuned in. If A.V.C. is incorporated in the set, the meter indicator should be connected in the anode circuit of the controlled valve. In this case the current reading will be at minimum when the station is accurately tuned in, because the valve will then be operating at a lower degree of sensitivity than when no signal is being received. This, in turn, is due to the fact that the A.V.C. biasing effect will be at maximum when a strong signal is being received, thereby causing a drop in current consumption.

"Sir,—I wish to draw your attention to a misleading statement which I notice in a recent issue of PRACTICAL AND AMATEUR WIRELESS, and which I have come across several times in previous issues. It is to the effect that reaction must be dispensed with when using a diode or double-diode triode as detector. As you are aware, reaction works perfectly well with this type of valve, when taken from the plate of the triode following the diode, as the H.F. choke usually included in the coupling of diode to triode seems to pass sufficient H.F. for the purpose.

"*I have found that should there not be sufficient reaction at the top of the waveband, a small capacity connected across this H.F. choke will remedy matters.*

"By the way, I notice that you always gloss over what I consider to be the greatest snag in using a superhet converter for short-wave reception: *i.e.*, the fact that each station has two tuning positions, which makes it very difficult to calibrate a set properly and to find your way about the waveband.

"I should be very grateful for a design that does away with this in a simple manner."

The italics are mine.

I am quite sure that the author of the article to which this reader refers had no idea of making a general statement that reaction could not be used with a diode in any circumstances. In fact, I know that the same contributor has, in the past, described diode-circuits in which reaction is used. Personally, I have found that although reaction can be obtained without difficulty, it is rarely smooth in operation, and does not give the same "build-up" as when a triode is employed. Besides, if H.F. is passing through the choke, surely that component is at fault, or is unsuited for its position in the circuit. And as to shunting it with a fixed condenser—well, why use a choke at all? Its object is to prevent the passage of high-frequency currents.

Let me leave this subject by saying that reaction can be obtained with a diode, but it is rarely satisfactory and indicates that the rectifier circuit and its coupling to the following valve is not fully efficient. I might add that I have never been able to obtain reaction when using an H.F. metal-oxide rectifier as a diode!

## Car Radio

AT an Exide luncheon which I attended recently Mr. Frank Murphy (of wireless-set fame) spoke about car radio. He said that in his opinion it would never become really popular in this country, although widely adopted in America. For one thing we in this country were not so susceptible to "stunts" as the Americans, and wanted a better form of entertainment. Mr. Murphy said that the average business man had no time to use a car-radio during the day, and when on his way home at night he preferred peace and quiet. On the other hand, the "family" man used the car for picnicking when on pleasure bent, and then left the car for the river bank. I do not agree that these two isolated examples serve to show the futility of car-radio, and I am sure that thousands of motorists will continue to fit receivers in their cars—and enjoy the results they give. I did agree with one remark, however, which was that it would be better, in the case of lower-priced cars, to fit more powerful headlamps and to take steps to silence the engine and bodywork than to spend the money on a wireless set to tax still further the ever-willing accumulator.

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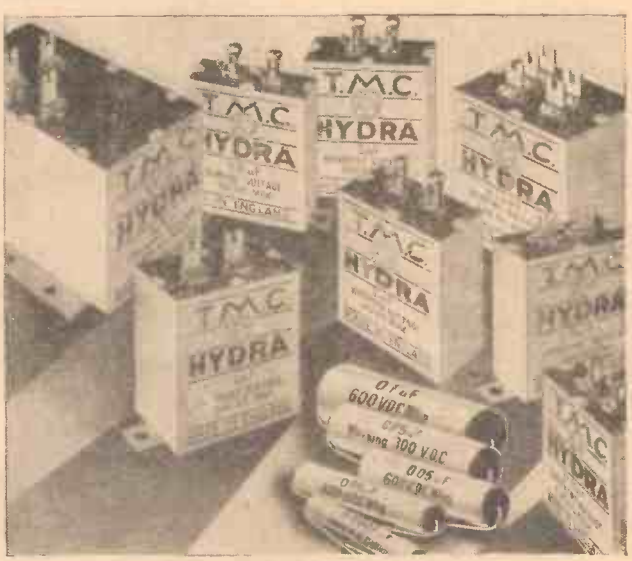


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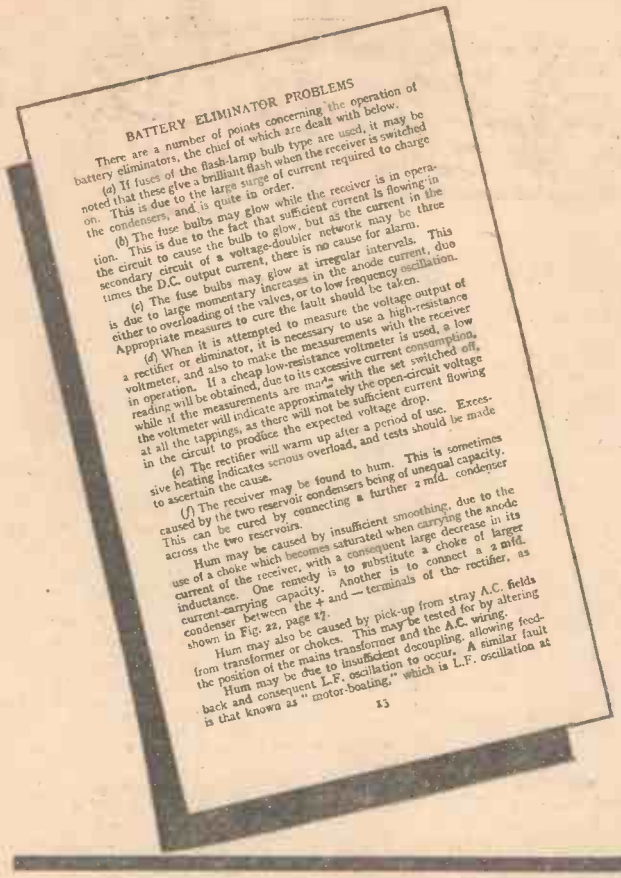


BATTERY ELIMINATOR PROBLEMS

There are a number of points concerning the operation of battery eliminators, the chief of which are dealt with below.

(a) If fuses of the flash-lamp bulb type are used, it may be noted that these give a brilliant flash when the receiver is switched on. This is due to the large surge of current required to charge the condensers, and is quite in order.

(b) The fuse bulbs may glow while the receiver is in operation. This is due to the fact that sufficient current is flowing in the circuit to cause the bulb to glow, but as the current in the secondary circuit of a voltage-doubler network may be three times the D.C. output current, there is no cause for alarm.

(c) The fuse bulbs may glow at irregular intervals. This is due to large momentary increases in the anode current, due either to overloading of the valves, or to low frequency oscillation. Appropriate measures to cure the fault should be taken.

(d) When it is attempted to measure the voltage output of a rectifier or eliminator, it is necessary to use a high-resistance voltmeter, and also to make the measurements with the receiver in operation. If a cheap low-resistance voltmeter is used, a low reading will be obtained, due to its excessive current consumption, while if the measurements are made with the set switched off, the voltmeter will indicate approximately the open-circuit voltage at all the tappings, as there will not be sufficient current flowing in the circuit to produce the expected voltage drop.

(e) The rectifier will warm up after a period of use. Excessive heating indicates serious overload, and tests should be made to ascertain the cause.

(f) The receiver may be found to hum. This is sometimes caused by the two reservoir condensers being of unequal capacity. This can be cured by connecting a further 2 mfd. condenser across the two reservoirs.

Hum may be caused by insufficient smoothing, due to the use of a choke which becomes saturated when carrying the anode current of the receiver, with a consequent large decrease in its inductance. One remedy is to substitute a choke of larger current-carrying capacity. Another is to connect a 2 mfd. condenser between the + and — terminals of the rectifier, as shown in Fig. 22, page 17.

Hum may also be caused by pick-up from stray A.C. fields from transformer or chokes. This may be tested for by altering the position of the mains transformer and the A.C. wiring.

Hum may be due to insufficient decoupling, allowing feed-back and consequent L.F. oscillation to occur. A similar fault is that known as "motor-boating," which is L.F. oscillation at

15

# A PAGE OF PRACTICAL HINTS

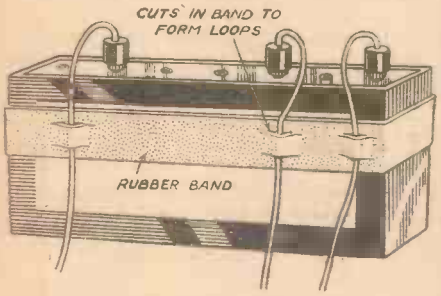
SUBMIT YOUR IDEA

# READERS WRINKLES

THE HALF-GUINEA PAGE

## Holding Grid-bias Leads

A NEAT and safe way of holding grid-bias leads is to stretch around the battery an elastic band which has in it small cuts to form loop-holes through

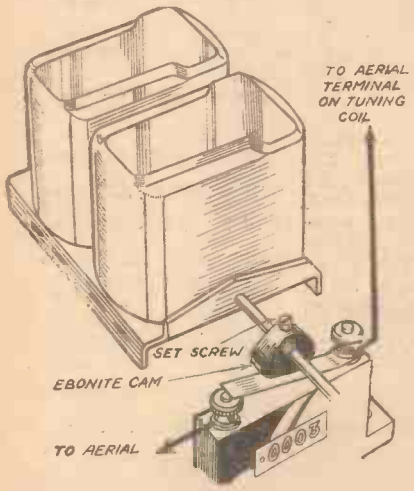



*A neat arrangement for holding grid bias leads.*

which the leads can be threaded. The band can be bought for a penny or made from a piece of motor-cycle tyre which has just the right tension for the job.—G. L. TATTUM (Mold, N. Wales).

## Aerial Condenser Switching Device

HAVING serviced a few "screen-grid" three-valvers, etc., it was brought to my notice that in some cases when a series condenser was put in the aerial to improve selectivity on the medium-wave bands it had to be shorted out on the long-wave band to improve the volume on one or




*A simple device for cutting out an aerial condenser.*

two continental stations. I therefore devised the following simple arrangement.

A piece of springy brass about 1¾in. long by ¼in. wide is bolted on one terminal of a fixed condenser, so that when depressed it makes contact on the opposite terminal. A small cam cut out of a piece of ebonite is pushed on to the wave-change switch rod, and is secured by drilling a small hole down to the centre and screwing a small

### *THAT DODGE OF YOURS!*

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

bolt into it. The condenser is placed under the cam so that when the switch is turned from medium waves to long waves the condenser is shorted by the cam. When the switch is turned again the spring breaks contact, thus placing the condenser in series.—C. A. CARTLEDGE (Lancaster).

## A Simple Test Board

HAVING to test and overhaul numerous sets at different times I have found it very inconvenient to have to disconnect my own set in order to accommodate them on test, so I devised the panel arrangement

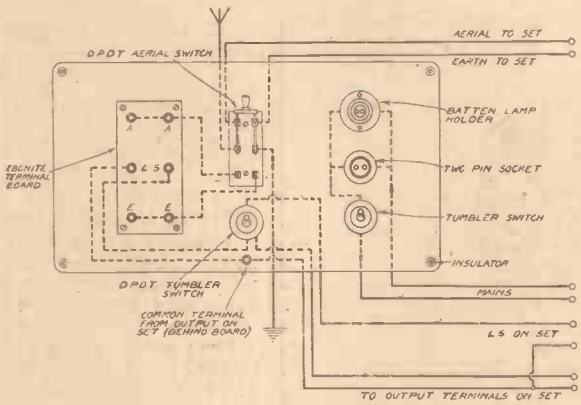



*Fig. 1.—Layout and wiring diagram for a simple test board.*

shown in the accompanying illustration, Fig. 1.

The terminal board provides for two aerial, two earth, and two loud-speaker connections which, in conjunction with the two centre switches, facilitate the handling of the set or loud-speaker under test, without disturbing the permanent receiver.

The mains points provide alternative bayonet or two-pin connections, and when not in use for radio these can be used for a variety of purposes.

The circuit for the two-way tumbler switch is given in Fig. 2.—W. E. USMAR (Maidstone).

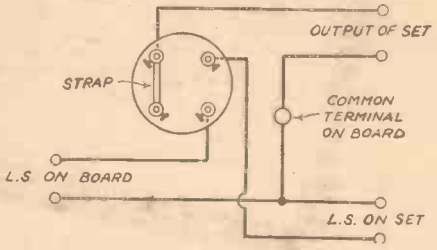
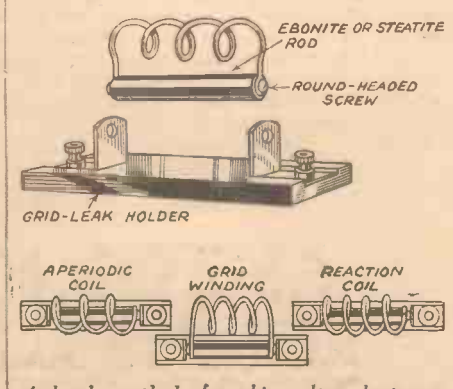



*Fig. 2.—Circuit for a two-way tumbler switch when used on the simple test-board.*

## Ultra-short Plug-in Coils

HANDY plug-in coils for ultra-short-wave sets can easily be made in the following manner.

The holder is made from an old resistance holder, while the part to bridge between the two spring ends may be made either from a piece of ebonite or dowel rod. A hole is then bored in the ends of the bridge piece and a round-head screw put into each end. This round-head screw acts both as the end-piece of the ebonite and the holder for the wire forming the coil. This completes the holder and the following number of turns will be about right for a condenser of 40 mmfd.: aperiodic three turns, grid four turns, and reaction four turns. The grid coil should be inclined at an angle of 90 deg. to allow for the length of the holder.—G. LAWRENCE (Bristol).




*A handy method of making ultra-short-wave plug-in coils.*

TESTS OF STANDARD RECEIVERS ON OUR AERIAL

# REVIEWS OF LATEST RECEIVERS

## The "Wayfarer" 4-Valve, Battery-operated Portable

By F. J. CAMM

FROM the earliest days of radio, designers have been intrigued by the possibilities of satisfactory radio in a really portable form, and which could be carried from room to room easily and without the need for the muscles and physical development of a boneless wonder. Portables have come and gone in the march towards that ideal, and even to-day there are very few portables to which the term can accurately be applied. One does not need a portable set which can only be lumped—I use the word for want of a better term—from one room to another, but one which is light, can be carried upstairs, or into the garden, or taken with you on a picnic; one which, in a word, becomes a personal item of equipment like your watch, your fountain-pen, or your spectacles. If we admit that those are the desirable attributes of a satisfactory portable, and add the technical requirements that it must also be capable of receiving half a dozen stations on the medium-wave band and two or three on the long-wave band, we must come to the very definite conclusion that very few receivers can properly be so described.

### Midget Portables

It will be remembered that about a couple of years ago I tackled this problem and produced two very light portable receivers—the "Featherweight Portable 4" and the "Atom Light-Weight Portable," both of which satisfactorily complied with the specifications detailed above. But my efforts to reduce size were puny compared with the designer of the "Wayfarer" 4-valve, battery-operated portable. This really midget receiver, which I have submitted to exacting tests over a number of weeks, and considered purely as a radio set, is superior to many receivers of the standard non-portable type and costing twice its price. It will receive sixteen stations on the medium-wave band, all at comfortable loud-speaker strength, and free from the squawky threshold noises sometimes associated with portables using frame aerials; and five on the long-wave band. In only two cases was it necessary to operate the detector valve almost to the point of oscillation. The remaining fourteen stations were received at such strength that ample movement of the volume control remained before the valve burst into oscillation.

### Long-wave Performance

On the long-wave band, Huizen, Radio Paris, Deutschlandsender and Droitwich were receivable at excellent strength. Another astonishing thing about the "Wayfarer" is the quality of reproduction; it is really excellent.

And now regarding its qualifications to be classed as a genuine portable receiver. I am aware that toy wireless sets have been produced in the past perhaps smaller than the "Wayfarer," but this is radio in its best sense. It measures 8½in. by 8½in. by 4in., and weighs only 9lb. inclusive of batteries. It is, in fact, little larger than a box camera, and is fully guaranteed for one year. Its light weight and small size thus make it ideal for campers, hikers, and cyclists. It is an ideal additional receiver to have in any home. It is provided with an unspillable accumulator and socket for the attachment of an outside aerial.

### Midget Valves

Its small size has been made possible by the production of specially small and efficient components, of which the midget Hivac series of valves form the most important part. Valve size had always militated against the design of multi-valve portables, and when it was desired to use at least four valves in a portable circuit, the set became unwieldy. It was possible to purchase small transformers, midget switches, and lilliputian coils, but the physical characteristics of valves remained unchanged until the production of the midget series, which are equally as efficient and have as good characteristics as their larger counterparts.

The circuit is the tried and trusty Screen Grid H.F., screen-grid detector and 2 L.F. stages employing pentode output, reaction being applied to the detector valve, and the L.F. amplifier being of the triode type. The tuning is carried out by a semi-ganged condenser with concentric trimmer. The accumulator has a capacity of 10 ampere hours, and the total consumption of the valves is only .4 of an amp. There is thus sufficient low-tension capacity for twenty-five hours' entertainment. The H.T. battery is of ample capacity and of 70 volts. Undoubtedly, the excellent performance of this well-finished receiver is due to the minute attention to detail and layout as well as to high quality internal and external workmanship and finish.

### Frequency Range

A moving-iron type loud-speaker is used which is provided with an elliptical diaphragm. It has adequate frequency range and the reproduction is very clear indeed. In order to prevent leakage of H.F. into the L.F. portion of the receiver, a filter, consisting of an H.F. choke with double by-pass condensers, is arranged in the detector stage. The coupling between the detector and the first L.F. amplifier is by resistance capacity, whilst a small but well-designed and efficient transformer couples the first L.F. valve to the pentode-output valve, which is, by the way, a standard size pentode.

The battery compartments are compact and rattle proof, spring retainers restricting their movement but permitting them to be removed quite easily.

The case is covered in durable leatherette, all corners relieved and chamfered, and the purchaser has the choice of no less than twelve different colour finishes.

A black waterproof cover, with red seaming, can be obtained at 7s. 6d. extra. This has a flap which, secured by Zip fasteners, permits tuning-in without removing the complete cover.

A small turntable specially designed for the Wayfarer was reviewed in our issue dated October 26th.

At its price of five guineas, it would be difficult to find its peer for honest value and high quality performance.

**SPECIFICATION:**

CIRCUIT: Four-valve straight, with self-contained frame aerial.
VALVE COMBINATION: S.G. H.F. amplifier; S.G. grid detector; triode L.F. amplifier; pentode output.
CONTROLS: Three in number—tuning with concentric trimming knob; reaction and combined wave-change and on-off switch.
REMARKS: Efficient arrangement for eliminating H.F. currents in the L.F. side of the receiver. Totally enclosed H.F. and detector valves to prevent interaction. Resistance-capacity coupling between detector and L.F. stage and direct-fed transformer between L.F. and output stage. Tone control permanently fitted across loud-speaker. H.T. battery combines grid-biasing battery. External aerial may be attached by means of socket outside containing case.
PRICE: 5 guineas.
MAKERS: London Electric Appliances, Ltd., 62, Glengall Road, Old Kent Road, S.E.15.

*NEXT WEEK!*

**The Ferranti "Una" A.C. Consolette**

# Designing Your Own Wireless Set

Further Notes are Given Concerning the Design of the H.T. Unit for A.C. Mains Operation, Special Reference Being Made to Thermal-Delay Switching

IN considering the A.C. power-supply unit last week we concluded by making a reference to the thermal-delay type of switch. It is desirable that a switch of this kind should always be included when the

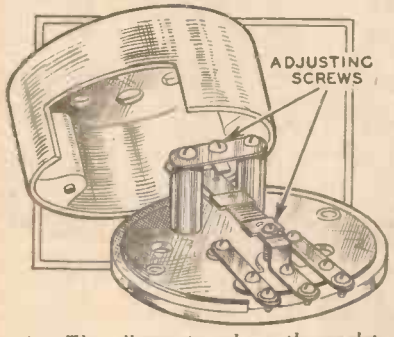



*Fig. 1.—This illustration shows the usual type of thermal-delay switch.*

receiving valves are all of the indirectly-heated type and when the rectifier is directly heated; the same rule applies when using a metal rectifier. The function of the delay switch is perfectly simple, and the component consists essentially of two strips of metal riveted together and having a winding of resistance wire round them. The winding is connected to an L.T. supply, and is therefore heated when current is passed through it. The heat developed is transferred to the bimetal strip, which is caused to bend, due to the fact that the two metals expand at different rates. There is a contact point on the end of the strip, this being arranged to touch another fixed contact when bending takes place. It will be seen that if the H.T. circuit is broken and the two sides of the break joined to the two contacts, it will be completed when the bimetal strip bends. This it is designed to do after about 30 seconds, which is approximately the time taken for the valve-heaters to attain their working temperature.

## Different Connections

A typical thermal-delay switch of the most usual type is shown in Fig. 1, while methods of using it are illustrated in Figs. 2, 3 and 4. Before dealing with these circuits it should be mentioned that there is another type of delay switch, built in the form of a valve and having pins fitted, but this is perhaps not so widely used. The connections shown in Fig. 2 are those which are required when using a valve rectifier, and when the windings of the delay switch are heated from the filament winding. It is seen that the centre tapping of this winding—which is the H.T.+ terminal—is joined to the centre of the three grouped terminals on the switch, and that the separate switch terminal (the fixed contact) is connected to the smoothing choke and load condenser. This is generally the most convenient arrangement when using a valve rectifier, provided that the rectifier-filament winding is capable of providing the necessary heater current for both the valve and the switch heating element, the latter taking 1 amp.

## Using the Valve-heater Winding

When the current from this winding is insufficient the circuit shown in Fig. 3 may be used. In this case the switch winding is heated from the valve-heater winding, and the contacts are used to break the negative H.T. circuit. The reason for including the switch in the negative side is that the heater winding is now in the negative circuit, and there is thus only a small potential difference between the winding and the contacts; if the voltage were high there would be a danger of arcing between the parts of the switch. As shown, the switch heater is

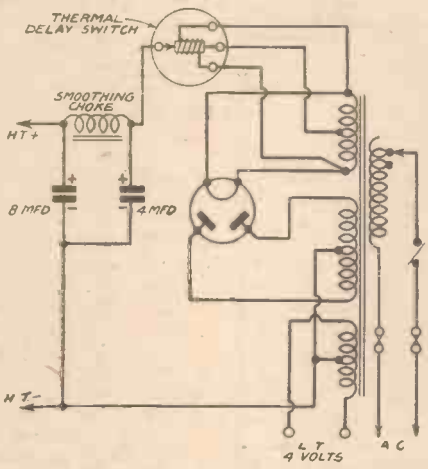



*Fig. 2.—Showing how a thermal-delay switch can be included in the positive H.T. circuit, the winding being fed from the rectifier filament supply.*

fed from the transformer winding which supplies the heaters of indirectly-heated valves, but it may, if desired, be operated from a winding used for the filament of a large directly-heated valve, since a type of switch is obtainable which operates at 7½ volts, ½ amp.

The latter statement might appear rather as a contradiction of what has been written above, where it was stated that the thermal delay is normally employed when all the receiving valves are indirectly heated. Actually, however, the switch can be useful in other instances, and where H.T. voltages up to 1,000 or so are concerned. The switch is then an additional safety measure, which prevents the accidental application of high peak voltages to the smoothing condensers. Where any doubt exists concerning the need or otherwise for the delay switch, and when high voltages (500 or over, for instance) are concerned, it is always a wise precaution to include it in the circuit.

Fig. 4 shows the delay switch used in conjunction with a metal rectifier connected on the usual voltage-doubler principle, and the circuit is really very similar to that in Fig. 3, with the exception that the voltage-doubler condensers are permanently in circuit, although the smoothing condensers are isolated until the switch contacts close.

## Delay Adjustment

It has been mentioned that the contacts of the thermal-delay switch are arranged to close about 30 seconds after the set is switched on, but the delay time can be varied within certain limits by means of the adjusting screws (shown in Fig. 1). Normally it will be unnecessary to alter these, but if any doubt is felt concerning the suitable functioning of the switch it is a good plan to connect a voltmeter across the output H.T. terminals and watch the needle after the set is switched on. The needle should remain stationary at first, and then it should jump to a figure representing the required H.T. voltage. There should be no further appreciable movement after this. Should it be found that the voltage first indicated is noticeably higher than the correct figure, and that it gradually falls to the correct one, it will be evident that the switch contacts are closing too soon and that the adjusting screws should be turned so as to make a wider gap between the contacts. In order to safeguard against damage to the meter it should be of a type having a full-scale reading at least 50 per cent. higher than the correct H.T. voltage.

## Smoothing-Condenser Voltages

We have now considered most of the points of importance in connection with the design of the power-supply system, but there are a few items to which further reference should be made. For example, the working voltage of the smoothing condensers has not been dealt with at any length, and this is an important matter. The most important thing to remember is that the working voltage is often quite different from the test or peak voltage, the latter generally being about twice the former. The test voltage is of very little consequence and should be ignored, the condensers being chosen with a working

(Continued overleaf)

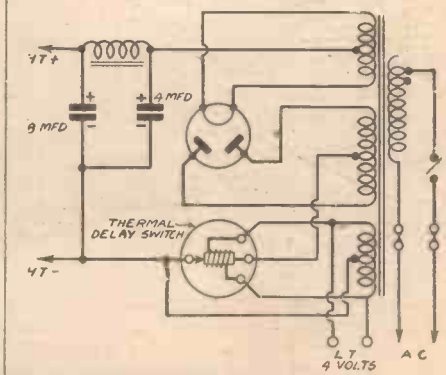



*Fig. 3.—The connections for the T.D. switch when it is supplied from the transformer winding which provides the heater current for the receiving valves.*

(*Continued from previous page*)

voltage at least 20 per cent. higher than any voltage which is likely to be developed across them. This means that in a receiver operating at a normal H.T. voltage of 250, and where the voltage may rise to nearly 200—due to the fact that a T.D. switch is not included, or allowing for a slight difference in time between the heating of the rectifier cathode and those of the valves—the condensers should have a working voltage of not less than 350. This may not always be necessary, but it does give a reasonable good safety factor, which is always desirable.

Certain cheap, foreign condensers are not definitely rated at any working voltage, but are merely marked with a figure which might relate to the test voltage or anything else the makers care to consider. These should always be avoided, for they can lead to a considerable amount of trouble and expense.

### Electrolytic and Paper Condensers

With regard to the type of smoothing condensers, it can be said that these should, wherever possible, be of the electrolytic type, which is somewhat more effective, more compact, and often less expensive. It is worth mentioning that, in general the metal container is the negative pole, the insulated terminal at the base being positive. The correct polarity should carefully be maintained, for the condensers are liable to be damaged if it is reversed. There is little chance of making any mistake in the case of an A.C. set, because the condensers are generally mounted on a metal or metallised chassis so that the case is automatically in contact with the chassis, which is always in contact with H.T. negative.

Electrolytic condensers can be used in a voltage-doubling circuit, but it is generally more convenient to use paper ones for this purpose, because one of the condensers is not earth connected and must therefore be mounted on some form of special insulating bracket.

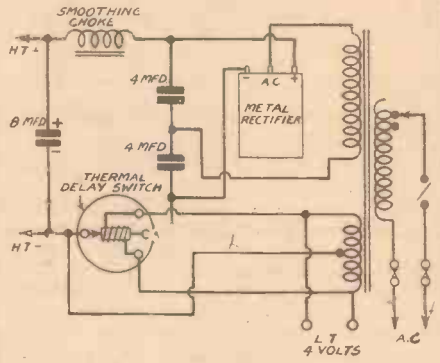



*Fig. 4.—This circuit shows how a thermal-delay switch can be used in a circuit employing a metal rectifier.*

### The Use of Fuses

In all of the circuits given in previous articles it will have been noticed that fuses have been included in the mains leads. These are important, and should not be omitted in any circumstances, for if they are a short circuit may cause irreparable harm to the mains transformer and many other components, besides blowing the main house fuse. It is not essential to include a fuse in both of the mains leads, but it is best to do so, and the value can be determined by the current which is passed. In practice it can be taken as a suitable general rule that for sets taking up to 60 m/A fuses rated at .5 amp. are suitable; sets which take 120 m/A should have 1 amp. fuses. The fuses should be of the special type intended for use in mains sets, since those of the flash-lamp type, and those in short glass tubes are unsatisfactory; the end caps should be at least three-quarters of an inch apart. The reason for this is that the current can arc across them, so negativing their safety factor.

Although it is usual to include fuses in the mains circuit only, there is much to be said for placing one in the main H.T. positive lead as well, because this protects the rectifier, smoothing components, and transformer secondary winding. The fuse should be placed between the positive terminal from the rectifier and the smoothing choke or delay switch, and should be rated at a figure equal to approximately four times the normal H.T. current. Thus, for a receiver taking 120 m/A the fuse should be rated at about 480 m/A; in practice a .5 amp. component would be used. In the same way, a .25 amp. fuse would be appropriate in a receiver taking 60 m/A. The reason for choosing a value a good deal higher than the working current is that it must be able to withstand the current surge which usually takes place when switching on; this same remark applies to the fuses in the mains circuit.

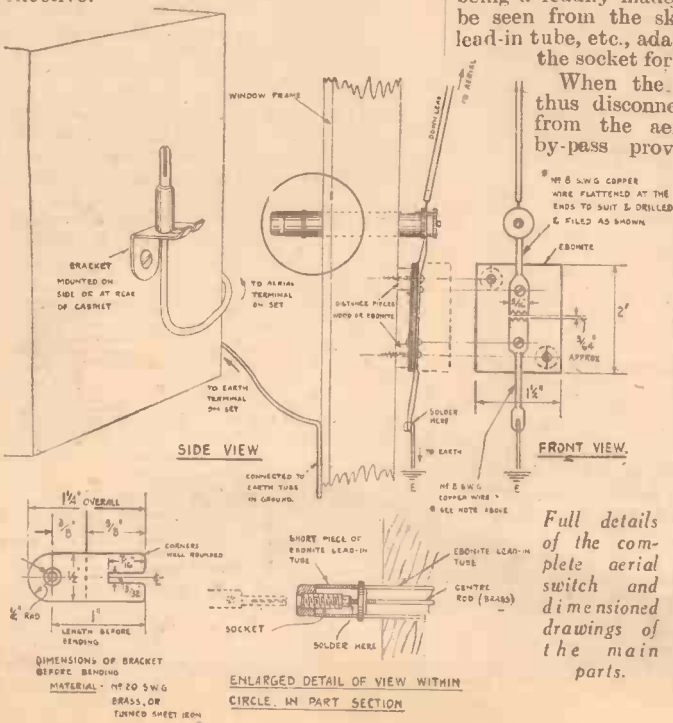
# A Quick Aerial Release Device

THE accompanying sketches show an arrangement for quickly releasing an aerial and at the same time providing an automatic earthing system which has been found to be very convenient and effective.

The easily-made clip, which can be screwed to either side or rear of the cabinet, was found to be just the thing for "lodging" the banana plug on when withdrawn from the aerial lead-in socket, the latter being a readily made combination (as will be seen from the sketch) of a standard lead-in tube, etc., adapted to accommodate the socket for the banana plug.

When the plug is withdrawn, thus disconnecting the radio set from the aerial, the lightning by-pass provides an easy path to earth for any charge on the aerial. This by-pass can be very easily made from odd parts with the aid of a small hand drill, hammer, and file. I used for this part No. 8 S.W.G. fairly soft copper wire, carefully hammered out approximately to the dimensions given.

The addition of a small cover (shown dotted) would tend to keep the gap across the by-pass free from small particles of soot, etc., thus ensuring the maintained efficiency of the aerial system.—WM. N. SPAIN.




*Full details of the complete aerial switch and dimensioned drawings of the main parts.*

## RADIOGRAM REFINEMENTS

RECORDS should not be stacked on their edges, unless it is certain that they are held perfectly vertical. The reason for this is that if the place in which they are stored gets warm the records are liable to soften, and will bend in the centre. Store them flat, and should any become bent due to the above cause, they may be flattened by placing between two sheets of thick glass and stood in a warm place or in the rays of the sun. Naturally, they must not be subjected to too much heat! A velvet pad or a very soft hair brush should be used periodically to remove dust and grit from the grooves and so to avoid unnecessary friction.

## LA GRANJA

IT is worth noting that CEC, La Granja, Santiago, Chile, another 4 kilowatter operating on 28.12 metres (10,670 kc/s) and which is used for a public radio telephony service with Spain, has been reported to be working between G.M.T. 01.30-02.00. It is an official station, of which it is said more will be heard in the near future, as a regular programme of short-wave broadcasts is to be established. The broadcasts conclude with a bugle call.

## REGINALD DIXON AS CHURCH ORGANIST

REGINALD DIXON, the well-known organist of the Tower Ballroom, Blackpool, is to broadcast for the first time as a church organist on November 3rd. He will then be taking part in a musical recital, available to Northern listeners, at the Manchester Road Congregational Church, Nelson. His part of the programme will include compositions by Bach, Massenet, and Handel.

# Trouble Tracking Made Easy—4

In this Article Details of Mains Receiver Tests are Given.

By IDRIS EVANS.

IN last week's article it was emphasised that the tests described were not, in all cases, applicable to mains operated receivers. It was suggested that voltage tests could be made before inserting the valves in their respective sockets, and that the anode current passed could be measured by removing each valve in turn. These tests must not be applied to mains sets, as removal of one or more of the valves while the mains unit is on may cause

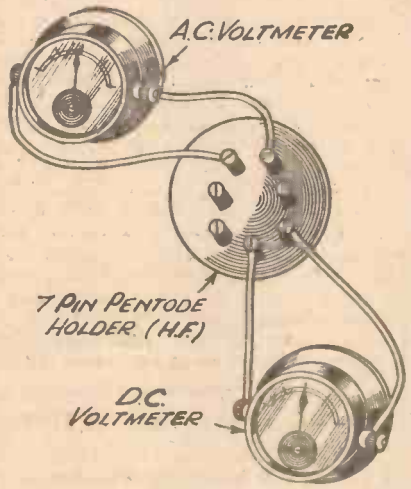



*Fig. 1.—Showing method of testing voltages of H.F. pentode.*

damage to condensers connected across the output circuit of the rectifier, or to the rectifier itself. This rule also applies to receivers employing battery type valves supplied from an eliminator. In receivers of this type it is therefore advisable to fit a fuse in the input circuit so that components will be safeguarded if there happens to be a short circuit across the receiver wiring. This fuse should have a current rating slightly higher than the normal current consumption of the set, so that the current surge which occurs when switching on can safely be handled.

## Voltage Tests on A.C. Sets

As in the case of the battery type of set voltage tests should be conducted first. If the receiver is supplied from an A.C. source of supply an A.C. and a D.C. meter should be used in order to make a thorough check of the voltages. Most modern valves of the A.C. type require a heater voltage of 4 volts; this may be measured by prodding an A.C. voltmeter across the heater terminals of the valveholders. It is very desirable to keep the heater voltage within 5 per cent. of the specified value if good results are to be obtained. Should the voltage not fall within the 4-volt limit the mains transformer should be inspected. It will have been noticed that transformers have voltage and current ratings marked on their terminal strips—for example, 4 volts at 5 amps. It is necessary to connect the correct load across the heater winding in order to obtain the correct output voltage. In the case quoted above, five 4-volt 1 amp. valves may be fed from the 5-amp. winding. If only one or two valves were used, the load would be too low and, in most cases, the voltage applied to the heater circuit would be excessive. In such cases a dissipating resistance should be connected across the winding (calculated by applying Ohm's Law) in order fully to load the winding. Another cause of incorrect heater voltage is the use of the wrong input socket on the mains transformer. If the voltage of the mains does not exactly coincide with any of the markings on the transformer, a socket having the next higher voltage marking should be used: for example, if the supply is 235 volts and the transformer is marked 200, 220, and 240, the 240-volt socket should be used. The use of the 220 socket in this case would

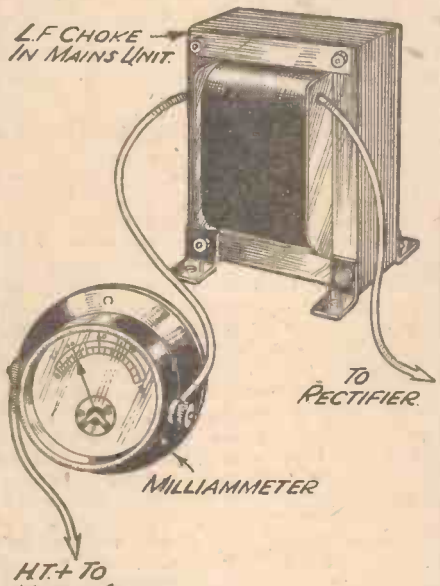



*Fig. 2.—Measuring the total H.T. current consumption.*

cause excessive voltage to be applied to the heater circuit. Lack of voltage across the valve heater pins may be due to a break in the leads between the heater winding of the transformer and the valve pins, a break in the heater winding, or a break in the primary winding of the transformer; it is assumed, of course, that the input fuse is in order.

The A.C. meter may then be used to measure the voltage across the H.T. secondary winding of the transformer, in order to ascertain whether the correct voltage is being applied to the rectifier. Lack of voltage at this point may be due to a break in the leads from the transformer, or to a break in the primary or the secondary winding of the transformer. A dead short circuit across the winding would also cause lack of voltage, but this fault does not often occur. Low voltage at this point may be due to shorted turns in the transformer secondary, and high voltage may be due to shorted turns in the primary winding. After ascertaining that the A.C. voltages are in order, the D.C. meter may be used to test the voltages on the anodes and the screens of the valves. It is essential for the meter to have a high internal resistance if accurate readings are to be obtained, especially in the case of valve screens. If the receiver chassis cannot conveniently be removed, the voltages may be measured from the top of the chassis by slightly lifting the valves so that the meter prod may be touched on the requisite pin. When this is done care must be taken not to lift the valve too far so as to break contact in the holder sockets, and it must also carefully be ascertained that the meter positive prod does not touch the chassis. After the positive prod has been placed in contact with the point at which a voltage measurement is required, the negative prod should be connected to the metal chassis. This will give the anode voltage plus the bias voltage if contact is being made to the anode pin of the valve, or the screen voltage if the positive prod of the meter is in contact with the valve screen pin. Low voltage at these points may be due to high anode or screen circuit resistances, to low smoothed voltage being supplied from the rectifier, or to the use of a low value bias resistance. High voltage, on the other hand, may be due to low anode or screen resistances, excessive smoothed voltage, or high bias resistance. Lack of voltage will indicate a break in the anode or screen circuit due to a defective component (*e.g.*, transformer primary, resistance, or choke) or wire.

## Current Tests

If the voltages are in order, it is generally found that the current consumed by the valves is also of the correct value, as

(*Continued on page 216*)

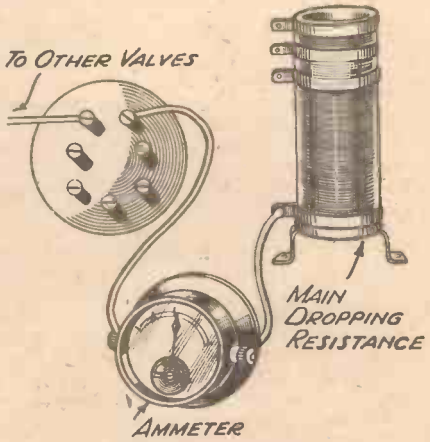


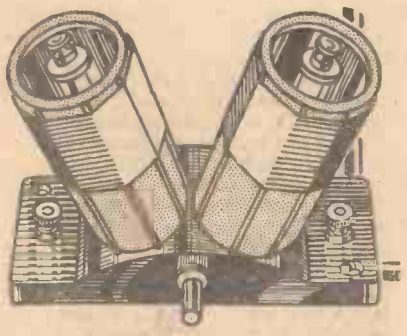

*Fig. 3.—Measuring the heater current in A.C./D.C. receiver.*

# Try Something New

**Invention Can Only Arise When You Depart from Present Methods, and Amateurs Who are Keen on Experimenting will Find Some Novel Suggestions in This Article**

By W. J. DELANEY

ALTHOUGH the old tag has it that "Necessity is the mother of invention," it is not always as a result of necessity that some new scheme is developed. It is true that when one is in need of some particular requirement, research and experiment take place in order to find some method of meeting that requirement, and as a result a new invention is probably born. But there are many inventions which have been produced entirely as the result of experiment and incursions into unknown realms, and it is here that the keen wireless amateur can probably develop his interests to the benefit of the general community. It is, of course, useless to dip haphazard into the junk box and try the effect of combining two existing pieces of apparatus, or to try the effect of joining certain wires



*An early attempt at increasing efficiency in coils. No screening is employed, but no interaction takes place.*

together in an existing receiver. That way lies danger. If, however, the rudiments of the science are fully grasped it is possible to see in imagination some useful schemes which could be developed, and the following outline of some ideas which have occurred from time to time may form the basis for experiment and might lead to fruitful results. It must be emphasised, however, that the only way to discover these new ideas is to "be different," and not to follow in the existing lines of practice.

## Tuning Developments

Let us take, for instance, the main part of the broadcast receiver, namely, the tuning circuit or station selector. Every listener knows that it is essential to tune to the exact resonant point in order to obtain the station clearly, any deviation resulting in distortion, which varies according to the degree of selectivity of the receiver. During the past year an automatic tuning device has been produced which will pull the circuits into tune provided that they are first brought to an approximately correct setting. Why not dispense entirely with the tuning circuit consisting of an inefficient tuning coil and a condenser? As at present employed, a coil of a certain inductance value is used, and in order to obtain various stations a parallel capacity is varied. Now the impedance of this combination varies throughout the entire tuning range, and thus the arrangement is only at maximum efficiency at one setting, all other settings having varying degrees of efficiency according to the proportions between inductance and capacity. The permeability tuner overcomes this defect to a certain extent, but even so it is not perfect. Is there not some better way of causing a valve to oscillate at a definite frequency in such a manner that the acceptance of the circuit would be at a maximum only over a narrow band, adjustable for each station in the interests of quality, but in such a manner that nothing on either side would be rectified?

## Static Elimination

Another drawback to reception is the background of noises generally referred to as "static." It has been stated that owing to the fact that there is no definite frequency to atmospherics, or, in other words, that owing to the broad band of frequencies covered by these disturbances, they cannot be eliminated. Here is an opportunity for the inventor to originate some form of circuit which will be unresponsive to such "untuned" frequencies, or which will prevent them from passing to the output circuits. It should be remembered that, at the moment, the range of a super-heterodyne receiver of good design is only limited by the ratio of signal to disturbance noises, and thus there is a real need for some static eliminator.

## Speaker Design

Then consider the present loud-speaker. This is an inductive load on the output valve, and it is well known that an inductive load varies with the frequency. Thus, it must of necessity be inefficient. Is there no way of making a loud-speaker which is "resistive" as compared with "inductive"? Alternatively, try to design an output circuit in which the valve will work into a resistance which will convert the audio impulses into sound.

Again, is the cone the best method of transferring the sound waves into the surrounding air? Is there not some better method, at present undiscovered, by which the sounds may be produced without the risk of attenuation at each end of the musical scale, and which will function equally at minimum and maximum volume, *i.e.*, from a whisper to volume sufficient for a large hall?

We have seen the experimental "cold cathode" valve, but it has not yet appeared on the market. Is there no method by which the present high-voltage supplies may be dispensed with, and equal results obtained? The valve is a marvellous production, it is true, but the interior of a modern universal receiver of any pretensions at all is almost comparable to a cooking oven, and this dissipation of heat represents waste. Waste represents inefficiency, and, therefore, invention is required to dispense with this wasteful production of heat. The simplest scheme which can be visualised at the moment is a new form of low-frequency coupling, which would enable valves to be reduced in number without loss of volume.

## Components

Reduction in size has already been tackled, and the many recently-introduced Midget components show that there is still room for improvement regarding the size of components. A general reduction in all components would enable the receiver itself to be made smaller, and if the reproducing device could also be re-designed we should not need the large cabinets which at present disfigure many a room. The

*A successful equipment for reducing man-made static. Can you evolve a scheme to remove ordinary static?*

"loud-speaker" which I visualise would cause the air to be set in motion by some electrical means (as compared with the present mechanical systems) and thus would result in a diffusion of sound throughout the room or hall, and there would be no directional effect.

The suggestions which are received from time to time from readers who wish to take advantage of our Wrinkles award show that many hours of careful experiment are undertaken, but many amateurs follow the lines which have already been well-tried and simply introduce a modification of an existing idea. Therefore, as the title of this article suggests, break away from present-day methods and seek entirely new avenues of exploration, and maybe you will succeed in solving many of the problems which to-day beset the technicians and designers of wireless apparatus.

Practical Television

SUPPLEMENT TO PRACTICAL AND AMATEUR WIRELESS

November 2nd, 1935. Vol. 2. No. 16.

# C.R. Tube Television Reception Faults—2

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

SINCE the cathode-ray tube is a wholly electrical device, and the user is controlling the operation of a stream of electrons which move with enormous speeds within the glass envelope (evacuated of all trace of gas for most television purposes and hence known as hard tubes), it is only natural that the performance of this device is one susceptible to many outside and inside influences. The very nature of the scheme adopted for reproducing the received television picture makes this so, and in the previous article (September 7th issue) several of the faults which may arise and the methods which can be employed to eradicate them were described at length. In the notes which follow it is proposed to give the reader details of other defects.

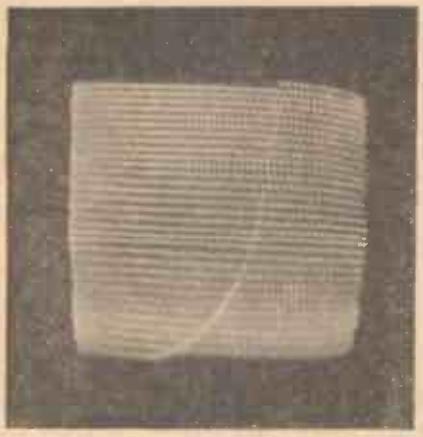


*Fig. 1.—Showing the effect of parasitic oscillations.*

## Double Modulation

The question of non-linearity of scan has been mentioned on several occasions in this journal, and will be remembered as a defect located in the dual time base. It arises from a reduction in the uniform velocity of the H.F. and L.F. scanning traces and can only be cured by a more careful design of the equipment involved and the use, in the case of H.F. pentode time bases, of valves whose characteristics exhibit constant anode currents over a wide voltage variation.

Another point which should be noted in this connection, and one which is overlooked invariably, is that this change of scanning velocity brought about by non-linearity has a modulation effect. For a given beam cross-section the intensity of the spot trace (apart from its intensity modulation) is a function of the speed with which it moves over the fluorescent screen. Slow movement gives a bright trace and fast movement a dim trace (the terms "fast" and "slow" are, of course, purely relative one to the other), so that, although intensity modulation demands a constant trace velocity, there will be a secondary modulation at the ends of the line trace due to this reducing trace velocity, and this causes a brightness variation which tends to destroy partially the true television picture formation. This, of course, is apart from the more noticeable picture trace distortion, and is yet another reason for avoiding non-linearity in the time base trace.

## Parasitic Oscillations

If by faulty design parasitic oscillations are present in the equipment, the built-up line scan will give the appearance of being modulated. When the spot is focused sharply this may appear as wavy lines, and in Fig. 1 is shown an actual low-definition light field scan exhibiting this defect. One way to cure the trouble is by employing earthed metal shields round the cathode-ray tube electrode system. The result of this is very clearly demonstrated in Fig. 2, where a photograph has been made of the same scan but with the disturbing oscillation removed.

Incidentally, this same photograph portrays very prominently yet another possible defect, giving the appearance of two bright axes at right angles. The peculiarity has been termed very frequently the white cross effect, but it should be noted that this result is only noticed as a rule when there is some form of gas filling present, and, as was mentioned earlier, for television picture reproduction nearly all the tubes used are classed in the hard (exhausted) category. It arises from ionisation effects, producing a conducting current between each pair of deflecting plates. To eliminate the effect the electrode system can be made asymmetrical inside the tube itself, when the axes are then transferred to the edge of, or even beyond, the observed scanning field.

## The Flyback

Also in Fig. 2, the return stroke or flyback of the spot to its initial position after the L.F. time base has triggered is very conspicuous. This will naturally mar the picture, but under service conditions it is arranged that the flyback is submerged in the rectangular shaped L.F. synchronising pulse, which is located in the black region of the signal, and is therefore not visible. One way of eliminating the flyback, however, is to arrange for the sharp rise of the current in the gas-filled relay as it ionises to give an inductive voltage "kick" in the secondary of a transformer, through the primary of which the current is caused to pass. By suitably arranging the polarity this voltage kick can be applied to the cathode-ray tube's modulating cylinder, and the effect is to black out the beam and so render the return stroke quite invisible.

## Hum Bands

In the previous article reference was made to the deleterious effects of 50-cycle

*Fig. 2.—A view of the scan shown in Fig. 1 with the oscillation removed.*

A.C. mains hum in the time base generating circuits. If a similar hum is induced on the light-modulation cylinder of the tube through bad screening or inadequate power-pack smoothing in the gun-volt supply, there will be an alternate darkening and lightening of the scanned field, in the form

(Continued overleaf)

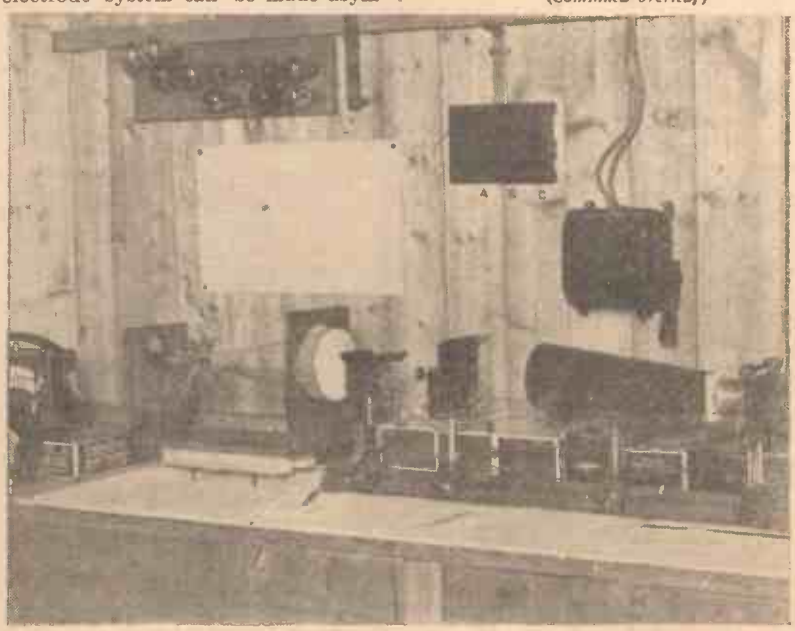


*Fig. 3.—Photometric equipment involved in C.R. tube luminosity tests.*

## PRACTICAL TELEVISION

*(Continued from previous page)*

of zones or bands. This is shown in Fig. 4 for a horizontally-scanned picture, and if the hum is severe this will completely spoil the picture, just as in an ordinary radio receiver mains hum will drown the programme sound heard from the loud-speaker.

With a 25-picture-per-second repetition the 50-cycle hum will exhibit two light and two dark bars which, under properly synchronised conditions, will remain quite steady. Any lack of synchronism will be exhibited by the bars moving up or down according to whether the picture speed is greater or less than the required figure. From an examination of the cause mentioned previously the cure is obvious, namely, much better smoothing and/or more careful attention to the screening or earthed shields, which will prevent such an induction on the modulation electrode.

### A Neutralising Field

Since the very nature of the electron stream makes it highly susceptible to both electric and magnetic influences, it is possible that the reconstituted picture may appear slightly out of centre. Careful lay-out and the elimination of stray fields will do much to overcome this trouble, but even then the picture may be deflected or turned as a whole. This can be corrected and normality restored by using either a permanent magnet or a coil carrying direct current suitably placed with reference to the tube. The resultant magnetic field will then neutralise the stray one, and in practice it

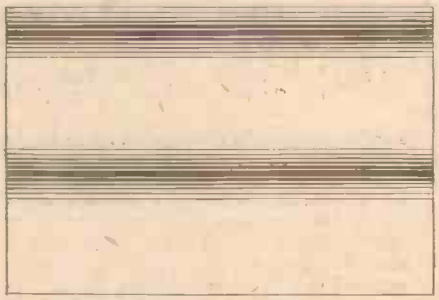


*Fig 4.—50-cycle hum bands in a scanning trace repeated 25 times per second.*

is found better to use a relatively powerful field located at reasonable distance from a the tube in lieu of a weak field in close proximity.

Picture brightness is another important factor, and within the limits set by the tube's rating is under the control of the user. Originally it was thought that television pictures reproduced on a cathode-ray tube screen would not be bright enough for comfortable observation at home. This has now been disproved by practical demonstration, while in the laboratory luminosity tests have been undertaken to obtain proper quantitative data. The photometric equipment involved is quite simple in character, and in Fig. 3 is illustrated material laid out for this purpose. As an expression of the results obtained it can be mentioned that as far back as last year tubes were made which had a brightness of 0.024 lumens per sq. cm., but this figure has now been improved upon. When using an actual receiver do not have the screen brighter than is necessary, otherwise there may be a tendency to overrun it with a consequent decrease in useful life.

### Modulation

Coming now to modulation, it is essential that the tube should give a constant spot size over the range of cylinder voltage required to give the full depth of modulation. Even assuming that the radio receivers and amplifiers are capable of accepting and passing through each stage television signals without mutilating them, the observed picture will lack detail if the spot is misfocused or fluffy. Again, contrast will be lacking if instead of the spot darkening with decrease of signal intensity it expands. These factors necessitate a very careful voltage adjustment over the several electrodes, so that within the working range of signal voltage only electron beam intensity is altered.

Pictures can have an excess or deficiency of high frequency. In the case of the former multiple images will appear giving a throw off at the trailing edges of the vertical lines in the picture. Frequency cut-off will show itself as an absence of detail, just as in the case of an ordinary low-definition transmission.

### Overloading

Just as it is possible to overload an ordinary thermionic valve, so the cathode-ray tube can be over-modulated. Harsh, dark pictures will then be seen somewhat as indicated in Fig. 3 of the previous article. The remedy is, of course, to reduce the signal input through the appropriate volume control. It is only by experience that the proper balance between all the variable quantities can be obtained, but if attention is paid to the various points which have been outlined the experimenter will be rewarded with results which will surprise him for their quality.

## TELE-NEWS

### Television Programmes

NOW that the technical details concerning the two types of radiated television signals have been made known by the companies concerned, the outstanding item occupying the minds of those in charge of television at the B.B.C. hinges on the question of programme organisation and service. No matter how perfect are the received pictures from the technical angle, unless the method of presentation, programme material and hours of service are acceptable to the public, interest will wane quickly and the trade will not benefit to any material extent.

It is stated that the B.B.C. Television Director is recommending a daily service of three hours, of which one hour will be given in the afternoons to enable dealers and others to give demonstrations, and the remaining two hours will be used in two separate periods in the evenings. From past experience it has been found that a television programme not exceeding an hour's length and made up of a variety of short items is more acceptable to those looking in than one long spell of, say, a film or play. The subject would have to be of outstanding merit to hold the attention for a long time, and so the suggestion to have several short items is most commendable.

Another recommendation which it is anticipated will be made to the Advisory Committee is that the Marconi-E.M.I. and Baird systems will be used on alternate weeks. This will give the public a much better chance to judge the merits of the separate systems, and is to be preferred to alternations of shorter intervals. Taking a cue from Germany, it is also to be hoped

that the authorities will arrange for several televiewing rooms, where the public can witness the transmissions in comfort and without charge. This will stimulate interest very quickly, and the audiences should be invited to make constructive criticisms of what they see.

### Television Costs

NO intimation has yet been given of the cost of the television transmitting equipment which is to be installed in the Alexandra Palace, while the cost of the programmes is, of course, merely a matter of conjecture at the moment. It has been stated, however, that the B.B.C. have fixed up a long-term lease for the building in North London, for which they are paying a yearly rental of £1,500, to which must be added a further £1,000 per annum for the use of the Palace's large concert hall.

### Aerials for Television Signals

THE ultra-short-wave transmitting aerials which are to be installed at the Alexandra Palace are not of simple design, and a great deal of research is being undertaken by the B.B.C. in order to arrive at a satisfactory solution. It is essential that they should provide a good signal over a wide service area, and quite frequently test transmissions from the top of Broadcasting House can be heard on the ultra-short waves. If the signals had to be directional the matter would be comparatively simple by building up an aerial array with reflectors, but to ensure good radiation in all directions with the high powers that will be employed adds a measure of complication.

### Television Abroad

APART from Germany and the more recent activities of France, there does not seem to be any outstanding effort on the part of other European countries to provide a television service. No doubt the situation and ultimate results in England, France and Germany are being watched carefully, and from developments which materialise in these countries other nations will formulate their plans. In the Institute of Radio Technology in Vienna, however, it is learned that a low-powered radio transmitter and television equipment has been installed. In addition, Austria's next-door neighbour, Hungary, has appointed a committee to study developments in other countries, and in this way save much of the pioneering expenses which are inevitable in developing a new science to the service stage.

### German Television

GERMANY is becoming television-minded. Five hundred thousand visitors saw, for the first time, the wonders of television at the great German Broadcasting Exhibition in Berlin. In spite of Hall IV being burnt, the television demonstration was carried out, although the apparatus was eventually destroyed. This setback, states a German paper, "merely makes us the more anxious to advance, and to proceed as far as possible with television." In any case, the Exhibition proved that television to-day has reached a high technical and artistic standard. Wireless has been voted a luxury, but the German opinion is that there can be knowledge between peoples without wireless.

At a large gathering in Nürnberg, Adolf Hitler said: "My one wish is that all Germans of the Reich should at this moment be able to see you, my German comrades. This wish to-day is no longer a Utopian one but a reality. Intensive propaganda by word of mouth can to-morrow be amplified by sight. Television is, therefore, no luxury but a political necessity. We call upon everyone to build up television in our country." It would thus appear the Germany anticipates great things from television.

### A Comparison

A FRENCH technical paper commenting on the Radio Exhibition recently said :—

"In London, exhibitors had been warned not to show anything to do with television. In Berlin, on the contrary, television was one of the most important features of the Exhibition. In one street twenty television and sound receivers were displayed on either side, allowing visitors to note the different methods of television, and to judge of the effect produced by high and low definitions (90-360 lines), and of pictures of different sizes per second (25 or 50 pictures). A comparison could also be made between electronic systems and mechanical systems.

Besides this, two television displays were given continuously. One was in a case with 10,000-volt valves, and the other was a cathode-tube receiver the picture of which, registered on an intermediate film, was developed, fixed and projected on a large screen in less than two minutes.

"There was no particular ceremony about the Olympia opening. In Berlin, the opening took place with theatrical effect in true Germanic tradition. Dr. Goebbels' speech was broadcast by all stations, and the press was filled with long articles about the Exhibition. An astonishing fac t was, however, that for the first time. the Germans abstained from propaganda pictures of statistical tables which, in preceding years, literally overwhelmed the wireless exhibition."

# Short-Wave Notes

A U.S.A. station which is an excellent channel for receiving the WBZ, Boston, N.B.C. programmes is W1XK, Millis, on 31.35 metres (9,570 kc/s). It works from midday to 06.00 G.M.T. daily, and as the power is 10 kilowatts the signal is a good one from about 22.00.

More details are now forthcoming with regard to COCD, Havana, on 48.94 metres (6,130 kc/s). At present it is being picked up at excellent strength between G.M.T. 01.00-04.00. The station continues to put out announcements in three languages—namely, Spanish, English, and French, and as an interval signal strikes three notes (ascending in the scale). It closes down regularly at 05.00 with Ted Lewis's "Good Night Song," preceded on some nights—or rather mornings—by "Smoke Gets in Your Eyes." Transmissions now take place on week days between G.M.T. 16.00-05.00, and on Sundays from G.M.T. 22.00-04.00.

If you wish to try for a "possible," make a search for ZHJ, Penang, Straits Settlements, now operating on 39.3 metres (7,630 kc/s). Here we find English-speaking announcers giving out a news bulletin and also compèring programmes of Oriental music. Time: G.M.T. 11.30-13.40. I cannot say whether exploration will permit you to kill two birds with one stone, but you may again find ETA, Addis Ababa, active, in the immediate neighbourhood—namely, 39.37 metres (6,620 kc/s). This is the station which was used for the memorable broadcast from Abyssinia—or should I say Ethiopia?—on September 9th last.

As a landmark or jumping-off point on the dial, you should try to pick up on any evening the 8th harmonic of Poste Parisien, Paris, which is a fairly strong signal. You will find it on 39.1 metres (7,673 kc/s).



# BOOKS RECEIVED

## Domestic Engineering

HAS it ever occurred to you how much the comfort and convenience of modern civilisation depends upon the Domestic Engineer? Our homes, offices, and works would soon become uninhabitable were it not for the essential services, water and drainage, and most of our comfort would be non-existent were it not for the work done by the Gasfitter, the Electrical Engineer, and the Heating and Ventilating Engineer.

In equipping modern buildings, the activities of the Plumber and Domestic Engineer, the Gasfitter, the Heating and Ventilating Engineer, and the Electrical Engineer are interwoven with each other. It is interesting to note, therefore, that a comprehensive work, entitled "Plumbing and Domestic Engineering," has just been published and will be completed in about thirty weekly parts.

In accordance with the usual practice in the case of technical serials issued by the house of Newnes, this publication deals with all branches of Plumbing and Domestic Engineering, also Heating and Ventilation, in a manner which can be readily appreciated by any practical man. The purely theoretical side of the subject has been kept down to a minimum, but all practical details regarding the methods of planning, installing, and maintaining the essential services in houses and large buildings are dealt with by clearly written articles which are illustrated by line diagrams and action photographs.

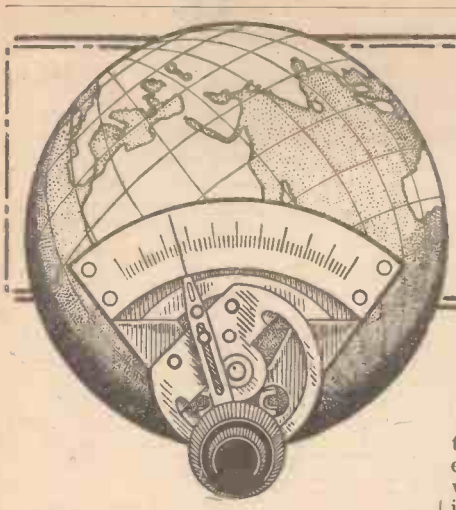
Readers who are interested in any of the above-mentioned subjects should certainly see a copy of Part 1, which contains a most interesting Free Chart printed in colours to illustrate some of the current systems of hot water supply and central heating.

Apart from those directly interested in domestic engineering, anyone who has a practical interest in building will find this work most useful for reference purposes. It is edited by Mr. E. Thomas Swinson, F.R.San.I., R.P. No. 1 was published on October 16th, price 1s.

## TROUBLE TRACKING MADE EASY

(Continued from page 211)

voltage and current is to a great extent interdependent in mains receivers. The total current consumption may best be measured by connecting a milliammeter in the output circuit of the rectifier, and the individual consumption of the valves may be checked by breaking the anode lead and connecting a milliammeter to the free ends; the mains supply must, of course, be switched off before the break is made. High current consumption will indicate that the applied voltage is excessive; that the bias resistances have a low value; or to a short or partial short across the circuit; partial shorts are generally due to leakage in condensers. Low consumption may be due to the use of high bias resistances, or low input voltage. In receivers of the A.C./D.C. type the heater current should also be measured. This may be done in the manner shown in Fig. 3, where an ammeter is shown connected between the negative end of the main dropping resistance and the heater pin of the first valve in the series sequence. It is emphasised at this point that valve heaters are connected in series in A.C./D.C. and D.C. receivers, and therefore the removal of a valve or the use of a valve with a broken heater circuit will produce a break in the whole heater circuit.



# SHORT WAVE SECTION

## FREQUENCY CHANGING ON SHORT WAVES

**A Simple Explanation of the Different Methods of "Mixing" the Oscillator and Signal Frequencies by Different Systems**

THE superhet is becoming increasingly popular for efficient short-wave reception, and will probably be used to an even greater extent for the reception of the television transmissions on ultra-short waves. But although the superhet has been brought to a very high state of perfection as a broadcast receiver, it has probably not been developed to quite the same extent for S.W. reception, and it is only recently that it has become possible to obtain a frequency-changing valve which has been specially designed to function efficiently on short waves.

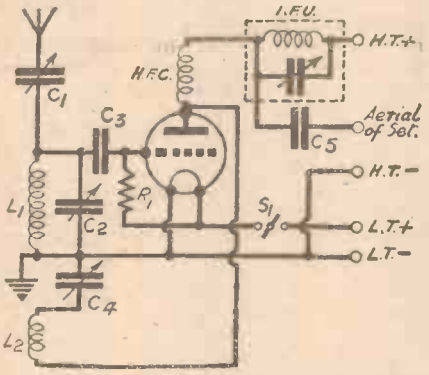



*Fig. 1.—The connections for a valve used as an autodyne frequency-changer are shown in this circuit.*

### The Autodyne

Until about a year ago it was almost standard practice to use a single valve of the screen-grid or H.F. pentode type as short-wave frequency-changer, this being connected on the autodyne—or auto-superheterodyne—principle as shown in Fig. 1. In this case only a single tuned circuit was employed and the valve was made to oscillate at a frequency somewhat different from that of the transmission it was desired to receive. In other words, the intermediate frequency was obtained by tuning the oscillating valve to a frequency higher or lower than that of the required signal and so producing a beat note. Actually, the action is rather more involved than this simple explanation might suggest, but it is not necessary to do more than deal with the general principle here. The autodyne arrangement, although it proved very satisfactory in many ways, suffered from the objection that it did not provide a very high degree of selectivity. Another disadvantage was that each station could be received at two settings of the tuning condenser—one above and the other below that corresponding to the wavelength of the transmission. This naturally had the effect of crowding the dial on wavebands which are widely used, and made the identification of transmissions and the calibration of the set more difficult.

The only alternative to the autodyne until comparatively recently was a frequency-changer consisting of two separate valves, each with its own tuning circuit; and even here it was difficult to obtain perfectly satisfactory results, due to the fact that it was often impossible to obtain a sufficiently high output from the oscillator, or adequate coupling between the oscillator and the first detector.

### The Pentagrid

Many of the difficulties of frequency changing on short waves (and on broadcast waves as well, of course) were overcome by the introduction of the pentagrid or heptode, in which the coupling between the oscillator and detector is electronic and takes place inside the valve, instead of in the external tuning circuits. Due to the very efficient "mixing" and to the reasonably high output from the oscillator it is easily possible to ensure thorough "mixing" on all wavelengths. Generally speaking, it is necessary to use two tuning circuits, one for the aerial input and one for the oscillator section, as shown in Fig. 2, but it is by no means difficult to gang the two condensers, since the tuning of the aerial circuit is rarely critical.

### Aperiodic Aerial Circuit

In consequence, two similar coils can be used in the aerial and oscillator circuits (special coils for the appropriate positions are to be preferred and are made by several manufacturers) and to tune them by means of a two-gang .00016-mfd. condenser, using a trimmer of about 35 mmfd. in parallel with the aerial section. Stations can first be received by operating the gang condenser, and can then be brought up to full strength by adjustment of the trimmer.

As an example of the unimportance of perfectly-accurate aerial-circuit tuning it might be mentioned that perfectly good reception can be obtained by leaving this

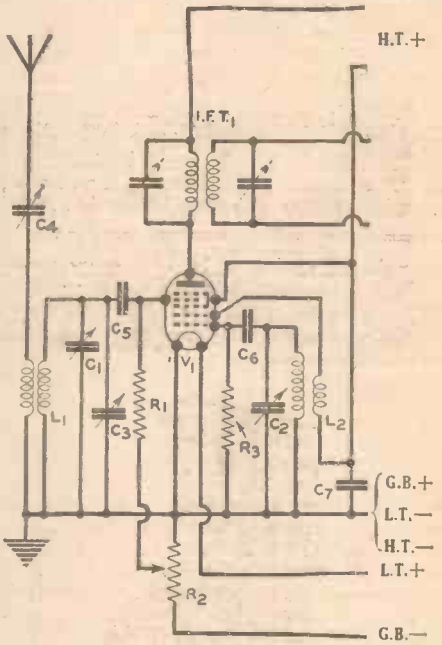



*Fig. 2.—This is the circuit for a pentagrid frequency-changer of a short-wave superhet. It is part of the circuit of a two-valve short-wave superhet described in the July issue of "Practical Television."*

circuit aperiodic, merely connecting a S.W. H.F. choke or a 100,000-ohm non-inductive resistance between the aerial and earth terminals, as shown in Fig. 3. It is not suggested that this arrangement is as satisfactory as that illustrated in Fig. 2, but it does give very good results when

*(Continued overleaf)*

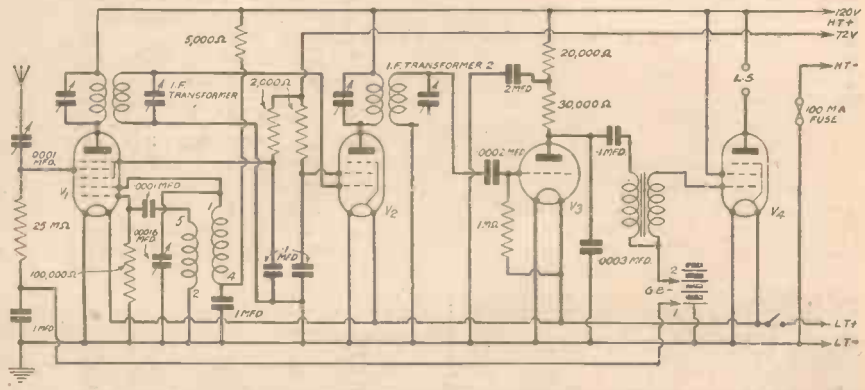



*Fig. 3.—When using a pentagrid, fairly satisfactory results can be obtained by tuning the oscillator section only, and leaving the aerial circuit aperiodic, as shown here.*

(*Continued from previous page*)

maximum sensitivity and a high degree of selectivity are not required.

Despite the value of the pentagrid frequency-changer for the short-wave superheterodyne, there is one disadvantage which must not be overlooked: this is that the comparatively high capacity between the grid which serves as the oscillator anode and the first-detector control grid is liable to affect the tuning of the oscillator circuit. The result is that the tuning of the oscillator is upset, so that the wrong I.F. is produced. This means that the sensitivity is considerably reduced. From this it must not be gathered that the fault is serious, for it often passes unnoticed, but simply that it does exist and may have a deleterious effect in certain instances.

### The Triode-hexode

Some of the faults just referred to can be overcome by using a triode-pentode, but here the difficulty of maintaining a sufficiently high oscillator output appears again. The capacity between the two sections of the valve is low enough for all practical purposes, but the coupling is not electronic, and is difficult to obtain in a satisfactory form. A modification of this valve, however, in the form of the triode-hexode which was introduced about the time of the Show, appears to have none of the disadvantages of all other frequency-changers. The valve is similar in construction to the triode-pentode with the exception that there is a fourth grid in the detector portion, this being connected to the grid of the triode oscillator as shown in Fig. 4. The result is that "mixing" is purely electronic, and that the capacity between the two parts of the valve is so low that the tuning of the oscillator is not affected by changes in the input circuit. Another important point is that the oscillator output is high enough at all frequencies embraced by the short-wave band. As yet the triode-hexode is obtainable only for mains operation, and the connections for the Osram X. 41 are shown in Fig. 4, where it will be seen that a resistance-fed tuned-anode circuit is used for the oscillator, and that a variable-mu or A.V.C. bias can be applied to the detector section in exactly the same manner as is done with a pentagrid or triode-pentode.

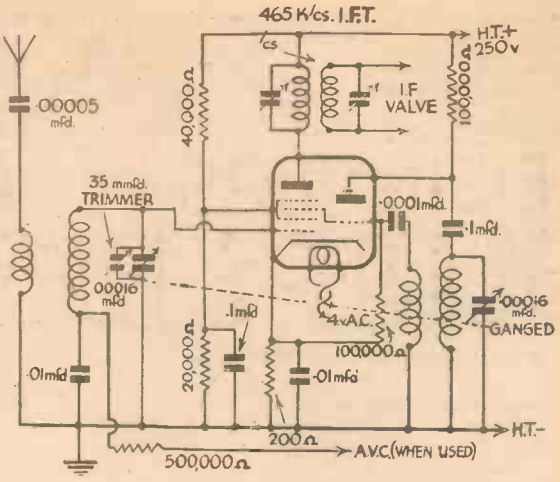



*Fig. 4.—The circuit for the Osram X. 41 triode-hexode used as a short-wave frequency-changer.*

The intermediate frequency employed has a pronounced effect upon the results to be obtained, and it has been found that 465 kc/s is most satisfactory for all of the types of frequency-changer mentioned when used on wavelengths, say, 12 metres upwards.

# Leaves from a Short-wave Log

### Logging Continentals

AT various times, in these columns, the wavelength, frequency and power of various individual stations have been given, and it is from this kind of data that you should make up your short-wave station register.

It is the logging of these broadcasters which will facilitate your search for more distant signals. It is obvious that in the course of tuning-in one of these more powerful transmissions you will come across carrier waves of stations which do not tally with registered condenser readings. Do not pass them over, but spend some time in investigation, as it is mainly in this accidental manner that interesting broadcasts are picked up. Careful and slow tuning will bring in a number of "tweets," and every one of these is worth a few minutes' examination, especially after midnight when most of the European medium-wave stations have closed down, and there is less likelihood of the mystery signal proving a harmonic.

In the list of Continental countries given recently, to your surprise you may notice that Poland is included. So far, the Warsaw programmes have not been available on short waves, except on very special occasions, but tests are now being carried out by a 20 kilowatter, SPW (Warsaw), habitually used for traffic with U.S.A., Japan, and Europe on 22 metres (13,635 kc/s), and it is this station which will probably be taken over by the Broadcasting Authorities for the transmission of special programmes destined to Polish nationals overseas, in particular in the North American Continent. In the tests announcements are given out in Polish, German, French, English, and Italian, and regular references are made to Polskie Radjo Warszawa (phon: *Varshavva*), as in the case of the long-wave station.

### Denmark and Budapest

Three powerful European stations which have not been so frequently mentioned lately, but which are worth-while captures, are OXY, Skamlebaek (Denmark), on 49.5 metres (6,060 kc/s), taking the Copenhagen programmes, and HAS3 and HAS4, Budapest, on, respectively, 19.52 metres (15,370 kc/s) and 32.88 metres (9,134 kc/s). The Dane may be picked up at excellent strength daily from G.M.T. 18.00 until Copenhagen closes down; on Sundays he is to be heard one hour earlier. HAS3, Budapest, works only on Sundays from G.M.T. 14.00-15.00, leaving HAS4 to give a special transmission from G.M.T. 23.00-24.00. It is an easy matter to identify these two broadcasts, as the interval signal is that of the medium-wave station, and the call is put out frequently in several languages. Recently tests have also been carried out on 43.86 metres (6,840 kc/s), HAT2.

Readers interested in the present Italo-Abyssinian conflict should note that on short waves it is possible to get war news from several sources at odd hours. In addition to the bulletins broadcast by our Empire transmitters for the various zones, we may turn to the Prato Smeraldo stations for the Italian version. Rome on 25.4 metres (11,811 kc/s) and 31.13 metres (9,635 kc/s) broadcasts daily. The schedule is as follows: G.M.T. 13.15, 17.00, and 18.45 on 25.4 metres, and at G.M.T. 22.59 on 31.13 metres. Several news bulletins in English are issued every day.

At other times, news is also to be obtained from the Zeesen (German) short-wave stations, in the programmes destined to Africa, Asia, Canada, and the United States.

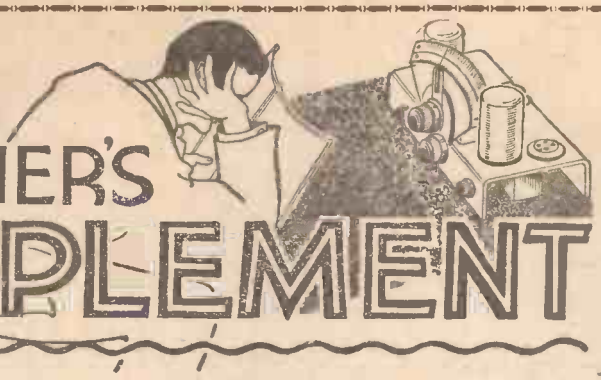
Paris-Pontoise (France) also puts out topical bulletins for the benefit of the English-speaking races.

### Addis Ababa

Although considerable publicity was made regarding a recent broadcast from Addis Ababa (Abyssinia), few listeners seemed to have picked up the transmission. So far, there is only one transmitter which has been adapted to telephony, namely, ETA on 16.42 metres (18,270 kc/s), 25.09 metres (11,955 kc/s) and 39.37 metres (7,620 kc/s), but although tests have been picked up at odd times, no report has yet reached us of any broadcast likely to be of interest to us. It is useful to know that of the Italian stations handling traffic with their colonies and consequently with the war zone, the following are equipped for both telegraphy and telephony: ITQ, Asmara (Eritrea), 16.42 metres (18,270 kc/s), 5 kilowatts; IBR and IBA, Rome-San Paulo on, respectively, 20.89 metres (14,630 kc/s) and 82.78 metres (3,624 kc/s), and ITK, ITF and ITD, Mogadiscio (Italian Somaliland), of which the channels are 18.31 metres (16,385 kc/s), 28.63 metres (10,480 kc/s) and 36.61 metres (8,195 kc/s).

Mention must also be made of the IAC, Coltano, transmitters, which are frequently heard working with ships on 16.95 metres* (17,699 kc/s), 23.32 metres* (12,865 kc/s), 23.45 metres (12,795 kc/s), 35.23 metres* (8,315 kc/s), 45.11 metres (6,650 kc/s), 47.20 metres* (6,355 kc/s), and others. (The most powerful of these are indicated by an *.)

WAVELENGTH-CALIBRATED TUNING SCALES



# BEGINNER'S SUPPLEMENT

**A Simple Explanation of the Important Points to be Watched if a Calibrated Tuning condenser Drive is to be Used Satisfactorily**

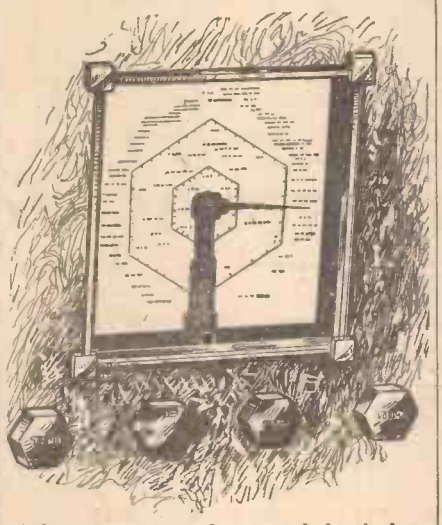
IT is by no means unusual to receive an enquiry from a constructor who has made a new set which, in all probability, works perfectly well, although stations are not received in their correct positions on the tuning scale. This applies, of course, only when a wavelength- or station-calibrated tuning dial is used, and the fault is not with the scale, the condenser or the coils—all of which are usually blamed in turn—but with the constructor. The point is that a wavelength scale can be used satisfactorily only in certain circumstances. Simply to buy a reliable set of coils, a good tuning condenser and a well-made drive is not sufficient; for the scale calibration to be of any value the coils must have particular inductance values on long and medium waves, the condenser vanes must be of suitable shape, and the drive must be designed for use with the particular condenser chosen.

## Inductance and Capacity Effects

This might be understood more clearly when the reminder is given that the wavelength of any tuned circuit is governed by the inductance of the coil and the capacity of the condenser. For the more mathematically-minded it might be stated that the wavelength is determined from the simple formula: $\lambda$ (wavelength) = 1,885 $\sqrt{L}$ (inductance) × C (capacity). Thus, if all coils were designed to have the same inductance values, and if the vanes of all condensers were the same shape, the same wavelength-calibrated tuning scale could be used in any receiver. But this desirable state of affairs has not yet been reached, instead of which, some coils have a medium-wave inductance of 157 microhenries and a long-wave inductance of 2,200 microhenries, whilst others have values of 169 microhenries and 1,900 microhenries. Others, again, have different values from these, and a few (very few, fortunately) are not rated at any particular inductance.

In view of the facts just set out, it is evident that care must be taken in making a choice of tuning scale. The only completely satisfactory method is first of all to choose the coils which are most convenient and best suited for the receiver to be made, and then to obtain a modern condenser and drive, these two being of the same make. Be quite sure, however, that the scale fitted to the drive is calibrated for use with coils having inductance values which are the same as those of the coils first decided upon. This method might appear very obvious, but the obvious is often overlooked!

When these rules cannot be rigidly followed, for example, if it is desired to make use of an older type of condenser which is on hand, the only satisfactory arrangement is to use a tuning scale calibrated in equal divisions of 0-100 or 0-180, and then to keep a log of the settings for the more important stations. In the same way, if the makers do not give definite inductance values for the



*A large, easy-to-read tuning dial which is fitted to certain 1936 McMichael receivers.*

long- and medium-wave windings of the coils to be used, it is practically useless to attempt to employ a ready-made wavelength-calibrated scale.

## Coil Values

It is interesting to observe that most coil manufacturers are now standardising their coils with inductance values of 157 and 2,200 microhenries, and it can be taken for granted that any modern condenser of reputable make will have vanes which are shaped to follow the same "law." At the same time, however, there are still quite a few whose long-wave inductance is 1,900 microhenries. Thus, if a condenser and drive intended for use with coils of the more usual values were used the wavelength calibration would be entirely "out" on long waves, although perfectly satisfactory on the lower waveband. There are several wavelength-calibrated drives available which are intended for 157-1,900 microhenry coils.

The above remarks apply to aerial and normal intervalve coils only, and the position is completely different when the oscillator coil of a superhet is considered. This generally has inductance values of 126 and 1,056 microhenries when the intermediate frequency is 110 kilocycles, or 85 and 300 microhenries for an I.F. of 465 kilocycles. This is of little consequence in practice, however, provided that the oscillator coil chosen is of the same make as the other coils in the set, and designed for use with them. In this case it is necessary only to consider the inductance values of the other coils, and to be sure that the ganged tuning condenser is designed for the same I.F. as are the coils, when choosing the drive.

When any doubt exists regarding the exact suitability of the coils, condenser and scale, it is well to be on the safe side by obtaining a scale which is marked in both wavelengths and degrees; if then the wavelength scale does not track-up correctly it can be ignored and the other scale used. There is a large number of scales of this type, so that no difficulty need exist in making a choice.

## Preliminary Adjustments

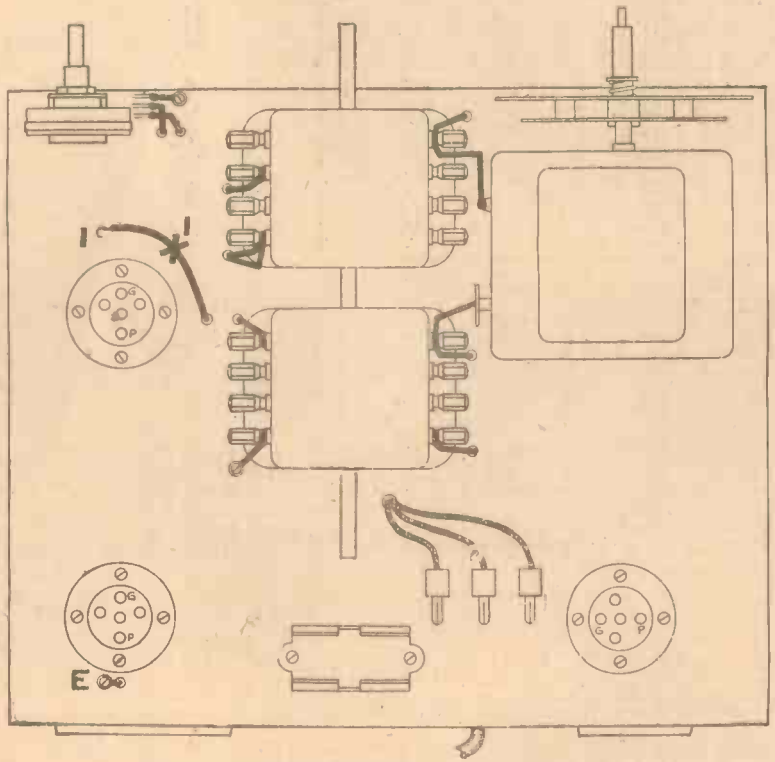
Even when all of the precautions mentioned above have been carefully observed it is necessary to make preliminary adjustments to the trimmers of the gang condenser. In doing this it is best to tune to a station of known wavelength, and fairly near to the bottom of the medium-wave range, and then to vary the trimmers little by little until the reading agrees with the known wavelength. As an example of what is meant, suppose that the station is working on 270 metres and the scale reading is 275 metres, the trimmer screws must be turned down slightly, so as to increase the capacities. As these capacities are increased the wavelength pointer can gradually be moved down to the correct reading. After the desired result has been obtained, the readings should be checked on two or three other transmissions on higher wavelengths. Due to unavoidable stray capacities and the like, it might eventually be found necessary to make a slight compromise with regard to the actual readings if they are to be as nearly as possible accurate over the full range.

As a final word it should just be mentioned that in attaching the drive (with scale) to the condenser spindle it should be ascertained that the condenser vanes are really "full-out" when the scale pointer is at the lowest reading.

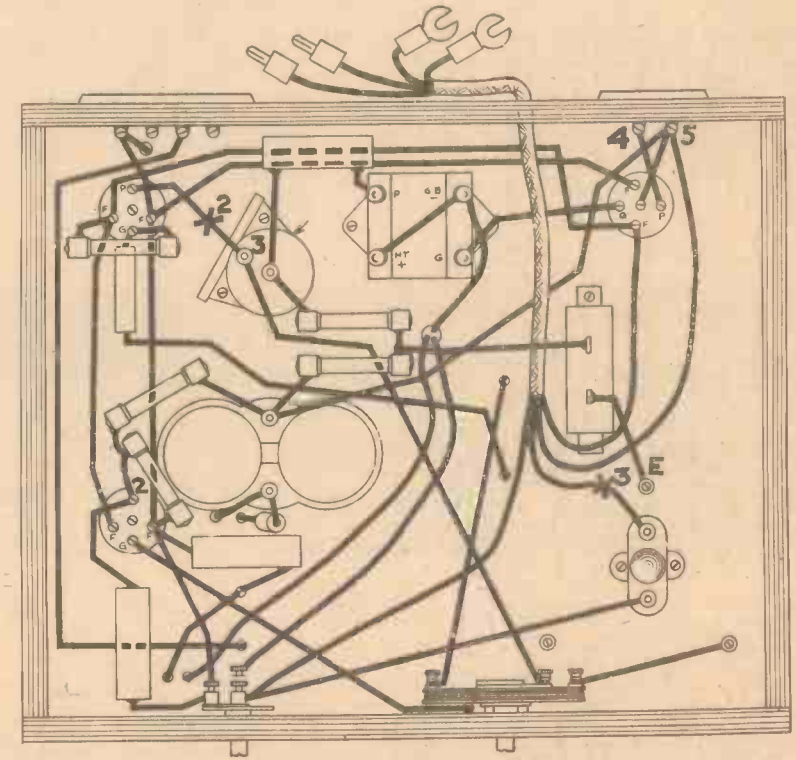
If it is found that the readings appear evenly disposed, but incorrectly ranged throughout the complete scale, the dial may be refitted to bring them into correct alignment. One dial on the market has slots cut.

*The popular J.B. "Airplane" drive which is calibrated in wavelengths from 200 to 500 and 800 to 2,000 metres.*

# Practical and Amateur Wireless SERVICE DATA SHEET No. 8 FOR THE SUMMIT THREE




Top of Chassis View




Underside of Chassis

## Approximate Voltage Readings

Voltmeter —to E

„ +to 1=120 volts.
„ +to 2= 55 volts.
„ +to 3= 60 volts.
„ +to 4=115 volts.
„ +to 5=120 volts.

## Approximate Current Readings

Milliammeter connected at × 1=2 m.A.
„ „ „ × 2=1½ m.A.
„ „ „ × 3=8½ m.A.

## Approximate Resistance Readings

Coils

Ohmmeter connected across 1 and 4=1.2 ohms (med. wave)
Ohmmeter connected across 1 and 4=8 ohms (long wave)
„ „ „ 8 and 4=14 ohms (long wave)
„ „ „ 8 and 4=1.3 ohms (med. wave)

L.F. Transformer

Ohmmeter connected across P and HT=600 ohms
„ „ „ G and GB=3,500 ohms

## REPLIES IN BRIEF

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

**D. W. (Gateshead).** The issue in question is now out of print, but the blueprint (AW388) may still be obtained.

**D. D. (Edinburgh).** We regret that we have no knowledge of local shops, but the wire could be obtained direct from Messrs. Ormiston, Clerkenwell Road, London, E.C.

**G. S. U. (Tottenham).** The H.F. pentodes would no doubt prove well worth obtaining and preferable to the S.G. valves for this particular set. Those of the variable-mu type are to be preferred, and if the circuit does not include variable bias arrangements it should be modified to include this refinement.

**J. B. (Glasgow).** There may be interaction between wires or chokes, and this should be the first point to receive attention. The wrong voltages will also cause the trouble, and careful decoupling is necessary.

**W. H. R. (Merton).** We would recommend the Hall-Mark Four or the 1936 Sonotone.

**D. A. E. (Dungannon).** You did not enclose the stamped envelope. You do not appear to have a suitable short-wave condenser, but we would suggest that you construct one of the receivers described in our short-wave section from time to time. We have no blueprint which will exactly suit your requirements.

**T. B. B. (Bognor Regis).** We regret that we have not published constructional details of headphones or loud-speakers. It is not possible accurately to test valves with headphones, although these could be used in conjunction with other apparatus for the purpose. We would refer you to the recently published articles under the Beginner's Supplement, entitled "Testing Your Own Valves."

**H. B. (Birkby).** You did not enclose the sample of wire. Any size of former may be used, although for the ultra-short ranges a small diameter must be used in order that the small quantity of wire may be employed. The size of the reaction condenser will depend upon the coil details, but a value of .0001 to .0003 mfd. will be found quite suitable.

**A. S. (Market Drayton).** You can either fit another similar coil to convert the tuning into band-pass, or alternatively fit a wave-trap device so as to cut out the unwanted stations. The latter will probably prove most suitable, as it will avoid large signal losses, which might be incurred if you endeavour to adopt the band-pass arrangement with the existing type of coil.

**H. J. F. (Chingford).** In our series entitled "Making Your Own Components," descriptions were given for making a screened dual-range coil, and this will probably suit your requirements. The particular issue describing this coil is dated Jan. 26th. 1935.

**H. G. (Plymouth).** The L.F. circuit could be broken, but you must avoid a voltage surge in the last stage as a pentode valve is fitted. It would be preferable to switch off before making the change.

**F. E. W. (Manchester).** The circuit cannot work as sketched by you. There is no H.T. in the first valve circuit, the condenser C3 effectively blocking the D.C. supply. Was this a mistake in the drawing, or is this condenser actually wired in the circuit?

**G. U. (Balham).** The choke could be constructed quite easily. A glass tube will prove most efficient and an old test tube is easily obtainable. Use 50 to 100 turns of 24 D.C.C. wound evenly in the centre of the tube.

**C. T. A. (W.C.1).** A tone control would be most practicable and could be cut out of circuit when gramophone record reproduction is desired. The range of control will depend upon your particular requirements. Details have been given in our pages of various tone control circuits.

**M. O. (Godalming).** Write to the makers of the receiver concerning the fault. Even if the guarantee period has expired, the fault should not exist in a good receiver and you will probably find that some important component has broken down. We cannot advise readers concerning modifications to commercial receivers.

**R. A. E. (Berwick).** A loose valve would cause the fault. If the valve is of an old pattern, open the valve legs slightly. The valve holder may have become weakened through continual plugging-in and removing of the valve.

**P. S. (Blackheath).** One valve would not be sufficient. You would require at least three L.F. stages, and to develop sufficient volume a high-power mains valve should be employed in the last stage. At least 10 watts would be necessary.

**G. K. (Farnborough).** Your scheme seems highly practicable, and we would suggest that you communicate with one of the well-known component manufacturers who may be interested in your idea.

**G. W. R. A. (Worcester).** There is no mistake in the diagram. You have overlooked the fact that the bias resistance is only effective on gramophone as the pick-up is then joined between grid and earth, whereas on radio the grid leak is joined direct to the cathode.

**T. Y. (Donegal).** An electrolytic condenser could be used with safety. The voltage is low, and therefore you could obtain one of the high capacity condensers having a value of, say, 25 or 50 mfd.

**F. U. P. (Norbiton).** We have dealt with the subject on many occasions, and will no doubt repeat the information in due course.

# LETTERS FROM READERS

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

All letters must be accompanied by the name and address of the sender (not necessarily for publication).

## Our Data Sheets

SIR,—Being an old reader of your journal, I wish to say what a splendid help the weekly data sheet is. I think, however, that it could be improved still further by adding a theoretical drawing, and showing by means of numbers and crosses where the tests should be made. By this means, readers could gain valuable ideas, which could be applied to any set, and I am sure that there must be a great many readers beside myself who are more familiar with theoretical diagrams than pictorial ones.—F. MONSTEVENS (Birmingham).

## Schoolboy Designers

DEAR THERMION,—You have written a good deal on the subject of schoolboy designers. I know a boy of eighteen, just left school, who designed and built a complete talkie outfit, including quality amplifier; I have not actually seen this apparatus, but people who have done so declare the reproduction to be excellent.

I myself am fifteen years of age, and claim to be a designer in a small way myself. I enclose the circuit (not reproduced) of my present set, which I built to run off a 120-volt lighting plant—hence the four output valves, as I wanted good quality, but decided that batteries or a converter would be a nuisance. The set is fairly straightforward except for the detector stage, which is, to say the least, unusual. I have tried the triode portion of the 13DHA as a power grid detector; but it overloaded more easily than it does as a pure L.F. amplifier, and seemed no more sensitive than the diode. Also quality was not so good. A.V.C. is provided by the second diode, and seems quite effective—the delay voltage is provided by the 13DHA's cathode bias resistance.

The coils are Colvern Ferrocart G10, G13, G14. An output of 2-3 watts is obtained, with good quality and plenty of stations with fair selectivity.—R. F. HILL (Alton).

## Logged on the 40-m. Band

SIR,—Having read various reports of S.W. reception in your excellent paper, I submit a list of some of the stations I have received on the 40-m. band during the last few days:—

G6GO, G2WR, G5KJ, G5CG, G6FH, G5GO, G5GL, G6LD, G5ZJ, G5WW, G2MI, G6IF, G5PW, G2SS, G6NY, G6GL, G6LX, F8JT, G6HV, G2AO, G2NJ, G6UD, G5DH, G5QB, G5VD, GI5MZ, G5BW, G5PH, G5ML, G6UD, G5KJ, G5JL, G5PT, G2KC, G2XC, G5PB, G2OV, G2AV, G5MM, G2ZD, PAODK, G5BP, G2ZT(?), G2KV, G5JW, G6PK, G2IC, G5GI, G2LU, G6WU, G2YV, G6YU, G5NQ, G6DH, and DJC.

My receiver is a two-valver (det. + pen.) It is an "all-waver" capable of working the L.S. at quite good volume. It has separate S.W. and broadcast tuning condensers, both fitted with slow drives, and has band-spread reaction. I hope these remarks will be of interest to other readers.—W. H. GEORGE (Haverfordwest).

## "P.W." Articles Broadcast

SIR,—I recently found another use for PRACTICAL AND AMATEUR WIRELESS. From 20,00 to 21.00 hours B.S.T. I listened to G6LX of Peterborough, Northamptonshire on 40 metres, testing "for interference on broadcast receivers," by reading from your excellent journal.

First: "Realistic Reproduction and its Problems—No. 2," from the issue of Sept. 21st, following the "Nonsense about Rays," by F. J. Camm; "Quality: New aids to ideal Reproduction," and finally ending with "Voltage Tests," from "Our Service Data Sheets" of Sept 14th. I'm sure no better reading material could have been used by G6LX: I certainly admire his choice.—ERNEST J. LOGAN (Hertford).

## Jamming on the 40-m. Band

SIR,—In a recent issue of PRACTICAL AND AMATEUR WIRELESS I saw a letter from Mr. A. W. Mann, of Middlesbrough, and I should also like to say a few words about the 40-m. wave-band. My set is an all-wave straight three, an old set turned into a short-wave receiver by fitting an all-wave coil. The 40-m. wave-band stretches on my dial from 90 to 120. On Sunday, October 6th, at 11.30 a.m. to 12 noon, I received the following stations at R7 to R8.

G6DL, G6DH, G6PP, G6PK, G6SR, G6AH, G5PP, G5MR, G5JW, G5RO, G5IS, G5KA, G5MC, G5QB, G2IC, G2FC, G2OU, G2WD, G2MI, G2IP, G2XC, and G2AC. Now, how can any more stations get in without getting jammed? Twenty-two stations between 90 and 120 on the dial, in half an hour at R7 or R8. I quite agree with Mr. A. W. Mann, there certainly is something wrong.—A. E. MILLINCHIP (Hartlebury).

CUT THIS OUT EACH WEEK

## Do you know

—THAT it is now possible to arrange a circuit which will automatically "tune" to a definite frequency.

—THAT the centre-tap from a heater winding on a mains transformer must be disconnected from earth if a hum-dinger is employed.

—THAT to avoid noises on short waves it is preferable to use an insulated earth lead.

—THAT in addition to the above precaution it is also worth while on the broadcast bands to avoid the earth wire touching other earthed bodies before entering the ground.

—THAT if noises arise when a receiver is subjected to vibration, an immediate examination should be made to locate the faulty connection.

—THAT if the above step is not taken some component may be damaged beyond repair, due to the intermittent contact.

—THAT a microphone should not be included direct in a grid circuit without the use of a transformer.

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

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

# RADIO CLUBS AND SOCIETIES

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

### THE RADIO PHYSICAL AND TELEVISION SOCIETY

ON Friday, October 18th, the annual general meeting of this Society was held. The chair was taken by Mr. J. Hobbs.

Mr. E. G. Nurse stated that owing to pressure of work he would be obliged to resign his post of Hon. Secretary. Mr. M. E. Arnold was then elected Hon. Secretary for the coming year, while Mr. W. G. Licence was elected to fill the post of Assistant Hon. Secretary. All the other officers were re-elected and Mr. Nurse was created Vice-President. The need for further members was stressed by the Chairman, who emphasised the exceptional facilities possessed by the Society.

Meetings are held at 72A, North End Road, West Kensington, on the first and third Fridays, and the next meeting will be on Friday, November 1st, at 8 p.m., when a lecture and demonstration will be given by Dr. C. G. Lemon and Mr. J. Hobbs on Micro-wave Reception and Transmission. Readers of PRACTICAL AND AMATEUR WIRELESS are cordially invited to attend, and are assured of an interesting evening. Further details can be obtained from the Hon. Sec. M. E. Arnold, 12, Nassau Road, Barnes, S.W.13.

### A.-A. R. and T. S. ELECTRIC ORCHESTRA

THE newly-formed Anglo-American Radio and Television Society Electric Orchestra will be heard for the first time at a private dance being held by the Society in Uxbridge near the end of November. The orchestra comprises all-electric instruments. It is hoped to shortly broadcast the orchestra from a continental station. On October 30th, the first meeting of the winter-session of the West Middlesex and East Bucks Branch of the Society will be held. A demonstration of a modern commercial receiver will be among the attractions. No charges are made for attending the meeting and those desiring to do so should write to Mr. Leslie W. Orton at "Kingsthorpe," Willowbank, Uxbridge, for details—kindly enclose stamped addressed envelope.

### THE CROYDON RADIO SOCIETY

"AMPHION," music critic of *The Croydon Advertiser*, lectured to the Croydon Radio Society in St. Peter's Hall, Ledbury Road, S. Croydon, on Tuesday, October 15th. Also present were members of the Short-Wave Radio and Television Society of Thornton Heath. The subject, "Intelligent Musical Listening," gave full scope for the lecturer's well-known provocative views. He deplored the fact that the wrong people, those of a low intellectual level, were deciding upon the standard of quality for a wireless receiver. After explaining why lowbrow was entertainment and highbrow art, he went on to insist that a piece of music must have shape or form. That was where jazz, represented by the "Rhapsody in Blue" must always fail. Its composer had strung a number of tunes together haphazardly, and thus it had no plot, character, or logical conclusion as a book would have. Moreover, it would fail because it had only one device, that of syncopation, leading to monotony on account of no variety.

"Amphion" thoroughly discussed Binary and Ternary form, illustrated by a record of Mozart's "Eine Kleine Nachtmusik," and, indeed, records illustrated many of his remarks. Not everyone agreed with them, however. A member of the Thornton Heath Society, in extolling jazz, said that no classical composer was of use for dance music. He was reminded of names like Strauss, Gungl and Archibald Joyce. On Tuesday, November 5th, Mr. M. Cumbers, member, is demonstrating his home-made acoustic gramophone. Hon. Sec. E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

### NORTH MANCHESTER RADIO SOCIETY

ON Friday evening, October 25th, at 8 p.m., a meeting of radio enthusiasts was held at the British Legion, Elms Street, Bury New Road, Whitefield, near Manchester. The Society proposed to hold meetings weekly at the British Legion, and at these meetings, besides assisting new-comers to radio, etc., lectures and demonstrations are to be given from time to time by representatives of various manufacturers. Also arrangements are to be made for members to visit places of interest such as Kearsley Power Station, Broadcasting House, Manchester, etc., etc. This Society is for the benefit of all radio enthusiasts in Manchester and surrounding districts, and the organisers hope that all will give their support in helping to make this new society a success. Particulars of membership fees, etc., can be obtained by sending three halfpence in stamps to Mr. R. Lawton, 10, Dalton Avenue, Thatch Leach Lane, Whitefield, near Manchester.

### DEPTFORD RADIO CLUB

A "WIRELESS CLUB" meets every Tuesday evening at 8 p.m., at The Deptford Men's Institute, Clyde St., Deptford, S.E.8, and all men interested in radio are cordially invited to join. This club is held in connection with the L.C.C. Evening Institute, and is under the direction of Mr. G. Edwards, G2UX, and will deal with Short-wave work as well as Broadcasting.—The subscription is a purely nominal one of 1s. 3d. for a session of three months.—G. Edwards (G2UX), Mem. R.S.G.B.

# CATALOGUES RECEIVED

### WATMEL WIRELESS CO., LTD.

MESSRS. WATMEL'S new season's list includes many old favourites, as well as certain new models, and the range includes wire-wound volume controls with linear or graduated windings; composition volume controls; dual controls; special heavy-duty variable resistors; an earthing clip, and an interesting inset which enables the relation between current, power, voltage drop and resistance value to be ascertained in a simple manner. The volume controls are obtainable with or without a combined switch, and the prices range from 3s. to 15s. 6d. The address is High Street, Edgware, Middlesex.

### CLIX CONNECTORS

NO constructor should be without the latest Clix lists, which describe and illustrate various small items without which no receiver is complete. There are, for instance, in addition to the well-known valve-holders of the chassis-mounting type, such small parts as aerial and earth socket strips; pick-up and loud-speaker socket strips; mains selector plates; plugs and sockets of various types (which, incidentally, may be obtained plain or with various markings engraved thereon). These lists may be obtained on application to Lectrolinx, Ltd., of 79a, Rochester Row, London, S.W.1.

### FULL O'POWER BATTERIES

THE special construction of the Full O' Power battery is largely responsible for its high standard of performance under all conditions. Full particulars of the complete range of these batteries suitable for battery set users are given in a compact little booklet (No. 667), issued by Siemens Electric Lamps and Supplies, Ltd., 38 and 39, Upper Thames Street, London, E.C.4. In the single capacity type there are two series, the "Cadet," which is suitable for modest sets requiring from 6 to 7 milliamps. of H.T. current, and the "Standard," designed for the more ambitious receiver taking up to 10 milliamps. Where space and weight are of little importance, there is the power and triple capacity series, which is recommended for a discharge rate of 10 to 20 milliamps. There is also the super radio battery intended for use where a discharge rate of from 15 to 30 milliamps is required. A novel feature of this booklet is the inclusion of the 1st League Football Fixtures for the season 1935/6.

# Practical and Amateur Wireless
# BLUEPRINT SERVICE

These blueprints are full-size. Copies of appropriate issues containing descriptions of these sets can in most cases be obtained as follows:—"Practical Wireless" at 4d., "Amateur Wireless" at 4d., "Practical Mechanics" at 7½d., and "Wireless Magazine" a 1/3, post paid. Index letters "P.W." refer to "Practical Wireless" sets, "P.M." to "Practical Mechanics" sets, "A.W." refer to "Amateur Wireless" sets, and "W.M." to "Wireless Magazine" sets. Send, preferably, a postal order (stamps over sixpence unacceptable) to "Practical and Amateur Wireless" Blueprint Dept., Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

## PRACTICAL WIRELESS.
### STRAIGHT SETS. Battery Operated.

| | Date of Issue | No. of Blueprint |
|---|---|---|
| **One-valve : Blueprints, 1s. each.** | | |
| All-Wave Unipen (pentode) | 14.10.33 | PW31A |
| **Two-valve : Blueprints, 1s. each.** | | |
| All-Wave Two (D, Pen) | — | PW28 |
| Four-range Super Mag. Two (D, Pen) | 11.8.34 | PW36B |
| **Three-valve : Blueprints, 1s. each.** | | |
| Bijou Three (SG. D, Pen) | 29.10.32 | PW5 |
| Argus Three (SG, D (pen), Pen) | 12.11.32 | PW6 |
| Solo Knob Three (D, 2 L.F. (trans.)) | 10.12.32 | PW8 |
| Selectone Battery Three (D, 2 L.F. (trans.)) | — | PW10 |
| Alpha Q.P.P. Three (D, Q.P.P.) | 25.3.33 | PW14 |
| Ferrocart Q.P.P. Hi-Mag Three (SG, D, Q.P.P.) | 25.3.33 | PW15 |
| Three-Star Nicore (SG, D (SG), Pen) | 24.6.33 | PW24 |
| Auto-B Three (D, LF, Cl. B) | — | PW27 |
| F.J.C. 3-valve A.V.C. (Transfer Print) (SG, D, Pow.) | — | PW32 |
| Sixty-Shilling Three (D, 2 L.F. (R.C. & trans)) | 2.12.33 | PW34A |
| Leader Three (SG, D, Pow.) | 3.3.34 | PW35 |
| Summit Three (HF Pen, D, Pen) | 18.8.34 | PW37 |
| All-Pentode Three (HF Pen, D (pen), Pen) | 22.9.34 | PW39 |
| Hall-Mark Three (SG, D, Pow.) | — | PW41 |
| Hall-Mark Cadet (D, LF, Pen (R.C.)) | 23.3.35 | PW48 |
| F. J. Camm's Silver Souvenir (HF Pen, D (pen), Pen) (All-Wave Three) | 13.4.35 | PW48A |
| Genet Midget (D, 2 LF (trans)) | *June* '35 | PM1 |
| Cameo Midget Three (D, 2 LF (trans)) | 8.6.35 | PW51 |
| 1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen) | 17.8.35 | PW53 |
| Battery All-wave Three (D, 2 LF (R.C.)) | 3.8.35 | PW56 |
| **Four-valve : Blueprints, 1s. each.** | | |
| Fury Four (2 SG, D, Pen) | — | PW11 |
| Beta Universal Four (SG, D, LF Cl. B) | 15.4.33 | PW17 |
| Radiopax Class B Four (SG, D, LF, Cl. B) | 27.5.33 | PW21 |
| Nucleon Class B Four (SG, D (SG), LF, Cl. B) | 6.1.34 | PW34B |
| Fury Four Super (SG, SG, D, Pen) | — | PW34C |
| Battery Hall-Mark 4 (HF Pen, D, Push Pull) | 2.2.35 | PW46 |
| **Five-valve : Blueprints, 1s. each.** | | |
| Superset (SG, SG, D, LF, Cl. B) | — | PW26 |

### Mains Operated.

| | | |
|---|---|---|
| **Two-valve : Blueprints, 1s. each.** | | |
| A.C. Twin (D (pen), Pen) | 22.4.33 | PW18 |
| A.C.-D.C. Two (SG, Power) | 7.10.33 | PW31 |
| Selectone A.C. Radiogram Two (D, Pow.) | 29.4.33 | PW19 |
| **Three-valve : Blueprints, 1s. each** | | |
| Mains Express Three (SG, D, Pen) | 8.10.32 | PW3 |
| Double-Diode-Triode Three (HF Pen, D.D.T., Pen) | 10.6.33 | PW23 |
| D.C. Ace (SG, D, Pen) | 15.7.33 | PW25 |
| A.C. Three (SG, D, Pen) | 16.9.33 | PW29 |
| A.C. Leader (HF Pen, D, Power) | 7.4.34 | PW35C |
| D.C. Premier (HF, Pen, D, Pen) | 31.3.34 | PW35B |
| Ibique (HF Pen, D (Pen), Pen) | 28.7.34 | PW36A |
| Armada Mains Three (HF Pen) D, Pen) | 18.8.34 | PW38 |
| F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen) | 11.5.35 | PW50 |
| "Allwave" A.C. Three (D, 2 LF (R.C.)) | 17.8.35 | PW54 |
| A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen) | 31.8.35 | PW56 |
| **Four-valve : Blueprints, 1s. each.** | | |
| A.C. Quadpack (SG, SG, D, Pen) | 2.12.33 | PW34 |
| A.C. Fury Four (SG, SG, D, Pen) | 25.2.33 | PW20 |
| A.C. Fury Four Super (SG, SG, D, Pen) | 10.2.34 | PW34D |
| A.C. Hall-Mark (HF Pen, D, Push-Pull) | — | PW45 |
| Universal Hall-Mark (HF Pen, D, Push-pull) | 9.2.35 | PW47 |

### SUPERHETS.

| | | |
|---|---|---|
| **Battery Sets : Blueprints, 1s. each.** | | |
| Supersonic Six (Six valve) | — | PW16 |
| Premier Super (Five valve) | 23.9.33 | PW30 |
| £5 Superhet (Three valve) | — | PW40 |
| F. J. Camm's 2-valve superhet (two valve) | 13.7.35 | PW52 |
| **Mains Sets : Blueprints, 1s. each.** | | |
| Luxus A.C. Superhet (four valve) | 14.10.33 | PW33 |
| A.C. £5 Superhet (three valve) | — | PW43 |
| D.C. £5 Superhet (three valve) | 1.12.34 | PW42 |
| Universal £5 Superhet (three valve) | 15.12.34 | PW44 |

## SHORT-WAVE SETS.

| | | |
|---|---|---|
| **Two-valve : Blueprints, 1s. each.** | | |
| Midget Short-wave Two (D, Pen) | 15.9.34 | PW38A |
| **Three-valve : Blueprints, 1s. each.** | | |
| Empire Short-wave Three (D, 2 LF (R.C. and Trans)) | — | PW7 |
| Experimenter's Short-wave Three (SG, D, Power) | 23.9.33 | PW30A |

### PORTABLES.

| | | |
|---|---|---|
| **Three-valve : Blueprints, 1s. each.** | | |
| Atom Lightweight Portable (SG, D, Pen) | 2.6.34 | PW36 |
| **Four-valve : Blueprints, 1s. each.** | | |
| Featherweight Portable Four (SG, D, LF, Cl. B) | 6.5.33 | PW12 |

### MISCELLANEOUS.

| | | |
|---|---|---|
| S.W. Converter-Adapter (1 valve) | 23.2.35 | PW48A |

## AMATEUR WIRELESS AND WIRELESS MAGAZINE.
### CRYSTAL SETS.

| | | |
|---|---|---|
| **Blueprints, 6d. each.** | | |
| Four-station Crystal Set | — | AW427 |
| 1934 Crystal Set | 4.8.34 | AW444 |
| 150-mile Crystal Set | — | AW450 |

### STRAIGHT SETS. Battery Operated.

| | | |
|---|---|---|
| **One-valve : Blueprints, 1s. each.** | | |
| B.B.C. One-valver | — | AW344 |
| B.B.C Special One-valver | — | AW387 |
| Twenty-station Loud-speaker One-valver (Class B) | — | AW449 |
| **Two-valve : Blueprints, 1s. each.** | | |
| Melody Ranger Two (D, Trans) | — | AW388 |
| Full-volume Two (SG, Det, Pen) | 17.6.33 | AW392 |
| Iron-core Two (D, Trans) | — | AW395 |
| Iron-core Two (D, Q.P.P.) | 12.8.33 | AW396 |
| B.B.C. National Two with Lucerne Coil (D, Trans) | — | AW377A |
| Big-power Melody Two with Lucerne Coil (SG, Trans) | — | AW338A |
| Lucerne Minor (D. Pen) | — | AW426 |
| Family Two (D, Trans) | — | WM278 |
| **Three-valve : Blueprints, 1s. each** | | |
| 8 Radiogram (D, RC, Trans) | — | AW343 |
| P.T.P. Three (Pentode-Triode-Pentode) | *June* '35 | WM389 |
| Class-B Three (D, Trans, Class B) | 22.4.33 | AW386 |
| New Britain's Favourite Three (D, Trans, Class B) | 15.7.33 | AW394 |
| Home-Built Coil Three (SG, D, Trans) | 14.10.33 | AW404 |
| Fan and Family Three (D, Trans, Class B) | 25.11.33 | AW410 |
| £5 5s. S.G.3 (SG, D, Trans) | 2.12.33 | AW412 |
| 1934 Ether Searcher: Baseboard Model (SG, D, Pen) | 20.1.34 | AW417 |
| 1934 Ether Searcher, Chassis Model (SG, D, Pen) | 3.2.34 | AW419 |
| Lucerne Ranger (SG, D, Trans) | — | AW422 |
| Cossor Melody Maker with Lucerne Coils | — | AW423 |
| P.W.H. Mascot with Lucerne Coils (D, RC, Trans) | 17.3.34 | AW337A |
| Mullard Master Three with Lucerne Coils | — | AW424 |
| Pentaquester (HF Pen, D, Pen) | 14.4.34 | AW431 |
| £5 5s. Three: De Luxe Version (SG, D, Trans) | 19.5.34 | AW435 |
| Lucerne Straight Three (D, RC, Trans) | — | AW437 |
| All Britain Three (HF Pen, D, Pen) | — | AW448 |
| "Wireless League" Three (HF Pen, D, Pen) | 3.1.34 | AW451 |
| Transportable Three (SG, D, Pen) | — | WM271 |
| Multi-Mag Three (D, 2 Trans) | — | WM288 |
| Percy Harris Radiogram (HF, D, Trans) | — | WM294 |
| £6 6s. Radiogram (D, RC, Trans) | *Apr.* '33 | WM318 |
| Simple-tune Three (SG, D, Pen) | *June*, '33 | WM327 |
| Tyers Iron-core Three (SG, D, Pen) | *July* '33 | WM330 |
| C.B. Three (D, LF, Class B) | — | WM333 |
| Economy-pentode Three (SG, D, Pen) | *Oct.* '33 | WM337 |
| All-wave Three (D. 2LF) | *Jan.* '34 | WM348 |
| "W.M." 1934 Standard Three (SG, D, Pen) | — | WM351 |
| £3 3s. Three (SG, D, Trans) | *Mar.* '34 | WM354 |
| Iron-core Band-pass Three (SG, D, QP21) | *June* '34 | WM362 |
| 1935 £6 6s. Battery Three (SG, D, Pen) | *Oct.* '34 | WM371 |
| Graduating to a Low-frequency Stage (D, 2LF) | *Jan.* '35 | WM378 |
| **Four-valve : Blueprints, 1s. 6d. each.** | | |
| 65/- Four (SG, D, RC, Trans) | — | AW370 |
| "A.W." Ideal Four (2SG, D, Pen) | 16.9.33 | AW402 |
| 2 H.F. Four (2SG, D, Pen) | — | AW421 |
| Crusaders' A.V.C. 4 (2 HF, D, QP21) | 18.8.34 | AW445 |
| (Pentode and Class-B Outputs for above: blueprints 6d. each) | 25.8.34 | AW445A |
| Quadradyne (2SG, D, Pen) | — | WM273 |
| Calibrator (SG, D, RC, Trans) | *Oct.* '32 | WM300 |
| Table Quad (SG, D, RC, Trans) | — | WM303 |
| Calibrator de Luxe (SG, D, RC, Trans) | *Apr.* '33 | WM316 |
| Self-contained Four (SG, D, LF, Class-B) | *Aug.* '33 | WM331 |
| Lucerne-Straight Four (SG, D, LF, Trans) | — | WM350 |
| £5 5s. Battery Four (HF, D, 2LF) | *Feb.* '35 | WM381 |
| The H.K. Four | *Mar.* '35 | WM384 |
| **Five-valve : Blueprints, 1s. 6d. each.** | | |
| Super-quality Five (2HF, D, RC, Trans) | *May* '33 | WM320 |
| New Class-B Five (2SG, D, LF, Class-B) | *Nov.* '33 | WM340 |
| Class-B Quadradyne (2SG, D, LF, Class-B) | *Dec.* '33 | WM344 |
| 1935 Super Five (Battery Superhet) | *Jan.* '35 | WM379 |

### Mains operated.

| | | |
|---|---|---|
| **Two-valve : Blueprints, 1s. each.** | | |
| Consolectric Two (D, Pen) A.C. | 23.9.33 | AW403 |
| Economy A.C. Two (D, Trans) A.C. | — | WM286 |
| **Three-valve : Blueprints, 1s. each.** | | |
| Home-lover's New All-electric Three (SG, D, Trans) A.C. | — | AW383 |
| S.G. Three (SG, D, Pen) A.C. | 3.6.33 | AW390 |
| A.C. Triodyne (SG, D, Pen) A.C. | 19.8.33 | AW399 |
| A.C. Pentaquester (HF, Pen, D, Pen) A.C. | 23.6.34 | AW439 |
| D.C. Calibrator (SG, D, Push-pull Pen) D.C. | *July* '33 | WM328 |
| Simplicity A.C. Radiogram (SG, D, Pen) A.C. | *Oct.* '33 | WM338 |
| Six-guinea A.C./D.C. Three (HF Pen, D, Trans) A.C./D.C. | *July* '34 | WM364 |
| Mantovani A.C. Three (HF Pen, D, Pen) A.C. | *Nov.* '34 | WM374 |
| **Four-valve : Blueprints, 1s. 6d. each.** | | |
| A.C. Melody Ranger (SG, DC, RC, Trans) A.C. | — | AW380 |
| A.C./D.C. Straight A.V.C.4 (2 HF, D, Pen) A.C./D.C. | 8.9.34 | AW446 |
| A.C. Quadradyne (2 SG, D, Trans) A.C. | — | WM379 |
| All Metal Four (2 SG, D, Pen) | *July* '33 | WM329 |
| "W.M." A.C./D.C. Super Four | *Feb.* '35 | WM382 |
| Harris Jubilee Radiogram | *May* '35 | WM386 |

### SUPERHETS.

| | | |
|---|---|---|
| **Battery Sets: Blueprints, 1s. 6d. each.** | | |
| 1934 Century Super | 9.12.33 | AW413 |
| Super Senior | — | WM256 |
| 1932 Super 60 | — | WM269 |
| Q.P.P. Super 60 | — | WM319 |
| "W.M." Stenode | *Oct.* '34 | WM373 |
| Modern Super Senior | *Nov.* '34 | WM375 |
| **Mains Sets: Blueprints, 1s. 6d. each.** | | |
| 1934 A.C. Century Super, A.C. | 10.3.34 | AW425 |
| 1932 A.C. Super 60, A.C. | — | WM272 |
| Seventy-seven Super A.C. | — | WM305 |
| "W.M." D.C. Super, D.C. | *May* '33 | WM321 |
| Merrymaker Super, A.C. | *Dec.* '33 | WM345 |
| Heptode Super Three, A.C. | *May* '34 | WM359 |
| "W.M." Radiogram Super, A.C. | *July* '34 | WM366 |
| "W.M." Stenode, A.C. | *Sep.* '34 | WM370 |
| 1935 A.C. Stenode | *Apl.* '35 | WM385 |

### PORTABLES.

| | | |
|---|---|---|
| **Four-valve : Blueprints, 1s. 6d. each.** | | |
| General-purpose Portable (SG, D, RC, Trans) | — | AW351 |
| Midget Class-B Portable (SG, D, LF, Class B) | 20.5.33 | AW389 |
| Holiday Portable (SG, D, LF, Class B) | 1.7.33 | AW393 |
| Class B) | 1.7.33 | AW393 |
| Family Portable (HF, D, RC, Trans) | 22.9.34 | AW447 |
| Town and Country Four (SG, D, RC, Trans) | — | WM282 |
| Two H.F. Portable (2 SG, D, QP21) | *June* '34 | WM363 |
| Tyers Portable (SG, D, 2 Trans) | *Aug.* '34 | WM367 |

### SHORT-WAVERS. Battery Operated.

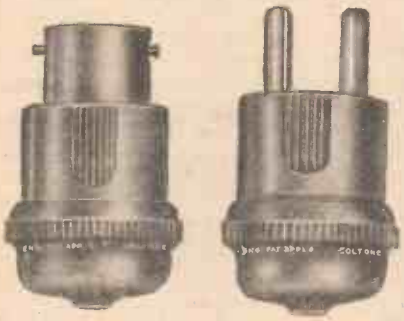
| | | |
|---|---|---|
| **One-valve : Blueprints, 1s. each.** | | |
| S.W. One-valve | — | AW329 |
| S.W. One-valve for America | — | AW429 |
| Roma Short-waver | 10.11.34 | AW452 |
| **Two-valve : Blueprints, 1s. each.** | | |
| Home-made Coil Two (D, Pen) | 14.7.34 | AW440 |
| **Three-valve : Blueprints, 1s. each.** | | |
| World-ranger Short-wave 3 (D, RC, Trans) | — | AW355 |
| Experimenters' 5-metre Set (D, Trans, Super-regen) | 30.6.34 | AW438 |
| Experimenter's Short-waver | *Jan.* 19, '35 | AW463 |
| Short-wave Adapter | *Dec.* 1, '34 | AW456 |
| Superhet, Converter | *Dec.* 1, '34 | AW457 |
| The Carrier Short-waver | *July* '35 | WM390 |

# Facts & Figures

## COMPONENTS TESTED IN OUR LABORATORY

### The "Presto" Plug Adaptor

A NEW type of combined plug and two-pin adaptor has been produced by Messrs. Ward and Goldstone, and is shown in its two forms on this page. Unlike previous models of this combination device there are no parts to be detached or reversed and the change from one type of connector is carried out by a simple part rotation of the upper portion of the connector. The two metal contacts on the lamp-holder plug are slotted and the two pins run in these slots and are carried in the upper portion of the connector. A



*The new "Presto" plug adaptor, on the left as a lamp connector, and on the right in its alternative form as a two-pin plug.*

quick thread is cut on the smaller part of the connector and the upper portion turns over it, thus withdrawing the plug portion and leaving the two pins protruding. This is a very handy device and should be fitted to all ordinary electrical apparatus to facilitate its use with either the standard lamp-holder or the standard 5-amp. socket. The body is finished in bakelite and may be obtained in brown, walnut or ebony finish, and an efficient cord grip is fitted. The price is 10s. per dozen.

### Hivac Midget Valves

SOME confusion has arisen regarding the price of the recently-introduced Midget valves in the Hivac range, and we are therefore giving below the latest prices of all of the Midgets, to the various types of which an output pentode has now been added. The complete range, with prices, therefore, consists of an S.G. Type XSG—a screen-grid valve—costing 15s. 6d. Type XL—a medium-impedance triode—costing 10s. 6d. Type XD—a triode designed especially for detection purposes—costing 10s. 6d. Type XP—a low-impedance triode designed for small power outputs—costing 12s. 6d. Type XY—an output pentode designed for a load of 25,000 ohms—costing 15s. 6d.

It should be noted that the design of these Midget valves renders them suitable for use in short-wave receivers and to reduce losses in this type of receiver it is possible to obtain these valves (with the exception of Type XY) with bases of Frequentite in place of the usual bakelite. If, therefore, you desire the valves for this purpose you should make a point, when ordering, of specifying the special short-wave base.

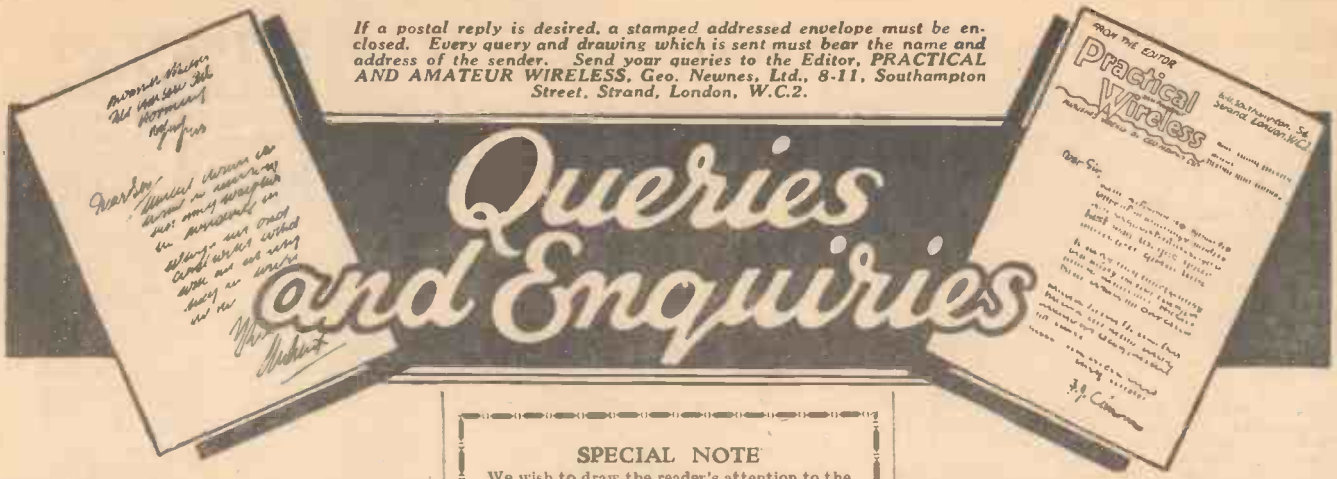
### Eddystone Quench Coil

MANY listeners prefer the super-regenerative type of receiver for short-wave work, especially for reception on wavelengths of 7 metres and below. There are certain advantages to be obtained from this type of circuit, and in many cases the amateur winds his own quench coils. A special unit has, however, now been produced by Messrs. Stratton for use in this type of circuit, and it consists of the two essential quench coils mounted on a special base. The coils are wound on the honeycomb principle, spaced ¼in. apart, on a small diameter paxolin former. This is mounted on a special base which may be screwed to the baseboard of the receiver, whilst permitting the paxolin former to be moved into any desired position from vertical to horizontal. Thus unwanted coupling effects may be entirely removed and screening is unnecessary. The ends of the coils are brought out to soldering lugs projecting from the ends of the tube, and if used as a grid coil it should be tuned with a condenser of .006 mfd. maximum capacity, when the quenching frequency will be found to be approximately 20 kc/s. The price of this useful unit is 4s. 6d.

### Raymart Aerial Accessories

SOME useful short-wave aerial devices may be obtained from the Radio Mart of 19, John Bright Street, Birmingham. In addition to the usual type of glass insulator, priced at 4d. each, there are transposition blocks made from a ceramic material sold in sets of ten at 4s. 6d., or singly at 6d. each. For the construction of the Zeppelin type of aerial a special "T" piece made from glazed porcelain may be obtained for 1s. and for leading-in purposes there are some useful bushes made from similar material. A single hollow bush with an air-spaced O.B.A. conductor heavy enough to obviate losses or danger in carrying voltages up to 10,000 and currents up to 20 amps. costs 1s. 6d., and other types of bush are obtainable with single or double-cone ends at 1s. 3d. and 1s. 9d. respectively. There are numerous other short-wave components in the complete Raymart range and these will be fully illustrated and reviewed in later issues.

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




### Acid Corrosion

**"I find great difficulty in keeping my leads to the accumulator in good condition. After the battery is returned from the charging station I put on the leads, and before the battery is ready for charging again I find that the volume has gone, and when I take off the leads they fall to pieces at the end and have gone all green. Is this always the case, and if not, how can I stop it?"—Y. W. F. (Bognor).**

YOU are presumably using ordinary flex and placing the bare ends round the terminals. Furthermore, the terminals are probably loose where they are supposed to be locked into the top plate of the battery. Adopt the following procedure. Carefully clean all the top parts of the battery, taking the terminals apart if necessary. Scrape off all verdigris, and make certain that the bush which passes through the accumulator top is quite tight. Wipe dry, and fit to the ends of your L.T. leads the special lead connectors which may be obtained from any good wireless store. Use either clips, or spade ends, but make certain they are of lead or lead-coated. Clamp these tightly under the terminal heads and then smear all the metal with vaseline, when we are sure you will experience no further difficulty.

### Loud-speaker Adjustment

**"I have an old balanced armature speaker and find it difficult to keep the adjustment at the most sensitive point. As I turn the adjusting screw it gets more sensitive until there is a click and it sticks, and I have to make several turns in the opposite direction to get it unstuck, when I have to start again to get the best point. In this way it takes some minutes to get the best position, which is just before it sticks. Is there any way to prevent this?"—S. K. O. (Upper Clapton).**

WITHOUT knowing the exact type of speaker it is difficult to state an exact cure. With some speakers the dodge of sticking a piece of fairly thick paper on the armature so that it will not stick to the magnet may be found to prevent the trouble. In others, the small spring which is used to hold the armature away from the magnet may be found to have weakened. Again, the cone may have become limp or weak due to continued use, and the resistance formerly offered by it may now be insufficient to hold the armature at the best point. Our recommendation is to dispose of the speaker and obtain a more modern design, when we feel sure you will find that the improved reproduction will be well worth the expense of the new model. A modern moving-coil speaker will handle a much greater signal than the model you have, and at the same time will give much better quality.

**SPECIAL NOTE**

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

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

(2) Suggest alterations or modifications of receivers described in our contemporaries.

(3) Suggest alterations or modifications to commercial receivers.

(4) Answer queries over the telephone.

(5) Grant interviews to querists.

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

### The two-valve Superhet

**"I am about to build the 2-valve superhet described in July by you, but am not sure on some points. Would you please tell me if the L.F. transformer has a ratio of 1 : 1 and if the resistances are of the 1 watt type? Also is it possible to use a pick-up on this receiver and, if so, where to connect the leads?"—H. K. (Egham).**

THE transformer may have a ratio of either 3 or 5 to 1, the latter ratio giving the greater signal strength. This fact must be decided in conjunction with the type of pick-up which you intend to use. It is important to remember that there is only a single L.F. stage in this circuit, and, consequently, there is very little amplification for gramophone pick-up work. At the most the signals will be very weak, and therefore, if you intend to make use of a pick-up, a highly sensitive instrument should be obtained, and it should be joined across the primary of the L.F. transformer to obtain the additional step-up so provided. It will have to be cut out of circuit when radio reception is required, as this particular circuit is of the reflex type. The resistances are all of the 1 watt type.

### Reflexing a Valve

**"Would it not be possible to make use of the old-time reflex arrangement to obtain a small set of the modern type? I have been experimenting with a set of this nature and have obtained a superhet using only three valves, and should like to know whether you would be interested in details to pass on to your readers."—G. T. (Tonbridge).**

WE are afraid you are rather out of date with modern developments, as you will see on referring to various back numbers of this periodical that we have already given details concerning the use of the reflex circuits in modern receiver design, and have, in addition, given complete constructional details of a superhet receiver in which only two valves were employed. However, if there is any novelty in your circuit we should certainly be interested in details of it.

### Short-wave Coils and Circuit

**"Could you supply information regarding date of any issue of your journal excepting that published January 14th, 1933, supplying details of construction for simple plug and socket short-wave coils with suitable circuit for same."—R. W. M. (Crewe).**

WE have given various constructional details for plug-in coils of the short-wave type, but not giving at the same time a complete receiver circuit for use with them. The coils may, of course, be wound to provide any particular combination, and it should not be difficult to arrange for any type of coil to provide either for a loose-coupled aerial coil or a tapped coil, and a separate reaction coil having variable coupling. The various articles which are given in our Short-wave Section will help you in this direction.

**The coupon on page 227 must be attached to every query.**

# Miscellaneous Advertisements

**Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.**

## RECEIVERS, COMPONENTS AND ACCESSORIES

**Surplus, Clearance or Secondhand, etc.**

## PREMIER SUPPLY STORES

ANNOUNCE a City Branch at 165 and 165a, Fleet Street, E.C.4 (next door to Anderton's Hotel), for the convenience of callers; post orders and callers to High Street, Clapham.

OFFER the following Manufacturers' Unused Goods at a Fraction of the Original Cost; all goods guaranteed perfect; carriage paid over 5/-, under 5/- postage 6d. extra; I.F.S. and abroad, carriage extra; orders under 5/- cannot be sent C.O.D.; please send 1½d. stamp for large new illustrated catalogue, also November bargain supplement.

WORLD Famous Continental Valve Manufacturer; mains types, 4/6 each, H.L., L., power; high and low magnification, screen grid; variable Mu screen grid; 1, 3, and 4 watt A.C. output, directly heated pentodes; V.H.P., D.D.T. Diode Tetrodes, 250 volt 60 m.a. full wave rectifiers; A.C., D.C. types, 20 volts, 0.18 amp. filaments; screen grid; variable Mu screen grid; H., H.L., power and pentodes.

THE following Types, 5/6 each: .350 v., 120 m.a. full wave rectifiers, 500v. 120 m.a. full wave rectifiers, 2½ watt indirectly heated pentodes.

2-VOLT H.F., L.F., 2/3; power, low consumption power, super power, 2/9; screened grid, variable mu screened grid, 5- or 4-pin pentodes H.F. Pen., V.M., H.F. Pen., 5/-.

THE following American Types, 4/6; 250, 210, 245 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 27, 77, 78, 2A5, 281. All other types, 6/6.

B.T.H. Moving Coil Speakers, matched pairs, 8in. 1,500 ohms. 7,500 ohms (1,500 speaker as choke 7,500 speaker in parallel with H.T. supply), with output transformer for pentode, 15/6 per pair; A.C. kit for pair, 12/6.

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

A LARGE selection of Pedestal, table and radio-gram cabinets at a fraction of original cost.

BLUE-SPOT 29P.M., P.M. Moving Coil multi-ratio transformers, 15/-; handles 4 watts. Sono-chorde ditto, 10/6.

ELIMINATOR kits, condensers, resistances and diagrams, 120v. 20 ma., 20/-; Trickle charger, 8/- extra, 150v. 30 m.a. with 4v. 2-4 amp. C.T., L.T., 25/-, trickle charger, 6/6 extra; 250v. 60 milliamps, with 4v. 3-5 amps., C.T., L.T., 30/-; 300v. 60 m.a. with 4 volts 3-5 amps., 37/6; 200v. 50 m.a., with 4v. 3-5 amps. L.T., 27/6.

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

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

COLLARO Gramophone Unit, consisting of A.C. motor 200-250v. high quality pick-up and volume control, 45/-. Motor only, 35/-.

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

WIRE Wound Resistances, 4 watts, any value up to 50,000 ohms, 1/-; 8 watts, any value up to 100,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

MAGNAVOX 144, 15/-, 144 Magna, 25/-, 152, 17/6, 152 Magna, 37/6, 154, 12/6, Dual-Matched Pairs D.C. 144/152, 32/6. Ditto Magna, 62/6. A.C. Energis-ing Kit to suit any of above, 10/-, all 2,500 ohms. P.M. 7 inch, 16/6, P.M. 9 inch, 22/6. State transformer required.

12 TO 2,000 Metres without Coil Changing; huge purchase of Lissen all-band 2-gang screened coils, suitable for screen grid, H.F. stage (tuned) screened grid detector type receiver, complete circuit supplied, 12/6.

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

POTENTIOMETERS by Best Manufacturers, 200, 350, 500, 1,000, 2,500, 5,000, 8,000, 10,000, 15,000, 25,000, 50,000, 100,000, 250,000, 500,000, 1 meg., 2/-; 5,000, 10,000, 15,000, 100,000 with mains switch, 2/-.

1,000 OHM, 150 milliamp, Semi-variable resist-ance, 2/-; 1,000 ohm, 250 milliamp, tapped for any number, .18 valves, 3/6; 800 ohms. 350 m.a., tapped, 2/-.

COSMOCORD pick-ups with Arm and Volume Control, wonderful value, 10/6.

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

RELIABLE Soldering Irons, 200/250 volts, .2 amps. 2/6 each.

PREMIER short-wave tuning condensers (S.L.F.) complete ceramic insulation, silver-sprayed brass vanes, noiseless pigtail, .00015, .00016, .0001, 2/9. Double spaced, .00005, .000015, .000025, 3/- each.

BRASS reaction condensers (S.L.C.) with integral slow-motion, 2/9. Mica condensers, .00002, .00005, 6d.

PREMIER short-wave coils with circuit, 4- and 6-pin type, set of 4, 13-170 metres, 7/-, for either type. Low-loss formers, 4- and 6-pin ribbed, 1½inch diameter, 1/-. Short-wave valve holders, 4-, 5- and 7-pin, baseboard, 10d.; chassis, 6d.

ELECTROLYTIC Condensers T.C.C., 8mf. 440v., 3/-; 550v., 4/-; 15 mf. 50v., 1/-; 15 mf. 100v., 1/-; 15 mf. 12v., 1/-; Dubilier 4 or 8mf. 550v., 3/-; 8 plus 4 500v., 4/-; 50v. 50mf. 1/9; 12mf. 20v., 6d.

U.S.A. 4, 8, or 12mf. 550v., 1/9; 100 mf. 12v., 1/3; 2,000 mf. 12v., 6/-; 8+4 mf. 500v., 2/3; 4+4 mf., 2/-.

PAPER Condensers. Dubilier 4mf. 500v. working, 4/-; ditto 700v., 5/-; ditto, 800v., 6/-; Western Electric, 250v., working 1 mf., 6d.; 2 mf., 1/-; 4 mf., 2/-; 1 mf. 2,000 v., working, 3/-.

CONDENSER Blocks 250v. working various taps. 6mf., 2/-; 10mf., 3/-; 8.5 mf., 2/6.

MAINS Transformers. Premier, all have tapped primaries, C.T., L.T.'s and Engraved terminal Board. H.T.8 plus H.T.9, 2 L.T.'s, 10/-; Rectifier, 8/6 extra; H.T. 10, 2 L.T.'s, 10/-; Rectifier, 9/6 extra; 250 plus 250 60 m.a. 3 L.T.'s, 10/-; 350 plus 350 150 m.a. 3 L.T.'s, 12/6.

WESTERN ELECTRIC Manufacturers type 350 plus 350 60 m.a. 2 L.T.'s, 6/3; 350 plus 350 120 m.a. 3 L.T.'s, 9/6.

VARIABLE condensers. Premier, all brass, short wave, .00015 slow motion, 3/9; British Radio-phone, all brass, 2-gang, .00015 each section, 5/6; Ormond, .00025, 1/6; Polar, all brass, .0005 slow motion, 3/11; Lissen 2-gang, .0005, front trimmer, disc drive, 5/11; Utility 3-gang fully screened, trimmers and disc drive, 7/6.

BAKELITE reaction condensers, .00015, .00035, .0001, .0003, .0005, 9d.

LISSEN 3-gang, superhet coils, 6/-; Iron core coils with circuit, 2/11 each; Varley band-pass aerial coils, B.P.5 type, 2/9; ditto band-pass transformer, B.P.8, 2/6.

H.F. Chokes Premier screened, 1/6; Premier short-wave, 9d.; pre-sets, any value, 6d.

PREMIER smoothing chokes, 25 m.a., 20 henries, 2/9; 40 m.a. 40 henries, 4/-; 60 m.a. 40 henries, 5/6; 150 m.a., 50 henries, 10/6; 60 m.a., 80 henries, 2,500 speaker replacement, 5/6.

PREMIER auto transformer 100/200-250 and vice versa, 100 watt, 10/-; 50 watt, 7/-.

CLARION S.M. drives, moving light, 2 inch knob for short waves, 2/-.

## PREMIER SUPPLY STORES

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WOBURN RADIO offer following lines:—

W.R.C. Short-Wave Condensers, .0001, .00015, .00016, .0002, .00025, .0003, .0005, all with slow and fast drive, 2/- each. Ormond two-piece dial for same 1/-.

W.R.C. Short-Wave Coils, 13-22 metres, 20-44 m., 40-90 m., 2/8 each, set of three 7/6. Four-pin type to fit standard holder. S.W. Chokes, 10-100 metres, 10d. Pye S.W. valve holders, 6d. Erie Resistances, all values to 2 meg., 6d. Plessy Resistances, ½-watt mixed values, 3/- dozen.

GROSVENOR 4v. A.C. Bandpass Sets, 1936 model, made by Ever Ready, Mullard Valves, iron cored coils, Rola Speaker, in original cartons, listed 12 gns. £6 10s. 0d., carriage forward.

WATES Rotary Converter, 230 v. D.C. input, 230v. 60 watts A.C. output, brand new, £2 5s. 0d. Few only Wates 6-valve chassis, complete with valve holders, switch, and terminal strip, 2/- each. Coils for same, Bandpass, 2/- per set.

ALL goods as offered last week.

ELECTRIC soldering irons, 200-250v., boxed complete with flex and adaptor, copper bit, 1/11, post 6d.

W.R.C. Eliminators. Guaranteed 12 months. 150v. 30 m.a. Three positive H.T. Tappings. Westinghouse rectifiers. A.C. Model, 21/-. A.C. and trickle charger, 2v. ½ amp., 32/6, carriage 1/- extra.

TRADE enquiries invited.

WOBURN RADIO CO., 9, Sandland Street, Holborn, W.C.1.

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FERGUSON Universal Midget Receiver for AC/DC., 100-250 Volts. Moving Coil Speaker. Wonderful tone and outstanding selectivity. Limited number. 65/- Car. Paid. Send for latest list, hundreds of other Bargains. Pearl and Pearl, 190, Bishopsgate, London, E.C.2.

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### 1,000 SENSATIONAL CLEARANCE BARGAINS!

**60/70 per cent. Discounts on thousands of genuine offers. Accessories, 21/- Microphones, 1/9; 100/1 transformers, 1/6; L.F. Transformers, 1/2; H.M.V. 3 and 4-gang condensers, 2/11; Amplion D.R. Coils, 11d.; KITS, metal chassis, blue-prints, valves. Band Spread Short-Wave III, 25/-; Ditto, S.W. Adaptor, 12/6. 50 ONLY, 4v. A.C./D.C. chassis, complete with valves, 49/6. ORDER EARLY. Just a few of thousands of bargains, comprising largest selection of bargain-priced radio goods available.**

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This coupon is available until November 9, 1935, and must be attached to all letters containing queries.

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### ANNOUNCES

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RADIOMART.—Igranic tapered potentiometers, ½ meg., 1 meg., with 3-point switch; 2/-.

RADIOMART.—Lissen 3-gang bandpass superhet coils, 6/-; Lissen latest (L.N.5155) screen grid 2-gang coils, 5/11.

RADIOMART Famous All-wave Skyscraper 2-gang coils, 12-2,000 metres, switched and screened, full circuit diagram; 12/6.

RADIOMART.—Utility 2-gang 0.0005 Uniknob with large disc drive, 3/11; ditto, single with disc, 2/3.

RADIOMART.—British Radiophone, fully screened 2-gang 0.0005, top trimmers, latest compact type; 5/11.

RADIOMART.—Radiophone 3-gang as above, straight or superhet, 7/6; Utility ditto, 5/9.

RADIOMART.—British Radiophone 2-gang, as above but fitted Uniknob trimming, straight line dial; 9/6.

RADIOMART.—Latest Lucerne Station straight line dials, oxidised escutcheon; 3/11.

RADIOMART.—Utility Midget 2-gang superhet, 3/3; Polar 2-gang straight, with drive 3/11; both screened with trimmers.

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RADIOMART.—Non-inductive tubulars, 1,500v., 0.01, 0.02, 0.04, 0.05, 0.1in., 6d.; 0.2, 0.25, 8d.; 0.5, 9d.

RADIOMART.—Short-wave H.F. chokes, 9d.; *Wireless World* states: "Very efficient 100 to below 10 metres."

RADIOMART.—Bakelite variable, Readyradio, 0.0003, 0.0005, 9d.; Lotus 0.0003, Utility 0.0003, 0.0005, 1/-.

RADIOMART.—Useful 2 gross packets assorted round-head wood screws, 9d.; solder tags, 6d.

RADIOMART.—1¼in. ribbed short-wave coil forms; valve holder type, loloss, 4-pin 1/6; 6-pin 1/9; threaded for winding 2d. extra.

RADIOMART.—Lissen 30 hy. 40 m.a. chokes, 2/-; ditto 60 m.a., 2/11; Lissen eliminator chokes, 1/3.

RADIOMART.—Bayliss 20 hy. smoothing chokes, 3/11; Ferranti A.F.5, boxed, 15/-; Lissen Hypernik, 10/6 transformers, 3/6.

RADIOMART.—Pushback, the wire used by set makers, ready tinned and sleeved; 6yd. 6d.

RADIOMART.—Telsen 7/6 Radiogrand transformers, 3-1, 5-1, 3/6; Centralab ½ meg. potentiometers, 1/6.

RADIOMART.—T.C.C. electrolytics, 6 mfd.; 10 mf. 25v. 6d., 6 mf. 50v. 9d.; 15 mf. 100v. 1/-.

RADIOMART.—Electrolytics N.S.F., 8×8 mfd., 500v. working, 3/6; N.S.F. 4 mf., 1/11; Dubilier 8 mf. 500v., 2/11.

RADIOMART.—Climax binocular all-wave chokes, 1/11; Metvick R.F.C., 9d.; resincored solder, 9ft., 6d.

RADIOMART.—Bellinglee 6-way battery leads, complete plugs, 4d.; Bellinglee safety mains plug and socket, 6d.

RADIOMART.—Insulated terminals, Bellinglee, black, Telsen, red, black, 1d.; Telsen 0.0003 presets, 9d.

RADIOMART.—Fuses, Telsen, ½ amp., 1 amp., 3 amp., 2d.; Telsen 100 m.a., 2d.

RADIOMART.—Brand new EDC converters, cost £7, input 6 or 12 volt, output 240 v. 40 m.a. Ideal portable amplifiers, transmitters, caradio or battery set with large output, 37/6.

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